Francis Xavier Engineering College

(An Autonomous Institution)
Tirunelveli 627003
Tamil Nadu India

Department of Artificial Intelligence and Data Science

Curriculum and Syllabi–R2021-UG

CHOICE BASED CREDITSYSTEM AND OBE

6TH BOARD OF STUDIES

Francis Xavier Engineering College

(An Autonomous Institution)Tirunelveli 627003 Tamil Nadu India

Department of Artificial Intelligence and Data Science

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VI BOARD OF STUDIES

Vision of the Department

To impart **quality education** and produce high quality, creative and **ethical engineers**,**in still professionalism**, enhance students' problem-solving skills in the domain of artificial intelligence and data science with a focus to prepare them for the industry, engage them inpotential research areas, to pursue and have continued professional growth to serve the **greater cause of society**.

Mission of the Department

To provide skill-based education to master the students in problem solving and analytical skills to enhance their niche expertise in the field Artificial Intelligence and Data Science. To educate the students with latest technologies to update their knowledge in the field of AI and Data science. To enable students to experience content-based learning with premier quality data science Education, research, industrial collaboration and to become an successful entrepreneur recognized globally. To guide students in research

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Programme Educational Outcomes(PEOs)

PEO1 To Formulate, analyze and solve Engineering problems with strong foundation in Mathematical, Scientific, Engineering fundamentals and modern computing Practices through advanced curriculum.

PEO2 Analyze the requirements, realize the technical specification and design the Engineering solutions by applying Artificial Intelligence and Data Science theory and principles.

PEO3 Demonstrate technical skills, competency in AI and DS and promote collaborative learning and teamwork spirit through multi-disciplinary projects and diverse professional activities.

PEO4 Equip the graduates with strong knowledge, competence and soft skills that allows them to contribute ethically to the needs of society and accomplish sustainable progress in the emerging computing technologies through life-long learning.

Programme Specific Objectives(PSOs)

PSO_1 Implement Artificial Intelligence and datascience techniques such as search algorithms, neural networks, machinelearning and data analytics for solving a problem and designing novel algorithms for successful career.

PSO_2 Apply the skills in the areas of health care, education, agriculture, intelligent transport, environment, smart systems and in the multi-disciplinary area of Artificial Intelligence And Data Science.

PSO_3 Graduates will acquire practical competency with emerging technologies and open Source platforms related to areas of Artificial Intelligence and Data Science to become a successful Entrepreneur.

Programme Outcomes(POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify,formulate,review research literature,andanalyze complex engineering problems reaching substantiated conclusions using first

principles of mathematics,naturalsciences,and engineering sciences.

3. Design/developmentofsolutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal,and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge andresearch methods including design of experiments, analysis and interpretation of data, andsynthesisoftheinformationtoprovidevalid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, andmodernengineeringandITtoolsincludingpredictionandmodelingtocomplexenginee ring activitieswithan understandingofthelimitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilitiesrelevant totheprofessional engineeringpractice.

7. Environmentandsustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts,and demonstrate the knowledge of,and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member orleader in diverse teams,and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a membe rand leader in a team,to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Mapping with PO Vs PEO, PSO

PO	PEO1	PEO2	PEO3	PEO4
1		3		
2		3		
3		1	3	3
4	3	1		
5				1
6			1	2
7				3
8	1			1
9	1			
10	2			
11	2			
12	1	2	3	
PSO1	3		2	
PSO2	3	3	2	2
PSO3		3	3	2

FRANCIS XAVIER ENGINEERING COLLEGE

B.TECH. – Artificial Intelligence and Data Science

REGULATIONS 2021

Choice Based Credit System and Outcome Based Education

SUMMARY OF CREDIT DISTRIBUTION

S.No	Category	Credits Per Semester								Total Credits	Credits in %
		I*	II*	III	IV	V	VI	VII	VIII		
1	HSSM	3	2	1	4			3		13	7.9
2	BS	12	4	4	4					24	14.5
3	ES	5	13	4						22	13.3
4	PC			14	15	12	12	5		58	35.2
5	PE					6	6	6		18	11
6	OE					3	3	6		12	7.2
7	EEC			1	1	1	3	2	10	18	10.9
Total		20	19	24	24	22	24	22	10	165	100

Minimum Number of Credits to be Acquired: 165*

HSSM - Humanities and Social Sciences including ManagementBS -

Basic Science

ES - Engineering

SciencesPC -

Professional Core

PE - Professional Elective

OE – Open Elective/Programme Specific Elective for Expandable

ScopeEEC - Employability Enhancement Course

FRANCIS XAVIER ENGINEERING COLLEGE

B.TECH.–Artificial Intelligence and Data Science

REGULATIONS2021

Choice Based Credit System and Outcome Based Education

I-VIIISemester Curricula and Syllabi

SEMESTER-I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA1201	Matrices and Advanced Calculus	BS	4	3	1	0	4
2	21PH1301	Physics for Engineers	BS	3	3	0	0	3
3	21CY1401	Engineering Chemistry	BS	3	3	0	0	3
4	21CS1501	Problem Solving and Logical Thinking using C.	ES	3	2	1	0	3
Theory cum Practical Courses								
1	21HS1101	English for Professional Communication	HSSM	4	2	0	2	3
Practical Courses								
1	21PY1311	Physics and Chemistry Lab	BS	4	0	0	4	**2**
2	21CS1511	Programming Practice Lab using C	ES	4	0	0	4	**2**
Total				**25**	**13**	**2**	**10**	**20**

SEMESTER II

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
TheoryCourses								
1	21HS2101	English for Technical Communication	HSSM	2	2	0	0	2
2	21MA2201	Partial Differential Equation and Application of Fourier Series	BS	**4**	3	1	0	4
3	21EE2503	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	**3**
Theory cum Practical Courses								
1	21CS2501	Introduction to Computing using Python	ES	5	3	0	2	**4**

2	21ME1513	Computer Aided Engineering Graphics	ES	5	3	0	2	**4**
Practical Courses								
1	21EE2511	Fundamentals of Electrical and Electronics Engineering Lab	ES	4	0	0	4	**2**
Mandatory Courses								
1	21GE2M01	Indian Constitution and Cultural Heritage*	MC	2	2	0	0	**0**
			Total	25	16	1	8	19

* This Course is applicable only for the students admitted in 2021-2022 & 2022-2023Academic Year

SEMESTERIII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA3205	Probability &Statistics	BS	4	3	1	0	4
2	21IT3501	Digital Principles and System Design	ES	4	3	1	0	4
3	21AI3601	Artificial Intelligence and Expert Systems	PC	3	3	0	0	3
4	21AI3602	Data Science Essentials	PC	3	3	0	0	3
Theory cum Practical Courses								
1	21A13603	Data Structures	PC	5	3	0	2	4
Practical Courses								
1	21AI3611	Artificial Intelligence lab	PC	4	0	0	4	2
2	21AI3612	Data Science lab	PC	4	0	0	4	2
3	21PT3902	Soft Skills-Verbal Ability	EEC	2	0	0	2	1
Mandatory Courses								
1	21HS1103	**TAMIL HERITAGE**	HSSM	1	1	0	0	**1**
			Total	30	16	2	12	24

*This course is applicable for students admitted from 2021-2022 Academic year

SEMESTERIV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS3101	Ethics and values	HSSM	3	3	0	0	3
2	21MA4201	Discrete Mathematics	BS	4	3	1	0	4
3	21CS3601	Computer Architecture	PC	3	3	0	0	3
4	21AI4601	Data Analytics	PC	3	3	1	0	4
5	21CS4602	Design and Analysis of algorithms	PC	3	3	0	0	3
Theory cum Practical Courses								
1	21CS4604	Operating System Concepts	PC	4	2	0	2	3
Practical Courses								
1	21AI4611	Data Analytics Laboratory	PC	4	0	0	4	2
2	21PT3901	SoftSkills–Aptitude1	EEC	2	0	0	2	1
Mandatory Courses								
1	21GE2M02	Environmental and Sustainable Engineering	MC	2	2	0	0	0
2	21HS2103	**TECHNOLOGY IN TAMIL CULTURE**	HSSM	1	1	0	0	**1**
			Total	29	20	2	8	24

*This course is applicable for students admitted from 2021-2022 Academic year

SEMESTERV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS5602	Computer Networks	PC	3	3	0	0	3
2	21CS4601	Database Management Systems	PC	3	3	0	0	3
3		Professional Elective –I	PE	3	3	0	0	3
4		Professional Elective– II	PE	3	3	0	0	3
5		Open Elective I	OE	3	3	0	0	3
Theory cum Practical Courses								
1	21IT3602	Object Oriented Programming with Java	PC	5	3	0	2	4
Practical Courses								
1	21CS4611	Database Management Systems Laboratory	PC	4	0	0	4	2
2	21PT3904	Soft Skills–Reasoning	EEC	2	0	0	2	1
			Total	26	18	0	8	22

SEMESTERVI

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21AI6601	Robotic Process Automation	PC	3	3	0	0	3
2	21AI6602	Machine Learning Techniques	PC	3	3	0	0	3
3		Open Elective–II	OE	3	3	0	0	3
4		Professional Elective – III	PE	3	3	0	0	3
5		Professional Elective – IV	PE	3	3	0	0	3
Theory cum Practical Courses								
1	21AI6603	Cloud Computing and Big Data Analytics	PC	5	3	0	2	4
Practical Courses								
1	21AI6611	Machine learning Laboratory	PC	4	0	0	4	2
2	21PT3903	Soft Skills-Aptitude II	EEC	2	0	0	2	1
3	21AI6911	Project Work Phase–I/Internship	EEC	4	0	0	4	2
			Total	30	17	0	12	24

SEMESTERVII

S.NO	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21AI7601	Deep Learning	PC	3	3	0	0	3
2	**21HS4101**	Principles of Management	HSSM	3	3	0	0	3
3		Professional Elective– V	PE	3	3	0	0	3
4		Professional Elective–VI	PE	3	3	0	0	3
5		Open Elective–III	OE	3	3	0	0	3
6		Open Elective–IV	OE	3	3	0	0	3
Practical Courses								
1	21AI7611	Deep learning Laboratory	PC	4	0	0	4	2
2	21AI7912	Business Analytics with Power BI	EEC	4	0	0	4	2
			Total	26	18	0	8	22

SEMESTERVIII

S.NO	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Practical Courses								
1	21AI8911	Project Work Phase–II/Start-up/Internship cum Project	EEC	20	0	0	20	10
			Total	20	0	0	20	10

Minimum Number of Credits to be Acquired: 165

List of Humanities and Social Sciences Including Management (HSSM) Courses

S.NO	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS2101	English for Technical Communication	HSSM	2	2	0	0	2
2	21HS3101	Ethics and values	HSSM	3	3	0	0	3
3	21HS4101	Principles of Management	HSSM	3	3	0	0	3
4	21HS1103	TAMIL HERITAGE □□□□□□ □□□□	HSSM	1	1	0	0	**1**
5	21HS2103	TECHNOLOGY IN TAMIL CULTURE □□□□□□□□ □□□□□□□□□□□□□□□	HSSM	1	1	0	0	**1**
Theory cum Practical Courses								
1	21HS1101	English for Professional Communication	HSSM	4	2	0	2	3

List of Basic Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA1201	Matrices and Advanced Calculus	BS	4	3	1	0	4
2	21PH1301	Physics for Engineers	BS	3	3	0	0	3
3	21CY1401	Engineering Chemistry	BS	3	3	0	0	3
4	21MA2201	Partial Differential Equation and Application of FourierSeries	BS	**4**	3	1	0	4
5	21MA3205	Probability & Statistics	BS	4	3	1	0	4
6	21MA4201	Discrete Mathematics	BS	4	3	1	0	4
Practical Courses								
1	21PY1311	Physics and Chemistry Lab	BS	4	0	0	4	**2**

List of Engineering Science Courses

S. No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS1501	Problem Solving and Logical Thinking using C.	ES	3	2	1	0	3
2	21EE2503	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	**3**
3	21IT3501	Digital Principles and System Design	ES	4	3	1	0	4
Theory cum Practical Courses								
1	21ME1513	Computer Aided Engineering Graphics	ES	5	3	0	2	4
2	21CS2501	Introduction to Computing using Python	ES	5	3	0	2	4
Practical Courses								
1	21CS1511	Programming Practice Lab using C	ES	4	0	0	4	**2**
2	21EE2511	Fundamentals of Electrical and Electronics Engineering Lab	ES	4	0	0	4	**2**

List of Employability Enhancement Course

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Practical Courses								
1	21PT3902	Soft Skills-Verbal Ability	EEC	2	0	0	2	1
2	21PT3901	Soft Skills–Aptitude I	EEC	2	0	0	2	1
3	21PT3904	Soft Skills–Reasoning	EEC	2	0	0	2	1
4	21PT3903	Soft Skills–Aptitude II	EEC	2	0	0	2	1
5	21AI6911	Project Work Phase–I/Internship	EEC	4	0	0	4	2
6	21AI6912	Internship	EEC					
7	21AI7912	Business Analytics with Power BI	EEC	4	0	0	4	2
8	21AI8911	Project Work Phase–II/Start-up/Internship cum Project	EEC	20	0	0	20	10

List of Professional Electives Courses

S.NO	Course Code	Course Name	Semester	L	T	P	C	Stream/Domain
Professional Elective I								
1.	21IT7716	Game Programming	5	3	0	0	3	AI

2.	21AI5701	Data Acquisition	5	3	0	0	3	Data Science
3.	21CS5603	Internet Programming	5	3	0	0	3	Networking
4.	21AI5702	AI Enhanced Software Engineering	5	3	0	0	3	Software Engineering
5.	21CS5701	Computer Graphics	5	3	0	0	3	Image Processing
6.	21CS5601	Theory of Computation	5	3	0	0	3	Computation and Programming
7.	21CS5703	IoT and its Applications	5	3	0	0	3	Recent Trends
Professional Elective II								
1.	21AI5703	Fuzzy Logic	5	3	0	0	3	AI
2.	21AI5704	Health Care Analytics	5	3	0	0	3	Data Science
3.	21IT6712	Wireless Communication	5	3	0	0	3	Networking
4.	21CS5702	Object Oriented Analysis and Design	5	3	0	0	3	Software Engineering
5.	21CS5808	Principles of Multimedia	5	3	0	0	3	Image Processing
6.	21CB5708	Web Technologies	5	3	0	0	3	Computation and Programming
7.	21AI5705	Drone Technology	5	3	0	0	3	Recent Trends
Professional Elective III								
1.	21AI6701	Java programming for AI	6	3	0	0	3	AI
2.	21IT6708	Data Wrangling	6	3	0	0	3	Data Science
3.	21CS7708	5G COMMUNICATIONS	6	3	0	0	3	Networking
4.	21IT6707	Software Project Management	6	3	0	0	3	Software Engineering
5.	21AI6702	Image Processing and pattern Recognition	6	3	0	0	3	Image Processing

6.	21CS6601	Compiler Design	6	3	0	0	3	Computation and Programming
7.	21CS7709	Block Chain Technologies	6	3	0	0	3	Recent Trends
Professional Elective IV								
1.	21AI6703	Machine Learning Operations (Industry Supported Course)	6	2	0	1	3	AI
2.	21AI6704	Recommendation systems	6	3	0	0	3	Data Science
3.	21IT7704	Wireless Adhoc and Sensor Networks	6	3	0	0	3	Networking
4.	21IT7713	Software Testing and tools	6	3	0	0	3	Software Engineering
5.	21CS5704	Virtual and Augmented Reality	6	3	0	0	3	Image Processing
6.	21CS7710	FullStack Application Development	6	3	0	0	3	Computation and Programming
7.	21IT6711	Quantum Computing	6	3	0	0	3	Recent Trends
Professional ElectiveV								
1.	21AI7701	Computer Vision	7	3	0	0	3	AI
2.	21AI7702	Sentiment Analysis	7	3	0	0	3	Data Science
3.	21AI7703	High Performance Networks	7	3	0	0	3	Networking
4.	21AI7704	Management Information System	7	3	0	0	3	Software Engineering
5.	21AI7705	Image and Video Analytics	7	3	0	0	3	Image Processing
6.	21CS7712	Information Security	7	3	0	0	3	Computation and Programming
7.	21CS7714	Cyber Forensics and its tools	7	3	0	0	3	Recent Trends
Professional Elective VI								
1.	21AI7706	Speech and Language Processing	7	3	0	0	3	AI
2.	21AI7707	Knowledge Engineering and Expert System	7	3	0	0	3	Data Science
3.	21CS7602	Cryptography and Network Security	7	3	0	0	3	Networking

4.	21CS6708	Agile Software Development	7	3	0	0	3	Software Engineering
5.	21AI7708	Human Computer Interaction	7	3	0	0	3	Image Processing
6.	21CB6706	Mobile Application Development	7	3	0	0	3	Computation and Programming
7.	21AI7709	Cognitive Science and Analysis	7	3	0	0	3	Recent Trends

List of Open Electives Courses

S.No	**Course Code**	**Course Name**	**Sem**	**L**	**T**	**P**	**C**	**Track**
Open Elective I								
1	21AI5801	Data Analytics tools and Techniques	5	3	0	0	3	Data Analytics
2	21AI5802	Data Science for Business	5	3	0	0	3	Business Intelligence
3	21AI5803	Introduction to Data science	5	3	0	0	3	Data Science
4	21AI5804	Introduction to Artificial Intelligence	5	3	0	0	3	Artificial Intelligence
5	21AI5805	Machine learning for Engineers	5	3	0	0	3	Machine Learning
Open Elective II								
1	21AI6801	Engineering Data Analytics	6	3	0	0	3	Data Analytics
2	21AI6802	Data Visualization for Engineers	6	3	0	0	3	Business Intelligence
3	21AI6803	Big data tools	6	3	0	0	3	Data Science
4	21AI6804	Introduction to Data Mining	6	3	0	0	3	Artificial Intelligence
5	21AI6805	Introduction to Deep Learning	6	3	0	0	3	Machine Learning

Open Elective III								
1	21AI7801	Modern Data management Principles	**7**	3	0	0	3	Data Analytics
2	21AI7802	Artificial Intelligence in Business	**7**	3	0	0	3	Business Intelligence
3	21AI7803	Introduction to R for Data Science	**7**	3	0	0	3	Data Science
4	21AI7804	Soft computing	**7**	3	0	0	3	Artificial Intelligence
5	21AI7805	AI and Robotics	**7**	3		0	3	Machine Learning
Open Elective IV								
1	21AI7806	Introduction to Predictive Analytics	**7**	3	0	0	3	Data Analytics
2	21AI7807	Business Analytics	**7**	3	0	0	3	Business Intelligence
3	21AI7808	ETL Tools	**7**	3	0	0	3	Data Science
4	21AI7809	AI in health care	**7**	3	0	0	3	Artificial Intelligence
5	21AI7810	Intelligent Automation	**7**	3	0	0	3	Machine Learning

List of Professional Core Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21AI3601	Artificial Intelligence and Expert Systems	PC	3	3	0	0	3
2	21AI3602	Data Science Essentials	PC	3	3	0	0	3
3	21CS4603	Computer Architecture	PC	3	3	0	0	3
4	21AI4601	Data Analytics	PC	3	3	1	0	4
5	21CS4602	Design and analysis of algorithms	PC	3	3	0	0	3
6	21CS5601	Computer Networks	PC	3	3	0	0	3
7	21CS4601	Database Management Systems	PC	3	3	0	0	3
8	21AI6601	Robotic Process Automation	PC	3	3	0	0	3
9	21AI6602	Machine Learning Techniques	PC	3	3	0	0	3
10	21CS3602	Software Engineering	PC	3	3	0	0	3
11	21AI7601	Deep Learning	PC	3	3	0	0	3

Theory cum Practical Courses								
1	21AI3603	Data Structures	PC	5	3	0	2	4
2	21CS4604	Operating System Concepts	PC	4	2	0	2	3
3	21IT3602	Java Programming	PC	5	3	0	2	4
4	21AI6603	Cloud Computing and Big Data Analytics	PC	4	2	0	2	3
Practical Courses								
1	21AI3611	Artificial Intelligence Lab	PC	4	0	0	4	2
2	21AI3612	Data Science Lab	PC	4	0	0	4	2
3	21AI4611	Data Analytics Laboratory	PC	4	0	0	4	2
4	21CS4611	Database Management Systems Laboratory	PC	4	0	0	4	2
5	21AI6611	Machine learning Laboratory	PC	4	0	0	4	2
6	21AI7611	Deep Learning Laboratory	PC	4	0	0	4	2

List of Minor Courses

Sl.No	**Course code**	**Course Name**	**Sem**	**L**	**T**	**P**	**C**	**Offered By**
1.	21AI4S01	Predictive Business Analytics	4	3	1	0	4	AI&DS
2.	21AI5S01	Business Intelligence Tools	5	3	0	2	4	AI&DS
3.	21AI6S01	Big Data Analytics For Business	6	3	0	0	3	AI&DS
4.	21AI7S01	Artificial Intelligence for Business	7	3	0	0	3	AI&DS
5.	21AI8S01	Project Work	8	0	0	0	4	AI&DS

List of Value Added Courses

S.No	Course Code	Course Name	Contact Periods	L	T	P	C
1	21AI4V01	Data Exploration and Visualization	4	0	0	4	2
2	21AI6V01	NLP Application using Python	4	0	0	4	2

List of skill Based Value Added courses

Batch 2022-2026

S.No	Course Code	Course Name	Contact Periods	L	T	P	C
1.	21AI2V01	Contemproary Coding Techniques	2	0	0	2	1
2.	21AI3V01	Advanced Python Programming	2	0	0	4	2
3.	21AI4V01	AI&ML Model Deployment	2	0	0	4	2
4.	21AI5V01	Computer Vision Using Open CV	2	0	0	4	2

Batch 2023-2027

S.No	Course Code	Course Name	Contact Periods	L	T	P	C
1.	21AI2V01	Data Reporting with EXCEL and SAS	2	0	0	2	1
2.	21AI3V01	Advanced Python Programming	2	0	0	4	2
3.	21AI4V01	AI&ML Model Deployment	2	0	0	4	2
4.	21AI5V01	Computer Vision Using Open CV	2	0	0	4	2

Semester I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA1201	Matrices and Advanced Calculus	BS	4	3	1	0	4
2	21PH1301	Physics for Engineers	BS	3	3	0	0	3
3	21CY1401	Engineering Chemistry	BS	3	3	0	0	3
4	21CS1501	Problem Solving and Logical Thinking using C.	ES	3	2	1	0	3
Theory cum Practical Courses								
1	21HS1101	English for Professional Communication	HSSM	4	2	0	2	3
Practical Courses								
1	21PY1311	Physics and Chemistry Lab	BS	4	0	0	4	**2**
2	21CS1511	Programming Practice Lab using C	ES	4	0	0	4	**2**
Total				**25**	**13**	**2**	**10**	**20**

21MA1201	**MATRICES AND ADVANCED CALCULUS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Preamble:

The course consists of topics in Matrices, Differential calculus, Integral calculus, Differential Equations and Vector calculus with applications to various engineering problems. This course will cover the following main topics: Cayley Hamilton Theorem, Linear differential equations of second order with constant coefficients, Methods of Variation parameter, Taylor's expansion of two variables, Maxima and Minima for two variables, Area and Volume in a multiple integrals, Green's theorem and Gauss divergence theorem.

Prerequisites for the course:

Students should have basic knowledge about matrices, differentiation and integration

Objectives

1. To apply advanced matrix knowledge to Engineering problems
2. To familiarize with the applications of differential equations.
3. To familiarize with the functions of several variables
4. To have Knowledge in Multiple integrals
5. To improve their ability in Vector calculus.

UNIT I	**MATRICES**	**9+3**

Matrices - Characteristic equation – Eigen values and Eigen vectors of a symmetric and non symmetric matrix – Properties of Eigen values and Eigen vector – Cayley – Hamilton theorem and its applications

SUGGESTED EVALUATION METHODS: ● Tutorial Problems on Eigen values , Eigen Vectors and Cayley Hamilton Theorem and Add MATLAB and for application Add Power method to find Eigen value & Eigen vector		
UNIT II	**ORDINARY DIFFERENTIAL EQUATIONS**	**9+3**
Differential Equations – Complementary Function – Particular Integral - Linear equations of second order with constant coefficients of types exponential, trigonometry, polynomial and its combination forms - Methods of Variation of parameter - Engineering Applications.		
SUGGESTED EVALUATION METHODS: ● Tutorial Problems on Linear differential equations of different types and Method of Variation parameters.		
UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**9+3**
Function of two variables – Partial derivatives – Taylor's expansion for two variables – Maxima and Minima for two variables – Jacobians of two and three variables – Euler's theorem for homogeneous function.		
SUGGESTED EVALUATION METHODS: ● Tutorial Problems on Taylor's series, Jacobians, Maxima and Minima for two variables		
UNIT IV	**MULTIPLE INTEGRALS**	**9+3**
Definite Integrals – Properties of definite integrals - Double integration in Cartesian coordinates – Area as a double integral in Cartesian coordinates – Triple integration in Cartesian coordinates – Volume as a Triple Integral		
SUGGESTED EVALUATION METHODS: ● Tutorial Problems on Area , Triple integration and Volume		
UNIT V	**VECTOR CALCULUS**	**9+3**
Vector dot product and Vector cross product - Gradient, divergence, curl – Solenoidal and irrotational fields –Unit normal vector - Angle between two surfaces - Directional derivatives – Green's theorem, Gauss divergence theorem (without proof) – Engineering Applications.		
SUGGESTED EVALUATION METHODS: ● Tutorial Problems on Angle between two surfaces, Green's theorem, Gauss divergence theorem.		
Total Periods		**45 + 15 = 60 Periods**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive Questions	1.Assignment 2. Online Quizzes	**1. Descriptive Questions**

Outcomes

Upon completion of the course, the students will be able to:

CO1: Find the eigen values, eigen vectors, inverse and the positive powers of a square matrix (Apply)

CO2: Identify the suitable method to solve second and higher order differential equations (Apply)

CO3: Find the maxima and minima for a given function with several variables, through by finding stationary points (Apply)

CO4: Compute area and volume using double and triple integration. (Apply)

CO5: Apply the concepts of Differentiation and Integration to Vectors. (Apply)

Text Books

1. B. S. Grewal, " Higher Engineering Mathematics", 43rd edition, 2017.
2. James Stewart, Calculus – Early Transcendals, 8th Edition, 2016.

Reference Books

1. A Textbook of Engineering Mathematics(Dr. A.P.J. Abdul Kalam Technical University, Lucknow) (For . Gautam Bhudh technical Universities ,Lucknow) January 2020
2. K. Ganesan, Sundarammal Kesavan, K. S. Ganapathy Subramanian & V. Srinivasan, "Calculus and Solid Geometry", Revised Edition, 2017

Web Resources

1. https://youtu.be/hbk01uhgsos
2. https://archive.nptel.ac.in/content/storage2/111/105/111105122/MP4/mod01lec01.mp4
3. Eigen values and eigen vectors - https://youtu.be/h5urBuE4Xh
   Cayley Hamilton theorem -https://youtu.be/WROFJ15hk00
4. ODE - https://youtu.be/Im242eBqaxw
5. Functions of several variables -https://youtu.be/PA82F91e1vs
6. Integration - https://youtu.be/bVui07yHjzE,
   Multiple integrals -https://youtu.be/3BbrC9JcjOU
   Volume as Triple integral - https://youtu.be/w_KiHgultbM
7. Vector calculus - https://youtu.be/v3ZC4Mo1fS0i
   Gauss divergence theorem https://youtu.be/U9LDcmKUGS0

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	1			1	1			1			
2	3	2	1	1				1	1			1			
3	3	2	1	1				1	1			1			
4	3	2	1	1				1	1			1			
5	3	2	1	1				1	1			1			

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1) : (Apply)

1) Compute the eigen values and eigen vectors for the Symmetric matrix A = $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

2) Find A^{-1} and A^4 using Cayley Hamilton Theorem for the matrix A= $\begin{bmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{bmatrix}$.

COURSE OUTCOME 2 (CO 2) : (Apply)

1) Solve $(D^2 - D + 1)y = \sin 2x + e^{-4x}$

2) Solve $(D^2 + a^2)\, y = \tan ax$ by using method of variation of parameters.

COURSE OUTCOME 3(CO 3) : (Apply)

1. Find the extreme values of the function $f(x, y)$= $x^3 + y^3 - 12x - 3y + 20$.
2. Calculate the maxima and minima of the function $f(x, y) = x^3y^2$ (1-x-y).

COURSE OUTCOME 4(CO 4) : (Apply)

1)Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

2) Find $\int_0^a \int_0^b \int_0^c xyz\, dz\, dy\, dx$

COURSE OUTCOME 5(CO 5) : (Apply)

1. Find the directional derivative of $\emptyset = xy^2 + yz^3$at the point (2,-1,1) in the direction of $\vec{\imath} + 2\vec{\jmath} + 2\vec{k}$.
2. Using Green's theorem , find $\int_c (x^2 - y^2)dx + 2xydy$ where C is the boundary of the rectangle in the XOY-plane bounded by the lines $x = 0, x = a, y = 0, y = b$.
3. Verify Gauss divergence theorem for $\vec{F} = 4xz\vec{\imath} - y^2\vec{\jmath} + yz\vec{k}$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0$ and $z = 1$.

21PH1301	PHYSICS FOR ENGINEERS (Common to AI&DS, CSE, CSBS, IT, ECE & EEE)	L	T	P	C
		3	0	0	3

Preamble

This course aims in imparting fundamental knowledge in materials which are essential in understanding and explaining engineering devices.

Prerequisites for the course

Basic theoretical concepts of Physics in XI and XII.

Objectives

1. To impart knowledge about electrical properties of materials.
2. To acquire knowledge about Semiconductor Physics.
3. To enable the students to gain knowledge on magnetic properties.
4. To elucidate the optical properties under the concepts of optical devices.
5. To motivate the students towards the application of nanomaterials.

UNIT I	ELECTRICAL PROPERTIES OF MATERIALS	9

Classical free electron theory – Expression for electrical conductivity – Thermal conductivity– Wiedemann -Franz law –Merits and Demerits – Quantum theory - Fermi- Dirac statistics – Density of energy states.

UNIT II	SEMICONDUCTOR PHYSICS	9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors –Extrinsic semiconductors – N-type & P-type semiconductors – variation of Fermi level with temperature and impurity concentration – Hall effect and devices.

UNIT III	MAGNETIC PROPERTIES OF MATERIALS	9

Magnetism in materials – magnetic field and induction – magnetization – magnetic permeability and susceptibility– Classification of Magnetic materials– Domain Theory - M versus H behavior - Hard and Soft magnetic materials–examples and uses–Magnetic Principle in computer data storage - Magnetic Resonance Imaging.

UNIT IV	OPTICAL PROPERTIES OF MATERIALS	9

Classification of Optical Materials–carrier generation and recombination processes– Absorption, Emission and Scattering of light in metals, Insulators and Semiconductors – Solar cell–LED–Organic LED–Laser Diodes– Optical Data Storage Techniques.

UNIT V	NANO DEVICES	9

Quantum Confinement Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure –Band gap of nanomaterials –Tunneling: Single electron phenomena and single electron transistor- Quantum dot Laser- Carbon Nanotubes - Properties and Applications.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
Descriptive	1. Assignment 2. Online Quizzes 3. Problem-Solving Activities	Descriptive

Outcomes	
Upon completion of the course, the students will be able to :	
CO 1	Expound the basics of classical and quantum electron theories. **Understand**
CO 2	Acquire knowledge on basic semiconductor physics and its application in various devices. **Understand**
CO 3	Identify the properties of magnetic materials and their applications in data storage. **Understand**
CO 4	Understand the functions of optical materials for Optoelectronics. **Understand**
CO 5	Interpret quantum theory concepts & study the density of states for various Quantum Confinements. **Apply**

Text Books

1. **Dr. P. Mani,"Physics for Information Science",SreeDhanam Publisher, 2017**
2. Senthilkumar G, Murugavel S, "Physics for Information Science",VRB Publication, 2017-2018

Reference Books

1. Srinivasan.P, "Physics for Electronics Engineering". Vishnu Prints Media, 1st edition Jan 2018
2. Kasap, S.O., Principle of Electronic Materials and devices, Tata Mc-Graw Hill Education, 20 th reprint 2019.
3. Halliday, D., Resnick, R. & Walker, J. ―Principles of Physics‖. Wiley, 2015.
4. S. Salivahanan,A. Rajalakshmi"Physics for Electronics Engineering and Information Science" - Tata Mc-Graw Hill Education,29 January 2018.

Web Resources

1. UNIT 1 -https://www.britannica.com/science/Fermi-Dirac-statistics
2. UNIT 2- http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1
3. UNIT 3- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934330/
4. UNIT 4- http://www.explainthatstuff.com/how-oleds-and-leps-work.html
5. UNIT 1 TO 5- https://easyengineering.net/ph8253-physics-for-electronics-engineering/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	2	2					1					1		
2	2	2					1					1		
3	2	2					1					1		
4	2	2					1					1		
5	2	2	1				1					1		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10

UNDERSTAND	50	50	20	20	40
APPLY	40	40	20	20	50
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0
	100	**100**	**50**	**50**	**100**

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Expound the basics of classical and quantum electron theories. (Understand)

1.The thermal conductivity of copper at 300 K is 470.4 $Wm^{-1}K^{-1}$.Calculate the electrical conductivity of copper at 300 K. (Lorentz number = $2.45x10^{-8}$)

2.On the basis of classical free electron theory derive an expression for the electrical conductivity.

3.Explain fermi dirac distribution for electrons in a metal and discuss the effect of temperature on fermi function.

COURSE OUTCOME 2: Acquire knowledge on basic semiconductor physics and its application in various devices. (Understand)

1. Derive an expression for the number of electrons in the conduction band of an intrinsic semiconductor.

2. Show that for a n-type semiconductor the hall Coefficient is given by $RH=+\frac{1}{ne}$. Describe an experimental setup to measure the Hall voltage.

COURSE OUTCOME 3: Identify the properties of magnetic materials and their applications in data storage. (Understand)

1. Distinguish between dia, para,ferro,antiferro and ferrimagnetic materials
2. Write short notes on magnetic recording materials and discuss any one in detail.

COURSE OUTCOME 4: Understand the functions of optical materials for Optoelectronics. (Understand)

1. An LED emits green light of wavelength (λ) = 5511.11 A^0. Find out the value of E_g.
2. Explain the theory and working of LEDs. What are the different types of LED? Explain the advantages.
3. Explain the construction and working of solar cells.

COURSE OUTCOME 5: Interpret quantum theory concepts & study the density of states for various Quantum confinements. (Apply)

1. Using the concept of DOS (Density of State) expound the different quantum confinements.
2. Using the single electron transistor interrupts the phenomena of a single electron.
3. Show the variation using the density of states in nanostructures for different dimensions.

21CY1401	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

Preamble

To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like electrochemistry, corrosion prevention methods, significance of alloys, benefits of renewable energy sources, engineering materials, desalination etc., which enable them to develop abilities and skills that are relevant to the study and practice of engineering chemistry.

Prerequisites for the course

Basic theoretical concepts of Chemistry in higher secondary level.

Objectives

1. To inculcate sound understanding of water quality parameters and water treatment techniques.
2. To make the students familiar with the principles of electrochemistry and corrosion.
3. To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
4. To have a thorough understanding on the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills, fuel cells and supercapacitors .
5. To make the students learn the basics of polymer chemistry, composites and nanomaterials.

UNIT I	WATER AND ITS TREATMENT	9

Hardness of water – Types – Expression of hardness – Units – Estimation of hardness of water by EDTA –Municipal water treatment- Boiler troubles (scale and sludge) – Treatment of boiler feed water – Internal treatment (phosphate and calgon conditioning)-External treatment – Ion exchange process- Desalination of brackish water - Reverse Osmosis.

UNIT II	ELECTROCHEMISTRY AND CORROSION	9

Electrodes- types, Cells- types, Construction (Daniel cell) - Electrode potential- Photo electrochemical cell-working and applications – Nernst equation and its applications- Emf series & its applications.
Corrosion- Causes- Types- Chemical, Electrochemical corrosion (galvanic, differential aeration), Corrosion control – Material selection and design aspects – Electrochemical protection – Sacrificial Anode cathodic Protection method.

UNIT III	PHASE RULE AND ALLOYS	9

Phase rule: Introduction, definition of terms with examples, One component system -Water system - Reduced Phase rule - Two component systems - Lead-Silver system – Pattinson's process.
Alloys: Introduction- Properties of alloys- Significance of alloying, Nichrome and Stainless steel (18/8) – Heat treatment of steel - Annealing - Tempering - Normalising - Hardening and Quenching - Surface hardening methods - Carburising - Nitriding.

UNIT IV	ENERGY SOURCES AND STORAGE DEVICES	9

Nuclear fission - Nuclear fusion - Differences between nuclear fission and fusion - Nuclear chain reactions - Nuclear energy - Light Water Nuclear Power Plant - Solar energy conversion - Solar cells - Wind energy.

Batteries & Fuel cells: Types of batteries – Primary battery (dry cell) Secondary battery (lead acid battery) Lithium ion battery – Electric Vehicles – working principles, Fuel cells – H_2-O_2 fuel cell and microbial fuel cell; Supercapacitors: Storage principle, types and examples.

UNIT V	**ENGINEERING MATERIALS**	**9**

Polymers: Classification of Polymers – Preparation, properties and uses of Teflon and Nylon 6,6- Benefits and Applications. Composites: Introduction: Definition & Need for composites; Properties and applications of Polymer matrix composites and hybrid composites.

Nanomaterials: Types of nanomaterials;properties and uses of nanoparticle, nanocluster, nano rod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, chemical vapour deposition and electrochemical deposition methods. Applications of nanomaterials in medicine, agriculture, energy and electronics.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
WRITTEN TEST	ASSIGNMENT & ONLINE QUIZZES	WRITTEN TEST

Outcomes

Upon completion of the course, the students will be able to:

1	Infer the quality of water parameters from quality parameter data and propose suitable methodologies to treat water. (Understand)
2	Identify and apply the basic principles of electrochemistry, corrosion and corrosion control. (Apply)
3	Apply the knowledge of phase rule and alloys for material analysis. (Apply)
4	Recognise different forms of energy resources and apply them in suitable energy sectors. (Apply)
5	Identify and apply basic concepts of polymer science, composites and nanotechnology in designing the synthesis of materials for engineering and technology applications. (Apply)

Text Books

1. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2018 (Unit I,II,III,IV,V).

Reference Books

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2018.
4. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
5. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
6. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

Web Resources

1. NPTEL Course https://www.digimat.in/nptel/courses/video/121106014/L01.html
2. Mod-06 Lec-36 Fundamentals of Electrochemical Techniques https://www.youtube.com/watch?v=l2ENx_Y0dNU
3. Heat treatment of steel https://www.youtube.com/watch?v=3IQz9LAPuIA
4. Renewable energy resources https://youtu.be/mh51mAUexK4
5. Nanomaterials https://youtu.be/qUEbxTkPIWI

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	1		1	1					1		
2	3	2	2	1		1	1					1		
3	3	1	1	1		1	1					1		
4	3	2	2	1		1	1					1		
5	3	2	2	1		1	1					1		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to infer the quality of water parameters from quality parameter data and propose suitable methodologies to treat water. (Understand)

1. How is the exhausted resin regenerated in an ion exchanger?
2. Suggest your valuable ideas to protect the boiler from corrosion.

COURSE OUTCOME 2: Students will be able to identify and apply the basic principles of electrochemistry, corrosion and corrosion control**. (Apply)**

1. Compare the mechanisms involved in electrochemical cells and electrolytic cells.
2. How corrosion is prevented by sacrificial anode cathodic protection methods.

COURSE OUTCOME 3: Students will be able to apply the knowledge of phase rule and alloys

for material analysis**. (Apply)**

1. Illustrate phase, component and degree of freedom with example
2. Will stainless steel rust? Justify.

COURSE OUTCOME 4: Students will be able to recognise different forms of energy resources and apply them in suitable energy sectors. **. (Apply)**

1. Is it safe to utilize wind energy for domestic purposes? How are commercial wind farms developed and how can I get a wind farm on my property?
2. Critically analyze nuclear power technology in terms of environmental and health safety. Draw a general layout of the Light water nuclear reactor and explain its components.

COURSE OUTCOME 5: Students will be able to identify and apply basic concepts of polymer science, composites and nanotechnology in designing the synthesis of materials for engineering and technology applications. **(Apply)**

1. What do you feel the repercussions are for extended life through utilization of nanotechnology?
2. Give an account of the preparation properties and uses of Teflon and nylon 6,6.

21CS1501	**PROBLEM SOLVING AND LOGICAL THINKING USING C**	**L**	**T**	**P**	**C**
		2	**1**	**0**	**3**

Preamble

This course aims to provide the students with a foundation in computer programming. The focus is to develop the basic problem solving skills in students, and to improve their proficiency in applying the basic knowledge of programming to solve problems. This will enable the students to develop modular applications related to the field of engineering.

Prerequisites for the course

- NIL

Objectives

1. To learn the basic constructs of C Programming.
2. To learn arrays and strings concepts of C Programming.
3. To learn functions in C and use pointers for storing data in the main memory efficiently.
4. To learn structures and union concepts of C Programming
5. To learn file processing functions and further develop applications in C

UNIT I	**INTRODUCTION TO PROBLEM SOLVING AND BASICS OF C PROGRAMMING**	**10**

Introduction to Computer Software-Generations of programming languages- problem solving and logical thinking- Algorithm- Flowcharts - practical examples- Characteristics of C-uses of C- Structure of a 'C' program – Files used in C programs- Compiling and executing C programs - C Tokens- Character Sets in C- Keywords- Identifiers- Using comments in C

SUGGESTED ACTIVITIES

- Discussion on Logical and Algorithmic thinking
- Demonstration of concepts using Algorithms and Flowcharts

SUGGESTED EVALUATION METHODS

- Write basic programs in C based on algorithm and flowchart
- Quiz on problem solving and basics of C programming

UNIT II	DECISION CONTROL STATEMENTS AND ARRAYS	10

Data Types- Variables- Constants- Managing Input and Output operations in C- Operators and Expressions- Type Conversion- Type casting - Decision Making: Branching and Iterative statements- Nested Loops-break and continue statements- Arrays: Declaration, Initialization- Operations- One dimensional Arrays- Two Dimensional Arrays- Multidimensional Arrays.

SUGGESTED ACTIVITIES

- Demonstrate the use of data types and operators
- Comparison study on the types of decision making and looping statements
- Comparison study with examples on the types of arrays

SUGGESTED EVALUATION METHODS

- Demonstration of programs using Nested if and Nested loops
- Demonstration of programs using arrays and its operations
- Quiz on data types, operators, statements, loops and arrays

UNIT III	FUNCTIONS, STRINGS AND POINTERS	10

Functions: Declaration and prototyping- Definition- Types- Call and Return statement- Parameter passing methods- Recursion and types. Strings: String operations- Arrays of Strings –Pointers: Declaration- Definition- Pointer Arithmetic- Null pointers- Pointers and Arrays- Pointers and Functions- Pointers and Strings- Pointers to Pointers, Dynamic Memory Allocation

SUGGESTED ACTIVITIES

- Discussion on array of pointers, function pointers and array of function pointers
- Comparison study on the types of dynamic memory allocation
- Solve problems on pointers to arrays, pointers to functions and pointers to pointers

SUGGESTED EVALUATION METHODS

- Demonstration of programs using pre defined, user defined and recursive functions
- Demonstration of programs using String manipulation functions
- Quiz on basics of functions, strings and pointers

UNIT IV	STRUCTURE, UNION AND ENUMERATED DATA TYPES	8

Structure: Declaration and Initialization- Nested Structures- Array of Structures- Structures and functions- pointers to structures- Self-referential structures. Unions: Declaration and Initialization- Arrays of union variables- unions inside structures- Enumerated data types

SUGGESTED ACTIVITIES

- Discussion and comparison of Structures and Unions
- Solve problems by using nested structures and union inside structures

SUGGESTED EVALUATION METHODS

- Demonstration of programs using pointers to structures and self referential structures
- Demonstration of programs using enumerated data types and its operations

UNIT V	**FILE PROCESSING AND PRE PROCESSOR DIRECTIVES**	**7**

Introduction to Files – Using Files in C- Read data from files- Write data to files- Error Handling during file operations- Command line arguments- Random file functions- Pre processor Directives: Introduction-Types- Unconditional directives- Conditional Directives- examples

SUGGESTED ACTIVITIES

- Assignment on modes of operations using files in C
- Discussion on types of pre-processor directives

SUGGESTED EVALUATION METHODS

- Demonstration of programs using file operations
- Demonstration of programs using pre-processor directives

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Apply algorithmic thinking to understand, define and solve problems (Apply)
CO2 Write simple programs in C using basic constructs, loops and arrays (Apply)
CO3 Use strings, functions and pointers in C to solve complex problems (Apply)
CO4 Write programs in C using structures and union to store different data (Apply)
CO5 Apply file operations and advanced features to develop real time solutions (Apply)

Text Books

1. Reema Thareja, "Programming in C", Oxford University Press, Second edition, 2016
2. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited, 2017.

Reference Books

1. Byron Gottfried "Programming With C" Fourth Edition, McGrawHill, 2018.
2. Yashvant P. Kanetkar. "Let Us C", BPB Publications, 2016.

Web Resources

1. https://www.programiz.com/c-programming
2. https://nptel.ac.in/courses/106105171/
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.tutorialspoint.com/cprogramming/index.htm
5. https://www.w3schools.com/c/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		
5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

Write algorithm and draw flowchart

1. To count the even numbers between 1 and 200 and print the sum
2. To calculate the simple interest and compound interest
3. To calculate sum of the digits of a number and check if "sum" is an Armstrong number

Course Outcome 2 (CO2): (Apply)

1. Write a program to print the grade of a student based on his marks using switch case.
2. Write a program to print the following pattern1
   22
   333
   4444
   55555
3. Write a program to input the elements of a two dimensional array. Then from this arraymake two arrays: one that stores all the odd elements of the array and other that storesall the even elements of the array

Course Outcome 3 (CO3): (Apply)

1. Write a program using function to calculate 'x' to the power of 'y' where 'y' can bepositive or negative.
2. Write a program to read a paragraph. Then count the number of words, number of lines,number of vowels and number of sentences in it
3. Find the output of the following:

```
main(){
char *str="ABCDEFGH";
(*str++);        // what will happen if str++;
is given here??printf("%s",str);        }
```

Course Outcome 4 (CO4): (Apply)

1. What will be the output of the C program?

```
#include<stdio.h>
int main() {
enum numbers
{
n1 = 1.5, n2 = 0, n3, n4, n5, n6
};
printf("%d %d\n", n1, n2);
}
```

2. How many bytes in memory taken by the following C structure?

```
#include <stdio.h>
struct test {
int k; char c;
};
```

Course Outcome 5 (CO5): (Apply)

1. Write a program to create a file and store 20 names in it. Write a program to read thenames in the file in the reverse order without reopening the file

2. Write a program that reads the file name and text of 20 words as command linearguments. Write the text into a file whose name is given as the file name

21HS1101	ENGLISH FOR PROFESSIONAL COMMUNICATION	L	T	P	C
		2	0	1	3

Preamble

This course is offered to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators.

Prerequisites for the course

The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To develop listening skills, and enhance the ability of comprehending.
2. To communicate confidently in varied real life situations.
3. To widen the basic reading skills of the first year Engineering and Technology students.
4. To master vocabulary, sentence structure and to write articles.
5. To create emotional awareness.

Module I	SHARING BASIC INFORMATION	12

Listening - Listening to basic technical concepts, short formal and informal conversations; Speaking- Formal Self-Introduction – Etiquette – Phrases to be used highlighting the characteristics, strengths and weaknesses - Conversation Practice; Reading - short comprehension passages on fundamental concepts, principles, and ideas that helps to understand the need of Technology in a rapidly changing global environment; Writing -Reading Comprehension on technical concepts and answering questions - drafting a self introduction with professional touch; Language development - Framing Yes/No questions, Question tag, Vocabulary development - formation of words– verb – Noun – Adjectives, Standard Abbreviations related to Engineering.

Suggested Activities	Evaluation Method
i) Listening to Conversations/ technical concepts from suggested app/prescribed modules - Submission of 5 Recorded Conversations.	i) Listening & Speaking: Submitted Conversation will be assessed for a) Language style as that of the sample audio. b) Pronunciation c) Intonation
ii) Introducing oneself to the audience in a professional way - Video Recording to be submitted.	ii) Introduction: Submitted Video Recording will be assessed for a) Communication Etiquette b) Language Style c) Sentence Construction
iii) Reading 3 Passages on Technology and answering questions through Google forms.	iv) Introduction with a professional touch highlighting the skill sets required for an engineer
iv) Drafting a self introduction	
v) Teaching of Grammar Contents	Activities iii to v will be assessed through Google form tests/ written tests.

<table>
<tr><td>Module II</td><td>SHARING TECHNICAL INFORMATION</td><td>12</td></tr>
<tr><td colspan="3">Listening - Listening to technical lectures by native speakers; Speaking - introducing a device/gadget to the audience; Reading - extensive reading – short narratives and news items from newspapers related to technology; Writing - sentence structure – paragraphs on describing a gadget – describing an electronic/ mechanical gadget, giving importance to its specifications, descriptions, merits and demerits; Language development - framing ‘Wh’ Questions, writing a complete sentence using the fragments given; Vocabulary development- prefix and suffix.</td></tr>
<tr><td colspan="2">Suggested Activities
i) Listening to Technical Lectures - Suggested Youtube channels
a) Learn Engineering
b) Jared Owen
c) Interesting Engineering
d) Practical Engineering

ii) Speaking / Submitting video recording / classroom presentation about an electronic/electrical/ a mechanical gadget giving importance to its specifications, descriptions, merits and demerits.

iii) Reading articles from Newspaper/ Google News / Times Now / and other Tech News Sites

iv) Writing reviews of a product

v) Teaching of Grammar Contents</td><td>Evaluation Method
i) Listening skills will be tested through
a) MCQs - Google Forms - 3 Sets
b) Quiz - Polling - 2 set

ii)Speaking: Submitted Video Recording/Presentation during class hours will be assessed for
a) Language Style & Fluency
b) Creation of Google Slides / Canva Slides
c) Content delivery

Activities iii to v will be assessed through Google form tests/ written tests.</td></tr>
<tr><td>Module III</td><td>UNDERSTANDING TECHNOLOGY</td><td>12</td></tr>
<tr><td colspan="3">Listening - listening to technical talks on emerging trends and filling in the blanks – cloze test; Speaking - asking for opinions about technical gadgets – presentation of reviews on electronic/electrical/mechanical/software products; Reading - Reading Comprehension – technical passages – Articles from journals; Writing - rearranging jumbled sentences; Language development - Direct Speech and Indirect Speech – Framing Indirect – Questions - Prepositions – Articles; Vocabulary development – Select Single Word Substitutes used in Engineering.</td></tr>
</table>

Suggested Activities i) Listening to Technical talks on emerging trends - Suggested YouTube channels a) Bernard Marr b) Concerning Reality c) Ideas and Inspiration ii) Speaking / Submitting video recording / classroom presentation on giving reviews about a product. iii) Reading articles -Extracts from reputed journals. iv) Rearranging Jumbled Sentences. v) Teaching of Grammar Contents	Evaluation Method i) Listening skills will be tested through a) Cloze Test - 2 Sets ii)Speaking: Submitted Video Recording/Classroom presentation will be assessed for a) Inquisitiveness b) Analytical skills c) Presentation Skills Activities iii to v will be assessed through Google form tests/ written tests.

Module IV	**STATING PROBLEMS AND EXPRESSING SOLUTIONS**	**12**

Listening- listening to talks relating to technology and noting down the merits and demerits; Speaking - stating a problem and expressing solutions giving more focus on pronunciation of words and sentence structure; Reading - comprehending Articles from Magazines – Identify the problem statement and note down solution statements; Writing - Identifying problems – Writing problem statement, Analyzing the situation – Gathering information related to the problem stated – Identifying solution criteria – Choosing the best solution – Implementing a solution – writing solution content - Measuring solution success – Report preparation – White paper writing – Release/launch notes; Language development- Tenses; Vocabulary development- Synonyms, Antonyms, Phrasal Verbs.

Suggested Activities i) Listening to talks related to Technology - Suggested YouTube channels a) Auto Car India b) Lesics c) Student Energy ii) Speaking / Submitting video recording / Classroom presentation on Technical issues faced in a gadget and expressing suitable solutions. iii) Reading articles -Extracts from reputed journals and identify problem statements and solution statements. iv) Writing - Identifying problems and giving solutions v) Teaching of Grammar Contents	Evaluation Method i) Listening skills will be tested through a) Note making - 2 Sets ii)Speaking: Submitted Video Recording / Classroom Presentation will be assessed for a) Expression of Innovative Ideas and Solution b) Sentence Structure Activities iii to v will be assessed through Google form tests/ written tests/ written exercises.

Module V	**EMOTIONAL AWARENESS AND MANAGEMENT**	**12**

Listening - Listening Types - Appreciative listening – Critical Listening – Relationship Listening; Speaking - presentation on the importance of Emotional Intelligence; Reading- Reading Articles on High Level Cognition - Cognitive Control – Decision Making – Social Behaviour – Emotion – Language and Consciousness; Writing - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others; Language development - modal verbs; Vocabulary Development - Fixed and Semi-Fixed Expressions.

Suggested Activities	Evaluation Method
i) Watching videos on types of Listening	i) Listening skills will be tested through a) Google form test- 2 Sets
ii) Presentation on Emotional Intelligence	ii)Speaking: Submitted Video Recording / Classroom Presentation will be assessed for a) Emotional awareness b) Communication Skills
iii) Reading Articles on High Level Cognition	
iv) Writing - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others	Activities iii to v will be assessed through Google form tests/ written tests/ written exercises.
v) Teaching of Grammar Contents	

S.No	List of Exercises	CO
1.	Conversation Recording using the suggested app	CO 1
2.	Self Introduction Video	CO 1
3.	Listening Test - Google Form	CO 2
4.	Presentation on the working principle of a gadget	CO 2
5.	Listening - Cloze Test	CO 3
6.	Reviewing a Product - Video Submission	CO 3
7.	Listening and Note Making	CO 4
8.	Talk on technical issues in a gadget and express suitable solutions.	CO 4
9.	Types of Listening - Google Form	CO 5
10.	Presentation on Emotional Intelligence	CO 5
Total Periods		30 Theory +30 Lab

Laboratory Requirements for a batch of 30 Students
Software: Globarena
1. Teacher console and 30 systems for students.
2. English Language Lab Software
3. Career Lab Software

Suggestive Assessment Methods:

1) Listening and answering questions - MCQ - Cloze Test - Note Making
2) Speaking - App/Software based testing
3) Reading - analyze the passage given - understand the concept and answer Questions - On-line Based
4) Written Tests

Continuous Assessment Test (20 Marks)	Lab Components Assessments (30 Marks)	End Semester Exams (50 Marks)

Written Examination	Completion of Suggested Exercises	Written Examination

Outcomes

Upon completion of the course, the students will be able to:

CO 1	Enumerate basic information using communication etiquette on par with international communication standards. (Apply)
CO 2	Interpret fundamental technical concepts in English language giving importance to syntax. (Apply)
CO 3	Evaluate advanced varied technical concepts in the current scenario and emerging trends to invent new concepts. (Apply)
CO 4	Write solutions for problems identified using the exact vocabulary and structure without grammatical errors as expected by the corporate world. (Apply)
CO 5	Manage and respond to self, others' emotions using skills of Self Awareness, Self Management, Self Motivation, Empathy & Social Relations to be an Emotionally Intelligent Human Being. (Apply)

Text Books

1. Butterfield, Jeff. Soft Skills for Every one. Cengage Learning: New Delhi,2017.
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

Reference Books

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges.

Web Resources

1. Self Introduction: https://youtu.be/Osa53-RYBk4
2. Working Principle of a Gadget: https://www.youtube.com/channel/UC6qf8AGvAGixZXWdxapvCqw
3. Product Review: https://youtu.be/ByhA05x7CWI
4. Times of India: https://timesofindia.indiatimes.com/home/headlines
5. Listening to Technical talks:
   Auto Car India https://m.youtube.com/user/autocarindia1
   Lesics : https://www.youtube.com/channel/UCqZQJ4600a9wIfMPbYc60OQ
   Student Energy https://www.youtube.com/user/studentenergy?app=desktop
6. Types of Listening https://www.youtube.com/watch?v=22gzvSindTU&t=1s

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1				2				2	1	3	2	2			
2	1	1		1				1	2	3	2	2			
3	1	1		1			2	1		2	2	2			
4	1	1		1				2		2	2	2			
5						1	1	2	2	3		2			

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) : Enumerate basic information using communication etiquette on par with international communication standards.

1) Listen to the talk on basic technical topics and answer the questions provided.
2) Introduce yourself in a professional way highlighting Characteristics, Strengths & Weaknesses.
3) Read the given technical passage and answer the questions provided.
4) Frame Yes/No Questions for the statements given.
5) Frame Question tags for the statements given.
6) Rearrange the jumbled words into a meaningful sentence.
7) Complete the sentence with the Noun form/ Verb Form/ Adjective form (as Directed) of the word given.
8) Give the expansion of the Abbreviations given.

COURSE OUTCOME 2 (CO 2) : Interpret fundamental technical concepts in English language giving importance to syntax.

1) Listen to the technical lecture and answer the questions provided.
2) Introduce a device or a gadget to the class giving importance to its specifications, description, merits and demerits.
3) Read the given passage / short narrative / article from a journal or newspaper to the class.
4) Write your review on any one of the gadgets you are using.
5) Frame "Wh" Questions for the statements given.
6) Punctuate the following statement given.
7) Complete the sentence using the fragments given.
8) Write a short passage on the given topic.
9) Fill in the blanks with the suitable prefix or suffix as directed.

COURSE OUTCOME 3 (CO 3) :Evaluate advanced varied technical concepts in the current scenario and emerging trends to invent new concepts.

1) Listen to the technical talk on the emerging trends and complete the statements given. (Cloze Test)
2) Ask questions to get an opinion about technical gadgets / software / devices
3) Read the given article from a journal and provide your ideas for further developments.
4) Rearrange the following jumbled sentences in the proper chronological order.
5) Write a short essay on any one of the given technical topics highlighting the future scope of the product.
6) Rewrite the following into Indirect Speech.
7) Frame indirect questions for the questions given.
8) Fill in the blanks with the suitable articles.
9) Give the one word substitutes for the given statement.

COURSE OUTCOME 4 (CO 4) : Write solutions for problems identified using the exact vocabulary and structure without grammatical errors as expected by the corporate world.

1) Listen to the technical talks and write down the merits and demerits of the product discussed.
2) Watch the video, evaluate the concept and express your solutions to the problem.
3) Read the given article and note down the problems stated.
4) Write down solutions for the problems faced while using a product.
5) Draft a white paper writing for the given situation..
6) Write launch notes for a product.
7) Convert the given statement to another form of the tenses as directed.
8) Pick out the suitable synonym for the underlined word in order to minimize plagiarism.
9) Fill in the blank with the suitable phrasal verb.

COURSE OUTCOME 5 (CO 5) : Manage and respond to self, others' emotions using skills of Self Awareness, Self Management, Self Motivation, Empathy & Social Relations to be an Emotionally Intelligent Human Being.

1) Watch the video on Types of listening and answer the questions.
2) Make a presentation on the importance of Emotional Intelligence.
3) Read the given article on High level cognition and answer the questions.
4) Read the article on social behaviour and redraft it in your own style

21PY1311	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

Preamble

The aim of this course is to make the students gain practical knowledge to co-relate with the theoretical studies and develop their practical applications in engineering materials by using the principles in the right way to implement in modern technology.

Prerequisites

Basic practical concepts of Physics and Chemistry in higher secondary level.

Objectives

- To understand the measurement techniques and usage of instruments in physics.
- To demonstrate competency and understanding of the basic concepts found in experimental Physics.
- To learn about the various electronic communication mechanisms and their usage in a practical manner.
- To make the students acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To develop an understanding about the range and uses of analytical methods in chemistry.

PHYSICS

S. No	List of Experiments (Any Five)	CO
1	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.	**3**
2	Determination of band gap of a Semiconductor (Forbidden energy band gap kit).	**3**
3	Determination of planck's constant and work function using the principle of photoelectric effect	**1**
4	Determination of Wavelength, and particle size using Laser.	**2**
5	Determination of Numerical aperture and acceptance angle in an optical fiber.	**2**
6	Determination of Young's modulus of the material-Non Uniform bending method.	**1**
7	Determination of rigidity modulus – Torsion pendulum.	**1**
8	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	**2**
9	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.	**1**
10	Determination of wavelength of spectral lines using grating – Spectrometer.	**2**
	CHEMISTRY (Any Five)	
1	Determination of total, temporary & permanent hardness of water by EDTA method.	**4**
2	Corrosion experiments – weight loss method.	**5**
3	Estimation of iron content of the given solution using potentiometer.	**5**
4	Conductometric titration of strong acid vs strong base.	**5**

5	Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.	**5**
6	Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.	**4**
7	Determination of strength of given hydrochloric acid using pH meter.	**5**
8	Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol- Gel method.	**5**
9	Estimation of sodium and potassium present in water using a flame photometer.	**5**
10	Determination of strength of acids in an acid mixture using conductivity meter.	**5**

List of Projects (PHYSICS)

S. No.	**List of Projects**	**Related Experiment**	**CO**
1.	**To study Infrared radiation emitted by different sources using phototransistors.**	3	1
2	To study the variations, in current flowing in a circuit containing a LDR, because of a variation: (a) In the power of the incandescent lamp, used to 'illuminate' the LDR. (Keeping all the lamps at a fixed distance). (b) In the distance of an incandescent lamp, (of fixed power), used to 'illuminate' the LDR.	2	3
3	**Design a circuit for cool automatic timer controlled Light which controls vehicle traffic passing through the intersection of two or more roadways by giving a visual indication to drivers when to proceed, when to slow , and when to stop using LED and 4017 counter IC along with the 555 timer.**	2	3
4	**Design and implement a circuit which anyone can make at home to save their home from thefts using the light has high intensity, monochromatic, directional and coherent in nature.**	4	2
5	Construct a household circuit consisting of three bulbs using a dual switching method.	1	3
6	Using ultrasonic sensor, design a ultrasonic distance finder using 8051	9	1
7	Design a water level indicator by connecting a Buzzer, resistor and transistor in series and connect this in parallel to LED.	2	3

List of Projects (CHEMISTRY)

1	Water Analysis : Analysis of perennial Thamirabarani River water samples collected from various locations (before and after blending of industrial waste water). i) Determination of various physical and chemical parameters (Hardness, pH,TDS, Alkalinity) of different water samples. ii) From the result, give a detailed report about the water sample whether it is fit/unfit for domestic and industrial purposes.	1, 6	4

2.	Water Quality Monitoring : Analysis of ground water samples collected from various districts (Tirunelveli, Madurai, Tuticorin, Kanyakumari, Tenkasi etc.,). i) Determination of various physical and chemical parameters (Hardness, pH, TDS, Alkalinity) of different water samples. ii) From the result, give a detailed report about the water sample whether it is fit/unfit for domestic and industrial purposes.	1,6	4
3.	Household Plumbing Deterioration Monitoring : Study of Conductivity of domestic water (Home) by Arduino method to track the deterioration of household plumbing. i) From the observations give a detailed report about the existence of various ions in water. ii) Give an explanatory report on tracking the deterioration in household plumbing.	4	5
4	Air quality monitoring : Study of air pollution in Nellai smart city in the early morning, noon and evening due to CO/CO2 emissions by Arduino method. i) From the observations give a detailed report about the impact of air pollution on human health. ii) Deduce an explanatory report on environmental impact due to CO/CO2 emissions.	4,10	5
5.	Food adulteration : Investigation of adulterants in various food stuffs (milk, chilli powder, turmeric powder, wheat flour, honey and ghee) by Chemical methods. i) Give a report on the presence of adulterants in the given food samples. ii) From the observations give a brief report about the impact of food adulteration on human health.	1	4
6.	Design of molecules (composites) by computational techniques.	4,10	5

Lab Assessment	
Lab Components Assessments (50 Marks)	**End Semester Exams (50 Marks)**

Outcomes	
Upon completion of the course, the students will be able to:	
CO1	Understand measurement technology, usage of new instruments and real time applications in engineering studies.(Understand)
CO2	Operate different instruments and be capable of analysing the experimental results. (Analyse)

CO3	Applying basic knowledge to design various circuits (Apply)
CO4	Have knowledge and will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters. (Apply)
CO5	Gain knowledge and will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. (Apply)

Reference Books

- Physics Laboratory Manual, Department of Physics, Francis Xavier Engineering College, Tirunelveli.
- A Textbook of Engineering Physics Practical ,UNIVERSITY SCIENCE PRESS (An Imprint of Laxmi Publications Pvt. Ltd.)2nd edition .
- J.Mendham, R.C. Denney, J.D.Barnes, M.Thomas and B.Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (5th edition 2009).

Web Resources

Virtual Lab - https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html
Young's Modulus- https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=1
Virtual Lab - https://www.vlab.co.in/ba-nptel-labs-physical-sciences
Numerical Aperture - https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
Water Quality standards - https://www.youtube.com/watch?v=OlGllOZlIyI

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	3	2	1						1		1	1		
2	3	2	1						1		1	1		
3	3	2	1						1		1	1		
4	3	2	1						1		1	1		
5	3	2	1						1		1	1		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: The students will be able to understand measurement technology, usage of new instruments and real time applications in engineering studies (Understand)

1.Find the Young's modulus of the material of a beam using Non-Uniform bending method. (Given : Thickness of the beam d = 6.35 mm)

COURSE OUTCOME 2: The students will be able to operate different instruments and be capable of analysing the experimental results (Analyse)

1.Using a given laser source and grating (i) determine the wavelength of the given laser light source and also using a given laser source and glass plate (ii) determine the average size of the particles of lycopodium powder by diffraction method.

1.Determine the thermal conductivity of a given bad conductor (Glass) using Lee's disc method. (Given: M= 800 $X10^{-3}$ Kg, S = 370 $JKg^{-1}K^{-1}$).

COURSE OUTCOME 3: The students will be able to applying basic knowledge to design various circuits (Apply)

1.Design a circuit for finding unknown resistance and specific resistance of a given coil of wire.
Find the energy band gap of semiconductor diode.

COURSE OUTCOME 4: The students will be able to have knowledge and will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters. (Apply)

1.Estimate the amount of total hardness present in 250ml of the given water sample by EDTA method. You are provided with a standard hard water of strength 0.01N.What is the permissible limit of hardness in drinking water.

2.Calculate the amount of total alkalinity present in 500ml of the given water sample. You are provided with a standard NaOH solution of strength 0.01N.

3.What is the permissible limit of alkalinity in drinking water?

COURSE OUTCOME 5: The students will be able to gain knowledge and will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.(Apply)

1.Determine the amount of NaOH present in 1000 ml of the given sample solution by pH metry. What is the

pH of a blood sample?

2. Find the amount of HCl and CH3COOH present in 1000 ml of the given sample solution by Conductometry. Which Acid Is The Best Conductor Of Electricity?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF WEEKS REQUIRED
1	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.	**1**
2	Determination of band gap of a Semiconductor (Forbidden energy band gap kit).	**1**
3	Determination of planck's constant and work function using the principle of photoelectric effect.	**1**
4	Determination of Wavelength, and particle size using Laser	**1**

5	Determination of Numerical aperture and acceptance angle in an optical fiber	**1**
6	Determination of Young's modulus of the material-Non Uniform bending method.	**1**
7	Determination of rigidity modulus – Torsion pendulum.	**1**
8	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	**1**
9	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.	**1**
10	Determination of wavelength of spectral lines using grating – Spectrometer.	**1**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1						1		1	1		
2	3	2	1						1		1	1		
3	3	2	1						1		1	1		
4	3	2	1						1		1	1		
5	3	2	1						1		1	1		

1-Low , 2- Medium, 3- High

21CS1511	Programming Practice Lab using C	L	T	P	C
		0	0	4	2

Preamble

The goal of the practice lab is to provide the students with foundation in computer programming to enhance the problem solving skills related to the field of engineering. It enables the algorithmic approach among the students to solve real world problems thus providing the base to learn other new programming languages

Prerequisites for the course

- **NIL**

Objectives

1. To develop C programs using conditional and looping statements
2. To be able to use arrays and strings in C
3. To build modular programs using functions in C
4. To explicitly manage memory using pointers in C
5. To develop applications in C using structures and files

S. No	List of Experiments	CO
1	Programs using simple statements	CO1
2	Programs using decision making statements	CO1
3	Programs using looping statements	CO1
4	Programs using one dimensional and two dimensional arrays	CO2
5	Programs using strings.	CO2
6	Programs using user defined functions and recursive functions	CO3
7	Programs using functions and pointers	CO3
8	Programs using structures and pointers	CO4
9	Programs using structures and unions	CO4
10	Programs using file concept	CO4

S.No.	List of Projects	Related Experiment	CO
1.	Vaccine Status Registration System	Ex. 1 to 10	CO5
2.	Toll Bill Management system	Ex. 1 to 10	CO5
3.	Voting Eligibility system	Ex. 1 to 10	CO5
4.	Cricket Scorecard Display system	Ex. 1 to 10	CO5
5.	Medical History Viewing System	Ex. 1 to 10	CO5
6.	Bus/ Flight Ticket Reservation System	Ex. 1 to 10	CO5
7.	Vehicle Parking Control System	Ex. 1 to 10	CO5
8.	Canteen Menu Management System	Ex. 1 to 10	CO5
9.	Grocery Checklist Management System	Ex. 1 to 10	CO5
10.	Diary Management System	Ex. 1 to 10	CO5

11.	Retail Shop Inventory Management System	Ex. 1 to 10	CO5
12.	Pharmacy Inventory System	Ex. 1 to 10	CO5
13.	Library Book Management System	Ex. 1 to 10	CO5
14.	Student Subject Selection System	Ex. 1 to 10	CO5
15.	Student Leave Application System	Ex. 1 to 10	CO5

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	**End Semester Exams (50 Marks)**
• Exercises (Hacker rank score) • Project File (Progress Score) • Viva voce	1. Record note 2. Exercises 3. Viva voce

Course Outcomes

Upon completion of the course, the students will be able to:

CO1	Implement program using control statements
CO2	Implement arrays and perform string operations
CO3	Develop reusable modules, store data in main memory effectively using pointers
CO4	Form heterogeneous data using structures, union and files
CO5	Build a project based on the required concepts learnt in C

Laboratory Requirements

- **C compiler**
- **System with windows**
- **Internet**

Reference Books

1. **Reema Thareja, "Programming in C",Oxford University Press, Second edition, 2016**

Web Resources

1. **https://www.hackerrank.com/**
2. **https://www.codechef.com/selflearning?itm_medium=navmenu&itm_campaign=learncp**
3. **https://www.hackerearth.com/practice/basic-programming/input-output/basics-of-input-output/tutorial/**

Problem Statement:

Write a program that takes in a letter class ID of a ship and display the equivalent string class description of the given ID. Use the table below.

Class ID	**Ship Class**
B or b	Battle Ship
C or c	Cruiser
D or d	Destroyer
F or f	Frigate

Input Constraints:
The first line contains an integer **T**, the total number of test cases. Then **T** lines follow, each line contains a character.
$1 \leq \mathbf{T} \leq 1000$
Output Constraints:
For each test case, display the Ship Class depending on ID, in a new line.

Example:

INPUT	**OUTPUT**
3 B C D	Battleship Cruiser Destroyer

COURSE OUTCOME 3: (Blooms Category: Apply) (Problem Source: Hacker rank)

Problem Statement:

Functions are a bunch of statements grouped together. A function is provided with zero or more arguments, and it executes the statements on it. Based on the return type, it either returns nothing (void) or something. For example, a function to read four variables and return the sum of them can be written as

```
int sum_of_four(int a, int b, int c, int d) {
int sum = 0;
        sum += a;
        sum += b;
        sum += c;
        sum += d;
        return sum;                    }
```

+= : Add and assignment operator. It adds the right operand to the left operand and assigns the result to the left operand. So a += b is equivalent to a = a + b;

Task

Write a function int max_of_four(int a, int b, int c, int d) which reads four arguments and returns the greatest of them. Note that it is not built in max function in C. Code that will be reused is often put in a separate function that returns the greater of the two values.

Input Constraints:
Input will contain four integers(one on each line)
Output Constraints:
Print the greatest of the four integers.
Sample Input: 3 4 6 5
Sample Output: 6

COURSE OUTCOME 4: (Blooms Category: Apply) (Problem Source: Hacker rank)

Problem Statement:

You are transporting some boxes through a tunnel, where each box is a parallelepiped, and is characterized by its length, width and height. The height of the tunnel feet and the width can be assumed to be infinite. A box can be carried through the tunnel only if its height is strictly less than the tunnel's height. Find the volume of each box that can be successfully transported to the other end of the tunnel. Note: Boxes cannot be rotated.

Input Constraints:
The first line contains a single integer, denoting the number of boxes. Lines follow with three integers on each separated by single spaces, and which are length, width and height in feet of the box.

Output Constraints:
For every box which has a height lesser than 41 feet, print its volume in a separate line.

SAMPLE INPUT			**SAMPLE OUTPUT**
4			
5	5	5	
1	2	40	125
10	5	41	80
7	2	42	

SEMESTER II

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS2101	English for Technical Communication	HSSM	2	2	0	0	2
2	21MA2201	Partial Differential Equation and Application of Fourier Series	BS	**4**	3	1	0	4
3	21EE2503	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	**3**
Theory cum Practical Courses								
1	21CS2501	Introduction to Computing using Python	ES	5	3	0	2	**4**
2	21ME1513	Computer Aided Engineering Graphics	ES	5	3	0	2	**4**
Practical Courses								
1	21EE2511	Fundamentals of Electrical and Electronics Engineering Lab	ES	4	0	0	4	**2**
Mandatory Courses								
1	21GE2M01	Indian Constitution and Cultural Heritage*	MC	2	2	0	0	**0**
			Total	25	16	1	8	19

* This Course is applicable only for the students admitted in 2021-2022 & 2022-2023 Academic Year

21HS2101	ENGLISH FOR TECHNICAL COMMUNICATION	L	T	P	C
		2	0	0	2

Preamble

This course is offered to develop strategies and skills to enhance professional students' ability to read and comprehend engineering and technology texts. Foster their ability to write convincing job applications and effective reports. Develop their speaking skills to make technical presentations, participate in group discussions. The outcome of the course is to help students acquire the language skills of listening, speaking, reading and writing competency in English language thereby making them meet the global expectations.

Prerequisites for the course

- The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To widen strategies and skills to augment ability to read and comprehend engineering and technology texts.
2. To draft convincing job applications and effective reports.
3. To develop speaking skills to make technical presentations, participate in group discussions.
4. To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization.
5. To cultivate writing skills both technical and general.

MODULE 1	READING AND STUDY SKILLS	**6**

Reading - Reading longer technical texts / technical blogs and taking down notes; Writing - interpreting charts (all the types), graphs – comparing and contrasting statements/paragraphs – analysing technical details - writing technical blogs; Vocabulary Development - Select Technical Vocabulary; Language Development - Active Voice and Passive Voice

Suggested Activities	Evaluation Method
i) Visit to the Library - Reading articles on emerging trends and taking down notes in the prescribed format - Submission through FAST FORMS - Minimum 2	i) Content & Structure
ii) Writing compare and contrast statements. (Eg. Windows 10 Vs Windows 1, RPA Developer Vs RPA Analyst, Edge Computing Vs Quantum Computing) related to the programme.	ii) Submission: Fast form Document Submitted document will be assessed for a) Communication Etiquette b) Language Style c) Sentence Construction
iii) Create a Technical Blog based on their course of study	iii) Create a channel and post the Tech Blog they have created
iv) Teaching of Grammar Contents	Activity iv will be assessed through Google form tests/ written tests.

MODULE 2	INTRODUCTION TO PROFESSIONAL WRITING	**6**

Reading - Technical related topics; Writing - statement of purpose - press release – extended definitions - writing instructions – checklists – recommendations – Minutes of the Meeting ; Language Development - Subject Verb Agreement, Compound Words.

	Suggested Activities **i) Visit to the Library - Reading articles on emerging trends and writing down purpose statements and extended definitions. Submission through FAST FORMS - Minimum 2** **ii) Writing a set of 8 Instructions, Recommendations and Checklists for the suggested topics. (each 2 sets)** **iii) Teaching of Grammar Contents**	Evaluation Method i) Content & Structure ii) Submission: Fast form Document Submitted document will be assessed for a) Format b) Language Style c) Sentence Construction Activity iii will be assessed through Google form tests/ written tests.
MODULE 3	INTERVIEW SKILLS	**6**
	Listening - Listening to mock Interviews ; Speaking - answering Interview questions – GD Strategies; Reading- newspaper article - read company profile - practice in speed reading ; Writing - Job Application - Resume- Internship application - letter to the editor - email etiquette - positive, negative and neutral responses - sending professional emails; Writing opinion paragraph - Writing paragraphs with reasons; Vocabulary Development - select Technical Vocabulary Language Development - If – Conditionals	

Suggested Activities **i) Listening to UPSC Toppers Mock Interviews.** **ii) Drafting Job application and Resume building.** **iii) Teaching of Grammar Contents**	Evaluation Method i) Answering questions for Interview questions(Android app based) Responses will be assessed for a) Fluency b) Communication etiquette c) Language style ii) Submission: Fast form Document Submitted document will be assessed for a) Language Style b) Design Activity iii will be assessed through Google form tests/ written tests.

MODULE 4	REPORT WRITING I	**6**

Reading - newspaper article & take notes - read company profile - project profile; Writing - Fire accident Report, Industrial Visit Report, Project Report; Vocabulary Development- finding suitable synonyms - paraphrasing ; Language Development - Clauses.

Suggested Activities **i) Drafting reviews and reports on Industries -** **a) Profile & Products** **b) Trending technology adopted** **c) Careers** **d) Latest news** **Min - 2 Industries** **ii) Teaching of Grammar Contents**	Evaluation Method i) Content & Structure Activity ii will be assessed through Google form tests/ written tests.

MODULE 5	REPORT WRITING II	**6**

Reading - newspaper article & take notes - read survey & business report; Writing - Writing Feasibility Reports, Survey Reports, Business Report; Vocabulary Development - verbal analogies ; Language Development - Prepositional Phrases.

Suggested Activities **i) Drafting feasibility report on-** **a) Launching a new product / Technology** **Min - 2** ii) Creating a survey form to collect data using different platforms like google forms, survey monkey etc. **iii) Teaching of Grammar Contents**	Evaluation Method i) Content & Structure ii) Relevance of the question framed, Question structure Activity iii will be assessed through Google form tests/ written tests.	
	Total Periods	**30**

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
(i) Google Form based - on-line Test (ii) Written Test	(i) Google Form based - on-line Test incorporating Listening, Speaking and Reading	Written Test

Outcomes	
Upon completion of the course, the students will be able to:	
CO1	Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more. (Apply)
CO2	Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals. (Apply)
CO3	Articulate appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world. (Apply)
CO4	Write reports utilizing the required format prescribed on par with international standards using the exact vocabulary to make their reports worthy to be read. (Apply)
CO5	Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness. (Apply)

Text Books

1. Mike Markrl. Technical Communication,Palgrave Macmillan: London, 2012.
2. Sumant,S and Joyce Pereira. Technical English II. Chennai: Vijay Nicole Imprints Private Limited, 2014.
3. Kumar, Sanjay and Pushp Lata. Communication Skills: A Workbook. New Delhi: OUP, 2018.

Reference Books

1. Raman, Meenakshi & Sangeetha Sharma. Communication Skills. New Delhi: OUP, 2018
2. Rizvi M, Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007

Web Resources

1. Interpretation of Charts : https://youtu.be/4lxA7lo9GLU : https://www.englishhints.com/charts-and-graphs.html
2. Instructions https://www.wikihow.com/Write-Clear-Instructions
3. Resume building https://novoresume.com/career-blog/how-to-write-a-resume-guide
4. Report writing - https://www.youtube.com/watch?v=FXIuHOFAxos ; https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing
5. UPSC Interview: https://www.youtube.com/watch?v=OhJWg-0qdI0

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1	1		1	2		2	1	1		2	1	1			
2	1			2		1		1		3	2	1			
3						3	2	1	2	3		2			
4		1	1	1		1	1	1	2	3	2	2			
5		1		1		1	1	1	1	3	2	2			

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) : Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more.

1) Read the given passage and take notes.
2) Analyse the given type of chart or graph and answer the questions given.
3) Analyse the given chart or graph and write paragraphs comparing and contrasting the data.
4) Analyse the given chart or graph and write paragraphs giving importance to technical details.
5) Fill in the blank with appropriate technical vocabulary.
6) Convert the given active voice sentence into passive voice or impersonal passive voice.

COURSE OUTCOME 2 (CO 2) : Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.

1) Write a purpose statement for the tool or gadget given.
2) Write an extended definition for the given word.
3) Write 8 instructions / recommendations on the given topic.
4) Write the Minutes of the meeting for the given meeting.
5) Fill in the blank with appropriate Subject Verb agreement.

Fill in the blank with suitable compound words.

COURSE OUTCOME 3 (CO 3) : Articulate appropriately in Interviews and Group Discussions effortlessly following the strategies expected by the corporate world.

1) Listening to mock interviews and answering the questions.

Listen to the strategies of GD and answer the given questions

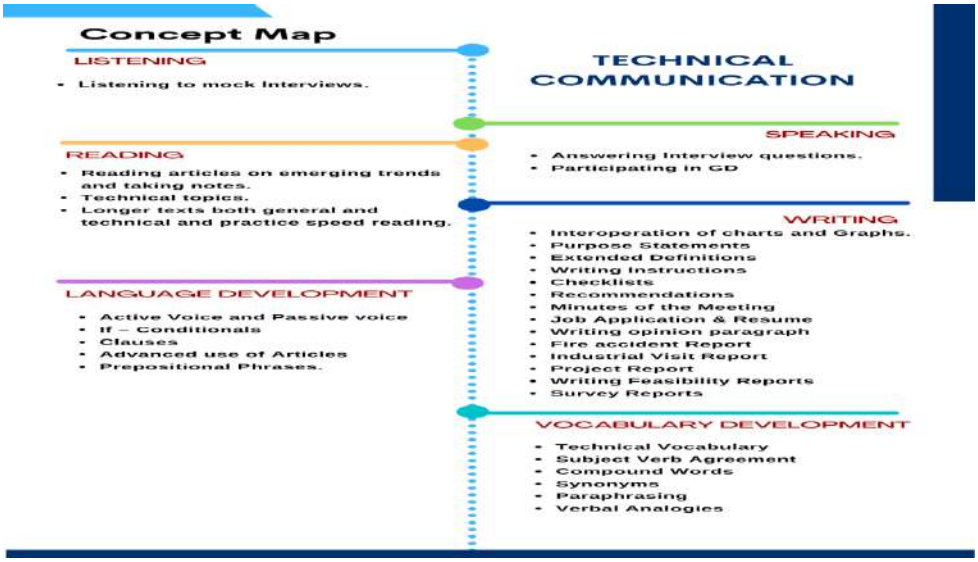
2) Read and submit a recording of technical content following the strategies of speed reading.
3) Write Job application with a cover letter for the given job description.
4) Write paragraphs expressing opinion on the given topic.
5) Fill in the blank / complete the sentence with appropriate If-Conditionals.

COURSE OUTCOME 4 (CO 4) : Write reports utilizing the required format prescribed on par with international standards using the exact vocabulary to make their reports worthy to be read.

1) Write a fire accident report for the provided incident.
2) Write an Industrial visit report.
3) Write a report on the Project work undertaken by the candidate giving importance to the current status report and the time needed for the completion of the project.
4) Find the appropriate synonym for the given word.
5) Paraphrase the given passage.
6) Fill in the blank with appropriate clauses.

COURSE OUTCOME 5 (CO 5) : Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.

1) Write a Feasibility report for a business / project proposal given.
2) Write a survey report for the given scenario.
3) Pick out the appropriate Verbal Analogy.
4) Fill in the blank with appropriate articles.
5) Complete the sentence with appropriate Prepositional Phrases.
6) Choose the appropriate word to complete the sentence.



21MA2201	PARTIAL DIFFERENTIAL EQUATION AND APPLICATIONS OF FOURIER SERIES	L	T	P	C
		3	1	0	4

Preamble:
The course consists of topics in Complex Integration, Partial Differential Equations and LaplaceTransformswithapplicationstovariousengineeringproblems.Thiscoursewillcoverthefollowing main topics: Construction of analytic function, Taylors and Laurent's series, Poles andResidues, Half range sine series, Harmonic analysis, Fourier Series Solutions of one dimensionalwave and heat flow equation and Applications of Laplace transforms for solving linear ordinarydifferentialequations up to secondorder with constant coefficients.

Prerequisitesforthecourse
21MA1201-MatricesandAdvancedCalculus

Objectives

1. TointroducetotheconceptofAnalyticalfunction
2. TofamiliarizewithComplexintegration
3. TointroduceFourierseries analysis which is central to many applications in engineeringfieldand its use insolving boundary value problems
4. ToacquaintthestudentwithPDEandFourierseriestechniquesinsolvingwaveandheatflowproblems used in various situations.
5. ToimprovetheknowledgeofLaplacetransforms.

UNIT I	ANALYTICFUNCTIONS	9+3

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions – Harmonic function – Harmonic Conjugate - Construction of analytic function by Milne Thomson'smethodand bilinear transformation -transformation w = 1/z .

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonConstructionofanalyticfunctionbyMilneThomson'smethod andbilineartransformation.

UNIT II	COMPLEXINTEGRATION	9+3

Complexnumbersanditsconjugate-Cauchy'sintegraltheorem (without proof) – Cauchy'sintegral formulae and its higher order derivatives (without proof) and its applications – Taylorsand Laurent's series – Types of Singularities – Poles and Residues – Cauchy's residue theorem(withoutproof).

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonTaylor'sseries,Laurent'sseriesandCauchy'sresiduetheorem.

UNIT III	FOURIERSERIES	9+3

Dirichlet's conditions – General Fourier series – Change of Intervals - Odd and even functions –Half range sine series – Half range cosine series - Root mean square value – Harmonic analysis forFourierseries - Engineering Applications.

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonFourierseriesofOddandevenfunctions,Halfrangesineandcosine series,Harmonicanalysis.

UNIT IV	PDEANDAPPLICATIONSOFFOURIERSERIES	9+3

ClassificationofPDE –Methodofseparationofvariables-FourierSeriesSolutionsofonedimensionalwaveequation–FourierSeriesSolutions of onedimensional equationofheat conduction - Engineering Applications.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsonFourierSeriesSolutionsofonedimensionalwaveequationandheat conduction equation.		
UNIT V	**LAPLACETRANSFORMS**	**9+3**
Properties of Laplace Transform – Inverse transforms – Convolution theorem (Without Proof) – Partialfraction-ApplicationsofLaplacetransformsforsolvinglinearordinarydifferentialequationsup tosecond orderwith constant coefficientsonly -Engineering Applications.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsonLaplacetransformusingpartialfraction,Convolutiontheoremand solvingODE.		
	TotalPeriods	**45+15=60Periods**

SuggestiveAssessmentMethods

ContinuousAssessmentTest (20Marks)	FormativeAssessmentTest (20Marks)	EndSemesterExams (60Marks)
1.DescriptiveQuestions	1.Assignment 2. Online Quizzes	1.DescriptiveQuestions

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1 : Apply Cauchy-Riemann equations to problems of fluid mechanics, thermodynamics andelectro-magneticfields. (Apply)
CO2:Solvecomplexvaluedintegralfunctionsusingresidues.(Apply)
CO3:ConstructtheFourierseriesexpansionoftheperiodicfunction.(Apply)
CO4:Solvetheproblemsofonedimensionalwaveandheatequation.(Apply)
CO5:ApplyLaplaceTransformtechniquetosolvethegivenordinarydifferentialequation.(Apply)

TextBooks

1. B.S.Grewal,"HigherEngineeringMathematics",45rd edition,2017.
2. Kreyszig.E,"*AdvancedEngineeringMathematics*",JohnWiley&Sons.Singapore,15theditio n, 2017.

ReferenceBooks

1. ATextbookofEngineeringMathematics(Dr.A.P.J.AbdulKalamTechnicalUniversity,Luck now)(For.GautamBhudhtechnicalUniversities,Lucknow)January2020
2. AdvancedEngineeringMathematics,H.K.DASS,S.CHANDandCompanyLimited,New Delhi,22ndrevisededition,2018.

WebResources

1. https://youtu.be/LGxE_yZYigI
2. Analyticfunctions-https://youtu.be/b5VUnapu-qshttps://youtu.be/8jPr6rGstYk
3. ComplexIntegration-https://youtu.be/4yC4IXcMKJg
4. Fourierseries-https://youtu.be/LGxE_yZYigI
5. Applicationsoffourierseries-https://youtu.be/YfGHNdVeyB4
6. LaplaceTransform-https://youtu.be/c9NibpoQjDk

COVsPOMappingandCOVsPSOMapping:

CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1				1	1			1			
2	3	2	1	1				1	1			1			
3	3	2	1	1				1	1			1			
4	3	2	1	1				1	1			1			
5	3	2	1	1				1	1			1			

COURSE LEVEL ASSESSMENT QUESTIONS

COURSEOUTCOME1 (CO1) :(Apply)

1. Constructananalyticfunctionwhoseimaginarypartis $v=e^{x}(x\cos cosy-y\sin sin)$
2. Findthe bilinear transformation that maps thepointsZ =0, -1points On to the $i,0,\infty$.

COURSEOUTCOME2(CO2):(Apply)

1)Solve$\int \frac{2z_e}{(z+1}^4 dt$ usingCauchy'sIntegralformulawhereCis$|z|=2$.

2)Compute$\int \frac{2z-1}{(z+1)(z-3)} dt$ usingCauchy'sResiduetheoremwhereCis$|z|=2$.

COURSEOUTCOME3(CO3):(Apply)

1) ConstructFourierseriesfor$(x)=x$in$(-\pi,\pi)$.
2) ConstructFourierseriesfor $f(x)=x^2$ in $(-l,l)$.

COURSEOUTCOME4(CO4):(Apply)

1) Identify the PDE $u_{xx}=au_{tt}^2$
2) Atightlystretchedstringwithfixedendpoints$x=0,x=l$isinitiallyatrestinitsequilibrium

position.If itis vibrating,giving eachpoint avelocity $\lambda(l-x)$.Findthedisplacementofthestringatanytime‘t’

COURSE OUTCOME5(CO5):(Apply)

1)Solve $\frac{d^2x}{dt^2}-3\frac{dx}{dt}+2x=2$, given $x=0$ and $\frac{dx}{dt}=5$ for $t=0$ using Laplace Transform method.

2)Find the Laplace transform for $\frac{\cos a\cos at-\cos b\cos bt}{t}$.

21EE2503	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Physics
- Engineering Mathematics

Course Objectives

The course will enable students to:

- Know the basic concepts of electric circuits and analysis and introduction to measurement and metering equipments for electric circuits
- Gain knowledge on the basic operation of electric machines and transformers.
- Have an Introduction of semiconductor devices and its applications.
- To understand the fundamentals of digital electronics.
- Learn about the basics of communication systems.

UNIT I	ELECTRICAL CIRCUITS	9 + 2

Ohms Law – Kirchoff's Laws – Steady State Solution of DC Circuits –Mesh and Node Analysis- Introduction to AC Circuits – Operating Principles of Moving Coil and Moving Iron Instruments, Dynamometer type Wattmeter and Induction type energy meter.

UNIT II	ELECTRICAL MACHINES	7

DC Generator - DC Motor - Single Phase Transformer - single phase induction Motor: Construction, Principle of Operation, EMF Equation and Applications.

UNIT III	SEMICONDUCTOR DEVICES AND APPLICATIONS	8

Characteristics of PN Junction Diode and Zener Diode– Half wave and Full wave Rectifier –Bipolar Junction Transistor: CB, CE, CC Configurations and Characteristics.

UNIT IV	DIGITAL ELECTRONICS	10

Number System –Number System Conversions- Introduction to logic families-RTL, DTL, TTL-Logic Gates - Half and Full Adders – Half Subtractor and Full Subtractor.

UNIT V	BASICS OF COMMUNICATION SYSTEMS	9

Types of Signals: Analog and Digital Signals – Modulation: Amplitude and Frequency Modulation-Demodulation-Communication Systems: Radio, TV, Microwave, Satellite (Block Diagram Approach only)

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1.DESCRIPTION QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS	1.ASSIGNMENT 2.ONLINE QUIZZES 3.PROBLEM –SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand and apply the basics of electric circuits, analysis, measurement and metering for electric circuits.

CO2: Understand the basic operation of electric machines and transformers

CO3: Understand the utilization of semiconductor devices.

CO4: Understand the fundamentals of digital circuits.

CO5: Understand the basics of communication systems.

Text Books

1. R. Muthusubramanian, S.Salivahanan and K A Muraleedharan, “Basic Electrical, Electronics and Computer Engineering”, 2nd ed., Tata McGraw Hill, 2012.
2. R.S Sedha, “Applied Electronics”, S. Chand & Co., 2008.

Reference Books

1. Mittle and V. N. Mittle, “Basic Electrical Engineering”, Tata McGraw Hill Edition, New Delhi, 2005.
2. T K Nagsarkar and M S Sukhija, “Basics of Electrical Engineering”, Oxford press 2005.

Web Resources

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/105/108105155/
3. https://nptel.ac.in/courses/108/105/108105132/
4. https://nptel.ac.in/courses/117/102/117102061/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3												
2	3	2				2						2	3		
3	3														
4	3	3	2										2		
5	3					2						2			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	30	30	05	05	20
UNDERSTAND	20	20	10	10	20
APPLY	20	20	05	05	20
ANALYZE	20	20	05	05	20
EVALUATE	10	10			20
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Understand and apply the basics of electric circuits, analysis, measurement and metering for electric circuits.

1.Calculate the equivalent resistances for the two resistance 7 ohms and 12 ohms connected in series.

a. 7 ohms

b. 9 ohms

c. 12 ohms

d. 19 ohms

1.Which equipment is used to measure the current?

a. ammeter

b. voltmeter

c. wattmeter

d. energymeter

COURSE OUTCOME 2: Understand the basic operation of electric machines and transformers

1.Which is the outermost covering of D.C machine?

a. Yoke

b. armature

c. field winding

d. commutator

1.Which is the static device?

a. transformer

b. DC generator

c. DC motor

d. Induction motor

COURSE OUTCOME 3: Understand the utilization of semiconductor devices.

1.The device which is used to convert the alternating current into direct current is known as

a. chopper

b. rectifier

c. motor

d. transistor

1.Which device is also known as voltage regulator?

a. Zener diode

b. PN diode

c. motor

d. transistor

COURSE OUTCOME 4: Understand the fundamentals of digital circuits.

1.Which number system has a base 16

a. Hexadecimal

b. Octal

c. Binary

d. Decimal

1.Which of these sets of logic gates are known as universal gates?

a.XOR, NAND, OR

b. OR, NOT, XOR

c. NOR, NAND, XNOR

d. NOR, NAND

COURSE OUTCOME 5: Understand the basics of communication systems.

1,_____ is defined as the process by which some characteristics (i.e. amplitude, frequency, and phase) of a carrier are varied in accordance with a modulating wave

a. modulation

b. demodulation

c. demultiplexing

d. none of these

1._____ is the equipment which converts physical message, such as sound, words, pictures etc., into corresponding electrical signal.

a. transmitter

b. receiver

c. channel

d. none

21CS2501	Introduction to Computing using Python (Common for AI&DS,CSE,CSBS,ECE,EEE,IT)	L	T	P	C
		3	0	1	4

Preamble

This course provides learners an insight into Python programming, and develop programming skills to manage the development of software systems. It covers programming environments, important instructions, data representations, intermediate level features, image processing, exception handling and file data processing of Python.

Prerequisites for the course

- Problem Solving Techniques, Logical Thinking

Objectives

1. To know the features of Python.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and use function calls.
4. To use Python data structures – strings, lists, tuples, dictionaries.
5. To work with files in Python.

To work with images

UNIT I	INTRODUCTION TO PYTHON PROGRAMMING	4

Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators– Values and Types – Statements - Operators – Boolean Values – Operator Precedence – Expression - Conditionals: if, if-else, if elif else Constructs

UNIT II	LOOPS, FUNCTIONS AND LISTS	6

Loop Structures/Iterative Statements –Loop Control Statements – List – Adding Items to a List – Finding and Updating an Item – Nested Lists –List Concatenation – List Slices – List Methods – List Loop – Mutability. Function Call and Returning Values – Fruitful Function – Parameter Passing – Local and Global Scope – Recursive Functions.

UNIT III	STRING, ARRAYS, TUPLES	7

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating – Basic Built-In String Functions. –Using Arrays with Numpy: Vectors and operations - vector properties and characteristics, Pandas - Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value.

UNIT IV	DICTIONARY, FILES	6

Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function – Finding Key and Value in a Dictionary.

Introduction to Files – File Modes – Opening and Closing Files – Reading and Writing Files

UNIT V	EXCEPTION HANDLING, IMAGE PROCESSING	7

Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

Image Processing - Image File Formats, Image-Manipulation Operations, The Properties of Images, Python Image Library(PIL)- Converting an Image to Black and White/Grayscale, Blurring an Image, Edge Detection and Reducing the Image Size.

Total Periods	30 Theory +30 Lab

Laboratory Requirements

- 60 Systems with windows / LINUX operating system with python IDLE or equivalent.

Suggestive Assessment

Continuous Assessment Test (30 Marks)	Lab Components Assessments (20 Marks)	End Semester Exams (50 Marks)
1. DESCRIPTIVE QUESTIONS	1. LAB EXPERIMENTS 2. MODEL EXAMINATION	1. DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: Write Python programs for solving problems using conditional statements.

CO2: Write Python programs for solving problems using looping statement and list and decompose a Python program into functions.

CO3: Represent data using Python strings, arrays, tuples, dictionaries and solve computational problems using them and use Numpy and Pandas libraries in real time applications.

CO4: Develop programsto read and write data from/to files in Python and handle exceptions while dealing with data.

CO5: Apply the power of graphics for processing images.

Text Books

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition,Shroff/O'Reilly Publishers, 2016

Reference Books

1. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.

Web Resources

1. Python for Data science - https://onlinecourses.nptel.ac.in/noc20_cs36/course (Unit III – Numpy, Pandas)
2. https://www.geeksforgeeks.org/image-processing-in-python-scaling-rotating-shifting-and-edge-detection/ (Unit V)

List of experiments

S.NO	NAME OF EXPERIMENTS	CO
1	Basic Python Programming a) Alice buys a toy with a selling price of 100 rupees. There is a discount of x percent on the toy. Develop a python program to find the amount Alice needs to pay for it.	**CO1**

2	Python Programs using conditionals – if, if – else, if – elif – else statements b) Write a program that takes cost price and selling price as input and displays whether the transaction is a **Profit** or a **Loss** or **Neither.** a) Chef considers the climate HOT if the temperature is **above** 2020, otherwise he considers it COLD. You are given the temperature *C*, write a python program to find whether the climate is HOT or COLD. b) Write a Python Program to read the unit of electricity consumed in a house and calculate the amount to be paid for the electricity consumed. The bill amount should be calculated as per the given specification: a. For 0 to 100 units the per unit is ₹ 0/- b. For 0 to 200 units, for the first 100 unit the per unit cost is zero and the next 100 units, the consumer shall pay ₹ 1.5 per unit. c. For 0 to 500 units, the consumer shall pay ₹ 0 for the first 100 units, for the next 100 units the consumer shall pay ₹ 2 per unit, for the next 300 units the unit cost is ₹3.00/-	CO1
3	Python Programs using looping statements a) Implement Python Script to generate first N natural numbers. b) Implement Python Script to check given number is palindrome or not. c) Implement Python script to print factorial of a number. d)Implement Python Script to check given number is Armstrong or not.	CO2

	e) Square the Digits : Given a two digit number, calculate the sum of square of the digits. Repeat the same for the output till any of the number in series repeats. Output should be the first number that repeats in the process. Sample : Input : 13 Explanation : ('^' denotes power in this explanation) Step 1 : 1^2 + 3^2 = 1 + 9 = 10 Step 2 : 1^2 + 0^2 = 1 + 0 = 1 Step 3: 1^2 = 1 1 repeats hence output should be "1" Output: 1 Input: 7 Explanation: Step 1 : 7 ^2 = 49 Step 2 : 4^2 + 9^2 = 16 + 81 = 97 Step 3 : 9^2 + 7^2 = 81 + 49 = 130 Step 4: 1^2 + 3^2 + 0^2 = 1+ 9 + 0 = 10 Step 5 : 1^2 + 0^2 = 1 + 0 = 1 Step 6: 1^2 = 1 1 repeats hence output should be "1" Output: 1	
4	Python Programs using Functions a) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000. b) Have the function CodelandUsernameValidation(**str**) take the **str** parameter being passed and determine if the string is a valid username according to the following rules: 1. The username is between 4 and 25 characters. 2. It must start with a letter. 3. It can only contain letters, numbers, and the underscore character. 4. It cannot end with an underscore character. If the username is valid then your program should return the string **true**, otherwise return the string **false**.	CO2

	Examples Input: "aa_" Output: falseInput: "u_hello_world123" Output: true	
5	Python Programs using List a) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34',67', '55', '33', '12', '98'). b) In this program, create a list of numbers from 1 to 50 named **list_1**. The numbers should be present in the increasing order: Ex **list_1 = [1,2,3,4,5, ...,50]** i.e. index zero should be 1, index one should be 2, index two should be 3 and so on. Given an input let's say **a**, you have to print the **number** of elements of **list_1** which are divisible by **a, excluding** the element which is equal to **a.Input:** Number **aOutput:** In a single line, the number of elements (i.e. the count and not the elements) which are divisible by **a. Example: Input: 24 Output: 1** c) In this program, create a list of numbers from 1 to 50 named **list_1**. The numbers should be present in the increasing order: Ex **list_1 = [1,2,3,4,5, ...,50]** i.e. index zero should be 1, index one should be 2, index two should be 3 and so on. Given an input let's say **a**, you have to print the **number** of elements of **list_1** which are divisible by **a, excluding** the element which is equal to **a.Input:** Number **aOutput:** In a single line, the number of elements (i.e. the count and not the elements) which are divisible by **a**. Example: Input: 24 Output: 1 d) Given a list l of size N and two elements x and y, use counter variables to find which element appears most in the list, x or y. If both elements have the same frequency, then return the smaller element. Write a Python program to implement the above said statement. Note: We need to return the element, not its count. **Example 1:** **Input:** N = 11 l = [1,1,2,2,3,3,4,4,4,4,5] x = 4, y = 5 **Output: 4** **Explanation:** frequency of 4 is 4. frequency of 5 is 1. **Example 2:** **Input:** N = 8 l = [1,2,3,4,5,6,7,8] x = 1, y = 7**Output: 1** **Explanation:** frequency of 1 is 1.frequency of 7 is 1.Since 1 < 7, return 1.	CO3

6	Python Programs using String, Tuples, Numpy array and Pandas. a) Accepts a string and calculate the number of upper case letters and lower case letters. b) Write a python program to check whether the given string is palindrome or not. c) Create all possible strings by using 'a', 'e', 'i', 'o', 'u'. Use the characters exactly once. d) Python Program to Sort a List of Tuples in Increasing Order by the Last Element in Each Tuple e) Use mtcars.csv dataset do the following: What is the type of each variable of the mtcars data set? o Divide the column that has the car name into columns that contain the make and model of the car. o Do all observations have a make and model value? If there are missing values, can you fix them? (Hint, use Google to help you.) o Some car companies have more than one make. In this data Chrysler, Plymouth, and Dodge were all made by Chrysler. Likewise Cadillac and Pontiac are made by GM and Lincoln and Ford are both made by Ford. Create a company variable based on the data in the make variable o Create a name for use in displaying results that is a character string composed of make, a space character, if the company name is not the same as the make then the company in parentheses (), and model.	CO3
	f) Write a python program to sort the DataFrame first by 'name' in descending order, then by 'score' in ascending order. **Sample Python dictionary data and list labels:** exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']} labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j'] Values for each column will be: name : "Suresh", score: 15.5, attempts: 1, qualify: "yes", label: "k" **Expected Output:Orginal rows:** name score attempts qualify a Anastasia 12.5 1 yes b Dima 9.0 3 no c Katherine 16.5 2 yes d James NaN 3 no e Emily 9.0 2 no f Michael 20.0 3 yes g Matthew 14.5 1 yes	

	h Laura NaN 1 no i Kevin 8.0 2 no j Jonas 19.0 1 yes Sort the data frame first by 'name' in descending order, then by 'score' in ascending order: name score attempts qualify a Anastasia 12.5 1 yes b Dima 9.0 3 no c Katherine 16.5 2 yes d James NaN 3 no e Emily 9.0 2 no f Michael 20.0 3 yes g Matthew 14.5 1 yes h Laura NaN 1 no i Kevin 8.0 2 no j Jonas 19.0 1 yes	
7	Python Programs using Dictionary a) Create a dictionary and apply the following methods 1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len() b) Write a Python Program to multiply all the items in a dictionary.	CO3
8	Python Programs using Files a) Write Python script to display file contents. b) Write Python script to copy file contents from one file to another. c) Write a Python program to count the number of lines, words, letters, blank spaces in a file.	CO4
9	Python Programs using Exceptions Write a Python program to solve the following: (Use Exception Handling) You are given a string . Your task is to find out whether is a valid regex or not. **Input Format** The first line contains integer , the number of test cases. The next lines contains the string . **Constraints:** 0<T<100 **Output Format** Print "True" or "False" for each test case without quotes. **Sample Input** 2 .*\+ .*+ **Sample Output** True False	CO4

	Explanation .*\+ : Valid regex. .*+: Has the error multiple repeat. Hence, it is invalid.	
10	Calculation of the Area : Don't measure Monte Hall : 3 doors and a twist Sorting : Arrange the books	CO2
11	Searching : Find in seconds Anagram Lottery Simulation - Profit or Loss	CO2
12	Simulate a password generator Simulate a grade book for a teacher Rock Paper and Scissor.	CO2
13	Python Program for: Converting an Image to Black and White/Grayscale Blurring an Image, Edge Detection and Reducing the Image Size	CO5

CO Vs PO Mapping and CO Vs PSO Mapping

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
1	2	2	2	1	1									3
2	1	2	1	1	1									3
3	1	2	1	1	1									3
4	1	1	1	2	1									2
5	2	2	2	2	1									2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**Lab Components**	**Model Exam**	**END SEM EXAM**
REMEMBER	10	10			10
UNDERSTAND	10	10			20
APPLY	80	80	100	100	70

ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Write a Python Program to read the unit of electricity consumed in a house and calculate the amount to be paid for the electricity consumed. The bill amount should be calculated as per the given specification:

a. For 0 to 100 units the per unit is ₹ 0/-

b. For 0 to 200 units, for the first 100 unit the per unit cost is zero and the next 100 units, the consumer shall pay ₹ 1.5 per unit.

c. For 0 to 500 units, the consumer shall pay ₹ 0 for the first 100 units, for the next 100 units the consumer shall pay ₹ 2 per unit, for the next 300 units the unit cost is ₹3.00/-

(Apply)

2. Chef and Chefina are at positions X and Y on a number line. They both love badminton. It is known that badminton courts are located at every integer point. They want to find a court such that the maximum distance travelled by either of them is **minimized**. Formally, suppose they choose the badminton court at position Z. You need to find the minimum value of max(|X-Z|, |Y-Z|)max(|X−Z|,|Y−Z|) across all possible choices of Z. Here, |X| denotes absolute value of X. Write a Python Program to Report this minimum value.

Input Format

The first line of input will contain a single integer T, denoting the number of test cases.
Each test case consists of two space-separated integers Xand Y.

Output Format

For each test case, output the minimum possible value of \max(|X-Z|, |Y-Z|)max(|X−Z|,|Y−Z|).

Constraints

1≤T≤1000
1≤X,Y≤1000
X<=Y

Sample :

Input
4
3 5

7 6
1 10
Output
1
1
5
16

3. Develop a Python Program to Check if a Date is Valid and Print the Incremented Date if it is. (Apply)

COURSE OUTCOME 2:

1. Write a Python Program to Read a Number n and Compute n+nn+nnn. (Apply)
2. Write a program to find Sum of Digit of a Number using Recursion in Python. (Apply)
3. Differentiate break and continue. (Understand)

COURSE OUTCOME 3:

1. What is printed by the following statements? (Apply)

```
s = "engineering"
r = ""
for item in s:
r = item.upper() + r
print(r)
```

2. Is string is mutable. Justify your answer. (Understand)
3. Write a Python Program to count the number of lowercase letters and uppercase letters in a string. (Apply)

COURSE OUTCOME 4:

1. What happens if the file is not found in the following Python code? (Apply)

```
a=False
while not a:
try:
f_n = input("Enter file name")
i_f = open(f_n, 'r')
except:
print("Input file not found")
```

2. Write a Python Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File. (Apply)
3. Write a Python Program to Extract Numbers from Text File. (Apply)
4. Write a Python Program to merge two files into a third file. (Apply)

COURSE OUTCOME 5:

1. Write a python program to convert RGB image to Black and white Image. (Apply)
2. How will you handle exception when it is raised? Explain. (Understand)

21ME1513	COMPUTER AIDED ENGINEERING GRAPHICS	L	T	P	C
		3	0	2	4

Prerequisites for the course

NIL

Objectives

1. To develop graphic skills in students.
2. Train to practice engineering graphics through drafting software.

UNIT I	INTRODUCTION	7

Computer aided drafting software. Simple Geometric constructions - draw and modify commons line Thickness-Lettering Practice-Title block, Dimensioning practice as per BIS conventions

UNIT II	ORTHOGRAPHIC PROJECTION	9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT III	SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES	9

Sections of regular solids as per BIS conventions - Constructing sectional views of simple objects and components - Development of lateral surfaces of regular solids-Projection of truncated solids .

UNIT IV	ISOMETRIC PROJECTIONS	5

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones ,Isometric view of simple components-flange, cylinder, chimney, lamp shades, valve, Brackets

UNIT V	PERSPECTIVE PROJECTIONS	5

Perspective projection of prisms, pyramids and cylinders by visual ray method.

S.No	List of Experiments	CO
1.	Basic drawing construction	C01, CO6
2.	Projection of simple Geometric objects and engineering components	C02, CO6
3.	Construction of simple objects and components sectional views	C03, CO6
4.	Projection of truncated solids	C04, CO6
5.	Perspective projection of solids	C05, CO6
	Total Periods	**45 Theory + 15 lab**

Laboratory Requirements

SYSTEM REQUIREMENTS

(For a batch of 30 Students)

Hardware:

1. Intel i3 core due processor with 4GB ram with 500GB hard disk – 30 Nos.
2. Laser Printer – 1 No.

Software:

Drafting package – AutoCAD – Adequate license (Open source)

Suggestive Assessment Methods

CAT 1 (30MARKS)	MODEL LAB (20 MARKS)	END SEMESTER EXAMS (50 MARKS)
30	20	50

Outcomes

Upon completion of the course, the students will be able to:

CO.1: Use of drafting software to draw basic geometrics, text , dimensions and title block
CO.2: Solve projections of solid problems and draw graphically
CO.3: Develop projections of sectioned solids and their developmental surface.
CO.4: Develop isometric views from orthographic projections
CO.5 Draw Perspective projections of simple solids
CO.6: Develop orthographic ,isometric and perspective projection and development of surfaces using drafting software.

Text Books

1. Venugopal K. and Prabhu Raja V., "Engineering]", New Age International (P) Limited (2016)
2.Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai(2015)

Reference Books

1. Kumar M.S., "Engineering Graphics", D.D. Publications, (2015)
2. Shah M.B. and Rana B.C., "Engineering Drawing", Pearson Education (2009)
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I & II combined), Subhas Stores, Bangalore, (2007)
4. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008)
5. Parthasarathy N.S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, (2015)

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

Special points applicable to end semester examination on Engineering Graphics:

1. There will be two questions in the end semester examination using drafting tool.
2. All questions will carry equal marks of 25 each making a total of 50

Web Resources

1. http://nptel.ac.in/courses/112103019
2. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3				3					2			2		
2	3				3					2			2		
3	3				3					2			2		
4	3				3					2			2		
5	3				3					2			2		
6	3				3					2			2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	LAB EXPERIMENTS	MODEL LAB	END SEM PRACTICAL EXAM
REMEMBER					
UNDERSTAND					
APPLY	100	100	100	100	100
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to drafting software to draw basic geometrics, Text , Dimensions and Title block (Understand)

1. What are the two systems of placing dimensions on a drawing? Illustrate your answer with sketches.
2. Show by sketches the difference between (i) continuous or chain dimensioning and (ii) progressive or parallel dimensioning. What are the advantages of one above the other?

COURSE OUTCOME 2: Students will be able to solve projections of solid problems and draw graphically ….(Apply)

1.A pentagonal pyramid of base side 25mm and height 40mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30o to VP. Draw the projections of the solid.

2.A hexagonal prism has side 25mm and height 50mm has a corner of its base on the ground and the long edge containing that corner inclined at 30o to HP and 45o to VP. Draw the projections of the solid.

COURSE OUTCOME 3: Students will be able to develop projections of sectioned solids and their developmental surface. ….(Apply)

1. A cylinder of base diameter 50mm and height 60mm rest on its base on HP. It is cut by a plane perpendicular to VP and inclined at 45^0 to HP. The cutting plane meets the axis at a distance 15mm from its top base. Draw the sectional plan and true shape of the section.

2.A regular hexagonal pyramid side of base 30 mm and height 60 mm is vertically on its base on HP, such that two of its sides of the base are perpendicular to VP. It is cut by a plane inclined at 30° to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid.

COURSE OUTCOME 4: Students will be able to develop isometric views from orthographic projections ….(Apply)

1. A cone of diameter 50 mm and axis 70 mm rests on its base on HP. A section plane perpendicular to VP and inclined at 30° to HP cuts the solid and passes through a point on axis which is 40 mm above HP. Draw the isometric view of a truncated cone.

2.A pentagonal pyramid of base edge 25 mm and height 65 mm rests vertically on its base on the HP such that one of its base edge parallel to VP. It is cut by a plane, parallel to HP and perpendicular to VP and passes through a point 25 mm from the apex. Draw the isometric view of the frustum of pyramid.

COURSE OUTCOME 5: Students will be able to draw Perspective projections of simple solid (Apply)

1.Draw the perspective view of a square prism of base side 40mm and height 50mm. one Vertical lateral face is parallel to PP and 30mm away from it. The station point is 80mm from PP, 80mm above the base and 60mm to the right of the axis of the prism.

2.A hexagonal pyramid of base side 25mm and axis length 50mm is resting on GP on its base with a side of base is parallel to and 20mm behind PP. The station point is 60mm above GP and 80mm in front of PP and lies in a central plane which is 50mm to the left of the axis of the pyramid. Draw the perspective view of a pyramid.

COURSE OUTCOME 6: Students will be able to develop Orthographic, isometric and perspective projection and Development of surfaces using drafting software. (Apply)

1. A hexagonal pyramid of base side 30 mm axis length 60 mm is resting on HP on one of its base corners with its axis inclined at 35˚ to HP and parallel to VP. Draw its projections.
2. A cylinder of base diameter 50mm and axis length 50mm is placed horizontally on GP on its base. The axis of the cylinder is 35mm behind PP. The station point is 70mm in front of PP and 70mm above the GP and is 50mm to the left of the axis. Draw the perspective projection of the cylinder.

19EE2511	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

Preamble

The significance of the Fundamentals of Electrical and Electronics Engineering Lab is renowned in the various fields of Engineering applications. For an Electrical Engineer, it is obligatory to have the practical ideas about the Electrical and Electronics Circuits. By this perspective we have introduced a Laboratory manual cum Observation for Electrical and Electronics Circuits.

Prerequisites for the course

Engineering Physics
Engineering Maths

Objectives

The course will enable students to:

- Verify basic electrical laws - KCL – KVL
- Gain knowledge on residential house wiring.
- Understand and practice the measurement of electrical parameters
- Study the basic electronic components & Design simple digital electronic circuits
- Understand and design basic logic circuits.

S.No	List of Experiments	CO
	LIST OF EXPERIMENTS (BASIC ELECTRICAL LAB)	
1	Verification of ohms law.	CO1
2	Verification of Kirchoffs laws for DC circuits.	CO1
3	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	CO1
4	Fluorescent lamp wiring.	CO1
5	Stair case wiring.	CO1
6	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	CO2
7	Measurement of energy using single phase energy meter.	CO2
	LIST OF EXPERIMENTS (BASIC ELECTRONICS LAB)	
8	Study of Electronic components and equipments-Resistor Color Coding	CO2
9	Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.	CO2
10	Study of logic gates AND, OR, EX-OR and NOT.	CO3
11	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	CO4
12	P-N Junction Diode Characteristics	CO5

13	Measurement of ripple factor of HWR	**CO5**
14	Input and Output Characteristics of Transistor in CB Configuration.	**CO5**

Total Periods :60

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	**End Semester Exams (50 Marks)**
EXPERIMENTS **1. Observation** **2. Viva voce**	**EXPERIMENTS** **1. Record note** **2. Viva voce**

Outcomes

Upon completion of the course, the students will be able to:

CO1:Demonstrate the basic electrical laws and domestic wiring.

CO2: Measure electrical quantities, energy and resistance.

CO3:Design basic electronic / logic circuits.

CO4:Perform soldering on electronic components in a PCB

CO5:Measuring the characteristics of electronic components.

Text Books

1. Jeyachandran K., Natarajan S. &Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. &Pranitha S., "Engineering Practices Lab Manual", VikasPuplishing House Pvt.Ltd, 2006.

Reference Books

1. Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2007.
2. Rajendra Prasad A. &Sarma P.M.M.S., "Workshop Practice", Sree Sai Publication, 2002. 5. Kannaiah P. & Narayana K.L., "Manual on Workshop Practice", Scitech Publications, 1999.
3. Laboratory Manual, Department of EEE, FXEC.

Web Resources

1.https://nptel.ac.in/courses/122106025/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3								2					3	
2	3	2							2					3	
3	3	2							2					3	
4	3	2							2					3	
5	3								2					3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model exam+ Rubric based (50 marks)	END SEM PRACTICAL EXAM (50 marks)
REMEMBER	10	10
UNDERSTAND	10	10
APPLY	30	30
ANALYZE	0	0
EVALUATE	0	0
CREATE	0	0
Total	50	50

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: :Demonstrate the basic electrical laws and domestic wiring(Apply)

1. Verify and simulateKirchhoffs voltage law for the given circuit.
2. Make a staircase wiring using two way controlled switch.

COURSE OUTCOME 2: Measure electrical quantities, energy and resistance. (Apply)

1. Measure the electrical quantities – voltage, current, power & power factor for the given RLC circuit.

2. Calculate energy consumed by the given load means of energy meter.

COURSE OUTCOME 3: Design basic electronic / logic circuits.(Apply)

1. Verify the combinational circuit and truth table for NOT and AND gate.
2. Verify the combinational circuit for adder which uses 2 bits.

COURSE OUTCOME 4: Perform soldering on electronic components in a PCB (Apply)

1. Assemble the following components as per the circuit diagram in the PCB.
2. Modify the given circuit as per the following by desoldering method.

COURSE OUTCOME 5: Measuring the characteristics of electronic components.(Apply)

1. Determine the VI characteristics of PN diode.
2. Determine the input characteristics of transistor which uses CB configuration.

21GE2M01	INDIAN CONSTITUTION AND CULTURAL HERITAGE	L	T	P	C
		2	0	0	0

Preamble:

The main objective of the Indian Constitution is to promote harmony throughout the nation. As we know, the Constitution is the supreme law and it helps in maintaining integrity in the society and to promote unity among the citizens to build a great nation.

Prerequisites for the course

- Nil

Objectives

1. To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it.
2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. To make students learn about the science management and knowledge system in our Indian Culture
4. To sensitize students towards issues related to 'Indian' culture, tradition and its composite character

UNIT I	INTRODUCTION AND BASIC INFORMATION ABOUT INDIAN CONSTITUTION	8

Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.		
UNIT II	**UNION EXECUTIVE AND STATE EXECUTIVE**	**8**
Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lokayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.		
UNIT III	**SCIENCE, MANAGEMENT AND INDIAN KNOWLEDGE SYSTEM**	**7**
Astronomy in India, Chemistry in India, Mathematics in India, Physics in India, Agriculture in India, Medicine in India ,Metallurgy in India, Geography, Biology, Harappan Technologies, Water Management in India, Textile Technology in India ,Writing Technology in India Pyrotechnics in India Trade in Ancient India/,India's Dominance up to Pre-colonial Times		
UNIT IV	**CULTURAL HERITAGE AND PERFORMING ARTS**	**7**
Indian Architect, Engineering and Architecture in Ancient India, Sculptures, Seals, coins, Pottery, Puppetry, Dance, Music, Theatre, drama, Painting, Martial Arts Traditions, Fairs and Festivals, Current developments in Arts and Cultural, India's Cultural Contribution to the World. Indian Cinema and its influence in cultural Heritage		
	Total Periods	**30**
Suggestive Assessment Methods		
Continuous Assessment Test (100 Marks)		**End Semester Exams**
1. **Descriptive questions** 2. Assignment		**NA**
Outcomes		
Upon completion of the course, the students will be able to :		
CO1	Identify and explore the basic features and modalities about the Indian constitution.	
CO2	Differentiate and relate the functioning of the Indian parliamentary system at the center and state level.	
CO3	To analyze the science management and knowledge system developed in our Indian Culture	

CO4	To understand, connect up and explain basics of Indian Traditional knowledge and modern scientific perspective.

WEB RESOURCES

- https://www.nios.ac.in/online-course-material/secondary-courses/indian-culture-and-heritage-(223)-syllabus.aspx#

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1							3			3					3
2							3			3					3
3							3			3					3
4							3			3					3
5							3			3					3

SEMESTER III

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA3205	Probability & Statistics	BS	4	3	1	0	4
2	21IT3501	Digital Principles and System Design	ES	4	3	1	0	4
3	21AI3601	Artificial Intelligence and Expert Systems	PC	3	3	0	0	3
4	21AI3602	Data Science Essentials	PC	3	3	0	0	3
Theory cum Practical Courses								
1	21A13603	Data Structures	PC	5	3	0	2	4
Practical Courses								
1	21AI3611	Artificial Intelligence lab	PC	4	0	0	4	2
2	21AI3612	Data Science lab	PC	4	0	0	4	2
3	21PT3902	Soft Skills- Verbal Ability	EEC	2	0	0	2	1
Mandatory Courses								
1	21HS1103	TAMIL HERITAGE* □□□□□□ □□□□	HSSM	1	1	0	0	**1**
			Total	30	16	2	12	24

21MA3205	PROBABILITYANDSTATISTICS	L	T	P	C
		3	1	0	4

Preamble:

This course provides an elementary introduction to probability and statistics with applications.Topicsinclude:basicprobabilitymodels;randomvariables;discreteandcontinuousprobabilitydistributions; statistical estimation and testing; confidence intervals; and an introduction tolinearregression.Controlchartsarea statistical-based controllingtoolthatassistsinmonitoring the improvements in the process over time. The goal of these control charts wouldbe to find any causes of variation as well as to analyze the process improvements that havebeen made.

Prerequisitesforthecourse

BasicknowledgeaboutmeasuresofcentraltendenciesandProbability.

Objectives

The Course will enable learners:

1. Thiscourseaimsatprovidingtherequiredskilltoapplythestatisticaltoolsinengineeringproblems.
2. Tointroducethebasicconceptsofrandomvariables.
3. Tointroducethebasicconceptsoftwodimensionalrandomvariables.
4. Toacquiretheknowledgeoftestinghypothesesforsmallandlargesamplesthisplaysanimportantrole in real life problems.
5. Tointroducethebasicconceptsofclassificationsofdesignofexperimentsthisplaysveryimportantroles in the fieldof agriculture and statistical qualitycontrol.

UNIT I	RANDOMVARIABLES	9 + 3

Samplespaces–Events-Axiomaticapproachtoprobability-ConditionalProbability-Randomvariables-Discreteandcontinuousrandomvariables–DiscreteDistributions–Binomialand Poissondistributions–ContinuousDistributions–Uniformand Normaldistributions.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsonDiscreteandcontinuousrandomvariables,Distributions.		
UNIT II	**TWO-DIMENSIONALRANDOMVARIABLES**	**9 + 3**
Joint distributions – Marginal distributions and conditional distributions – Covariance – CorrelationandLinearregressionanalysisforStatisticaldataonly-MethodofLeastSquares-CurveFitting.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsondistributions,Correlation,regression.		
UNIT III	**TESTINGOFHYPOTHESIS**	**9 + 3**
SamplingdistributionsandStandardError-Smallsamplesandlargesamples-Testofhypothesis-TypeI,TypeIIErrors-Largesampletestsformean–Smallsampletestsformean –tandftest-Chi-Squaredistribution-Testofindependenceofattributes.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsonSmallsampletestsformean–tandftest,Chi-Squaredistribution.		
UNIT IV	**DESIGNOFEXPERIMENTS**	**9 + 3**
Basicprinciplesofexperimentation-Analysisofvariance–One-wayclassification–CompletelyRandomizedDesign–Two-wayclassification-RandomizedBlockDesign–ComparisonofCRD andRBD.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsonANOVA,CompletelyRandomizedDesign		
UNIT V	**STATISTICALQUALITYCONTROLAND TIME SERIES**	**9 + 3**
Controlchartsformeasurements(XandRcharts)–Controlchartsforattributes(p,candnp charts)–Tolerancelimits-Acceptancesampling.-Timeseries.		
SUGGESTEDEVALUATIONMETHODS: • TutorialProblemsonXandRcharts,Controlchartsforattributes(p,candnpcharts)		
	TotalPeriods	**45+15=60Periods**

SuggestiveAssessmentMethods

Continuous AssessmentTest (20Marks)	Formative AssessmentTest (20Marks)	EndSemesterExams(60Marks)
1.DescriptiveQuestions	1.Assignment 2. Online Quizzes	1.DescriptiveQuestions

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1. Apply the concepts of random variables which can describe real life phenomena. (Apply)**CO2**.Applytheconceptsoftwo-dimensionalrandomvariableswhichcanapplyinengineeringapplications.(Apply)
CO3.Testingofhypothesesforlargesamplesandsmallsamplesinreallifeproblems.(Analyze)
CO4.Analyzethedesignofexperimentsinthefieldofagriculture(Analyze)
CO5.Applythechartsofsamplingdistributionsinengineeringandmanagementproblems.(Apply)

TextBooks

T1. Johnson,R.A.,Miller,IandFreundJ.,"MillerandFreund'sProbabilityandStatisticsforEngineers",Pearson Education, Asia, 8th Edition, 2015.

ReferenceBooks

R1Devore.J.L.,"ProbabilityandStatisticsforEngineeringandtheSciences‖,CengageLearning,NewDelhi, 8th Edition, 2014.
R2Papoulis,A.andUnnikrishnapillai,S.,"Probability,RandomVariablesandStochasticProcesses",McGraw HillEducation India, 4thEdition, NewDelhi, 2010
R3Ross,S.M.,"IntroductiontoProbabilityandStatisticsforEngineersandScientists",3rdEdition,Elsevier, 2004.
R4Spiegel.M.R.,Schiller.J.andSrinivasan,R.A.,"Schaum'sOutlineofTheoryandProblemsofProbability and Statistics",Tata McGrawHill Edition,2004
R5Walpole.R.E.,Myers.R.H.,Myers.S.L.andYe.K.,"ProbabilityandStatisticsforEngineersandScientists",Pearson Education, Asia, 8th Edition, 2007.
R6.Milton.J.S.andArnold.J.C.,"IntroductiontoProbabilityandStatistics",TataMcGrawHill,4thEdition, 2007.
R7.HamdyATaha,"OperationsResearchAnintroduction",10thedition,PrenticeHall

WebResources

1. Randomvariables-https://youtu.be/zujeSyREcQ4
2. Twodimensionalrandomvariables-https://youtu.be/_WM8vzYSQhs
3. Testingofhypothesis-https://youtu.be/8oNGkvuRP60
4. Designofexperiments-https://youtu.be/KhjM8YI3agk
5. Statisticalqualitycontrol-https://youtu.be/qb3mvJ1gb9g

COVsPOMappingandCOVsPSOMapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1				1	1			1			
2	3	2	1	1				1	1			1			
3	3	2	1	1				1	1			1			
4	3	2	1	1				1	1			1			
5	3	2	1	1				1	1			1			

COURSELEVELASSESSMENTQUESTIO

NSCOURSEOUTCOME1(CO1):(Apply)

1) Arandomvariable'X'hasthefollowingprobabilityfunction

X	0	1	2	3	4	5	6	7	8
p(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Determinethevalueof'a'

(ii) Find $(X<3), P(X\geq 3), P(0<X<5)$

(iii) Find the distribution function of X**.**

2) IfXisacontinuousrandomvariablewithprobabilitydensityfunction

$$(x)=\{kx^2, \quad -1<x<1 \ 0, elsewhere$$

thenfind(i)Thevalueof k

(ii)ThemeanandvarianceofX(i

ii)$(\frac{1}{3}\leq x\leq 4)$

COURSE OUTCOME2(CO2):(Apply)

1) If the joint p.d.f of (x,y) is given byp(x,y)=k(2x+3y), x= 0,1,2 &y =1,2,3.Find kand all the marginal and the conditional probability distribution of (x,y)&p(x+y>3)

2) If the joint PDF of X and Y is given by

$(x,y)=\{\frac{1}{8}(6-x-y);0<x<2,2<y<4,0 \quad else$

find

(a)$[X<1 \cap Y<3]$and$P[X<1/Y<3]$**.**

COURSEOUTCOME3(CO3):(Analyze)

2. A random sample of 200 tins of coconut oil gave an average weight of 4.95 kg.with a standard deviation of 0.21 kg. Do we accept that the net weight is 5 kgpertin at 5% level?
3. A sample of 26 bulbs gives a mean life of 990 hours with a S.D. of 20 hours. Themanufacturer claims that the mean life of bulbs is 1000 hours .Is the samplenotup to the standard.

COURSEOUTCOME4(CO4):(Analyze)

1. Performatwo-wayANOVAonthedatagivenbelow.

Plots ofLand	Treatments			
	A	B	C	D
I	38	40	41	39
II	45	42	49	36
III	40	38	42	42

2. Theyieldoffourstrainsofaparticularvariety of wheat was planted in fiverandomized blocks in Kgs per plot is given below. Test for difference betweenblocksand strains.

Blocks		1	2	3	4	5
strains	A	32	34	34	35	36
	B	33	33	36	37	34
	C	30	35	35	32	35
	D	29	22	30	28	28

COURSEOUTCOME5(CO5):(Apply)

1. 35successivesamplesof100castingseachtakenfromapopulationlinecontained

   3,3,5,3,5,0,3,2,3,5,6,5,9,1,2,4,5,2,0,10,3,6,3,2,5,6,3,3,2,5,1,0,7,4,3

   reject able castings Construct a P chart and state whether the process is undercontrol ornot.
2. Ten units were inspected for non-conforming welds with the total number ofdefectsas360.Construct aCchartfor thenumberofnon-conforming welds.

21IT3501	Digital Principles and System Design	L	T	P	C
		3	1	0	4

Preamble

Digital Principles and System Design design is used to develop hardware, such as circuit boards and microchip processors. Digital Logic Design aims to analyse various binary systems, basic postulates of Boolean Algebra and the K-map method for simplification of Boolean functions. It also describes the formal procedures for the analysis and design of combinational circuits like adders, code converters, decoder, encoder, multiplexers and Parity generators. It deals with the procedures for analysing and designing clocked (synchronous) sequential and asynchronous sequential circuits. The various circuit components such as registers and counters, Random Access Memory (RAM), Programmable logic devices such as ROMs, PLAs and PALs are dealt here.

Prerequisites for the course

- Basics of Digital Systems

Objectives

1. To design digital circuits using simplification of Boolean functions using Boolean Laws and Karnaugh Maps
2. To analyze and design combinational circuits
3. To design combinational circuits using HDL
4. To analyze and design synchronous and asynchronous sequential circuits
5. To design and analyze Programmable Logic Devices

UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	10+2

Arithmetic Operations :Binary Addition, Subtraction using 1's and 2's complements - **Boolean Algebra** : Theorems and Properties of Boolean Algebra - Simplification of Boolean functions - **Canonical and Standard Forms :**Minterms and Maxterms, Sum of Products and Product of Sums - Simplification of Boolean Functions using Karnaugh Map (2,3,4 Variables)–NAND and NOR Implementations.

SUGGESTED ACTIVITIES :

- Place Value Systems and Arithmetic Operations
- Simplification of Boolean functions using Boolean Laws and Karnaugh Map

SUGGESTED EVALUATION METHODS :

- Tutorial Problems
- Assignment Problems
- Quizzes

UNIT II	COMBINATIONAL LOGIC	10+2

Binary Adders - Carry Look Ahead Adder - BCD Adder - Binary Codes – **Code Converters**: Binary code to Graycode and Vice versa –BCD code to Excess 3 code and Vice versa - Decoders – Encoders – Multiplexers - Parity generators and Checkers - Introduction to HDL – HDL Models of Combinational circuits.

SUGGESTED ACTIVITIES :

- Flipped Classroom
- Applications of combinational circuits in class
- HDL for combinational Circuits

SUGGESTED EVALUATION METHODS :

- Tutorial Problems
- Assignment Problems
- Quizzes

UNIT III	**SYNCHRONOUS SEQUENTIAL LOGIC**	**10+2**

Introduction to Sequential Circuits - **Latches :** R-S Latch and D Latch, **Flip-Flops** :SR, JK, D, T and Master Slave Flip Flops - Analysis of Clocked Sequential Circuits –Flip-Flop Excitation Tables - State Reduction and Assignment - Design Procedure –Shift Registers -**Counters :** Design of Ripple counter, Mod-n Counter, Johnson counter, Ring counter

SUGGESTED ACTIVITIES :

- Flipped Classroom
- Applications of Counters and Shift Registers in class

SUGGESTED EVALUATION METHODS :

- Tutorial Problems
- Assignment Problems
- Quizzes

UNIT IV	**ASYNCHRONOUS SEQUENTIAL LOGIC**	**10+2**

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

SUGGESTED ACTIVITIES :

- Reduce State and Flow Tables for Asynchronous Sequential Circuits
- Application of a Hazard Free Circuit

SUGGESTED EVALUATION METHODS :

- Tutorial Problems
- Assignment Problems
- Quizzes

UNIT V	**MEMORY AND PROGRAMMABLE LOGIC**	**10+2**

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

SUGGESTED ACTIVITIES :

- Flipped Classroom
- Applications of Error Detection and correction codes, Programmable Devices

SUGGESTED EVALUATION METHODS :

- Tutorial Problems
- Assignment Problems
- Quizzes

Total Periods	**60**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS **2. PROBLEM SOLVING**	**1. TUTORIAL PROBLEMS** **2. ASSIGNMENT** **3. QUIZZES**	**1. DESCRIPTIVE QUESTIONS** **2. PROBLEM SOLVING**

Outcomes

Upon completion of the course, the students will be able to:

CO1– Understand the basic concepts of Binary arithmetic, Boolean Laws and Apply Boolean Boolean Laws and rules of K-Map in reducing Boolean expressions.

CO2– Design and Analyze Combinational circuits and design them using HDL language

CO3–Design and AnalyzeSynchronous Sequential Circuits, Shift registers and Counters.

CO4–Design and Analyze Asynchronous Sequential Circuits, Race free State Assignments and Hazard Free Circuits.

CO5–Analyze Error Detection, Error Correction and Design Programmable Logic Devices and solve expressions using the PLD devices

Text Books

1. M. Morris R. Mano, Michael D. Ciletti, ―Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog‖, 6th Edition, Pearson Education, 2017.

Reference Books

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2012
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Enhanced Edition, CENGAGE Learning, 2020

Web Resources

1. Digital Systems - https://nptel.ac.in/courses/106/108/106108099/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1	3	3											3	
2	3	3	2	2	2								3	
3	2	3	3	2	2								3	
4	2	3	3	2	2								3	
5	3	3	3	3									3	

BLOOMS LEVEL ASSESSMENT PATTERN

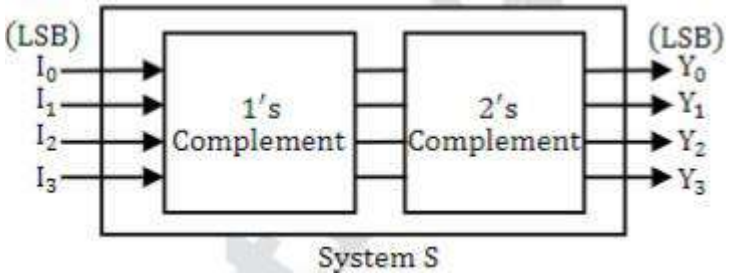
BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

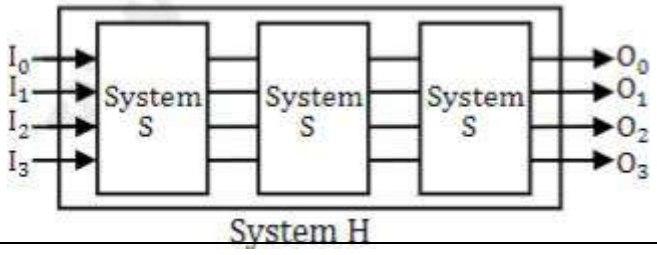
COURSE OUTCOME 1: Students will be able to Predict the suitable method for...(Apply)

Course Outcome 1 (CO1):

1. What are the limitations of K-map? (Remember)
2. State and Prove Consensus Theorem. (Understand)
3. Consider a System S as shown in figure.



System S performs 1's Complement of I/P and 2's Compliment to produce O/P. A new system H is designed in which 3 systems S are cascaded.



If input applied is I3 I2 I1 I0 = 1 0 1 0,
then the output O3 O2 O1 O0 will be equal to ? (Apply)

Course Outcome 2 (CO2):

1. Draw the truth table of half-adder. (Remember)

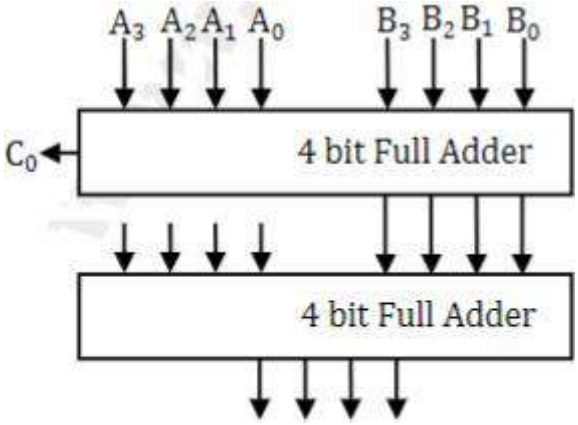
2. In a Multiplexer if there are 4 input line and one output line, how many select lines will be there? (Understand)

3. The following logic circuit adds two digits represented in Excess-3 code. The correction required after adding the two digits in Excess-3 form is as follows :

If C0 = 1, then add 3

If C0 = 0, then subtract 3

Identify the inputs to be given to the 2nd 4-bit full adder in terms of C0.



Course Outcome 3 (CO3):

1. Give the excitation table of T Flip-Flop.(Remember)

2. What is a Shift Register? What are the applications of Shift Register? (Understand)

3. Design and implement Mod-5 Synchronous Counter using JK Flip-Flop and also draw the timing diagram. (Apply)

Course Outcome 4 (CO4):

1. What is memory address register? (Remember)

2. Is it essential to have race free assignment? Justify. (Understand)

3. Design a circuit with primary inputs A and B to give an output Z equal to 1, when A becomes 1 if B is already 1. Once Z = 1, it will remain so until A goes to 0. Design and implement the circuit using S-R Latch. (Analyze)

Course Outcome 5 (CO5):

1. How to detect double error and correct single error? (Understand)

2. Implement the following two functions using PLA.(Apply)
F1 (A, B, C) = AB' + AC + A'BC'
F2(A, B, C) = (AC + BC)'.

3. Analyze a combinational circuit using ROM that accepts a three-bit binary number and outputs a binary number equal to the square of the input number. (Analyze)

21AI3601	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	L	T	P	C
		3	0	0	3

Preamble

The fundamental ideas and methods of artificial intelligence are covered in this course. The subarea of computer science known as artificial intelligence is focused on developing the software and hardware necessary to enable computers to perform actions that would be regarded as intelligent if it is similar to those carried out by people. The students in this course will learn general problem-solving techniques that they can use to solve a variety of issues in the real world. Students can discover how computers can reason, interact, solve problems, and learn.

Prerequisites for the course

- 21CS1501 – Problem solving and logical thinking using C
- 21CS2501 - Introduction to Computing using Python

Objectives

1. To understand basics about Intelligent agents and problem solving
2. To learn about the different search strategies in AI
3. To learn knowledge representation techniques and reasoning.
4. To understand the different ways of designing software agents
5. To know applications of Natural language processing and artificial neural networks

UNIT I	INTRODUCTION TO AI	9

Definition - Future of Artificial Intelligence - Characteristics of Intelligent Agents - Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

SUGGESTED ACTIVITIES:

- Basics of Intelligent Agents

SUGGESTED EVALUATION METHODS:

- **Quizzes**

UNIT II	PROBLEM SOLVING METHODS	9

Problem solving Methods - Search Strategies- Uninformed – Informed– Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations –Constraint Satisfaction Problems– Constraint Propagation - Backtracking Search- Game Playing – Optimal Decisions in Games– Alpha - Beta Pruning - Stochastic Games

SUGGESTED ACTIVITIES:

- Alpha Beta pruning
- Backtracking problem

SUGGESTED EVALUATION METHODS:

- Practical on Alpha Beta Pruning and Backtracking Problem using Python

UNIT III	KNOWLEDGE REPRESENTATION	9

First Order Predicate Logic– Prolog Programming– Unification – Forward Chaining - Backward Chaining – Resolution– Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

SUGGESTED ACTIVITIES:

- Prolog Programming for object classification
- Forward chaining and backward chaining.

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT IV	**SOFTWARE AGENTS**	**9**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems

SUGGESTED ACTIVITIES:

- Seminars on Agent communication

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT V	**EXPERT SYSTEMS**	**9**

Definition- Features of expert system- Organization-Characteristics- Knowledge representation in expert systems- Decision system in Robotics-Expert system tools- MYCIN-EMYCIN

SUGGESTED ACTIVITIES:

- Solving Real world problems with Speech Recognition Robot
- Seminars

SUGGESTED EVALUATION METHODS:

- Project Demonstration and Presentation

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS **2.CASE BASED QUESTIONS**	1. ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	**1. DESCRIPTIVE QUESTIONS** **2. CASE BASED QUESTIONS**

Course Outcomes

Upon completion of the course, the students will be able to:

1. Understand AI agents, Select and apply appropriate algorithms and AI techniques to solve complex problems
2. Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems
3. Represent knowledge using first order and predicate logics

Text Books

1.S.Russell and P.Norvig, Artificial Intelligence: A Modern Approach ,Prentice Hall, Third Edition, 2009
2.M.Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science),Jones and Bartlett Publishers,Inc.; FirstEdition, 2008.

Reference books

1. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press,2009.
2. William F. Clocksin and Christopher S.Mellish, Programming in Prolog: Using the ISOStandard, Fifth Edition, Springer, 2003.

Web Resources

1. https://www.udacity.com/course/intro-to-artificial-intelligence--cs271
2. https://onlinecourses.nptel.ac.in/noc22_ge29/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2									3		
2	3	3	3										3		
3	3	3	3	3									3	3	
4	3	3	3	2									3	3	
5	3	3	3										3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. How to measure the problem-solving performance of an algorithm? (Understand)
2. Describe the differences and similarities between problem solving and planning (Understand)

COURSE OUTCOME 2:

1. Given a constraint satisfaction problem with two variables x and y whose domains are Dx={1,2,3}, Dy={1,2,3} and constraint x.Consider the following constraint network R = where D1 = D2 = D3 = {a, b, c} and C = , , , }. How many solutions exist? **(Analyze)**

2. Given the following constraint networks X,Y and Z with four variables x1,x2,x3 and x4 all defined on the same domain values {red,blue}. The constraints in the network are as follows:

X: R13=R14=R23=R24={(red,blue) (blue,red)} Y: R13=R14=R23=R24={(red,blue) (blue,red)} , R12={(red,red) (blue,blue)} Z: R13=R14=R23=R24={(red,blue) (blue,red)} , R34={(red,blue) (blue,red)}

Identify the equivalent pairs **(Apply)**

3. Formulate the minimax and alpha–beta algorithms and how it works for the game of tic-tac-toe.

COURSE OUTCOME 3:

1. How LISP and PROLOG can help you in regard of developing artificial intelligence? Explain in detail with features (Analyze)
2. Translate the following statement into FOL. “For every a, if a is a philosopher, then a is a scholar” (Apply)

COURSE OUTCOME 4:

1. Write PEAS description of an agent that reports threat of tsunami activity: Determine what type of agent architecture is most appropriate (table lookup, simple reflex, goal-based, or utility-based). Give a detailed explanation and justification of your choice.(Analyze)

2. Describe the properties of the environment of the Tsunami Activity Reporter in terms of the principal distinctions we can make (accessible vs. inaccessible, deterministic vs. nondeterministic, episodic vs. nonepisodic, static vs. dynamic vs. semidynamic, discrete vs. continuous). That is, identify in detail which properties are characteristic of the environment described, and give a justification for your description (Apply)

COURSE OUTCOME 5:

1. A search engine is designed to work over a collection of 1000 documents. In response to a query Q, the system retrieves 200 documents, of which 15 are found to be relevant. It is known from human judgements that the collection has 25 documents which are relevant to Q. Estimate the precision and recall of retrieval. (Apply)
2. Compare the early development of robotics to those being developed today. How have advancements in the field of electronics affected robotics research today? (Analyze)

21AI3602	DATA SCIENCE ESSENTIALS	L	T	P	C
		3	0	0	3

Preamble

This course encompasses the analysis and evaluation of data using mathematics, statistics, and computer science. The main goal of this course is to gather useful data for forecasting, trend analysis, product development, and strategic decision-making.

Prerequisites for the course

- 21MA3202 - Probability and Statistics
- 21CS250 - Introduction to Computing using Python

Objectives

1. To introduce the essential elements of data science.
2. To explore the data, process the data and infer knowledge.
3. To summarize, analyze and visualize the data.
4. Be exposed with different applications in Data Science.
5. To identify and apply suitable techniques for solving real-world problems

UNIT I	INTRODUCTION TO DATA SCIENCE	9

Life cycle of Data Science Project –Setting goals – Listening to customers – Data Sources – Flat files, HTML, XML, JSON – Data Acquisition Pipeline - Role of data scientist – Predictive modeling - Understanding data – types of data.

SUGGESTED ACTIVITIES:

- In class activity identifying the data and data resources
- Analyze the role of data scientist

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT II	DATA EXPLORATION AND MANIPULATON	9

Vectors – Matrices – Data Frames -Indexing, Slicing, Aggregation – Broadcasting – Binning – Partitioning – k-neighbours example – Data selection – Handling missing data – Data loading, storage and file formats - Combining data sets – Concat, Append, merge and join operations.

SUGGESTED ACTIVITIES:

- Presentation and discussion on data exploration.
- Implementation of data handling

SUGGESTED EVALUATION METHODS:

- Practical on data selection and concat, merge operations.

UNIT III	**DATA ANALYSIS**	**7**

Central Tendencies – Dispersion – Correlation – Causation – Dependence and Independence – Conditional Probability – Bayes Theorem – Hypothesis and Inference – Defining statistical modeling – Data Cleaning and preparation.

SUGGESTED ACTIVITIES:

- Implementation of classification problem using Bayes Theorem

SUGGESTED EVALUATION METHODS:

- Assignment Problem
- Quizzes

UNIT IV	**VISUALIZATION**	**7**

Visualization Techniques - Bar chart – Line chart – Scatter plot – Histograms – Binning – Density and Contour plots – Visualizing Errors – Error bars – Text and Annotation – Customizing colours – Geo maps.

SUGGESTED ACTIVITIES:

- Perform the data visualization for behaviour of human in online social networks

SUGGESTED EVALUATION METHODS:

- Practical- Plot the charts for visualizing errors.

UNIT V	**RECENT ADVANCEMENTS**	**13**

Recommendation systems – Natural language processing – Image Data Analysis – Machine learning – Deep learning – Artificial Neural Networks – Case studies.

SUGGESTED ACTIVITIES:

- Implementation of Recommendation System
- Implementation of deep learning algorithm

SUGGESTED EVALUATION METHODS:

- Project submission

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 |Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS **2.CASE BASED QUESTIONS**	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	**1.DESCRIPTIVE QUESTIONS** **2.CASE BASED QUESTIONS**

Course Outcomes

Upon completion of the course, the students will be able to:

1. Understand the basic concepts of Data Science to practice Python functionality and libraries.
2. Use linear algebra, descriptive statistics to represent data and to understand distributions of data.
3. Prepare the data to improve its quality and to build the effective models
4. Interpret the significance of data using inferential statistics and visualization techniques.
5. Implement data science in Speech Recognition and Recommendation system etc,.

Text Books

1.Joel Grus ,"Data Science from Scratch",O 'Reilly Publishers, First Edition,2015

2.Wes McKinney,"Python for data analysis",O'Reilly Media.Second edition, 2017

Reference Books

1. Brain Godsey," Data scientist-Tackle the data science process step-by-step", Manning Publications Co,First edition, 2017.
2. Jake VanderPlas,"Python Data science Handbook", O'Reilly Media, Inc.,First Edition,2017

Web Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs74/preview
2. https://towardsdatascience.com/

T1	Joel Grus ,"Data Science from Scratch",O 'Reilly Publishers, First Edition,2015	Chp 9	Chp 2	Chp 6,7, 8	Chp 3	Chp 18, 20
T1	Wes McKinney,"Python for data analysis",O'Reilly Media.Second edition, 2017	Ch 6	Chp 5	Chp 7,1 4	Chp 9	-
R1	Brain Godsey," Data scientist-Tackle the data science process step-by-step", Manning Publications Co,2017.	Chp 3	-	-	-	-

R2	Jake VanderPlas,"Python Data science Handbook", O'Reilly Media, Inc.,First Edition,2017	-	Chp3	Chp 5	Chp 4	Chp5
W1	https://onlinecourses.nptel.ac.in/noc22_cs74/preview	Module 1	Module 3	Module 3	Module 3	Module 4
W2	https://towardsdatascience.com/	All Topics	All Topics	All Topics	All Topics	All Topics

CO Vs PO Mapping and CO Vs PSO Mapping

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
1	3	3	3										3		
2	3	3	3										3		
3	3	3											3	3	
4	3	3	2										3	3	
5	3	2	2	2	3								3	3	3

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Given the names and grades for each student in a Physics class of students, store them in a nested list and print the name(s) of any student(s) having the second lowest grade. (Apply)

2. Find the value of h (231,8) for the function below? def h(m,n): ans = 0 while (m >= n): (ans,m) = (ans+1,m-n) return(ans)(Apply)

COURSE OUTCOME 2:

1.In a class of 50,000 students what is the probability that more than 5050 students get grades D or worse (D or F) (approximately)(Analyze)

COURSE OUTCOME 3:

1. Find the statistical test/ technique would you use: We are an online shopping portal. We can tell if someone who is on our website is a mac user or a PC user. We want to test the hypothesis that among people who purchase something from our website mac users tend to spend more money than PC users.(Apply)

2. Your task is to conduct ANOVA over this data to check whether you get evidence that prices over the land were not same for the three years considered. Find the F-statistic for the given data.(Analyze)

COURSE OUTCOME 4:

1. Draw bar chart and box plot for a numerical data set and infer the results of visualization using various visualization Techniques.(Analyze)
2. How does text annotators helpful for Engineers? Give example (Analyze)

COURSE OUTCOME 5:

1. Find the number of vectors present in the null space of the given matrix $\begin{matrix} 1 & -3 & -5 \\ -2 & 1 & 3 \end{matrix}$

Reflect your recommendations in data science process(Analyze)

2. Design a data science project for the following scenario. Student Evaluation Dataset is based on an evaluation form filled out by students for different courses. It has different attributes including attendance, difficulty, score for each evaluation question, among others. This is an unsupervised learning problem. The dataset has 5820 rows and 33 columns. [https://archive.ics.uci.edu/ml/datasets/Wine+Qualityhttps://archive.ics.uci.edu/ml/datasets/Turkiye+Student+Evaluation](Apply)

21AI3603	**DATA STRUCTURES** **(Common to AI-DS and CSBS)**	**L**	**T**	**P**	**C**
		3	0	2	4

Preamble

Data structures course focusing on effective programming than the syntax / semantics of any programming language. In other words, this course views the problem solving not just as solving the problem somehow but about solving the problem in the most efficient way.

Prerequisites for the course

- 21CS1501- Problem Solving and Logical Thinking using C

Objectives

1. To understand the concepts of ADTs
2. To Learn linear data structures – lists, stacks, and queues
3. To understand sorting, searching and hashing algorithms
4. To apply Tree and Graph structures
5. To learn the Sorting Techniques

UNIT I	**LINEAR DATA STRUCTURES – LIST**	**9**

Introduction to Data structures, Algorithms: Complexity –Time- Space trade off- Mathematical notations and functions- Asymptotic notations, Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly, doubly and circularly linked lists

SUGGESTED ACTIVITIES:

- Practice designing algorithms for some small simple problems, proving their correctness, and estimated their complexity

SUGGESTED EVALUATION METHODS:

- Assignment - Based on design, correctness and efficiency
- Quizzes

UNIT II	**LINEAR DATA STRUCTURES – STACKS, QUEUES**	**9**

Stack ADT – Operations – Applications: Evaluating arithmetic expressions- Conversion of Infix to postfix expression- Nested function calls, Recursion, Towers of Hanoi - Queue ADT: Operations - Circular Queue –Applications of queues

SUGGESTED ACTIVITIES:

- Practical- An application based on linear data structure
- Converting an algorithm from recursive to non-recursive using stack

SUGGESTED EVALUATION METHODS:

- Assignment Problem
- Quizzes

UNIT III	**NON LINEAR DATA STRUCTURES – TREES**	**9**

Tree ADT – tree traversals - Binary Tree ADT –binary search tree ADT –AVL Trees –B-Tree - B+ Tree - Heap – Binary Heap – Applications of heap.

SUGGESTED ACTIVITIES:

- Applications of trees.
- Practical - Implementing tree traversals.

SUGGESTED EVALUATION METHODS:

- Assignment related to application
- Programming exercises in the laboratory
- Quizzes

UNIT IV	**NON LINEAR DATA STRUCTURES - GRAPHS**	**9**

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Minimum Spanning Trees – Kruskal and Prim algorithm – Shortest path algorithm – Dijkstra's algorithm

SUGGESTED ACTIVITIES:

- Applications of graph.
- Practical - Implementing graphtraversals.

SUGGESTED EVALUATION METHODS:

- Assignment Problem
- Programming exercises in the laboratory
- Quizzes

UNIT V	**SEARCHING, SORTING AND HASHING TECHNIQUES**	9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Hashing- Hash Functions – Separate Chaining – Open Addressing

SUGGESTED ACTIVITIES:

- Comparison of internal sorting algorithms
- Practical – Implementation of Hash table

SUGGESTED EVALUATION METHODS:

- Programming exercises in the laboratory
- Quizzes

Total Periods	**45**

S.No	List of Experiments	CO
1	Linked List implementation of Queue ADT	CO1,CO2
2	Linked List implementation of Stack ADT	CO1,CO2
3	Applications of Stack	CO2
4	Implementation of Binary Trees and operations of Binary Trees	CO3
5	Graph – Breath First Search	CO4
6	Graph – Depth First Search	CO5
Total Periods		**45 Theory+ 30 lab**

Laboratory Requirements

- Windows with C, Turbo C++ 3.2.

Suggestive Assessment

Continuous Assessment Test (20 Marks)	Lab Components Assessments (30 Marks)	End Semester Exams (50 Marks)
1. DESCRIPTIVE QUESTIONS	1. LAB EXPERIMENTS(20) 2. MODEL EXAMINATION(10)	**1.DESCRIPTIVE QUESTIONS** **2.CASE BASED QUESTIONS**

Outcomes

Upon completion of the course, the students will be able to:

1. Understand the concept of abstract data types, algorithms, Big O notation (Understand)
2. Understand basic data structures such as arrays, linked lists, stacks and queues.(Apply)
3. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data (Apply)
4. Solve real world problems involving Graph, Tree, Heap (Apply)
5. Evaluate the suitability of different data structures for solving computing problems (Analyze)

Text Books

1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C‖, 2nd Edition, Pearson Education,1997
2. Reema Thareja, ―Data Structures Using C‖, Second Edition , Oxford University Press, 2011

Reference Books

1.D.S.Malik," data Structures using C++" ,Second edition,Course technology,2010
2.Paul Deital , Harvey deital , "C How to Program" , 8th Edition , Pearson,2016

Web Resources

1. https://www.programiz.com/dsa
2. https://nptel.ac.in/courses/106102064

		Unit I	Unit II	Unit III	Unit IV	Unit V
T1	Mark Allen Weiss, —Data Structures and Algorithm Analysis in C‖, 2nd Edition, Pearson Education,1997	Chp 1,Chp 2	Chp 3	Chp 4,Chp 6,Chp 8	Chp 9	Chp 5,Chp 7
T1	Reema Thareja, —Data Structures Using C‖, Second Edition , Oxford University Press, 2011	Chp 1,Chp 2,Chp 6	Chp 7,Chp 8	Chp 9,Chp 10,Chp 11,Chp 12	Chp 13	Chp 14,chp 15
R1	D.S.Malik," data Structures using C++" ,Second edition,Course technology,2010	Chp 5	Chp 6,Chp 7,Chp 8	Chp 11	Chp 12	Chp 9,Chp 10
R2	Paul Deital , Harvey deital , "C How to Program" , 8th Edition , Pearson,2016	Chp 12	–	–	–	Chp 6
W1	https://www.programiz.com/dsa	All Topics	All Topics	All Topics	All Topics	All Topics
W2	https://nptel.ac.in/courses/106102064	Module 1,Module 3	Module 2	Module 5,Module 6	Module 35,Module 29,Module 30	Module 22, Modul 23

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3												
2	3	3	3										3		
3	3	3	3										3		

4	2	3	3	3									3		
5	2	3	3	3											

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

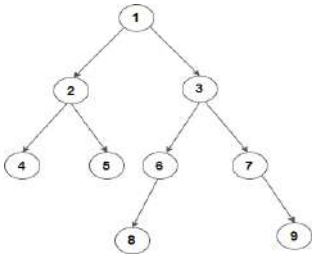
1. Given an array and a singly linked list. Which of these data structures uses more memory space to store the same number of elements? Justify your answer.(Understanding)
2. Which asymptotic notations can be used to describe the upper bound and lower bound of algorithm's running time and define also? (Remember)
3. Describe the functional code for deleting a desired node in a singly linked list (Understand)
4. Discuss the programming code in C language to create, insert and display the elements in a doubly linked list. (Apply)

COURSE OUTCOME 2:

1. Write the postfix form of each of the following infix. (Apply)
   A-B+(M/N) *(O+P)-Q/R^S*T+Z
   K+L-M*N+(O^P)*W/U/V*T+Q
2. Design a stack that returns minimum element in constant time (Analyze)
3. Given a 5 element stack S (from top to bottom: 2, 4, 6, 8, 10), and an empty queue Q, remove the elements one-by-one from S and insert them into Q, then remove them oneby-one from Q and re-insert them into S. List the elements in S (from top to bottom).(Analyze)

COURSE OUTCOME 3:

1. Given a binary tree, find all ancestors of a given node in it.(Understand)



2. Explain the following
   a) Complete Binary Tree
   b) Binary Tree
   C) Binary Search Tree. (Understand)
3. Write an algorithm to print complete binary search tree in increasing order. (Apply)
4. Suppose inorder and preorder traversal of a binary tree: (Analyse)
   Inorder D, B, H, E, A, I, F, J, C, G
   Preorder A, B, D, E, H, C, F, I, J, G

COURSE OUTCOME 4:

1. Describe taking an example "linked representation of graph" (Understand)
2. Prove that the maximum number of edges that a graph with n Vertices is n*(n-1)/2. (Apply)
3. Explain Dijkstra's algorithm with an example? (Apply)

COURSE OUTCOME 5:

1. How the insertion sort is done with the array? (Apply)
2. Develop a C program to sort the elements using bubble sort and insertion sort (Apply)

Let m = 17, h1(x) = (k+15)%m, h2(x) = (4k+11)%m, and h3(x) = (7k+2)%m. Insert the keys 23, 7, 50, and 91 into the bit vector, and show the resulting vectors content. Then, find a key that is a false positive; that is, find a key that appears to have been inserted, but wasn't.(Analyze)

21AI3611	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
		0	0	4	2

Preamble

The laboratory course will enable the students to use machine learning libraries, Python, LISP, and PROLOG to apply the concept of artificial intelligence to various challenges, such as the eight queens and travelling salesperson difficulties. These exercises are designed to give students hands-on experience that will help them develop general problem-solving abilities that can be applied to a variety of real-world issues. Students can study how machines can think, interact, solve problems, and learn.

Prerequisites for the course

- 21CS250 - Introduction to Computing using Python
- 21CS1501- Problem Solving and Logical Thinking using C

Objectives

- To study and discuss various techniques and algorithms of AI used in general problem solving.
- To solve optimization problems, constraint satisfaction problems, and game programming.
- To apply the AI concepts to solve real world problem.

S.No	List of Experiments	CO
1	Basics of PROLOG	CO1
2	Write simple fact for the statements using PROLOG.	CO1
3	Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.	CO1
4	Write a program to solve the Money Banana problem.	CO2
5	Write a program to solve 8-Queen problem.	CO3
6	Write a program to Solve problems using Best First Search	CO4
7	Write a program Solve problems using Depth First Search	CO4
8	Write a program Solve problems using union and intersection of a list	CO4
9	Write a program to flatten a list	CO4
10	Write a program to solve water jug problem using LISP/PROLOG	CO5
11	Write a program to solve Hill Climb Algorithm	CO5

12	Write a constraint logic program for weather monitoring using Fuzzy Prolog	CO5

S.No.	List of Projects	Related Experiment	CO
1	Family Tree	**1,2,3**	CO1
2	Ordering a Pizza	**1,2,5**	CO1
3	Sudoko Game	**1,2,4**	CO1
4	Retrieve a disease in base of different input with a prolog base of knowledge	**1,2,4**	CO2
5	Truth table maker	**1,2,4**	CO2
6	Tic Tac Toe Game	**1,2,6,7**	CO3
7	Offers for customers based on a database	**1,2,6,7**	CO3
8	pet shop	**1,2,8**	CO3
9	Words and their English meanings	**1,2,9**	CO4

10	Hangman Game	**1,2,10**	CO4
11	Railway Ticket Booking System	**1,2,11**	CO4
12	Cricket Score Sheet	**1,2,11**	CO5
13	Crossword	**1,2,12**	CO5
14	Quiz	**1,2,9**	CO5

Total Periods : 60

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	**End Semester Exams (40 Marks)**
• Lab Experiment(40) • Model Exam& Test project(20)	• Practical Exam

Outcomes:

Students can able to

Course Outcome 1(CO1):

Understand the basics of PROLOG and its working environment.

Course Outcome 2(CO2):

Design and develop expert system by using appropriate tools and techniques.

Course Outcome 3(CO3):

Solve the problems with different optimization Techniques like travelling salesman problem, 8-Queen problem

Course Outcome 4(CO4):

Implement the Depth first Search algorithm for solving the various problem Using PROLOG/Lisp.

Course Outcome 5(CO5):

Construct solutions for Image Classification and Object Detection in any large dataset.

Laboratory Requirements:

- PROLOG and Lisp
- Python

Reference Books

1. S.Russell and P.Norvig, Artificial Intelligence:A Modern Approach ,Prentice Hall, Third Edition, 2009.
2. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011

Web Resources

1. https://hackernoon.com/16-best-resources-to-learn-ai-machine-learning-in-2019-f95c4f59018b
2. https://learndigital.withgoogle.com/digitalgarage/course/elements-artificial-intelligence.
3. https://walker.cs.grinnell.edu/courses/261.sp98/lab-beginning-LISP-2.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										3		
2	3	3			3								3	3	3
3	2	2	3	3	3								3	3	3
4			3	3	3								3	3	3
5		3	3	3									3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam	END SEM EXAM
REMEMBER		
UNDERSTAND		
APPLY	100	100
ANALYZE		
EVALUATE		
CREATE		

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Consider the expression (all x (if (human x) (mortal x))). Write lisp expressions to extract each of the following. .(Understanding)

Allifhuman

2. Evaluate the following slightly tricky forms:(Evaluate)

(append '(a b c) '( ))
(list '(a b c) '( ))
(cons '(a b c) '( ))

Course Outcome 2 (CO2):

1. How can AI are used in fraud detection by the rule-based algorithms. Analyze the patterns to identify the fraudulent bank transaction.(Analyze)
2. Implement a k-means clustering algorithm for any given data set

Course Outcome 3 (CO3):

1. Implement the optimization technique to solve Robot problem using Means End Analysis.(Apply)
2. Apply any one randomized search technique (Simulated annealing, Genetic Algorithms, Particle swarm optimization) for solving problems like, TSP, Graph coloring, Vertex cover problem, shortest path problems, etc

Course Outcome 4 (CO4):

1. Select and apply appropriate algorithms and AI techniques to solve complex problems.(Apply)

Course Outcome 5 (CO5):

1. Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.(Analyze)

2. Implement Image Classification (MNIST Handwritten Digit Recognition) using Back propagation.(Apply)

21AI3612	**Data Science lab**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Preamble

This course encompasses the use of mathematics, statistics, and computer science to study and evaluate data. The key objective of this course is to extract valuable information for strategic decision making, product development, trend analysis, and forecasting.

Prerequisites for the course

- 21CS250 - Introduction to Computing using Python
- 21CS1501- Problem Solving and Logical Thinking using C

Objectives

- To explore the fundamental concepts of data analytics.
- To learn to analyze the data using intelligent techniques.
- To understand the various exploration methods and visualization techniques
- To develop the skills in applying appropriate supervised, semi-supervised or unsupervised learning algorithms for solving practical problems.

S.No	**List of Experiments**	**CO**
1.	Data Exploration - Array indexing, slicing, Reshaping, splitting, concatenation - Aggregation operations using Numpy - Broadcasting and sorting with Numpy	**CO1**

2.	Data Manipulation - Data import, export, indexing and data selection with Pandas - Rearranging, handling missing data with pandas - Simple application for data manipulation operation using sample dataset	**CO1**
3.	Data Wrangling - Split, apply,pivoting and combine operations - Wrangling string data	**CO1**
4.	Data Cleaning and Preparation - Handling, filtering, filling missing data - Data Transformation operation like removing, renaming - Discretization and Binning	**CO2**
5.	Statistical Analysis - Measuring mean, median and mode using Numpy	**CO3**
6.	Descriptive Statistics –Measuring central tendancies, dispersion, correlation, causation	**CO3**
7.	Visualizing Data -Generating Bar chart, Line chart and Scatterplot for a sample dataset using matplotlib	**CO4**
8.	Visualization advanced -Density and Contour plots – Visualizing Errors – Error bars – Text and Annotation – Customizing colours – Geo maps	**CO4**
9.	Data Modelling Implementation of linear regression for weather prediction using sample data set	**CO4**

10.	Advanced analytical methods -Finding outliers using k-nearest neighbors approach -Finding outliers using PCA approach	**CO5**
11.	Correlation -Calculating the correlation between two variables and make a scatter plot and find the relationship between them.	**CO5**
12.	Estimating a Linear Relationship - Statistical model for linear Relationship - Least Square Estimates	**CO5**

S.No.	**List of Projects**	**Related Experiment**	**CO**
1.	Sentiment analysis	**1-4,6**	CO1
2.	Fake news detection	**1-4,5,6**	CO1
3.	Detecting Parkinson's Disease	**1-4,6,8**	CO1
4.	Movie Recommendation	**1-4,5,6**	CO2
5.	Music Recommendation	**1-4,9,11**	CO2
6.	Color detection	**1-4,7,8**	CO3
7.	Gender and Age detection	**1-4,6,9**	CO3
8.	Uber data analysis project	**1-4,5,6**	CO3
9.	Drowsiness detection system	**1-4,9**	CO4
10	Laneline detection	**1-4,10**	CO4
11	Handwritten Digit Recognition	**1-4,7,8**	CO4
12	Credit card fraud detection	**1-4,9**	CO5
13	Customer segmentation	**1-4,8**	CO5
14	Product bundle identification	**1-4,10**	CO5
15	Breastcancer classification	**1-4,7**	CO5
16	SpeechEmotionRecognition	**1-4,10,9**	**CO5**

Total Periods : 60

Suggestive Assessment Methods

Lab Components Assessments(60 Marks) Lab Experiment (40) Model Exam & Test Project(20)	**End Semester Exams(40 Marks)** • Practical Exam

Outcomes: Students can able to

COURSE OUTCOMES: At the end of this course

students can able toCourse Outcome 1 (CO1):

Apply computing theory, languages, and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses

Course Outcome 2(CO2):

Collect and manage data to devise solutions to data science tasks.

- Collect, clean, and prepare data.
- Evaluate data in terms of source, volume, frequency, and flow.

Course Outcome 3(CO3):

Select, apply, and evaluate models to devise solutions to data science tasks.

- Identify and classify relevant variables for data science tasks.
- Choose and apply tools and methodologies to solve data science tasks.
- Assess the model used to solve data science tasks.

Course Outcome 4(CO4):

Effectively communicate data science-related information effectively in various formats toappropriate audiences.non-technical professionals visualize, explore, and act on data science findings

Course Outcome 5(CO5):

Interpret data science analysis outcomes.

- Interpret data, extract meaningful information, and assess findings.
- Evaluate the limitations of data science findings.
- Formulate and use appropriate models of data analysis to solve hidden solutions to business- related challenges

Laboratory Requirements:

- Python 3.10

- Desktop Systems: 30 Nos
- Anaconda Navigator/Jupyter/Spyder/Colab

Reference Books

1.Joel Grus ,"Data Science from Scratch",O 'Reilly Publishers, First Edition,2015

2.Wes McKinney,"Python for data analysis",O'Reilly Media.Second edition, 2017

Web Resources

1.https://onlinecourses.nptel.ac.in/noc22_cs74/preview
2.https://towardsdatascience.com/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										3		
2	3	2		3	3								3	3	3
3			3	3									3	3	3
4		3	3	3									3	3	3
5		3	3	3									3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam	END SEM EXAM
REMEMBER		
UNDERSTAND		
APPLY	100	100
ANALYZE		
EVALUATE		
CREATE		

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

Perform array indexing ,Reshaping, splitting, concatenation and slicing operations using Numpy to convert a one-dimensional list of data to an array by calling the array() NumPyfunction..(Apply)

1. Perform the Aggregation operations using Numpy Compute the arithmetic mean, standarddeviation, variance along the specified axis and test whether all array elements along a given axis evaluate to True.(Apply)

Course Outcome 2 (CO2):

1. Create an application for data manipulation operation by arrange data alphabetically toexpedite the process of finding useful information using sample dataset.(Apply)
2. Analyse the operations like Data import, export, indexing and data selection for sample data set with Pandas automate the process of performing data manipulations on differentdatasets that use a similar format.(Analyse)

Course Outcome 3 (CO3):

1. Implementation of linear regression for weather prediction using sample data set.(Apply)
2. Finding outliers using k-nearest neighbours approach using Advanced analyticalmethods.(Analyze)

Course Outcome 4 (CO4):

1. Perform data visualization to generating Bar chart, Line chart and Scatter plot for a sampledataset using matplotlib .(Apply)
2. Construct the Density and Contour plots using plt.colorbar() command, which automatically creates an additional axis with labeled color information for the plot: on sample data set.(Apply)
3. Perform Split, apply, pivoting and combine operations on string data by dataWrangling.(Apply)

Course Outcome 5 (CO5):

1. Perform the Statistical Analysis on sample data for Measuring mean, median and mode usingNumpy.(Analyze)
2. Perform the Descriptive Statistics on sample data by Measuring central tendancies, dispersion, correlation, causation.(Analyze)
3. You are given a dataset on cancer detection. You have built a classification model and achieved an accuracy of 96 percent. Why shouldn't you be happy with your model performance?What can you do about it?(Analyze)

21PT3902	VERBAL ABILITY	L	T	P	C
		0	0	2	1

Preamble

is course is developed to enhance the Verbal competency of the students as Verbal Ability is commonly a part of the various competitive exams conducted. This course equips the students in all the aspects of grammar and helps to enhance comprehensive abilities and Analytical skills.

Prerequisites for the course

- Foundational English

Objectives

1. To help the student understand the importance of having his language skills kept ready for effective use.
2. To provide a host of varied opportunities for the student to hone his acquired language skills basic components, namely, Grammar, Vocabulary, Spelling and Comprehension.

Module I	**6**
Articles, Tenses, Voices, Preposition, Conjunctions, Subject-verb agreement, Adverbials.	
Module II	**6**
Parts of speech, Simple, Complex & Compound Sentences, Direct & Indirect Speech, Kinds of Sentences, Degrees of Comparison, Clauses.	
Module III	**6**
Reading Comprehension, Analogies, Synonyms & Antonyms, Idioms and Phrases	
Module IV	**6**
Para jumbles, Phrasal verbs, Modifiers, Punctuations, Misspelled words.	
Module V	**6**
Verbal Syllogism, Figures of Speech, Word Completion, Sentence Completion, One word Substitutes	
Total Periods	**30**

Suggested Assessment Activities:

- MCQ test through Google forms or other online test platforms.
  Eg. JavaPoint - Verbal Ability https://www.javatpoint.com/verbal-ability

Suggestive Assessment Methods

Continuous Assessment Test -1 (30 Marks)	Continuous Assessment Test -2 (30 Marks)	Model Exam (40 Marks)
MULTIPLE CHOICE QUESTIONS	MULTIPLE CHOICE QUESTIONS	MULTIPLE CHOICE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the grammatical errors in a sentence.
CO2: Frame sentences using the correct syntax.
CO3: Understand the concepts stated in a sentence or paragraph and analyze using verbal reasoning.
CO4: Construct sentences logically and make the texts semantically meaningful as a whole.
CO5: Interpret and analyze texts on a deeper level.

Text Books

1. Wren, P.C., Martin, H, Prasada Rao, N.D.V. (1973–2010). High School English Grammar & Composition. New Delhi: Sultan Chand Publishers
2. Kumar, Sanjay, Pushp Latha. (2018) English Language and Communication Skills for Engineers, India: Oxford University Press.

Reference Books

1. Guptha S C, (2012) Practical English Grammar & Composition, 1 st Edition, India: Arihant Publishers
2. Steven Brown, (2011) Dorolyn Smith, Active Listening 3, 3 rd Edition, UK: Cambridge University Press.

Web Recourses

1. Indiabix : https://www.indiabix.com/online-test/verbal-ability-test/
2. All India Exams : https://www.allindiaexams.in/online-test/online-verbal-ability-test/all
3. faceprep: https://www.faceprep.in/verbal-ability/

CO Vs PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1										3	1	
2										3	1	
3										3	1	
4										2		1
5										2		1

COURSE CONTENT AND SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	Module I	
1	Articles	1
2	Tenses	1
3	Voices	1
4	Preposition	1

5	Conjunctions	1
6	Subject-verb agreement, Adverbials	1
Module II		
7	Parts of Speech	1
8	Simple, Complex & Compound Sentences	1
9	Direct & Indirect Speech	1
10	Kinds of Sentences	1
11	Degrees of Comparison	1
12	Clauses	1
Module III		
13	Reading Comprehension	1
14	Analogies	1
15	Synonyms	1
16	Antonyms	1
17	Idioms And Phrases	2
Module IV		
18	Para Jumbles	1
19	Phrasal Verbs	2
20	Modifiers	1
21	Punctuations	1
22	Misspelled words	1
Module V		
23	Verbal Syllogism	2
24	Figures of Speech	1
25	Word Completion	1
26	Sentence Completion	1
27	One word Substitutes	1

21HS1103	TAMIL HERITAGE	L	T	P	C
		2	0	0	1

Preamble: This course is offered to equip students to create awareness of the contribution of Tamil people to Indian culture by highlighting the characteristics of Tamil language and literature and exhibiting Tamil culture through traditional arts such as performing arts and fine arts.

Prerequisites for the course:

The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.

UNIT I	LANGUAGE AND LITERATURE	6

Language Families in India-Dravidian Languages –Tamil as Classical Language –Classical Literature in Tamil – Secular Nature of Sangam Literature –Distributive Justice in Sangam Literature Management Principles in Thirukural - Tamil Land Bakthi Literature Azhwars and Nayanmars-Forms of minor Poetry development of Modern literature in Tamil-Contribution of Bharathiyar and Bharathidhasan.

UNIT II	HERITAGE-ROCK ART PAINTINGS TO MODERN ART–SCULPTURE	6

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making- Massive Terracotta sculptures, Village Deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III	FOLK AND MARTIAL ARTS	6

Therukoothu, Karakattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance-Sports and Games of Tamils.

UNIT IV	THINAI CONCEPT OF TAMILS	6

Flora and Fauna of Tamils & Agam and Puram Concept from Tholkappiyam and Sangam Literature -Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age-Export and Import during Sangam Age-Overseas Conquest of Cholas.

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	6

Contribution of Tamils to Indian Freedom Struggle-The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine–Inscriptions & Manuscripts–Print History of Tamil Books.

Total Periods	30

Course Outcomes:

CO1	To widen the knowledge on the characteristics of Tamil language and literature.
CO2	To explore the traditional Tamil fine arts and its techniques of Tamil Heritage.
CO3	To evaluate the various types of performing arts and their cultural context.

CO4	To get an insight on the lifestyle and living techniques of Tamil ancestors.
CO5	To recognise and perceive the role played by Tamils in the unity and development of India.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								**1**	**2**	**3**	**1**	**3**
2								**1**	**3**	**2**	**3**	**2**
3								**1**	**3**	**2**	**1**	**2**
4								**3**	**2**	**2**	**3**	**2**
5								**2**	**3**	**3**	**2**	**3**

TEXT-CUM-REFERENCE BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL–(in print)
2. Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi-'Sangam City Civilization on the banks of river Vaigai'(Jointly Published by:Department of Archaeology &TamilNadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to TamilNadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization(Jointly Published by:Department of Archaeology &TamilNadu Text Book and Educational Services Corporation,Tamil Nadu)
8. Journey of Civilization Industo Vaigai(R.Balakrishnan)(Published by:RMRL)–Reference Book.

21HS1103	தமிழர் மரபு	L	T	P	C
		2	0	0	1

முன்னுரை(Preamble)

இப்பாடத்திட்டம் பொறியியல் பயிலும் முதலாம் ஆண்டு மாணவர்களின் முதலாம் பருவத்திற்கு உரியது. தமிழ் மொழி மற்றும் இலக்கியத்தின் தன்மைகளை எடுத்துரைத்து மரபுக் கலைகளான நிகழ்த்து கலைகள் மற்றும் நுண்கலைகள் வழியாகத் தமிழ்ப் பண்பாட்டை புலப்படுத்தி இந்திய பண்பாட்டிற்கு தமிழர்கள் ஆற்றிய பங்கினை மாணவர்கள் அறியச் செய்தல்.

பாடநெறிக்கான முன்நிபந்தனைகள்**(Prerequisites for the course)**

தமிழ் மொழியில் எழுத படிக்க தெரிந்திருத்தல் அவசியம்.

அலகு I	மொழி மற்றும் இலக்கியம்	6

இந்திய மொழிக் குடும்பங்கள்- திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ் காப்பியங்கள் தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - சிற்றிலக்கியங்கள்- தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி- தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II	மரபு- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை	6

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்- தேர் செய்யும் கலை- சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள்- மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு..

அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	6

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்	6

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும் , கல்வியும் - சங்க கால நகரங்களும் துறைமுகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	6

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு

Total Periods	**30**

எதிர்பார்க்கும் படிப்பின் முடிவுகள்

CO1	மாணவர்கள் தமிழ் மொழி மற்றும் இலக்கியத்தின் தன்மைகள் குறித்து அறிந்து கொள்வார்.
CO2	தமிழ் மரபு சார்ந்த நுண்கலைகளையும் அதன் நுட்பங்களையும் புரிந்து கொள்வர்.

CO3	நிகழ்த்து கலைகளின் வகைகளையும் அதன் பண்பாட்டுச் சூழலையும் அறிந்து கொள்வர்.
CO4	பழந்தமிழரின் வாழ்க்கைச் சூழல்களை அறிந்து கொள்வர்.
CO5	இந்திய ஒருமைப்பாட்டிற்கும் வளர்ச்சிக்கும் தமிழர்கள் ஆற்றிய பங்கு குறித்து அறிவர்.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								**1**	**2**	**3**	**1**	**3**
2								**1**	**3**	**2**	**3**	**2**
3								**1**	**3**	**2**	**1**	**2**
4								**3**	**2**	**2**	**3**	**2**
5								**2**	**3**	**3**	**2**	**3**

TEXT-CUM REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

SEMESTER IV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS3101	Ethics and Values	HSSM	3	3	0	0	3
2	21MA4201	Discrete Mathematics	BS	4	3	1	0	4
3	21CS3601	Computer Architecture	PC	3	3	0	0	3
4	21AI4601	Data Analytics	PC	3	3	1	0	4
5	21CS4602	Design and Analysis of algorithms	PC	3	3	0	0	3
Theory cum Practical Courses								
1	21CS4604	Operating System Concepts	PC	4	2	0	2	3
Practical Courses								
1	21AI4611	Data Analytics Laboratory	PC	4	0	0	4	2
2	21PT3901	Soft Skills – Aptitude1	EEC	2	0	0	2	1
Mandatory Courses								
1	21GE2M02	Environmental and Sustainable Engineering	MC	2	2	0	0	0
2	21HS2103	TECHNOLOGY IN TAMIL CULTURE* □□□□□□□□ □□□□□□□□□□□□□□□	HSSM	1	1	0	0	**1**
			Total	29	20	2	8	24

SYLLABUS

21HS3101	ETHICS AND VALUES	L	T	P	C
		3	0	0	3

Preamble:

The course is designed with the purpose of helping students in developing a holistic perspective about life. It opens the space for the student to explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society and as a unit in nature.

Prerequisites for the course

- Nil

Objectives

1. To help students distinguish between values and skills.
2. To help students identify what they 'really want to be' in their life and profession.
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

MODULE 1	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	9

1. **Understanding the need, basic guidelines, content and process for Value Education**
2. **Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration**
3. **Continuous Happiness and Prosperity- A look at basic Human Aspirations**
4. **Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority**
5. **Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario**
6. **Method to fulfill the above human aspirations: understanding and living in harmony at various levels.**

Suggested Activities:

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

MODULE 2	Understanding Harmony in the Human Being - Harmony in Myself	9

1. **Understanding human being as a co-existence of the sentient 'I' and the material 'Body'**
2. **Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha (happiness and physical facility)**
3. **Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)**
4. **Understanding the characteristics and activities of 'I' and harmony in 'I'**

5. **Understanding the harmony of I with the Body: Sanyam(control) and Swasthya (Health); correct appraisal of Physical needs, meaning of Prosperity in detail**
6. **Programs to ensure Sanyam and Swasthya**

Suggested Activities:

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss programs for ensuring health vs dealing with disease.

MODULE 3	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	**9**

1. **Understanding harmony in the Family- the basic unit of human interaction**
2. **Understanding values in human-human relationship; meaning of *Nyaya* (justice) and program for its fulfillment to ensure *Ubhay-tripti* (mutual happiness)**
3. **Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship**
4. **Understanding the meaning of *Vishwas*; Difference between intention and competence**
5. **Understanding the meaning of *Samman* (respect), Difference between respect and differentiation; the other salient values in relationship**
6. **Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* (Resolution, Prosperity, fearlessness, co-existence) as comprehensive Human Goals**

Suggested Activities:

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss scenarios. Elicit examples from students' lives. Pay a visit to the old age home / orphanage / physically & mentally challenged asylum and support them in catering their needs to ensure mutual happiness.

MODULE 4	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	**9**

1. **Understanding the harmony in the Nature**
2. **Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature**
3. **Understanding Existence as Coexistence (*Sah-astitva*) of mutually interacting units in all-pervasive space**
4. **Holistic perception of harmony at all levels of existence**

Suggested Activities:

Include practice sessions to discuss human beings as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. Submit a video documentary highlighting the ways of humans creating an imbalance in nature and ways to prevent it.

MODULE 5	Implications of the above Holistic Understanding of Harmony on Professional Ethics	**9**

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order,

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order

Suggested Activities:

Include a presentation session on identifying human inventions that are non eco friendly and brainstorming to come up with eco friendly production systems or eco friendly alternatives.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
Written Assessment MCQ / written exam	Activity / Presentation in the classroom / on or off campus activities	Written Examination

Outcomes

Upon completion of the course, the students will be able to:

CO1 - Understand the significance of value inputs in a classroom and start applying them in their life and profession

CO2 Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

CO3 Understand the value of harmonious relationship based on trust and respect in their life and profession

CO4 Understand the role of a human being in ensuring harmony in society and nature.

CO5 Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Books

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Books

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, JeevanVidyaEkParichay, Divya Path Sansthan, Amarkantak.

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PO 2	PS O 3
1						2	1	3	1	1	1	1			
2						2	1	3	1	1	1	1			
3						2	2	3	1	1	1	1			
4						1	2	3	1	1	1	2			
5						1	2	3	1	1	1	2			

Assessment Pattern

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) : Need, Basic Guidelines, Content and Process for Value Education

1) Explain the process of value education.
2) Illustrate the content of value education.
3) What should be the content of value education to make it complete? How do values relate to our day to day living?
4) Explain the content of self – exploration?
5) "Mutual fulfilment in human relationships is something we want, we aspire for." Explain
6) What is value education? Why is there a need for value education?
7) How does value education help in fulfilling one's aspirations?
8) What are the basic guidelines for value education?
9) Write a short note on the need for value education in today's scenario.
10) Values and skill complement each other. Elaborate.

COURSE OUTCOME 2 (CO 2) : Understanding Harmony in the Human Being - Harmony in Myself

1) Distinguish between Sukh and Suvidha in detail taking needs of yourself as an example
2) How can we ensure harmony in self ('I')?
3) The needs of the self are qualitative. Illustrate.
4) 'The need for physical facilities is temporary' – explain the meaning of this statement with any two examples.
5) Do you think that human beings are a sum-total of sentiments and physical aspects, the 'self' and the 'body'? Explain your answer using examples.
6) 'Human being is the co-existence of the Self and the Body' – elaborate on this statement.
7) Explain how activities in 'I' are continuous.
8) "I am the seer, doer and enjoyer. The body is my instrument" – Explain.
9) Explain the relation between the self and the body. What is the responsibility of the self towards the body?
10) Define Sanyam and Swasthya. How are they helpful in keeping harmony between self and body?

COURSE OUTCOME 3 (CO 3) :Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1) Define trust. or How is 'trust' the foundation value of relationships?
2) Define 'affection'. or How does affection lead to harmony in the family?
3) How can you say that love is the complete value?
4) What is the meaning of justice in human relationships? How does it follow from family to world family?
5) 'Discrimination leads to acrimony in relationships'. Explain. What problems are created when we discriminate?
6) What values are necessary in human relationships? Explain each briefly.
7) What is the basis of 'respect' for a human being? Do you see that other human beings are also similar to you? Explain.
8) Explain the comprehensive human goal. How does fearlessness follow from right understanding and prosperity?
9) Critically examine the state of society today in terms of fulfillment of comprehensive human

21MA4201	DISCRETEMATHEMATICS	L	T	P	C
		3	1	0	4

Preamble:
This is an introductory course in discrete mathematics. The goal of this course is to introducestudents to ideas and techniques from discrete mathematics that are widely used in science andengineering.Thiscourseteachesthestudentstechniquesinhowtothinklogicallyandmathematicallyandapplythesetechniques in solving problems. To achieve this goal, studentswilllearnlogicandproof,sets,functions,aswellasalgorithmsandmathematicalreasoning.Key topicsinvolvingrelations,graphs,trees,andcomputabilityarecoveredinthiscourse.

Prerequisitesforthecourse:
Basicknowledgeinsettheoryandvenn-diagram.

Objectives
The Course will enable learners:

1. Toextendstudent'slogicalandmathematicalmaturityandabilitytodealwithabstraction
2. Tointroducemostofthebasicterminologiesusedincomputersciencecoursesandapplicationof ideas to solvepractical problems
3. Tounderstandthebasicconceptsofgraphtheory
4. Tofamiliarizetheapplicationsofalgebraicstructures
5. TounderstandtheconceptsandsignificanceoflatticesandBooleanalgebrawhicharewidelyused in computer science and engineering

UNIT I	LOGICS	9+ 3

Propositionallogic–Truthtable–lawsoflogic-logicalconnectives-Tautologicalimplications -logicalequivalence-Propositionalequivalences-Predicatesandquantifiers–Rulesofinference –DirectandIndirectProofmethod

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonlogicalequivalence,Predicates,quantifiers,Inferences.

UNIT II	COMBINATORICS	9+ 3

Mathematical induction – Counting principle – Permutation and Combinations -Strong inductionand well ordering principle - The basics of counting – The pigeonhole principle – Inclusion andexclusionprinciple and its applications.

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonbasicsofcountingandpigeonholeprinciple,Inclusionandexclusion.

UNIT III	GRAPHS	9+ 3

Graphs-Basicdefinitionsofgraph–Graphmodels–Graphterminologyandspecialtypesof graphs–Handshakingtheorem-Matrixrepresentationofgraphs–AdjacencymatrixandIncidencematrix - graph isomorphism

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonMatrixrepresentationofgraphs,Graphisomorphism

UNIT IV	ALGEBRAICSTRUCTURES	9+ 3

Algebraic systems – Definition Semi groups and monoids – Definition of Sub-Semi groups andsub-monoids - Groups – Properties of Groups - Subgroups – Left and Right Cosets – Lagrange'stheorem.

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonGroups,subgroups,cosets.

UNIT V	**LATTICESANDBOOLEANALGEBRA**	**9+ 3**

Relation-Reflexiverelation-antisymmetricrelation–transitiverelation-Partialorderingrelation–Posets-Hassediagram–LatticesasPosets-Latticesasalgebraicsystems–Sublattices -Booleanalgebra.

SUGGESTEDEVALUATIONMETHODS:

- TutorialProblemsonLatticesasPosets,Lattices,Booleanalgebra.

TotalPeriods	**45+15=60Periods**

SuggestiveAssessmentMethods

ContinuousAssessmentTest (20Marks)	**FormativeAssessmentTest (20Marks)**	**EndSemesterExams (60Marks)**
1.DescriptiveQuestions	1.Assignment 2. Online Quizzes	1.DescriptiveQuestions

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1:Apply the concepts of the truth table to test the logic of a program.

(Apply)**CO2**:Solvetheengineeringproblemsusingprincipleofinclusion&exclusion(Apply)**C**

O3:Apply theknowledge of Graph terminology in real life phenomena

(Analyze)**CO4**:Applythealgebraicstructuressuchasgroupsandsubgroups.(Apply)

CO5:ApplytheknowledgeofBooleanAlgebrainreallifephenomena(Apply)

TextBooks

T1 Rosen,K.H.,"DiscreteMathematicsanditsApplications",8thEdition,TataMcGrawHillPub.Co.Ltd., New Delhi, Special Indian Edition, 2017.

ReferenceBooks

R1
Tremblay,J.P.andManohar.R,"DiscreteMathematicalStructureswithApplicationstoComputerScience",TataMcGrawHillPub.Co.Ltd,NewDelhi,33thReprint2018
R2ThomasKoshy,T."DiscreteMathematicswithApplications",ElsevierPublications,2016
R3Grimaldi,R.P."DiscreteandCombinatorialMathematics:AnAppliedIntroduction",newEdition,Pearson Education Asia, Delhi, 2016
R4"DiscreteMathematics",SSIyengar,VM.Chandrasekhar,EtalVikasPublishinghouse.
R5 "Combinatorics",RichardBrualdi,PearsonEducation.

WebResources

1. Logics-https://youtu.be/xlUFkMKSB3Y
2. Combinatorics-https://youtu.be/mLY2ZAPdTbg
3. Graphs-https://youtu.be/nf9e0_ylGdc
4. Algebraicstructures-https://youtu.be/4V_KYo6sMJs
5. Lattices-https://youtu.be/qPtGlrb_sXg

COVsPOMappingandCOVsPSOMapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS0 1	PS0 2
1	3	2	1	1				1	1			1		
2	3	2	1	1				1	1			1		
3	3	2	1	1				1	1			1		
4	3	2	1	1				1	1			1		
5	3	2	1	1				1	1			1		

COURSELEVELASSESSMENTQUESTI ONSCOURSEOUTCOME1(CO1):(Apply)

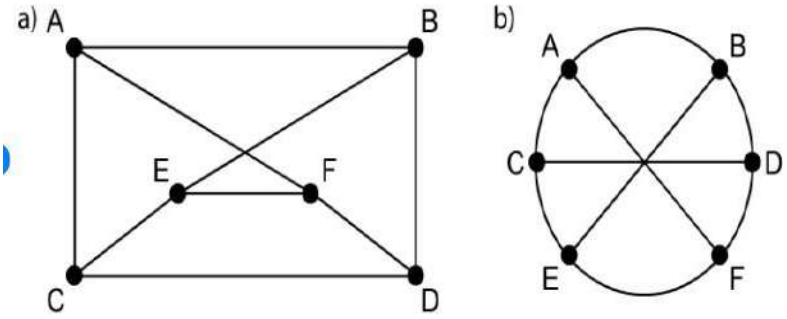
1. Without constructing the truth tables, simplify $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$.
2. Show that the premises '' one student in this class knows how to write programs in JAVA ''and '' Everyone who knows how to write programs in JAVA can get a high paying job implyaconclusion'' "Someoneinthis classcan getahigh payingjob".

COURSEOUTCOME2(CO2):(Apply)

1. Find the numbers between 1 to 250 that are not divisible by any of the integers 2 or 3 or 5or 7.
2. Find the number of distinct permutations that can be formed from all the letters of eachwordi)RADAR(ii)UNUSUAL.(iii)MATHEMATICS

COURSEOUTCOME3(CO3):(Analyze)

1. IfaconnectedgraphGisanEulergraphthenallverticesofGareofevendegree.(Apply)
2. ClassifytheIsomorphismbetweenthefollowinggraphs.(Analyze)



COURSEOUTCOME4(CO4):(Apply)

1. Showthat$(Q^+,*)$isanabeliangroupwhere*isdefinedbya*b= $\frac{ab}{2}$.
2. Showthatintersectionoftwosubgroupsofagroupisasubgroup.

COURSEOUTCOME5(CO5):(Apply)

1. In a Boolean algebra, if a, b, c $\in$ B

   thena $\leq b$ $\Leftrightarrow$ $b^I=0 \Leftrightarrow a^I \vee b=1 \Leftrightarrow b^I \leq a$

21CS3601	COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

Preamble:
Make the students to learn basic structure and operations of a computer and describe the instruction execution and performance of a machine.

Prerequisites for the course

- Basic Computer Knowledge

Objectives

1. To learn the basic structure and operations of a computer.
2. To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
3. To learn the basics of pipelined execution.
4. To understand parallelism and multi-core processors.
5. To understand the memory hierarchies, cache memories and virtual memories and to learn the different ways of communication with I/O devices.

UNIT I	BASIC STRUCTURE OF A COMPUTER SYSTEM	9
Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.		
Suggested Activities: Practical – Demonstration - Opening up a computer system and studying the components		
SUGGESTED EVALUATION METHODS: Quizzes		
UNIT II	**ARITHMETIC FOR COMPUTERS**	**9**
Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Sub word Parallelism		
Suggested Activities: Some Problems related with the above procedures		
SUGGESTED EVALUATION METHODS: Assignment problems		
UNIT III	**PROCESSOR AND CONTROL UNIT**	**9**
A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined data path and control – Handling Data Hazards - Control Hazards		
Suggested Activities: Flipped Classroom for building of datapath for additional instructions		
SUGGESTED EVALUATION METHODS: Quizzes		
UNIT IV	**PARALLELISM**	**9**

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units		
Suggested Activities: Showing some real time usages of the above mentioned procedures		
SUGGESTED EVALUATION METHODS: Quizzes		
UNIT V	**MEMORY SYSTEM**	**9**
Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements Secondary storage devices.		
Suggested Activities: EL - Survey of storage devices (NAS/SAN/RAID etc.) on different classes of system		
SUGGESTED EVALUATION METHODS: Quizzes		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Describe the internal structure and operation of digital computer.(Remember)
CO2 Understand the concepts for arithmetic and logic unit. (Understand)
CO3 Apply pipelining concept for instruction execution.(Apply)
CO4 Understand parallel processing architectures. (Understand)
CO5 Define the types of memory systems. (Remember)

Text Books

1. David A. Patterson and John L. Hennessey, "Computer organization and design', Morgan Kauffman / Elsevier, Fifth edition.

Reference Books

1. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition, Mc Graw- Hill Inc.

Web Resources

1. https://www.javatpoint.com/computer-organization-and-architecture-tutorial

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2												3	
2	3	2	2											3	
3	3	2	2											3	
4	3	2												3	
5	3	2												3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME: Students will be able to

Course Outcome 1 (CO1): Describe the internal structure and operation of digital computer. (Remember)

1. What are the components of a computer system?
2. Describe with an example about the operations and operands of the computer hardware.
3. List the different types of addressing modes with suitable examples.

Course Outcome 2 (CO2): Understand the concepts for arithmetic and logic unit. (Understand)

1. Discuss the algorithm for binary floating point addition that follows the decimal example.
2. Explain the sequential version multiplication algorithm in detail with diagram and example.
3. Summarise the speed up process in multiplication.

Course Outcome 3 (CO3): Apply pipelining concept for instruction execution. (Apply)

1. How the interrupt is handled during exception?
2. How data hazard can be prevented in pipelining?
3. Define Structural hazards?

Course Outcome 4 (CO4): Understand parallel processing architectures. (Understand)

1. Show the process of Multithreading with a diagram.
2. Explain SMT.
3. Compare shared memory multiprocessor and message-passing multiprocessor.

Course Outcome 5 (CO5): Define the types of memory systems (Remember)

1. How the interrupt is handled during exception?
2. Relate asynchronous DRAM with synchronous RAM.
3. Define translation buffer.

21AI4601	Data Analytics	L	T	P	C
		3	1	0	4

Preamble

This course would gain a general understanding of the procedures, technical skills, and best practices involved in developing data analytics solutions. Students will be introduced to a few Open-source industrial datasets. It would be demonstrated how to construct applications for utilizing the data to solve industrial challenges step-by-step.

Prerequisites for the course

- Structured Query Language (SQL)
- Basic knowledge in data science

Objectives		
The course will enable students: • To know the fundamental algorithms and techniques used in Data Analytics • To understand descriptive statistical techniques • To deal with case studies using data analytic techniques • To explore data and visualize insights • To carry out predictive analytics for real life case scenario		
	INTRODUCTION	
UNIT I	Data, Statistics and Decisions - Elements, Variables, and Data categorization - Levels of Measurement - Data management and indexing – Data Analytics life cycle – Hypothesis testing – t test- ANOVA – Examining single variable – Examining two variables – Visualizing distributions	**12**
SUGGESTED ACTIVITIES: • Practical on Visualization of data • Seminar on Data management and Indexing		
SUGGESTED EVALUATION METHODS: • Assignment Problem • Quizzes		
DESCRIPTIVE STATISTICS		
UNIT II	Measures of central tendency – Mean, Median, Mode, standard deviation, Z score, variance, correlation, covariance –summarization – skewness - kurtosis- Measures of location of dispersions Case studies for census data set.	**12**
SUGGESTED ACTIVITIES: • Practical- Find Z score on census data set		
SUGGESTED EVALUATION METHODS: • Assignment Problem • Tutorial Problem • Quizzes		
BASIC DATA ANALYSIS TECHNIQUES		
UNIT III	Regression analysis – Linear regression – logical regression -Classification techniques-Clustering- Partition based methods - Applications-Association rules analysis- Use cases –Case study: Iris flower classification using decision tree	**12**

SUGGESTED ACTIVITIES:

- Implementation of Image classification using Decision tree
- Applications of data analysis techniques

SUGGESTED EVALUATION METHODS:

- Assignment Problem
- Quizzes

EXPLORATORY DATA ANALYSIS		
UNIT IV	R Programming : Elements of structured data – Estimates of location, Estimates of variability – Exploring data distribution – Percentiles and boxplots – Frequency table, Histograms – Exploring binary and categorical data – Correlation – Exploring two or three variables	**12**

SUGGESTED ACTIVITIES:

- Practical- Data analytics in R

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

PREDICTIVE ANALYTICS		
UNIT V	Linear least squares – implementation – goodness of fit – testing a linear model – weighted re sampling Regression using Stats Models – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy measures -Time series analysis – moving averages – missing values – serial correlation – autocorrelation- survival analysis in titanic data set	**12**

SUGGESTED ACTIVITIES:

- Practical- Time series analysis of different data set using linear regression
- Implementation of survival Analysis

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Project demonstartion
- Assignment problems
- Quizzes

Total Periods	**60**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)

1. DESCRIPTIVE TYPE QUESTIONS 2. CASE BASED QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM – SOLVING ACTIVITIES	1. DESCRIPTIVE TYPE QUESTIONS 2. CASE BASED QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1 Find a meaningful pattern in data and make decisions based on statistical testsCO2 Analyze, summarize and interpret the data in meaningful way

CO3 Deal with real-world problems and use cases through advanced analytical methodsCO4 Explore, Understand and Infer useful information from data through estimation.

CO5 Develop intelligent decision support systems. Ability to derive inference using Predictive Analytics

Text Books

1. Joseph Schmuller ,"Statistical Analysis with R ",Wiley Publications,2017
2. Peter Bruce,Andrew Bruce"Practical Statistics for Data Scientist",O'Reilly Media, First Edition,2017

Reference Books

1. Thomas Mailund,"Data Analysis, Visualization, and Modelling for the Data Scientist", 2017.
2. "Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC^2,Wiley Publications, First Edition 2015Data Science from Scratch, Joel Grus,First Edition 2015, O'Reilly.

Web Resources

1. https://nptel.ac.in/courses/106107220
2. https://www.datacamp.com/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	3	3	3									3		
2	3	3	3										3	3	3
3	3	3	3	2									3	3	3
4	1	2	3	3	3								3	3	3
5	3	3	3	3									3	3	3

BLOOOMS LEVEL ASSESSMENT PATTERN

BLOOM'S CATEGORY	CONTINUOUS ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT 1	FAT 2	
REMEMBER	10	10			10
UNDERSTAND	20	20	5	5	10
APPLY	60	60	10	10	60
ANALYZE	10	10	10	10	40
EVALUATE	0	0			0
CREATE	0	0			0

COURSE LEVEL ASSESSMENT QUESTIONS COURSE OUTCOME 1 (CO 1) :

1.Collect a random sample of twenty stones. For each stone measureits

(i) maximum dimension

(ii) minimum dimension

(iii) weight.

Does there appear to be a connection between (i) and (ii), (i) and(iii), or (ii) and (iii)?(Analyze)

2.Collect a dozen volunteers and time them running a forty metrestraight sprint. Ask them to do two long jumps each and recordthe better one. (Measure the jump from the point of take-off rather than any board.) Is there a connection between the times and distances recorded?(Apply)

COURSE OUTCOME 2 (CO 2) :

1. The data below gives the marks obtained by 10 pupils takingMaths and Physics tests.

Pupil	A	B	C	D	E	F	G	H	I	J
Maths mark (out of 30) x	20	23	8	29	14	11	11	20	17	17
Physics mark (out of 40) y	30	35	21	33	33	26	22	31	33	36

Is there a connection between the marks gained by ten pupils,A, B, C ..., J in Maths and Physics tests?

2.For each of the following sets of data

1.draw a scatter diagram

3. calculate the product moment correlationcoefficient.

(i) x 1 3 6 10 12
y 5 13 25 41 49

(ii) x 1 3 5 7 9

(iii) x 1 1 3 5 5
y 5 1 3 1 5

(iv) x 1 3 6 9 1

y	44	34	24	14	4	*y*	12	28	37	28	112

TID	Transaction
T1	{A, B, C, D, E, F}
T2	{B, C, D, E, F, G}
T3	{A, D, E, H}
T4	{A, D, F, I, J}
T5	{B, D, E, K}

C 3) :

1 ase with 5 transactions and a minimum support threshold of 60% and a n d of 80%, find all frequent itemsets using (a) Apriori and (b) FP-Growth. f both processes. (d) List all strong association rules that contain "A" in the a n we use this constraint in the frequent itemset generation (c) phase?(Apply)

COURSE OUTCOME 4(CO 4) :

1.Write navigation to Apply Scatter Plot plot(variableAlongXAxis, variableAlongYAxis, data="DataSet",boxplot(pressure$pressure, main="Pressure Boxplot", ylab="Pressure") and Histogram

hist(USArrests$UrbanPop, main="Histogram - Urban Population", xlab="Urban Population") in R.(Analyze)

2.List six R functions which are used in descriptive statistics.(Remembering)

COURSE OUTCOME 5(CO 5) :

1. Categorise the diversity of individual data analysis application.(Understanding)

2. Eight test areas were given different

Concentration g/L (*x*)	1	2	3	4	5	6	7	8
Weight of crop 7 kg(*y*)	11.1	14	16.2	20	23.9	27	29	

Draw a scatter diagram to show the data.

Calculate the equation of the regression line *y* on *x* and show it on your diagram

What increase in weight of crop might be expected from raising the concentration offertiliser by 1 g/L?(Analyze)

21CS4602	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

Preamble

This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms, advanced data structures, graph algorithms (shortest path, spanning trees, tree traversals), string matching, elements of computational geometry, NP completeness.

Prerequisites for the course:

- C Programming
- Data Structures

Objectives

1. To understand and apply the algorithm analysis techniques.
2. To understand the algorithm techniques brute force and Divide and conquer
3. To understand algorithm design techniques dynamic programming and Greedy Technique.
4. To understand algorithm design technique Iterative Improvement
5. To understand backtracking and Branch and Bound.

UNIT I	INTRODUCTION	9

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms - Visualization

Suggested Activities: Workout on design of algorithms for some small simple problems, provide proof of correctness, and determine the complexity.

Suggested Evaluation methods: Assignment - Based on design, correctness and efficiency.

UNIT II	BRUTE FORCE AND DIVIDE-AND-CONQUER	9

Brute Force – Computing a^n – Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

Suggested Activities: Implementation of merge sort and quick sort.

Suggested Evaluation methods: Programming exercises in the laboratory, quiz, Assignment.

UNIT III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9

Dynamic programming – Principle of optimality - Coin changing problem– Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Dijkstra's shortest path algorithm - Prim‘s algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern - Huffman Trees.

Suggested Activities: Implementation of kruskal algorithm, prims algorithm and Huffman tree

Suggested Evaluation methods: Programming exercises in the laboratory, quiz, Assignment.

UNIT IV	ITERATIVE IMPROVEMENT	9

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.

Suggested Activities: Implementation of kruskal, prims algorithm and Huffman tree

Suggested Evaluation methods: Programming exercises in the laboratory, Assignment.

UNIT V	BACKTRACKING AND BRANCH AND BOUND	9

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem

Suggested Activities: Implementation of sum of subset problem, Travelling Salesman problem

Suggested Evaluation methods: Programming exercises in the laboratory, Assignment.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand the time and space complexity of algorithms (Understand)

CO2 Design algorithms for various computing problems using brute force and divide and conquer (Apply)

CO3 Write algorithms using dynamic programming and Greedy Technique (Apply)

CO4 Develop algorithms using Iterative Improvement (Apply)

CO5 Design algorithms using Backtracking and Branch and Bound (Apply)

Text Books

1. Anany Levitin, — "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2017.

Reference Books

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education.

4. Harsh Bhasin, ―Algorithms Design and Analysis‖, Oxford university press, 2015.

Web Resources

1. https://nptel.ac.in/courses/106106131/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.cs.duke.edu/courses/fall08/cps230/Book.pdf
4. https://swayam.gov.in/nd2_cec20_cs03/preview

T1	Joseph Schmuller ,"Statistical Analysis with R ",Wiley Publications,2017	Chp 1,Chp12,Chp 13	Chp 4,Chp 5,Chp 15	Chp 14	Chp 2,Chp 3	Chp 16
T1	Peter Bruce,Andrew Bruce"Practical Statistics for Data Scientist",O'Reilly Media, First Edition,2017	Chp 3	Chp 1	Chp 5	Chp 1,Chp 2,	Chp 5
R1	Thomas Mailund,"Data Analysis, Visualization, and Modelling for the Data Scientist", 2017	Chp 3	_	Chp 6,Chp 7	Chp 1,Chp 2,Chp 4,Chp 5	Chp 5,Chp 6
R2	"Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC^2,Wiley Publications, First Edition 2015	Chp 3	_	_	_	_
W1	https://nptel.ac.in/courses/106107220	Module 3,Module 4,Module 5	_	Module 7,Module 10,Module 12	_	Mpdule 8
W2	https://www.datacamp.com/	All Topics	All Topics	All Topics	All Topics	All Topics

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2									3		
2	3	3	3	3									3		
3	3	3	3	3									3		

4	3	3	3	3									3		
5	3	3	3	2									3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	5	5	5	10
UNDERSTAND	10	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE	40	25	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Distinguish between Algorithm and Psuedocode.? (Understand)
2. Define recurrence relation (Understand)
3. Differentiate between Bigoh and omega notation with example. (Understand)

Course Outcome 2 (CO2):

1. Write the differences between divide and conquer and greedy method? (Understand)
2. Explain the Brute force method to find the two closest points in a set of n points in k dimensional space (Apply)
3. Write Divide – And – Conquer recursive Merge sort algorithm and derive the time complexity of this algorithm (Apply)

Course Outcome 3 (CO3):

1. What does Floyd's algorithm do?(Understand)
2. Explain the working of Prims algorithm using Greedy technique. (Apply)
3. Solve the following instance of 0/1 Knapsack problem using Dynamic programming n = 3; (W1, W2, W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4. (Apply)

Course Outcome 4 (CO4):

1. Define multi stage graph with an example. (Understand)
2. What is stable marriage problem? Give the algorithm and analyze it. (Apply)
3. List the steps in simplex method and give the efficiency of the same? (Apply)

Course Outcome 5 (CO5):

1. Explain Sum of subset problem? (Apply)
2. Explain 0/1 Knapsack problem with respect to branch and bound method. (Apply)

21CS4604	OPERATING SYSTEM CONCEPTS	L	T	P	C
		2	0	2	3

Preamble:

In this course will be discussing about Address spaces, system call interface, process/threads, inter process communication, deadlock, scheduling, memory, virtual memory, file systems.

Prerequisites for the course

- Problem Solving and Logical Thinking using C

Objectives

1. Understand the principles and modules of operating systems.
2. Be familiar with the factors in process scheduling strategies, concurrent processes and threads.
3. Learn the algorithmic solutions to handle deadlock problems.
4. Understand the physical and logical memory management and feel the role of virtual memory.
5. To manage the issues related to file system interface, implementation and disk management.

UNIT I	PROCESSES	6

Introduction to operating systems – operating system structures – system calls – system programs – system structure - Processes: Process concept – Process scheduling – Operations on processes – Cooperating processes – Inter x process communication. **Case study:** IPC in Linux

Suggested Activities:

PRACTICAL:

Shell programming assignments

1. Shell programming
2. Read the history of Unix/Linux/Windows
3. Know the operating system in your phone/laptop

SUGGESTED EVALUATION METHODS:

Quiz on understanding of Linux and shell programming

UNIT II	THREADS, PROCESS SCHEDULING AND SYNCHRONIZATION	6

Threads: Multi-threading models– Threading issues - CPU Scheduling: Scheduling criteria – Scheduling algorithms – Algorithm Evaluation. Process Synchronization: The critical - section problem – Semaphores – Classic problems of synchronization – critical regions. **Case study:** Process Scheduling in Linux

SUGGESTED ACTIVITIES :

Practical:

Implement multi-threading using the Pthread library

Java threads

SUGGESTED EVALUATION METHODS:

Evaluation of the implementation of multi-threading

UNIT III	DEADLOCK	6

Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

Suggested Activities:
Discussion about realtime deadlock problems

SUGGESTED EVALUATION METHODS:
Quiz on the understanding of the different concepts in this module

UNIT IV	**MEMORY MANAGEMENT**	**6**

Memory Management: Background – Swapping – Contiguous memory allocation – Paging- Segmentation - Virtual Memory: Background – Demand paging –Process creation – Page replacement. **Case study:** Memory Management in Linux

SUGGESTED ACTIVITIES :
Practical:
1. Read and understand appropriate files in xv6 related to process scheduling and memory management Assignment problems on memory management

SUGGESTED EVALUATION METHODS:
- Quiz

UNIT V	**FILE SYSTEMS**	**6**

File System Interface: File concept – Access methods – Directory structure – File system mounting – Protection - File-System Implementation: Directory implementation – Allocation methods – Free space management – efficiency and performance - Mass Storage Structure: Disk scheduling – Disk management – Swap space management. **Case study:** File Systems in Linux, File Systems in Windows 7 and Input and Output in Linux

SUGGESTED ACTIVITIES:
Practical:
1. Use of system calls like creat, open, read, write, close, dup, readdir and scandir

SUGGESTED EVALUATION METHODS:
Quizzes

S.No	**List of Experiments**	**CO**
1	Installation of UNIX Operating System	5
2	Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir	5
3	Implement the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority	5
4	Implement Bankers Algorithm for Dead Lock Avoidance	5
5	Implement all page replacement algorithms a) FIFO b) LRU c) LFU	5
6	Implement the File Allocation Strategies a) Sequential b) Indexed c) Linked	5
	Total Periods	**30 Theory +30 Lab**

Laboratory Requirements

Unix with C

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (20 Marks)**	**End Semester Exams (50 Marks)**

1. DESCRIPTIVE QUESTIONS	1.CONDUCT OF EXPERIMENTS 2. MODEL EXAM	1.DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1 Choose the OS based on the knowledge on principles and modules of operating systems(Remember)
CO2 Explain the factors in process scheduling strategies, concurrent processes and threads (Understand)
CO3 Develop algorithmic solutions to handle deadlock problems(Create)
CO4 Analyze the physical and logical memory management and the virtual memory(Analyze)
CO5 Identify and solve the issues related to file system interface, implementation and disk Management(Apply)

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018

Reference Books

1. William Stallings, "Operating Systems – Internals and Design Principles", 9th Edition, Prentice Hall, 2018.

Web Resources

1. https://www.geeksforgeeks.org/operating-systems/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PS O2	PSO 3
1	3	3	3										3		
2	3	3	3										3		
3	3	3	3										3		
4	3	3	3										3		
5	3	3	3										3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	Average marks of Experiments	Model Practical	END SEM EXAM
REMEMBER	20	10			10
UNDERSTAND	40	20			20
APPLY	40	50	10	10	50
ANALYZE		20			20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOMES

Course Outcome 1 (CO1): CO1 Choose the OS based on the knowledge on principles and modules of operating systems.(Remember)

1. What is an operating system?
2. Recall the operating system structures.
3. List the methods in Inter process Communication

Course Outcome 2 (CO2): Explain the factors in process scheduling strategies, concurrent processes and threads (Understand)

1. Outline the role of the scheduler and how its behaviour influences the performance of the system
2. Summarize the process synchronization techniques managed using various techniques.
3. Explain the concept of threads.

Course Outcome 3 (CO3): Develop algorithmic solutions to handle deadlock problems (Create)

1. Discuss the methods of deadlock.
2. Elaborate the several approaches to mitigate the issue of deadlock in operating systems.

Course Outcome 4 (CO4): Analyze the physical and logical memory management and the virtual memory(Analyze)

1. Examine that how program memory addresses relate to physical memory addresses, memory management in base-limit machines and swapping
2. Infer the virtual memory management, including paging and segmentation.

Course Outcome 5 (CO5): Identify and solve the issues related to file system interface, implementation and disk Management (Apply)

1. Build the various Disk-Scheduling Algorithms.
2. Make use of the different Accessing Methods of a File and manipulate it.

21AI4611	Data Analytics Laboratory	L	T	P	C
		0	0	4	2

Preamble

This course provides implementation of statistics concepts in R. It also provides sound introduction to implement the data analysis framework. This course also provides various exercises to implement the data analysis on various data.

Prerequisites for the course

- Authenticate Interest in Statistical Programming
- Basic Understanding of statistics and data structure
- Python programming language
- Understand the concepts of data structures and algorithms. Basic knowledge of MySQL
- Algebra, calculus, Statistics and probability.

Objectives

- Understand the R Programming Language.
- Exposure on solving of data science problems.
- Understand The classification and Regression Model

S.No	List of Experiments	CO

1	R AS CALCULATOR APPLICATION a. Using with and without R objects on console	**CO1**
	b. Using mathematical functions on console c. Write an R script, to create R objects for calculator application and save in a specified location in disk.	
2	DESCRIPTIVE STATISTICS IN R a. Write an R script to find basic descriptive statistics using summary str, quartile function on mtcars& cars datasets. b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.	**C01**
3	READING AND WRITING DIFFERENT TYPES OF DATASETS a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R. c. Reading XML dataset in R.	**CO2**
4	VISUALIZATIONS a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data.	**CO2**
5	CORRELATION AND COVARIANCE a. Find the correlation matrix. b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data. c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data	**CO2**
6	REGRESSION MODEL Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).	**CO3**
7	MULTIPLE REGRESSION MODEL Apply multiple regressions, if data have a continuous Independent variable. Apply on sample dataset	**CO3**
8	REGRESSION MODEL FOR PREDICTION Apply regression	**CO3**

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	Model techniques to predict the data on sample dataset.	
9	CLASSIFICATION MODEL a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier	**CO4**
10	CLUSTERING MODEL a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.	**CO5**

List of Projects

Sl.No	**Project Title**	**Related Experiments**	**CO**
1.	Build a calculator Using R	1	**CO 1**
2.	Predicting use car prices	2	**CO2**
3.	Credit Card Fraud Detection	6,7,8,9	**CO3,CO4**
4.	Customer Segmentation	4,5,6	**CO2,CO3**
5.	Job Recommendation System	9,10	**CO5**
6.	Video Classification	8,9	**CO4,CO5**
7.	Human Action Recognition	8,9	**CO4,CO5**
8.	Image Caption Generator	6	**CO3**
9.	Product Price Suggestions	8	**CO3**
10.	Web Traffic Time Series Forecasting	10	**CO5**

Total Periods : 60

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	**End Semester Exams (40 Marks)**
• Lab Experiment(40) • Model Exam &Test PROJECT(20)	• Practical Exam

Outcomes: Students can able to

Course Outcome 1(CO1):

Understand the R Programming Language and build the application using R objects.

Course Outcome 2(CO2):

Perform the data visualization and Analysis of Co variance for categorical data.

Course Outcome 3(CO3):

Understand the classification and Regression Model

Course Outcome 4(CO4):

Evaluate the performance of Classifier for classification problem.

Course Outcome 5(CO5)

Implement the clustering algorithm for Unsupervised Classification.

Laboratory Requirements:

- R studio- Anaconda Navigator
- System with windows

Reference Books

1. Practical Statistics for data Science,Peter Bruce ,Andrew Bruce , May 2017,First Edition, O'Reilly
2. Data Science from Scratch, Joel Grus,First Edition 2015, O'Reilly.
3. Advances in Complex Data Modeling and Computational Methods in Statistics, Anna Maria Paganoni and Piercesare Secchi, Springer, 2013
4. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012

Web Resourses

1.https://www.altair.com/data-analytics/ 2.https://www.ibm.com/in-en/analytics/hadoop/big-data-analytics

3.https://datascience.foundation/sciencewhitepaper/big-data-analytics-idea-data-types-and-reference-architecture

CO Vs PO Mapping and CO Vs PSO Mapping

C	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO

O	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**0**	**1**	**2**	**1**	**2**	**3**
1	3	3	3		1	2			1	2		1	3	3	3
2	3	3	3						1			1	3	3	3
3	3	3	3	2					1			1	3	3	3
4	3	3	3	2					1	2			3	3	3
5	3		3						1				3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**Model Exam**	**END SEM EXAM**
REMEMBER		
UNDERSTAND		
APPLY	100	100
ANALYZE		
EVALUATE		
CREATE		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to predict the suitable method forCourse Outcome 1 (CO1):

1. Write R function to check whether the given number is prime or not?(Apply)

2. What is the significance of scatter plot matrix?(Understanding)

Course Outcome 2 (CO2):

1. Perform data analysis with machine learning methods for Car dataset.(Analyze)

2. Visualize data using any plotting framework.(Analyze)

Course Outcome 3 (CO3):

1. Apply multiple regressions on sample dataset.(Apply)

2. Apply logistic regression on sample dataset.(Apply)

Course Outcome 4 (CO4):

1. Implement Decision tree classification techniques for Iris dataset.(Apply)
2. Visualize data using any plotting framework for sample dataset.(Analyze)

Course Outcome 5 (CO5):

1. Implement the MR program that processes a weather dataset.(Apply)

21PT3901	APTITUDE - I	L	T	P	C
		0	0	2	1

Prerequisites for the course

- Basic Maths

Objectives

1. Expose the undergraduate students to solve aptitude problems using different methods and practices.
2. Expose the undergraduate students to understand and make decisions with mathematical, statistical, and quantitative information.

UNIT I	MODULE I	6

Number system, Number series, HCF and LCM of Numbers, Factors and Decimals.

UNIT II	MODULE II	6

Square roots and cube roots, Indices and surds, Simplification and approximation, Problems on ages and numbers.

UNIT III	MODULE III	6

Percentage, Profit, loss and discount, Average, Ratio and Proportion.

UNIT IV	MODULE IV	6

Partnership and share, Alligation and mixtures, Chain rule, Mensuration.

UNIT V	MODULE V	6

Pipes and cisterns, simple interest, Compound interest, Growth and depreciation.

Total Periods	30

Suggestive Assessment Methods

Continuous Assessment Test -1 (30 Marks)	Continuous Assessment Test -2 (30 Marks)	Model Exam (40 Marks)
MULTIPLE CHOICE QUESTIONS	MULTIPLE CHOICE QUESTIONS	MULTIPLE CHOICE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: Solve various concepts of number systems and their techniques in solving the HCF, LCM, Factors and Decimals.
CO2: Analyse the profit, loss and discount of real time situations and solve the average, ratio and proportion problems.
CO3: Solve the Problems on ages, Square roots, cube roots, Indices, surds, Simplification and approximation.
CO4: Solve the problems on Partnership, share, Alligation, mixtures, Chain rule, Mensuration.
CO5: Solve the problems on Pipes and cisterns, simple interest, Compound interest, Growth and depreciation.

Text Books

1. Dr. R S Aggarwal, A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S Chand Publications.

2. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Mc Graw Hill Publications.

Reference Books

1. U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications Pvt Ltd, India.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Third Edition, Pearson Education Pvt Ltd, India, 2016.
4. Arun Sharma, How to prepare for Logical Reasoning for CAT & other Management Exams, Fifth Edition, Mc Graw Hill Publications.
5. Jaikishan and Premkishan, How to Crack Test of Reasoning in all Competitive Examinations, Revised Edition, Arihant Publications.

Web Recourses

1. https://pdf.bankexamstoday.com/raman_files/Quant%20Formula.pdf
2. https://ugcportal.com/raman-files/QT-TRICKS.pdf
3. https://www.javatpoint.com/aptitude/quantitative#speed-and-distance
4. https://www.indiabix.com/aptitude/questions-and-answers/

CO Vs PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	1										2
2	2	1										2
3	3	1										2
4	3	1										2
5	2	1										3

COURSE CONTENT AND SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I – MODULE I		
1	Number system	**2**
2	Number series	**1**
3	HCF of Numbers	**1**
4	LCM of Numbers	**1**
5	Factors and Decimals	**1**
UNIT II – MODULE II		
1	Square roots	**1**
2	Cube roots	**1**
3	Indices and Surds	**2**
4	Simplification and Approximation	**2**
5	Problems on ages and numbers	**1**

UNIT-III MODULE III		
1	Percentage	**1**
2	Profit, loss and discount	**2**
3	Average	**1**
4	Ratio and Proportion	**2**
UNIT-IV MODULE IV		
1	Partnership and share	**2**
2	Alligation and mixtures	**2**
3	Chain rule	**1**
4	Mensuration	**1**
UNIT-V MODULE V		
1	Pipes and cisterns	**1**
2	Simple interest	**2**
3	Compound interest	**1**
4	Growth and depreciation	**2**

21HS2103	TECHNOLOGY IN TAMIL CULTURE	L	T	P	C
		2	0	0	1

Preamble:
This course is offered to develop technical thinking based on Tamil tradition and to acquaint students with the fundamentals of various technologies through Tamil culture and history.

Prerequisite: The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	6

Weaving Industry during Sangam Age–Ceramic technology–Black and Red Ware Potteries (BRW) – Graffition Potteries

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	6

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero Stones of Sangam Age– Details of Stage Constructions in Silapathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal -Chetti Nadu Houses, Indo –Saracenic architecture at Madras during British Period.

UNIT III	MANUFACTURING TECHNOLOGY	6

Art of Ship Building - Metallurgical studies- Jewells making - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads -Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gemstone types described in Silapathikaram.

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	6

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry -Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries –Pearl-Conceiving-Ancient Knowledge of Ocean-Knowledge Specific Society.

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	6

Development of Scientific Tamil – Tamil computing–Digitalization of Tamil Books–Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries –Sekai Project.

Total Periods	30

Course Outcomes:

At the end of the course the students will be able to

CO1	To learn the techniques adopted in Industries of ancient Tamil culture.
CO2	To assess the technical competence of ancient Tamil.
CO3	To achieve the ability to think about various production technologies in Tamil Culture.
CO4	To explore the recovery and development of agricultural and water management technical skills of Tamil culture.
CO5	To enumerate the technical development that Tamil has achieved in the field of science and computer.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								**1**	**2**	**3**	**1**	**3**
2								**1**	**3**	**2**	**3**	**2**
3								**1**	**3**	**2**	**1**	**2**
4								**3**	**2**	**2**	**3**	**2**
5								**2**	**3**	**3**	**2**	**3**

TEXT-CUM-REFERENCEBOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL–(in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi-'Sangam City Civilization on the bank of river Vaigai'(Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published By: TheAuthor)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) Journey of Civilization Industo Vaigai (R.Balakrishnan) (Published by:RMRL)–Reference Book

21HS2103	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		2	0	0	1

முன்னுரை(Preamble)

இந்தப் பாடத்திட்டம் பொறியியல் பயிலும் முதலாம் ஆண்டு மாணவர்களின் இரண்டாம் பருவத்திற்குரியது. தமிழ் மரபு சார்ந்த தொழில்நுட்ப சிந்தனையை வளர்த்து பல்வேறு தொழில்நுட்பங்களின் அடிப்படை கூறுகளைத் தமிழரின் பண்பாடு மற்றும் வரலாற்றின் மூலம் மாணவர்களை அறியச் செய்தல்.

பாடநெறிக்கான முன்நிபந்தனைகள்**(Prerequisites for the course)**

தமிழ் மொழியில் எழுத படிக்க தெரிந்திருத்தல் அவசியம்.

அலகு I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	6

சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்

அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	6

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல் , மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை

அலகு III	உற்பத்தித் தொழில் நுட்பம்	6

கப்பல் கட்டும் கலை - உலோகவியல் - நகைத் தொழில்நுட்பம் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்று சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்பு துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு IV	வேளாண்மை மற்றும் நீர் பாசன தொழில்நுட்பம்	6

அணை , ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்து குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்

அலகு V	அறிவியல் தமிழ் மற்றும் கணினித் தமிழ்	6

அறிவியல் தமிழின் வளர்ச்சி - கணினித் தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Total Periods	**30**

எதிர்பார்க்கும் படிப்பின் முடிவுகள்

CO1	மாணவர்கள் பண்டைத் தமிழரின் தொழில்நுட்பங்களை அறிந்து கொள்வர்.
CO2	பண்டைத் தமிழரின் தொழில்நுட்பத் திறனை மதிப்பிடுதல்.
CO3	தாய் மொழியில் பல்வேறு உற்பத்தி தொழில்நுட்பங்களைக் குறித்து சிந்திக்கும் திறனை அடைவார்.
CO4	தமிழரின் வேளாண்மை மற்றும் நீர் மேலாண்மை தொழில்நுட்ப திறன்களை மீட்டு உருவாக்கம் செய்தல் குறித்து அறிதல்.

CO5	அறிவியல் மற்றும் கணினி துறையில் தமிழ்ப் பெற்றுள்ள தொழில் நுட்ப வளர்ச்சியை அறிதல்.

Course Outcomes:

At the end of the course the students will be able to

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1		1			1		1	1	2	1		3
2		2	2		2	1	3	2	1	2		2
3		2	3	1	2	1	1	1	2	1		2
4			2				2	1	2	2		2
5			2				1	2	1	3		1

TEXT – CUM – REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம்(விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

SEMESTERV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS5602	Computer Networks	PC	3	3	0	0	3
2	21CS4601	Database Management Systems	PC	3	3	0	0	3
3		Professional Elective –I	PE	3	3	0	0	3
4		Professional Elective– II	PE	3	3	0	0	3
5		Open Elective I	OE	3	3	0	0	3
Theory cum Practical Courses								
1	21IT3602	Object Oriented Programming with Java	PC	5	3	0	2	4
Practical Courses								
1	21CS4611	Database Management Systems Laboratory	PC	4	0	0	4	2
2	21PT3904	SoftSkills–Reasoning	EEC	2	0	0	2	1
			Total	26	18	0	8	22

21CS5602	**COMPUTER NETWORKS**	**L**	**T**	**P**	**C**
		3	0	0	3

Preamble

This course offers a first formal introduction to performance analysis of different components of computer networks. Computer Network courses enables the learners to understand networking concepts, technologies and terminologies which in turn helps the students to analyze the flow control and perform error correction and detection. This course presents the concepts of transmission control protocol, which makes the individual to understand Application layer and also gives the glimpses of recent trends in computer networks.

Prerequisites

- Computer Architecture

Objectives

1. To understand layered architecture of computer networks and protocols.
2. To learn the various mediums used in the physical layer.
3. To understand the functionalities of data link layer.
4. To learn the routing algorithms and the use of IP addressing in the network layer.
5. To understand the working of transport layer

UNIT I	**INTRODUCTION, PHYSICAL LAYER**	**9**

Overview: Data Communication - Network Types - Internet History - TCP/IP Protocol Suite - The OSI Model - Digital Signals - Data rate limits - Performance - Line Coding - Block Coding -

Transmission Media: Guided Media - Unguided Media – Switching		
Suggested Activities: • Practical – Local Area Network set up • Practical – RJ45 Cable Crimping		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT II	**DATA LINK LAYER**	**9**
Link Layer Addressing - ARP - Error Detection and Correction - Data Link Control Services - Data Link Layer Protocols - HDLC - PPP - Media Access Control - Ethernet - Wireless LANs: IEEE 802.11, Bluetooth - Connecting Devices.		
Suggested Activities: • Practical – CRC Checking • Practical – Bluetooth Connection between PC and Mobile.		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT III	**NETWORK LAYER**	**9**
Network layer Services - Packet switching - Performance - IPV4 addresses –classful addressing and classless addressing- Forwarding of packets - Internet Protocol - ICMPV4 - Mobile IP - Routing algorithms - Routing Protocols - IPV6 addressing - IPV6 protocol -Transition from IPV4 to IPV6		
Suggested Activities: • Practical –Routing Concept Using CISCO Packet Tracer • Practical – IP Address Setting in PC/LAPTOP		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT IV	**TRANSPORT LAYER**	**9**
Transport Layer Services - Protocols - UDP - TCP: Transition Diagram, Flow Control, Error Control, Congestion Control - SCTP - QoS: Flow Control to improve QoS - Integrated Services - Differentiated Services - Client Server Programming.		
Suggested Activities: • Practical – Capturing of UDP, TCP Packets Using Ethereal • Practical – Establishing Client Server Concept Using Crossover connection between two systems		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT V	**APPLICATION LAYER AND SECURITY**	**9**

World Wide Web and HTTP –MIME- FTP - Electronic Mail - SMTP- Telnet - Secure Shell - Domain Name System - Network Layer Security - Transport Layer Security - Application Layer Security - Firewalls.

Suggested Activities:

Practical – File Transfer Systems Using Cross over connection between two systems.
Practical – Installation of Software Firewall.

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Identify the role of each layer in computer networks and its protocols. (REMEMBER)
CO2 Develop scheme for error detection and correction (CREATE)
CO3 Evaluate the performance of various routing algorithms. (EVALUATE)
CO4 Analyze the flow control and congestion control algorithms for QoS at end to end level. (ANALYSE)
CO5 Analyze the role of Application Layer Protocols and Security features (ANALYSE)

Text Books

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill, Fifth Edition, 2013
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Morgan KauffmannPublishers Inc., Third Edition, 2003.

Reference Books

1. James F. Kuross, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Addison Wesley, ThirdEdition,2004.
2. Pete Loshin, “IPv6: Theory, Protocol and Practice”, ELSEVIER, Morgan Kauffmann Publishers Inc.,Second edition, 2004
3. William Stallings, “ Data and Com puter Communication ”, Pearson Education, Sixth Edition, 2000.
4. Andrew S. Tannenbaum, “Computer Networks”, Pearson Education, Fourth Edition, 2003
5. D.E. Comer, “Internetworking with TCP/IP Vol- III”, (BSD Sockets Version), Pearson Education,Second Edition, 2003.
6. W. Richard Stevens, “UNIX Network Programming Vol-I”, Pearson Education, Second

Edition, 1998.
Web Resources 1. https://nptel.ac.in/courses/106/105/106105081/www.nptel.ac.in 2. http://www.protocols.com/pbook/tcpip1.html 3. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-cs38/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	3	3	3									3	3	
2	3	3	3	3									3	3	
3	3	3	3	3									3	3	
4	3	3	3	3									3	3	
5	3	3	3	3									3	3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for…(Apply)

Course Outcome 1 (CO1):

1. Examine the two types of line configuration. (Analyze)
2. Can you list the five components of data communication? (Remember)
3. List the common approaches for switching. (Understand)

Course Outcome 2 (CO2):

1. Infer why the data link layer is subdivided into two sublayers. (Analyze)
2. Compose your view on why fragmentation is recommended in a wireless LAN? (Create)
3. Show the Ethernet frame format. (Understand)

Course Outcome 3 (CO3):

1. Can you relate the two different classes of routing protocol? (Apply)
2. Demonstrate the need for sub netting?. (Understand)
3. Identify all the metrics used by routing protocols?. (Apply)

Course Outcome 4 (CO4):

1. Discover the services provided by Transport layer protocol? (Analyze)
2. Suppose a TCP connection is transferring a file of 5000 bytes. The first byte is numbered 10001.What are the sequence numbers for each segment if data are sent in three segments, each carrying 1000 bytes.. (Create)
3. Compare unicast, multicast and broadcast routing. (Analyze)

Course Outcome 5 (CO5):

1. Examine the function of SSH components? (Analyze)
2. Propose a comparison between GET and SET in SNMP. (Create)
3. Interpret the design of a MIB for a simple SNMP? (Evaluate)

21CS4601	DATA BASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Preamble

This course provides the fundamental knowledge about database concepts and its realization using relational data model. It focuses not only on data storage and retrieval but provides deeper understanding on eliminating redundant data and efficient data management as a whole for seamless transactions, security and recovery.

Prerequisites for the course

- Data structures

Objectives

1. To teach the basic database concepts, Entity Relationship model and Relational model
2. To describe the basics of SQL and construct queries using SQL
3. To demonstrate the use of constraints, relational algebra operations and Normal forms
4. To emphasize the importance of transaction processing and concurrency control
5. To describe data storage mechanisms and query processing techniques

UNIT I	INTRODUCTION TO DATABASE DESIGN	9

Introduction and applications of DBMS- Purpose of data base- Data Independence- Data models, Database System architecture- Database user Levels, Mappings–DBA- ER Diagrams - Entities, Attributes, Relationships, Constraints, keys - Extended ER features, Generalization, Specialization, Aggregation- Conceptual design with the E-R Model.

SUGGESTED ACTIVITIES

- Discussion about the overview of databases

SUGGESTED EVALUATION METHODS

- Assignment on creating E-R diagrams
- Quiz on database and data models

UNIT II	STRUCTURED QUERY LANGUAGE	10

SQL: Basics of SQL, DDL, DML,DCL, TCL-Enforcing integrity constraints- IN/NOT IN operators- aggregate functions-Built-in functions – numeric, date, string functions, set operations, views, sub queries, nested subqueries. Use of group by, order by, having, join and its types- triggers - cursors – functions - stored procedures		
SUGGESTED ACTIVITIES		
• Demonstrate the use of SQL queries		
SUGGESTED EVALUATION METHODS		
• Assignment on SQL • Quiz on SQL		
UNIT III	**RELATIONAL ALGEBRA AND SCHEMA REFINEMENT**	**9**
Introduction to the relational model- Querying relational data- Mapping E-R model to relational model - Relational algebra operations- functional dependencies and types- Armstrong axioms- normalization- Normalforms: 1NF, 2NF, 3NF,4NF,5NF,BCNF- properties and types of decompositions		
SUGGESTED ACTIVITIES		
• Solve problems regarding normalization		
SUGGESTED EVALUATION METHODS		
• Quiz on relational algebra operations • Quiz on normal forms		
UNIT IV	**TRANSACTIONS MANAGEMENT**	**10**
Transaction concepts- transaction states- ACID properties- implementation of atomicity and durability- schedules- Serializability- implementation of isolation- transaction definition in SQL- concurrent executions- need for concurrency- concurrency control- two phase commit and two phase locking protocol – Time stamping –Backup and Recovery techniques		
SUGGESTED ACTIVITIES		
• Discussion on types of concurrency control techniques		
SUGGESTED EVALUATION METHODS		
• Quiz on transaction concepts		
UNIT V	**DATA STORAGE, QUERYING AND RECENT TRENDS**	**7**
Physical Storage structures- RAID-File Organization-Indexing and types- Ordered indexing- B trees- B+ trees- Hashing and types- Query processing- Query optimization and cost estimation- Advanced Topics: case study on parallel database and distributed database		
SUGGESTED ACTIVITIES		
• Perform insertion and deletion operations on B trees and B+ trees		
SUGGESTED EVALUATION METHODS		
• Assignment on storage techniques • Comparison report on parallel and distributed database		
	Total Periods	**45**
Suggestive Assessment Methods		
Continuous Assessment Test	**Formative Assessment Test**	**End Semester Exams**

(20 Marks)	(20 Marks)	(60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1.DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1Understand the basic concepts of Database Systems in Database design using ER Modelling.(Understand)
CO2 Apply SQL queries to interact with the database.(Apply)
CO3 Apply normalization on database design to eliminate anomalies.(Apply)
CO4Analyze database transactions and can control them by applying ACID properties.(Analyze)
CO5 Understand the concepts of indexing, hashing and query processing.(Understand)

Text Books

1. Raghurama Krishnan, Johannes Gehrke , Database Management Systems, 3rd edition, Tata McGraw Hill, New Delhi, India, 2016.

Reference Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2019), Database System Concepts, 7th edition, McGraw-Hill, New Delhi,India.
2. Elmasri Navate, Fundamentals of Database Systems, Pearson Education, India, 2016.

Web Resources

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.geeksforgeeks.org/dbms/
3. https://www.guru99.com/what-is-dbms.html
4. https://searchsqlserver.techtarget.com/definition/database-management-system
5. https://onlinecourses.nptel.ac.in/noc21_cs04/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										3		
2	3	3	3		3	3							3		
3	3	3	3										3		
4	3	3	3		3	3							3		
5	2	3	3		2	2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Discuss about applications of Database Systems?(Remember)
2. Draw the ER diagram for a company needs to store information about employees identified by ssn, with salary and phone as attributes), departments (identified by dno, with dname and budget as attributes), and children of employees (with name and age as attributes). Employees work in departments, each department is managed by an employee; a child must be identified uniquely by name when the parent (who is an employee; assume that only one parent works for the company) is known. We are not interested in information about a child once the parent leaves the company. (Understand)

Course Outcome 2 (CO2):

1. Consider a university database and design an E-R diagram. Write SQL statements to create the corresponding relations and capture as many of the constraints as possible. If you cannot capture some constraints, explain why. (Apply)
2. Consider the following query: Find the names of sailors with a higher rating than all sailors with age<21. The following two SQL queries attempt to obtain the answer to this question. Do they both compute the result? If not, explain why? Under what conditions would they compute the same result? (Apply)

(a) selectS.sname from sailors S where not exists (select * from sailors S2 where S2.age<21 and S.rating<=S2.rating)

(b) select * from Sailors S where S.rating> ANY(select S2.rating from sailors S2 where S2.age<21)

Course Outcome 3 (CO3):

1. Consider a relation R with five attributes ABCDE. You are given the following dependencies. A->B, BC->E and ED->A (Apply)

(a) List all keys for R.

(b) Is R in 3NF?

(c) Is R in BCNF?

2. Assume that you are given a relation with attributes ABCD. (Apply)

(a) Assume that no record has null values. Write an SQL query that checks whether the functional dependency A->B holds.

(b) Assume again that no record has null values. write an SQL assertion that enforces the functional dependency A-> B.

(c) Let us assume that records could have null values. Repeat the previous two questions under this assumption.

Course Outcome 4 (CO4):

1. Consider the following actions taken by transaction T1 on database object X and Y: R(X), W(X), R(Y), W(Y) (Analyze)

(a) Analyse if another transaction T2 is run concurrently to transaction T without some form of concurrency control, could it interfere with T1?

(b) State your opinion whether the use of Strict 2PL would prevent interference between two transactions.

(c)Strict 2PL is used in many database systems. Give two reasons for its popularity.

2. We call a transaction that only reads database object a read-only transaction; otherwise it is called read-write transaction. Give brief answers to the following questions.(Analyze)

(a) What happens to the database throughput if the number of read-only transactions is increased?

(b) What happens to the database throughput if the number of read-only transactions is increased?

Course Outcome 5 (CO5):

1. Why should we create clustered indexes? What is co-clustering and when should we use it? (Understand)
2. What are the choices for managing locks in a distributed DBMS? What issues must be considered in optimizing queries over distributed data? (Understand)

PROFESSIONAL ELECTIVE I

S.No	Course Code	CourseName	Semester	L	T	P	C	Stream/ Domain
1	21IT7716	Game Programming	5	3	0	0	3	AI
2	21AI5701	Data Acquisition	5	3	0	0	3	Data Science

3	21CS5603	Internet Programming	5	3	0	0	3	Networking
4	21AI5702	AI Enhanced Software Engineering	5	3	0	0	3	Software Engineering
5	21CS5701	Computer Graphics	5	3	0	0	3	Image Processing
6	21CS5601	Theory of Computation	5	3	0	0	3	Computation and Programming
7	21CS5703	IoT and its Applications	5	3	0	0	3	Recent Trends

21IT7716	**GAME PROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

The course exposes students to software development through the techniques used in one of the largest fields of computing. Control and interactivity of both 2D and 3D environments is discussed and analysed at various levels.

Objectives

1. To understand the basics of 2D and 3D graphics for game development.
2. To understand the stages of game development.
3. To understand the basics of game engine.
4. To apply various tool kits for game development.
5. To develop simple games using Pygame environment..

UNIT I	**3D GRAPHICS FOR GAME PROGRAMMING**	**9**

Definition – Genres of Games, Basics of 2D and 3D Graphics, Game Objects Design – 2D and 3D Transformations – Projections – Colour Models – Illumination and Shader Models – Animation – Controller based Animation.

UNIT II	**GAME DESIGN PRINCIPLES**	**9**

Character Development, Storyboard Development for Gaming – Script Design – Script Narration –Game Balancing –Core Mechanics – Principles of Level Design – Proposals – Writing for Preproduction, Production and Post-Production.

UNIT III	GAME ENGINE DESIGN	9
Character Development, Storyboard Development for Gaming – Script Design – Script Narration –Game Balancing –Core Mechanics – Principles of Level Design – Proposals – Writing for Preproduction, Production and Post-Production.		
UNIT IV	**GAMING PLATFORMS AND FRAMEWORKS**	**9**
Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity –Single player and Multi-Player games.		
UNIT V	**GAME DEVELOPMENT USING PYGAME**	**9**
Developing 2D and3D Interactive Games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating Music and Sound – Asset Creations – Game Physics Algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based Games – Overview of Puzzle Games.		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1. ASSIGNMENT 2. QUIZZES	1. DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING

Outcomes

Upon completion of the course, the students will be able to:

CO1– Understand the concepts of 2D and 3D graphics.
CO2– Understand thehistory and Prepare game design documents
CO3– Understand the implementation of gaming engines.
CO4– Apply tools for gaming environments and frameworks
CO5– Apply various game programming techniques for simple game development

Text Books

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison-Wesley Professional, 2013.

Reference Books

1. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress Publishers, 2007.
2. Paul Craven, “Python Arcade games”, Apress Publishers, 2016.
3. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 2011.

Web Resources

1. https://www.udemy.com/course/pygame-python/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1	3	3	3										3	
2	3	3	3										3	
3	3	3	3										3	
4	3	3	3										3	
5	3	3	3										3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					20
UNDERSTAND	70	70	15	15	50
APPLY	30	30	10	10	30
ANALYZE					
EVALUATE					
CREATE					

21AI5701	DATA ACQUISITION	L	T	P	C
		3	0	0	3

Preamble

Student those who want to be successful Data Analysts must learn various technical, mathematical, creative, and interpersonal skills. This can require a background in computer programming, data visualization, spreadsheet applications, statistics, communication, storytelling, and time management

Prerequisites for the course:

- 21MA3205 Probability and statistics
- 21AI4601 Data Analytics

Objectives

- To understand the complexity and volume of Data and their challenges.
- To analyses the various methods of data collection.
- To comprehend the necessity for pre-processing Data and their issues.
- To understand predictive analytics and descriptive analytics.

To understand and implement Data Analytics with data convergence and Business Maturity Mode

UNIT I	INTRODUCTION TO DATA ACQUISITION	6

Data framework - fundamental concepts of Data management and analytics - Current challenges and trends in Data Acquisition.

UNIT II	DATA COLLECTION AND TRANSMISSION	9

Data collection- Strategies- Types of data sources- Structured vs. Unstructured data- ELT vs. ETL - storage infrastructure requirements -collection methods-log files- Sensors- Methods for acquiring network data (Lib cap-based and zero-copy packet capture technology)

UNIT III	DATA PREPROCESSING	9

Data pre-processing overview-Sampling - Missing Values - Outlier Detection and Treatment - Standardizing Data - Categorization - Weights of Evidence Coding - Variable Selection and Segmentation

UNIT IV	DATA ANALYTICS	12

Predictive Analytics: Regression, Decision Tree, Neural Networks - Descriptive Analytics: Association Rules, Sequence Rules- Social Network Analytics: Social Network Learning Relational Neighbour Classification

UNIT V	BIG DATA PRIVACY AND APPLICATIONS	9

Data Masking – Privately Identified Information (PII) -Privacy preservation in Big Data- Popular Big Data Techniques and tools- Map Reduce paradigm and the Hadoop system – Applications- Recommender Systems- Fraud Detection

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (20Marks)	FORMATIVE ASSESSMENT TEST (20Marks)	End Semester Exams (60Marks)
1. Descriptive question	1.Assignment	1. Descriptive question

2. CASE BASED QUESTIONS	**2.Quizzess** **3. Problem solving activities**	**2. CASE BASED QUESTIONS**

Course Outcomes

Upon completion of the course, the students will be able to:

- Identify the various sources of Big Data.
- Apply several key big data technologies used for storage, analysis and manipulation of data.
- Design new algorithms for collecting Big Data from various sources.
- Design algorithms for pre-processing Big Data other than the traditional approaches.
- Design methodologies to extract data from structured and un-structured data for analytics

Text Books

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", John Wiley & Sons, 2014

2. Min Chen, Shiwen Mao, Yin Zhang, Victor CM Leung, Big Data: Related Technologies, Challenges and Future Prospects, Springer, 2014.

Reference

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj ,"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends", John Wiley & Sons, 2013

2. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global

Web Resources

1.https://www.google.com/search?q=no+sql&oq=no+sql

2.https://hadoop.apache.org/

3.https://hive.apache.org/

4.https://hbase.apache.org/

COVsPO Mapping and COVsPSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3		3			3									
2	3		3	3		3									
3	3		3	3		3									3
4	3		3	3		3									3

5	3		3	3	3	3									3

COURSE OUTCOME LEVEL ASSESSMENT QUESTION:
COURSE OUTCOME 1:

1. Explain the fundamental concepts of data management and analytics (Understand)
2. Compare the current challenges and trend in data acquisition (analyze)

COURSE OUTCOME 2:

1. Fill in the blanks(Remember)

Q-1	**Construct nested partitions layer by layer via grouping objects into a <u>tree of clusters</u>**
Option 1	Hierarchical Clustering
Option 2	Partitional Clustering
Q-2	**The commonly used distance functions<u>are Euclidean and Manhattan distance /intercluster distance</u>**
Option 1	Euclidean and Manhattan distance
Option 2	Intra cluster distance
Q-3	**Members of the cluster are <u>closer to /away from</u>each other**
Option 1	closer to
Option 2	away from
Q-4	**The quality of clustering result depends on the algorithm, the <u>distance function</u>,/<u>cluster purity</u> and the application.**
Option 1	Distance function
Option 2	Cluster purity

COURSE OUTCOME 3:

1. A company called X Education sells online courses. Anytime someone comes to their website, they either enroll in course or do not. Those who are not getting enrolled even after seeing the course information are called leads. Now, to attract those leads back to their courses company tries different strategies like e-mail marketing or special discount etc. problem is that if, for example, the company have 50 leads, and it sends out an email to all 100 of them, it is possible that only 10 or 15 of them will enroll. Thus, there is a loss of money and effort on the company's behalf which take us to a cost-benefit analysis. Provide a solution for the above problem**(Apply)**

COURSE OUTCOME 4:

1. Perform outlier detection for the following using supervised algorithm **(Apply)**

- Choose a supervised dataset (e.g. spam base)
- Choose one of its classes (e.g. “non-spam e-mails”)
- Apply the one-class method over it
- Be careful, methods may only work with numerical features. Remove the class!
- Graph “outlines” distribution → cut-off point to decide outliers
- Are there suspicious outliers within this class e-mails?

2. Suppose we have a system that observes a person’s TV watching habits in order to recommend other TV shows the person may like. Suppose that we have characterized each show by whether it is a comedy, whether it features doctors, whether it features lawyers, and whether it has guns. Suppose we are given the examples below about whether the person likes various TV shows. Analyze using Machine learning algorithm.(Apply)

COURSE OUTCOME 5:

Build a recommendation system

1. Tapestry system does not aggregate ratings and requires knowing each other

   Basic idea: "People who agreed in their subjective evaluations in the past are likely to agree again in the future". Builds on newsgroup browsers with rating functionality (apply)
2. How do we measure similarity? How many neighbors should we consider? How do we generate a prediction from the neighbors' ratings? (Apply)

	Item1	Item2	Item3	Item4	Item5
Alice	5	3	4	4	?
User1	3	1	2	3	3
User2	4	3	4	3	5
User3	3	3	1	5	4
User4	1	5	5	2	1

21CS5603	INTERNET PROGRAMMING	L	T	P	C
		3	0	0	3

Preamble

This course Internet Programming deals with developing web applications using HTML,CSS, JAVASCRIPT, SERVLET, JSP ,PHP, and XML, jQuery. It provides an introduction and Basic Concepts of Server-Side Programming and Designing of Static and Dynamic WebPages.

Prerequisites for the course

- Basic Java Programming

1. To learn to design web pages using HTML5
2. To gain knowledge on creating interactive web pages using JavaScript
3. To know to use Cascading Style Sheets (CSS)

4. To study different technologies related to XML
5. To learn to develop server side scripting using PHP

UNIT I	**HTML 5, CSS 3**	**9**

Clients, Servers and Communication – Basic Internet protocols – World wide web -HTTP Request Message – HTTP Response Message -HTTPs – HTML5 – Tables – Lists –Forms– Image – CSS3 – Inline, embedded and external style sheets –Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

Suggested Activities:

- Programming exercises on HTML Tables, lists.
- Assignment on writing simple CSS Programs.

SUGGESTED EVALUATION METHODS:

- Grading system to evaluate simple HTML5 exercises.
- Tutorials on program writing skills.
- Simple application development using all the above mentioned features

UNIT II	**CLIENT SIDE PROGRAMMING**	**9**

Introduction to Scripting - Data types and Variables - Operators, Expressions and Statements - Functions - Arrays - Objects - Document Object Model - Event Handling – JSON

Suggested Activities:

- Implementing JavaScript programs using data types, arithmetic operators and basic input/output operations.
- Write an application to perform operations like finding the maximum, minimum, average values using single dimensional integer and float arrays.

SUGGESTED EVALUATION METHODS:

- Tutorials on conditionals and loops.
- Evaluation of the programs implemented

UNIT III	**SERVER SIDE PROGRAMMING**	**9**

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions-Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

Suggested Activities:

- Servlet programming with database connectivity and session tracking.
- JSP applications with database connectivity.

SUGGESTED EVALUATION METHODS:

- Demonstration of simple web application using Servlet and JSP.
- Tutorials on JSTL.

UNIT IV	**PHP and XML**	**9**

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions-Form Validation- Regular Expressions - Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema ,XSL and XSLT Transformation.

Suggested Activities:

- Simple PHP program implementation using Operators, Conditionals, loops.
- Implementing PHP program to open a non-existent file using exceptions.
- Developing simple applications like food menu, student record using XML.

SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.
- Case Studies.

UNIT V	**JQUERY**	**9**

JQUERY: Introduction to jQuery – Selectors – Elements: Manipulations, Changing and Setting elements – Events – Animations- Effects – jQuery HTML

Suggested Activities:

- Application development using jQuery
- Demonstration of programs using jQ HTML

SUGGESTED EVALUATION METHODS:

- Assignments on JS Selectors.
- Demonstration of the application development using JQ effects .

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1.DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ 3.PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand basic HTML and Cascading Style Sheets. (Understand)

CO2 Understand the concept of dynamic web page with validation using Java Script (Understand)

CO3 Apply server side programs using Servlets and JSP. (Apply)

CO4 Design web pages in PHP and to represent data in XML format. (Apply)

CO5 Use jQuery to develop interactive web applications (Apply).

Text Books

1. Jeffrey C and Jackson, —Web Technologies A Computer Science Perspective, Pearson Education, 2011.

Reference Books

1. Deitel and Deitel and Nieto, —Internet and World Wide Web - How to Program||,Prentice

Hall, 5th Edition, 2011.
2. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, Fourth Edition, 2007.
3. Stephen Wynkoop and John Burke —Running a Perfect Website‖, QUE, 2nd Edition,1999.
4. Bear Bibeault and Yehuda Katz, jQuery in Action, 2008.

Web Resources

1. https://www.tutorialspoint.com/internet_technologies/internet_useful_resources.htm
2. https://nptel.ac.in/courses/106105084

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2											3		
2	3	2	3	2	3								3		
3	3	2	3	2	3								3		
4	3	2	3	2	3								3		
5	3	2	3	2									3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for.(Understand)

Course Outcome 1 (CO1):

1. Explain the function of DNS and the protocol used (Understand)
2. Write the syntax to display the following statement "I am learning Web programming" (Understand)
3. Write HTML code to display an image. (Understand)

Course Outcome 2 (CO2):

1. Summarize the use of JSON? (Understand)
2. Write the need for Java script. (Understand)
3. Discuss any two JavaScript built in objects. (Understand)

Course Outcome 3 (CO3):

1. Rewrite the code segment to store current server time using session (Understand)
2. Explain how a JSP code to display the information at the client ends. (Understand)
3. How many methods are available in the life cycle of the servlet. (Understand)

Course Outcome 4 (CO4):

1. Design a neat diagram for XML Parse tree (Apply)
2. Assess the data types in XML schema. (Apply)
3. Create how XSLT transforms the document from one (Word) type to other type (HTML). (Apply)

Course Outcome 5 (CO5):

1. Change text color of the elements using jQuery. (Apply)
2. Create an application to change text contents of the elements on button click using jQuery.(Apply)
3. Design a simple show hide effect in jQuery.(Apply)

21AI5702	**AI -ENHANCED SOFTWARE ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession.

Prerequisites for the course

- C Programming

Objectives

1. To explore the fundamental concepts of software engineering
2. To understand fundamental concepts of requirements engineering and Analysis Modelling.
3. To understand the various software testing methodologies
4. To learn the software project management principles
5. To learn about Artificial Intelligence based software process and software testing

UNIT I	**INTRODUCTION**	**9**

Definition of terms - The evolving role of Software – Software characteristics - Software applications- Waterfall life cycle model -Evolutionary Process Model – Incremental Process Model – RAD model- Agile Process Model.

SUGGESTED ACTIVITIES:

- In-class activity on Application specific Product and Process view
- External Learning on impact of unified process models on Quality Software Development

SUGGESTED EVALUATION METHODS:

- Assignments: Selection of suitable software process models for a given software specification
- Tutorial problems: Identification of Sample Application for each process model and justify thesame stating reasons.

UNIT II	**REQUIREMENT ANALYSIS AND DESIGN**	**9**

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirement's elicitation and analysis, requirements validation, requirements management- Designing Concepts – Data Flow Diagram.

SUGGESTED ACTIVITIES:

- External Learning: Using open-source tools for RE to understand the requirements traceabilityand interdependency among the functionalities provided by the software project.

SUGGESTED EVALUATION METHODS:

- Tutorial on various Requirements elicitation mechanisms and selection of an appropriatestrategy.
- Assignment on Requirements categorization (considering contradicting, omission, commission of requirements) in a software project

UNIT III	**TESTING**	**9**
Software testing fundamentals - Test case design: White box testing - Basis path testing - Control structure testing. Black box testing - Testing strategies - Unit testing - Integration testing - System testing – Acceptance Testing-Testing Tools – Test Case Management.		
SUGGESTED ACTIVITIES: • External Learning: Understanding the requirements (SRS) and designing a suitable test suite. • External Learning: Determine valid interfaces for integration testing and design necessary stub and driver modules • External Learning on ideas of testing a simple online application on selected test cases • Tutorial on using Automation software for testing		
SUGGESTED EVALUATION METHODS: • Assignment on obtaining a mind-map on testing strategies Assignment: Testing of Sample application using any OSS on Software Test Automation		
UNIT IV	**SOFTWARE PROJECT MANAGEMENT**	**10**
Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis, Planning : Project Plan, Planning Process, Risk Management – Identification, Projection – Risk Mitigation, Monitoring and Management Plan.		
SUGGESTED ACTIVITIES: • External Learning on using tools for estimating Software Cost		
SUGGESTED EVALUATION METHODS: • Tutorial: Identification of potential risks for a software project during development/ maintenance and tabulate. • Assignment: Using a Software Configuration Management template for a software project		
UNIT V	**Artificial Intelligence in Software Engineering**	**8**
Introduction – Role of AI in SE - Challenges Ahead in AI for SE: Searching for strategies - Exploitation of Multicore - Giving Insight to Software Engineers - Compiling Smart Optimizationinto Deployed Software - Novel AI Friendly Software Development and Deployment - Search Based Software Engineering (SBSE) - AI based Software Testing - AI Based Testing Tools		
SUGGESTED ACTIVITIES: • External Learning on Novel AI Friendly Software Development and Deployment • External Learning on Search Based Software Engineering (SBSE).		
SUGGESTED EVALUATION METHODS: • Assignment: AI based Software Testing		
Total Periods		**45**
Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams(60 Marks)**

1. DESCRIPTIVE QUESTIONS	1.Open Book Test 2. Online Quizzes 3. Assignments	1.DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: Demonstrate about software engineering concepts and software developmentprocess models.(Understand)
CO2: Able to identify the requirements, Use appropriate design to implement therequirement and document.(Apply)
CO3: Recognize the knowledge about implementation, testing methods and comparison ofvarious testing techniques(Apply)
CO4:Develop a project schedule and handle the risk(Apply)
CO5:Understand the role of Artificial Intelligence in Software Engineering process(Apply)

Text Books

1. Roger S.Pressman, "Software Engineering: A Practitioner's Approach", 8th Edition, Tata McGraw Hill Edition, 2015. (Unit I -IV)
2. Mark Harman "The role of Artificial Intelligence in Software Engineering", Published in: 2012 First International Workshop on Realizing AI Synergies in Software Engineering (RAISE)
3. Mark Harman "Search Based Software Engineering for Program Comprehension" Published in:15th IEEE International Conference on Program Comprehension (ICPC '07) IEEE Computer Society Press, 2007 pp 3-13

Reference Books

1. Ian Somerville, "Software Engineering", 10th Edition, Pearson, 2016.
2. Shari Lawrence Pfleeger, "Software Engineering: Theory and Practice", 4th Edition, Pearson Education, New Delhi, 2014.

Web Resources

1. https://www.tutorialspoint.com/software_engineering/index.htm2. https://nptel.ac.in/courses/106/105/106105182/
3. https://www.javatpoint.com/software-engineering-tutorial
4. https://www.geeksforgeeks.org/ai-in-software-engineering/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3		3		3								3		
2	3		3	3									3		
3	3	3		3	3								3		
4	3		3		2				3		2		3		
5	3	3	3										3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS Category	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM**
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Draw the software process model for the banking system (Apply)
2. Select software life cycle model suitable for weather monitoring system and justify your answer.(Apply)

Course Outcome 2 (CO2):

1. Classify the following as functional /non-functional requirements for a banking system

(a) Verifying bank balance

(b) Withdrawing money from bank

(c) Completion of transactions in less than one second.

(d) Extending the system by providing more tellers for the customers (Apply)

2. Explain how to manage changing requirements during the requirements elicitation process?(Understand)

Course Outcome 3 (CO3):

1. Using Boundary value analysis, design the black-box test suite for a software that computes the squareroot of an input integer which can assume values in the range of 0 to 5000. (Apply)
2. Explain how to broaden testing coverage and improve the quality of white box-testing. (Understand)

Course Outcome 4 (CO4):

1. Analyze on how are the software risks assessed. (Analyze)
2. Calculate the risk involved in building a model for power plant system.(Analyze)

Course Outcome 5 (CO5):

1. Knowing advanced technology used in AI based Software Engineering. (Understand)
2. Knowing advanced technology used in AI based Software Testing.

(Understand)

3. Apply the software testing techniques by using different AI based Software Testing Tools

21CS5701	COMPUTER GRAPHICS	L	T	P	C
		3	0	0	3

Preamble

Computer graphics is a sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content.

Prerequisites for the course

- C Programming

Objectives

1. To study the 2-D transformations and clipping
2. To explore 3-D object representations and transformations.
3. To learn 3-D viewing and detect visible surfaces
4. To explore graphics programming using OpenGL
5. To enable the students to understand various 3-D modeling and animation tools.

UNIT I	INTRODUCTION	9

Applications of Computer Graphics - Overview of Graphics Systems - Input Devices - Output Primitives: Points and Lines - Line Drawing Algorithms - Mid-Point Circle and Ellipse Algorithms - Attributes of Output Primitives: Line, Curve, Color, Area-Fill, Character, Bundled Attributes - Antialiasing.

Suggested Activities: Graphics cards, display devices, Installation of APIs

SUGGESTED EVALUATION METHODS:

- Assignment on Brenham's Line Drawing Problems, Mid-Point Circle Drawing Problems
- Quizzes

	TWO-DIMENSIONAL CONCEPTS	9

Two-Dimensional Geometric Transformations - Two-Dimensional Viewing - Two-Dimensional

Point – Cohen Sutherland Line Clipping - Sutherland-Hodgeman Polygon Clipping - Weiler-Atherton Polygon Clipping - Text Clipping - Exterior Clipping.		
Suggested Activities: Performing transformations on 2D shapes, clipping		
SUGGESTED EVALUATION METHODS: • Assignment on Two-Dimensional Geometric Transformation, Cohen Sutherland Line Clipping Problem. • Quizzes		
UNIT III	**THREE-DIMENSIONAL CONCEPTS**	**9**
Three-Dimensional Display Methods - Three-Dimensional Object Representations: Polygon - Quadric Surfaces – Splines – Bezier curves and surfaces – Octree – BSP trees – Visualization of Datasets. Three-Dimensional Transformations: Translation – Rotation – Scaling – Reflection - Shearing - Composite transformation		
Suggested Activities: Implementation of 3D transformations on 3D objects		
SUGGESTED EVALUATION METHODS: • Assignment problems on Three-Dimensional Transformations • Quizzes		
UNIT IV	**THREE-DIMENSIONAL VIEWING AND VISIBLE SURFACE DETECTION**	**9**
Three-Dimensional Viewing and Clipping: Viewing Pipeline - Viewing coordinates – Projections – Clipping. Visible Surface Detection: Classification - Back-Face Detection - Depth-Buffer - Scan-Line - Depth Sorting – BSP - Tree Methods - Area Sub-Division - Octree Method – Ray casting – wireframe methods.		
Suggested Activities: Hidden surface removal, Shaders, Rendering		
SUGGESTED EVALUATION METHODS: • Assignment on Visible Surface Detection • Quizzes		
UNIT V	**GRAPHICS PROGRAMMING WITH OPENGL**	**9**
Drawing 3D Scenes – Perform Transformations - Colors And Light - Adding Texture and Shadows - Using Shading Models. Understanding 3D Modeling and Animation Tools like 3D Studio Max, Maya, Blender.		
Suggested Activities: Implementing simple animations using any 2D or 3D software tools		
SUGGESTED EVALUATION METHODS: • Assignment on 3D Modeling • Quizzes		
	Total Periods	**45**
Suggestive Assessment Methods		
Continuous Assessment Test	**Formative Assessment Test**	**End Semester Exams**

(30 Marks)	(10 Marks)	(60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Apply the two dimensional geometric transformations and 2-D clipping **(APPLY)**

CO2 Represent 2-D objects and do geometric transformations **(UNDERSTAND)**

CO3 Apply clipping and Detecting the visible surfaces in 3-D objects **(APPLY)**

CO4 Apply transformation, texture, shadow and shading in 3-D objects using OpenGL **(APPLY)**

CO5 Create simple model and animation using 3-D studio max, Maya and Blender tools **(APPLY)**

Text Books

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", Second Edition, Pearson Education, 2002.
2. Edward Angel and Dave Shreiner, "Interactive Computer Graphics: A Top-Down Approach with Shader -Based OpenGL", Sixth Edition, Pearson Education, 2012.

Reference Books

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics Principles and Practice", Second Edition, Pearson Education 2007.
2. F. S. Hill, "Computer Graphics using OpenGL", Second edition, Pearson Education 2003.

Web Resources

1. https://nptel.ac.in/courses/106/103/106103224/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										3		
2	3	3	3										3		
3	3	3	3										3		
4	3	3	3										3		
5	3	3	3										3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER					
UNDERSTAND	40		8		20
APPLY	60	60	12	12	60
ANALYZE					
EVALUATE					
CREATE		40		8	20

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to predict the suitable method for... (Apply)

Course Outcome 1 (CO1):

1. List the applications of Computer graphics. (Remember)
2. Identify any two attributes of a line? (Apply)
3. Differentiate aliasing and antialiasing? (Understand)

Course Outcome 2 (CO2):

1. Give the final coordinates of a unit square ABCD with vertex A placed on the origin after applying a uniform scaling of 2 units with respect to the centre of the square. (Understand)
2. What is the effect of inverse transformations? (Analyze)
3. Apply the equation for homogeneous transformation. (Apply)

Course Outcome 3 (CO3):

1. What is blobby object? (Remember)
2. Compare orthographic and oblique parallel projections. (Apply)
3. List the advantages of B - spline over Bezier curve? (Analyze)

Course Outcome 4 (CO4):

1. Explain different types of projection in detail and also explain the perspective projection for projecting 3D objects on a 2D surface.(13) Point out the meaning of array of structures. (Understand)
2. Construct the 3D viewing pipeline. (Apply)

Course Outcome 5 (CO5):

1. Describe about the various types of shading? (Remember)
2. Show the requirements of Full- Motion video Controller (Apply)

21CS5601	**THEORY OF COMPUTATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Preamble					
This course emphasizes on the Theory of Computation. This course explains the concept of Finite					

Automata, Push Down Automata, Turing Machines, Types of Grammars, Decidability and Undecidability of Problems. This Course helps the learners to know the models of computation, along with their variants in the context of formal languages and their recognizers. This can be applied in designing compilers and pattern recognition system, AI, parsing and formal verification and considered as one of the central area of computer science.

Prerequisites for the course

- Discrete mathematics and Combinations
- Data Structures

Objectives

1. To construct automata for any given pattern and find its equivalent regular expressions
2. To familiarize context free grammars.
3. To learn about push down automata.
4. To understand the working of Turing machines.
5. To study about undecidable problems.

UNIT I	FINITE AUTOMATA AND REGULAR EXPRESSIONS	9

Basic Definitions - Finite Automaton - DFA and NFA - Finite Automaton with -moves - Equivalence of NFA and DFA - Equivalence of NFAs with and without -moves - Regular Languages - Regular Expression - Pumping lemma for Regular Languages - Equivalence of finite Automaton and regular expressions-Minimization of DFA.

Suggested Activities:

- Defining finite automata for different types of patterns.
- Epsilon NFA to DFA direct conversion
- Regular expression for practical patterns

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT II	GRAMMARS	9

Introduction - Types of Grammar - Context Free Grammars and Languages - Derivations - Parse Trees - Equivalence of Derivations and Parse Trees - Ambiguity - Normalization of CFG - Elimination of Useless symbols - Unit productions - productions - Chomsky normal form - Greibach Normal form.

Suggested Activities:

- CFG for practical programming constructs
- Problems based on context-free grammar
- Proofs of all the grammar equivalence

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT III	PUSH DOWN AUTOMATA	9

Definition - Moves - Instantaneous descriptions -- Equivalence of Pushdown automata and CFG - Deterministic pushdown automata - Pumping lemma for CFL - Application of Pumping Lemma		
Suggested Activities: • Theorem Proofs • String acceptance using the converted PDA from CFG and CFG from PDA • Problems based on properties of CFL		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT IV	**TURING MACHINES**	**9**
Definitions - Models - Computable languages -Techniques for Turing machine construction - Extensions of Basic Turing Machine - Problems about Turing machine - Chomskian hierarchy of languages.		
Suggested Activities: • Problems on Turing machines as language acceptors, computing device • Turing machines as computing functions in both unary and binary representation and Multi-dimensional Turing machine		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT V	**UNDECIDABILITY**	**9**
Unsolvable Problems and Computable Functions - Recursive and recursively enumerable languages -Universal Turing machine - Post Correspondence Problem - P and NP completeness - Polynomial time reductions		
Suggested Activities: • Halting problem and other undecidable problems and their proofs • Problems based on PCP, MPCP and conversions		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ 3.PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Design finite state automata and regular expression for a language specification and convert one form to another form (Apply)
CO2 Apply Context Free Grammars for a syntax and normalize (Apply)
CO3 Design push down automata(PDA) for languages and convert CFG to PDA and vice versa(Apply)
CO4 Design Turing machine by applying different techniques (Apply)
CO5 Derive whether a problem is decidable or not.. (Apply)

Text Books

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Pearson Education, Third Edition, 2008.

Reference Books

1. Mishra K L P and Chandrasekaran N, "Theory of Computer Science-Automata, Languages and Computation", Prentice Hall of India, Third Edition, 2007.
2. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the theory of Computation", Prentice-Hall of India Pvt. Ltd, Second Edition, 2009.
3. Kamala Krithivasan and R. Rama, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, Delhi, 2009.
4. J. Martin, "Introduction to Languages and the Theory of Computation", Tata Mc Graw Hill, New Delhi,Third Edition, 2007.
5. Micheal Sipser, "Introduction to the Theory and Computation", Cengage Learning India, 2012**.**

Web Resources

1. https://onlinecourses.nptel.ac.in/noc19_cs79/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs83/preview
3. https://nptel.ac.in/courses/106/106/106106049/
4. http://ocw.mit.edu/courses/mathematics/18-404j-theory-of-computation-fall-2006/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2									3		
2	3	3	2	2									3		
3	3	3	2	2									3		
4	3	3	2	2									3		
5	3	3	2	2									3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for.(Apply)

Course Outcome 1 (CO1):

1. Recall the list of symbols used in regular expressions. (Remember)
2. Summarize the transistions involved in NFA.(Understand)
3. Summarize the transistions involved in DFA. .(Understand)
4. Choose Equivalence of NFAs with and without moves (Apply)

Course Outcome 2 (CO2):

1. What is the use of Grammar? (Remember)
2. Compare Chomsky normal form and Greibach Normal form. (Understand)
3. Analyze the importance of parse keywords. (Analyze)

Course Outcome 3 (CO3):

1. Narrate how to apply Pushdown automata. (Understand)
2. Write an algorithm for Pumping lemma for Regular Languages. (Apply)
3. Develop an application for Pumping lemma for Regular Languages. (Apply)

Course Outcome 4 (CO4):

1. What are the techniques used for Turing machine construction? (Remember)
2. Point out the meaning of Chomskian. (Apply)
3. How many models were used in Turing machine? (Remember)

Course Outcome 5 (CO5):

1. Develop a program to create Recursive and recursively enumerable languages (Apply)
2. Write about Polynomial time reductions (Apply)

21CS5703	**IOT AND ITS APPLICATIONS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

It defines a network of physical items – 'things'– that are built into sensors, apps and other technology to communicate and share data across the Internet with other devices and systems

Prerequisites for the course

- Embedded systems, mobile application development, Computer Networking, Microprocessors and Microcontrollers

Objectives

- Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

UNIT I	INTRODUCTION TO INTERNET OF THINGS	9

IOT Fundamentals - Characteristics of IoT - Physical Design of IoT - IoT Protocols - IoT communication models - IOT Communication APIs -IOT enabled Technologies – Sensors in IoT- Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IOT Levels and Templates

Suggested Activities:

- Survey the open hardware platforms available for IoT and compare their characteristics.
- IOT Levels and Templates
- Explore big data analytics.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT II	IOT REFERENCE ARCHITECTURE	9

Introduction- State of the art - Architecture Reference Model- IOT reference Model-IOT Protocols: Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and MQTT.

Suggested Activities:

- Describing IOT Reference Model.
- Explaining various IOT Protocols such as Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and MQTT.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT III	IOT DEVICES AND INTERFACING	9

IOT components - Sensors - Actuators - Hardware Platforms - Interfacing with devices: Setting up the board -Programming for IOT - Reading from Sensors, Communication: Connecting microcontroller with mobile devices - communication through Bluetooth, wifi, Ethernet.

Suggested Activities:

- Assignment on operational principles of sensors and actuators
- Identify the sensors required for the system, connect sensors
- Assignment on access technologies

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT IV	IOT CLOUD, WEB SERVICES AND DATA ANALYTICS	9

Introduction to Cloud Storage models - Cloud services and IOT - communication APIs -Cloud for IOT - Web server: Web server for IOT - Amazon Web services for IOT- Data analytics for IOT.

Suggested Activities:

- Lecture on Cloud Storage models/
- Explaining Web server for IOT
- Explaining data analytics for IoT.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT V	IOT SECURITY	9

Security Requirements in IOT - Security Concerns in IOT Applications - Security Architecture in the Internet of Things - Insufficient Authentication and Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IOT. Vulnerabilities - Secrecy and Secret- Key Capacity – Authentication and Authorization for Smart Devices - Transport Encryption.

Suggested Activities:

- Review of security in various IoT platform

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Identify physical design, components and communication models used in IOT (Remember)

CO2 Understand the protocol architecture of IOT.(Understand)

CO3 Implement sensor interfacing and collaborate them with network devices.(Apply)

CO4 Analyze protocols used for connecting devices to cloud and web servers.(Apply)

CO5 Analyze the security requirements and threats in IOT (Apply)

Text Books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT, 2014.

Reference Books

1. Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things Key applications and Protocols, Wiley, 2012
2. Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] by CunoPfister,2011
3. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
4. Security and Privacy in Internet of Things (IOTs): Models, Algorithms, and Implementations

Web Resources

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/
4. https://www.arenasolutions.com/blog/10-valuable-iot-web-resources/
5. https://www.gsma.com/iot/iot-resources/

1	3	3	3	2	2							2	3	3	
2	3	3	3	2	2							2	3	3	
3	2	2	2	2	2	2	2				2	2	3	3	
4	3	3	3	2	2							2	3	3	
5	3	3	3	2	2							2	3	3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for.(Apply)

Course Outcome 1 (CO1):

1.Define IoT. (Remember)

2.Give the evolutionary phases of IoT. (Understand)

3.Poin tout the challenges faced by Internet of Things.(Analyse)

Course Outcome 2 (CO2):

1.Analyze the use of ZigBee.(Analyze)

2.Examine the use of IEEE 1901.2a. (Remember)

3.Illustrate the high level ZigBee Protocol stack. (Apply)

Course Outcome 3 (CO3):

1. Analyze the purpose of Sensors, Actuators and Smart Objects .(Analyze)
2. Classify the different types of Sensors(Apply)
3. Formulate the communication criteria used for connecting smart objects. (Apply)

Course Outcome 4 (CO4):

1.Analyze the use of AWS in IoT. (Apply)

2.Examine the role of Python Web application framework – Django. (Apply)

3.Define Amazon S3 and Amazon RDS. (Remember)

Course Outcome 5 (CO5):

1. Examine the use of security Architecture (Remember)
2. Classify the different types of threads(Apply)
3. Analyze the use of secret keys(Apply)

Professional Elective II

	CourseCode	Course Name	Semester	L	T	P	C	Stream/Domain
1	21AI5703	Fuzzy Logic	5	3	0	0	3	AI
2	21AI5704	Health Care Analytics	5	3	0	0	3	Data Science
3	21IT6712	Wireless Communication	5	3	0	0	3	Networking
4	21CS5702	Object Oriented Analysis and Design	5	3	0	0	3	Software Engineering
5	21CS5808	Principles of Multimedia	5	3	0	0	3	Image Processing

6	21CB5708	Web Technologies	5	3	0	0	3	Computation and Programming
7	21AI5705	Drone Technology	5	3	0	0	3	Recent Trends

21AI5703	**FUZZY LOGIC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

Fuzzy logic deals with information arising from computational perception and cognition, that is, uncertain, imprecise, vague, partially true, or without sharp boundaries. It allows for the inclusion of vague human assessments in computing problems. New computing methods based on fuzzy logic can be used in the development of intelligent systems for decision making, identification, pattern recognition, optimization and control.

Prerequisites for the course:

- NIL

Objectives

1. To introduce the concepts of Fuzzy set and Fuzzy Relation.
2. To familiarize the features of Fuzzy membership function and its measures.
3. To summarize the applications of Fuzzy Logic and Optimization.
4. To provide comprehensive knowledge of fuzzy logic control to real time systems.

UNIT I	**INTRODUCTION : FUZZY SETS AND RELATIONS**	**9**

Classical Sets :Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions - Fuzzy Sets : Fuzzy Set operations, Properties of Fuzzy Sets. Crisp Relations: Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition.

SUGGESTEDACTIVITIES:

- Discussion about Cardinality of Crisp Relations

SUGGESTEDEVALUATIONMETHODS:

- Assignment problems
- Quizzes

UNITII	**FUZZY ARITHMETIC AND MEMBERSHIP FUNCTION**	**9**

Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Extension Principle - Fuzzy Transform (Mapping), Practical Considerations, Fuzzy Numbers Interval Analysis in Arithmetic, Approximate Methods of Extension - Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons, Fuzzy Vectors.Neural Networks, Genetic Algorithms, Inductive Reasoning.

SUGGESTEDACTIVITIES:

- Presentation and discussion on Vertex method and DSW Algorithm.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT III FUZZY DECISION MAKING AND CLASSIFICATION 9

Decision Making: Fuzzy Synthetic Evaluation, Fuzzy Ordering, Preference and consensus, Fuzzy Bayesian Decision Method, Decision Making under Fuzzy States and Fuzzy Actions.

Classification by Equivalence Relations - Crisp Relations, Fuzzy Relations. Cluster Analysis, Cluster Validity, c-Means Clustering - Hard c-Means (HCM), Fuzzy c-Means (FCM).

SUGGESTEDACTIVITIES:

- Implementation of Fuzzy Relations and Cluster Analysis.

SUGGESTEDEVALUATIONMETHODS:

- Assignment problems
- Quizzes

UNITIV	**FUZZY RULE BASED SYSTEM & PATTERN RECOGNITION**	**9**

Natural Language, Linguistic Hedges, Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Aggregation of Fuzzy Rules, Fuzzy Pattern Recognition: Feature Analysis -Partitions of the Feature Space -Single-Sample Identification-Multifeature Pattern Recognition -Image Processing.

SUGGESTEDACTIVITIES:

- Implementation of Rule-Based Systems.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNITV	**APPLICATIONS OF FUZZY LOGIC SYSTEM**	**9**

Fuzzy Control System: Control System Design Problem -Fuzzy Engineering Process Control - Industrial Applications -Fuzzy Logic Controllers – Various Industrial Applications of FLC Adaptive Fuzzy Systems -: Home heating system - liquid level control - aircraft landing- inverted pendulum – fuzzy PID control,

SUGGESTEDACTIVITIES:

- Implementation of Fuzzy based motor control.

SUGGESTEDEVALUATIONMETHODS:

- Project submission

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60Marks)**
• DESCRIPTIVE QUESTIONS • CASE BASED QUESTION	• ASSIGNMENT • ONLINEQUIZZES • PROBLEM-SOLVINGACTIVITIES	• DESCRIPTIVE QUESTIONS • CASE BASED QUESTION

Course Outcomes

Upon completion of the course,the students will be able to:

1. Explain the concepts of fuzzy logic for problem solving. (Understand)
2. Apply various parts of fuzzy logic based decision making process & fuzzy rule based techniques for various applications. (Apply)
3. Analyze the problem in nature and select suitable the fuzzy method to find solution. (Apply).
4. Evaluate the optimal solutions to real world problems using fuzzy logic techniques(Apply)
5. Design a fuzzy based application for a given real world problem. (Apply)

TextBooks

1. TimothyJ.Ross "Fuzzy Logic with Engineering Application", AJohnWilleyand Sons Ltd, Publication, 3rd Edition,2010.
2. GeorgeKlir and Bo Yuan "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall NJ, 2011.

ReferenceBooks

1. Jang J.S.R. Sun C.T &Mizutani E., "Neuro fuzzy and Soft Computing", PHI Learning Pvt. Ltd., 2012.

WebResources

Links for image database:

- https://nptel.ac.in/courses/127105006

T1	Timothy J.Ross "Fuzzy Logic with Engineering Application",AJohnWilley and Sons Ltd, Publication,3rd Edition,2010.	Chp 1	Chp 2	Chp 3	Chp 5	Chp 6
T2	George Klir and Bo Yuan "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall NJ, 2012	Chp 2	Chp4	Chp 3	Chp 4	Chp 6
R1	Jang J.S.R. Sun C.T &Mizutani E., "Neuro fuzzy and Soft Computing", PHI Learning Pvt. Ltd., 2012	Chp1	Chp 2	Chp13	Chp 11	Chp 4
W1	https://nptel.ac.in/courses/127105006	Module 1	Module 2	Module 3	Module 4	Module 5

W2	https://www.javatpoint.com/fuzzy-logic	All Topics	All Topics	All Topics	AllTopics	All Topics

COVsPO Mapping and COVsPSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3										3		
2	3	3	3										3		
3	3	3											3	3	
4	3	3	2										3	3	
5	3	2	2	2	3								3	3	3

COURSELEVELASSESSMENTQUESTIONS

COURSEOUTCOME1:

1. Given a conditional and qualified Fuzzy proposition ‘P’ of the form. P: If x is A, then y is B is S
    a. Where ‘S’ is fuzzy truth qualifier and a fact is in the form “x is A”. We want to make an inference
    b. In the form “y is B”. Develop a method based on the truth- value restrictions for getting
    c. the inference. (Understand)

COURSEOUTCOME2:

1. Consider four travel packages offered by Celtic, Club Mahindra, Metro and Himalaya travels. We want to choose one. Their costs are INR 100,000, INR 200,000, INR 150,000 and INR 175,000. Their travel time in hours are 150, 200, 100 and 125 respectively. They are viewed as interesting with degrees 0.4, 0.3, 0.6 and 0.5. Define your own fuzzy set of acceptable travel times. Then determine the fuzzy sets of interesting travel packages whose cost and travel times are acceptable and use this

set to choose one of your packages? (Apply)

2. Find the weights requires to perform the following classification using perceptron network. The vectors (1, 1, 1, 1) and (-1, 1, -1, -1) are belong to the class (so have target value 1) and vectors (1, 1, 1, -1) and (1, -1, -1, 1) are not belonging to class (so have target value -1). Assume learning rate as '1' & initial weight as '0'.(Apply)

COURSEOUTCOME3:

1.Consider the two pairs of patterns with bipolar symbols A1= (+1, +1, -1) and B1= (-1, +1, -1, +1); A2= (+1, -1, +1) and B2= (+1, -1, +1, -1). Calculate the weights for 2 X 2 Bidirectional associative memory(Apply)

COURSEOUTCOME4:

1.Let a function ($\boldsymbol{x}$) = $\boldsymbol{x2}$ be defined on the interval [0,31]. Apply Genetic algorithm for determining the maximum of the given function (Assume suitable missing data). (Apply)

COURSEOUTCOME5:

1. Design the general scheme for a Fuzzy controller. How different modules are interconnected?
2. Deploying the how to solve the problem of stabilizing the inverted pendulum? (Apply)

21AI5704	**HEALTH CARE ANALYTICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

Students able to learn the fundamental ideas and methods of Game Programming are covered in this course as intelligent if it is similar to those carried out by people

Pre requisites for the course:

- 21MA3205-Probability and statistics
- 21AI4601- Data Analytics

Objectives

- To know the introduction about the benefits, challenges and opportunities in healthcare for data science
- To explore specific technologies used to improve healthcare data
- To implement innovative tool to gather health relevant data
- To analyze various data linkage method for supporting the adoption of healthy lifestyles
- To implement various data visualization techniques for healthcare domain

UNITI	**INTRODUCTION**	**9**
Data science in health care- Benefits -challenges and opportunities- Introduction to classification algorithm and their performance analysis using medical examples		
UNITII	**CLINICAL NATURAL PROCESSING**	**9**
The role of deep learning in improving healthcare- making effective use of healthcare data using data-to text technology- Clinical natural processing with deep learning		
UNIT III	**HEALTHCARE ROBOTS**	**9**
Ontology based knowledge management for comprehensive geriatric assessment and reminiscence therapy on social robots- assistive robots for elderly: innovative tools to gather health relevant data		
UNITIV	**DATA LINKAGE**	**9**
Overview of data linkage methods for integrating separate health data resources- A flexible knowledge based architecture for supporting the adoption of health lifestyles with persuasive dialogs		
UNITV	**CLINICAL DATA VISUALIZATION**	**9**
Visual analytics for classifier construction and evaluation for medical data-Data visualization in clinical practice- using process analytics to improve healthcare process- a multi scale computational approach to understanding cancer metabolism		
	Total Periods	**45**

SuggestiveAssessmentMethods

ContinuousAssessment Test (30Marks)	**FormativeAssessmentTest (10 Marks)**	**EndSemester Exams(60Marks)**

• **DESCRIPTIVE QUESTIONS** • CASE BASED QUESTION	• ASSIGNMENT • ONLINEQUIZZES • PROBLEM-SOLVINGACTIVITIES	**1.DESCRIPTIVEQUESTIONS** 2. CASE BASED QUESTION

Course Outcomes

Upon completion of the course,the studentswillbeableto:

1. Able to know the fundamentals of data science used for healthcare applications (Understand)
2. Apply the use some unique technologies which is applicable for healthcare domain. (Apply)
3. Able to develop simple robotic application in healthcare sectors(Apply)
4. Able to integrate various data resources using data linkage approaches(Apply)
5. Apply visualization techniques for better understanding of healthcare applications (Apply)

TextBooks

1.Sergio Consoli, Diego and Melian petakovic, "Data science for healthcare methodologies and applications", springer,2019

2. Mike Mc Shaffrfy and David Graham, "healthcare analytics Complete", Fourth Edition, Cengage Learning, PTR, 2012.

ReferenceBooks

1.Ernest Adams and Andrew Rollings, "Fundamentals of healthcare analysis", 2 nd Edition Prentice Hall / New Riders, 2009.

2. Eric Lengyel, "Mathematics for healthcare analysis", 3 rd Edition, Course Technology PTR, 2011.

WebResources

- https://onlinecourses.nptel.ac.in/noc19_ge32/preview
- http://healthcareanlaytics/datasource.ac.in
- http://healthcaresectoranalyzis/towardsdatascience.in

COVsPO Mapping and COVsPSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										3		
2	3	3	3										3		
3	3	3											3	3	

4	3	3	2										3	3	
5	3	2	2	2	3								3	3	3

COURSEOUTCOME1:

1. How do you Collect Patient-Reported Outcomes and Total Pathway Costs for Value-Based Healthcare? **(Understand)**
2. Analyze about the technical challenges and opportunities regarding the application of data science in healthcare **(Analyze)**

COURSEOUTCOME2:

1. Explain the following Lemma with its proof:
   Any classifier C can be transformed into a classifier $\neg$ C by simplyreversing its outcome for each patient. As a consequence,
   $$FPR(\neg C) = 1 - FPR(C) \text{ and } TPR(\neg C) = 1 - TPR(C)$$ **(Analyze)**
2. Perform sentence aggregation for the following sentence: “The patient was intubated” and “The patient was given morphine**”.(Apply)**

COURSEOUTCOME3:

1. Implement with an example of prompting question formulation for user specific knowledge graph **(Apply)**

2. Analyze various innovative tools to gather health relevant data: for creating assistive robots for elderly **(Analyze)**

COURSEOUTCOME4:

1. Elaborate the Architectural model of the CGA and reminiscence applications(understand)
2. Demonstrate a use case of the data linkage process using two dataset from home care services. One homecare service is personal emergency response service and other home care services is telehealth service which remotely manage patient **(Apply)**

COURSEOUTCOME5:

1. From the following input data, how do you perform visual analytics for classifier construction and evaluation for medical data (apply)

Feature name	Feature type	Feature range
Age at surgery	Quantitative	[37.6,78]
Prostate volume	Quantitative	[9,365]
Preoperative PSA level	Quantitative	[0.11,107.11]
Number of biopsy cores	Integral	[1 . . . 28]
Number of positive biopsy cores	Integral	[1 . . . 10]
Positive biopsy cores (%)	Quantitative	[10,90]
Primary biopsy Gleason score	Integral	[2 . . . 5]
Secondary biopsy Gleason score	Integral	[2 . . . 5]
Clinical stage	Ordinal	{T1, T1a, T1b, T1c, T2, T2, T2b, T2c T3, T3a, T3b, T3c}

2. Demonstrate various Data Visualization Techniques in Clinical Practice with an example **(Apply)**

21IT6712	**WIRELESS COMMUNICATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

Wireless communication involves the transmission of information over a distance without the help of wires, cables or any other forms of electrical conductors. It is a broad term that incorporates all procedures and forms of connecting and communicating between two or more devices using a wireless signal through wireless communication technologies and devices.

Objectives

1. To study and understand the concepts and design of a Cellular System
2. To Study and Understand Mobile Radio Propagation Large
3. To Study and Understand Mobile Radio Propagation Small
4. To Understand the Concepts of Equalization and Diversity
5. To Understand the Concepts of Wireless Networks

UNIT I	**SYSTEM DESIGN FUNDAMENTALS**	**9**

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Interference and system capacity – Co-channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference - Cell Splitting, Sectoring.

UNIT II	**MOBILE RADIO PROPAGATION- LARGE**	**9**

Introduction to Radio Wave Propagation, Free Space Propagation Model-The Three Basic Propagation Mechanisms-Reflection- Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models		
UNIT III	**MOBILE RADIO PROPAGATION- SMALL**	**9**
Small Scale Multipath propagation- Doppler shift- Impulse Response Model of a multipath channel- Small-Scale Multipath Measurements-Direct RF Pulse System- Spread Spectrum Sliding Correlator Channel Sounding- Frequency Domain Channels Sounding-Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread- Flat fading- Frequency selective fading- Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels		
UNIT IV	**EQUALIZATION AND DIVERSITY**	**9**
Introduction, Equalizers in a communication Receiver, Equalizers - Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.		
UNIT V	**WIRELESS LAN**	**9**
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11 ,IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.		
	Total Periods	**45**
Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1. ASSIGNMENT 2. QUIZZES	1. DESCRIPTIVE QUESTIONS
Outcomes		

Upon completion of the course, the students will be able to:
CO1 – Understand The Concept and Design of a Cellular System. **CO2** – Understand Mobile Radio Propagation Large **CO3** – Understand Mobile Radio Propagation Small **CO4** – Understand the Concepts of Equalization and Diversity **CO5** – Understand the Concepts of wireless LAN
Text Books
1. Rappaport,T.S.,-Wireless communications", Pearson Education, Second Edition, 2010.
Reference Books
1. Wireless Communication –Andrea Goldsmith, Cambridge University Press, 2011 2. Van Nee, R. and Ramji Prasad, —OFDM for wireless multimedia communications, Artech House, 2000 3. David Tse and PramodViswanath, —Fundamentals of Wireless Communication, Cambridge University Press, 2005
Web Resources 1.https://www.geeksforgeeks.org/wireless-communication 2.https://www.tutorialspoint.com/wireless_communication/wireless_communication_overview.htm

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	3	3	3										3	
2	3	3	3										2	
3	3	3	3											
4	3	3	3										3	
5	3		3	3									3	

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND	20	30	5	5	10
APPLY	40	70	20	20	40
ANALYZE	40				50
EVALUATE					
CREATE					

21CS5702	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

Preamble

Object-Oriented Software Development is an approach/paradigm of developing software by identifying and implementing a set of objects and their interactions to meet the desired objectives. The first step towards this kind of software development is to learn and master the various concepts, tools and techniques that are to be used design and implementation of such systems.

Prerequisites for the course

- Computer Programming , Object Oriented Programming Systems

Objectives

1. To impart knowledge to specify, analyze the requirements for a particular system.
2. To explore and practice UML static modeling
3. To explore and practice UML dynamic modeling
4. To develop implementation model and map design to code effectively
5. To learn the design patterns for software architecture

UNIT I	INTRODUCTION	9

Basics of object oriented concepts - Introduction to OOAD - UML - Unified Process(UP)phases – Iterative and Evolutionary Development - Agile modeling and UP – Agile business modeling – Inception – Case study–the NextGen POS system

Suggested Activities:

- Identifying a suitable case study to work on for a complete end-end implementation
- Identify use cases for the chosen case study and develop the Use Case model

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT II	STATIC MODELING	9

Use case Modeling - Relating Use cases – include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class hierarchies - Aggregation and Composition - UML class diagrams – relationship – inheritance – Abstract classes

Suggested Activities:

- Identify the conceptual classes to develop a Domain Model and Class Diagram.
- Presenting the use case model (for the chosen case study) along with use case diagrams.
- Expand the domain model by identifying the hierarchies, association, aggregation and composition.
- Present the refined use case model and the basic domain model

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT III	DYNAMIC MODELING	9

System sequence diagrams – Communication diagrams - When to use Communication Diagrams -Relationship between sequence diagrams and use cases - Logical architecture and UML package diagram – Logical architecture refinement - UML activity diagrams and modelling –When to use activity diagrams -Operation contracts

Suggested Activities:

- Develop sequence diagrams for the scenarios identified in the use case model
- Presenting the complete domain model(after refinement) and class diagrams for the chosen case study
- Develop state and activity diagrams for the chosen case study

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT IV	IMPLEMENTATION AND APPLICATION	9

Mapping design to code – Test driven development – Refactoring – UML tools and UML as blueprint - UML state machine diagrams and modeling - UML deployment and component diagrams – Designing for visibility - Adopting Agile modeling on an UP project

Suggested Activities:

- Finalize the environment and initiate implementation
- Presenting the complete dynamic model with state and activity diagrams and refined sequence diagrams

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT V	**PATTERNS (DESIGN PRINCIPLES)**	**9**

Object design - Patterns – Pattern categories – Pattern Description – Patterns and software architecture - Responsibility driven design – GRASP – Creator – Information Expert – Low Coupling – Controller – High Cohesion

Suggested Activities:

- Identifying suitable design patterns to improve the design and documenting the rationale behind their selection. Proceed with the refined implementation by applying them.
- Demonstrate complete implementation without the design patterns

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 To Create documents that capture requirements for a software system **(Apply)**

CO2 Apply UML and design the static model of a software system **(Apply)**

CO3 Apply UML and design the dynamic model of a software system **(Apply)**

CO4 Develop UML implementation models and map design to code effectively **(Understand)**

CO5 Apply patterns to solve design problems in the real world applications **(Apply)**

Text Books

1. Craig Larman, "Applying UML and Patterns: An Introduction to object- oriented Analysis

and Design and iterative development", Third Edition ,Pearson Education, 2012

2. Frank Bachmann, RegineMeunier, Hans Rohnert "Pattern Oriented Software Architecture" Volume 1, 2008 reprint.
3. Scott Ambler, "Agile Modeling: Effective Practices for eXtreme Programming and the Unified Process", Wiley Computer Publishing, 2002

Reference Books

1. Mike O'Docherty, "Object –Oriented Analysis&Design :Understanding System Development with UML2.0", John Wiley & Sons,2005.
2. James W- Cooper, Addison-Wesley," Java Design Patterns–A Tutorial", 2000.
3. MichealBlaha, James Rambaugh, "Object-Oriented Modeling and Design with UML", Second Edition, Prentice Hall of India Private Limited, 2007

Web Resources

1. https://nptel.ac.in/courses/106/105/106105153/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	3	3						2		3		
2	3	3	3	2	2						2		3		
3	3	3	3	2	2						2		3		
4	3	2	2	3	3						2		3		
5	3	3	3	2	2						2		3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	40	40	10	10	40
UNDERSTAND	40	40	10	10	40
APPLY			5	5	
ANALYZE					

EVALUATE					
CREATE	20	20			20

21CS5808	PRINCIPLES OF MULTIMEDIA	L	T	P	C
		3	0	0	3

Preamble

The multimedia principle states that people learn better from words and pictures than from words alone. It is supported by empirically derived theory suggesting that words and images evoke different conceptual processes and that perception and learning are active, constructive processes.The purpose of multimedia is to combine all of these so that the benefits of each can be used in a desktop environment. Hypermedia: is software that allows the user to interactively manipulate information in a variety of formats - text, images, animation, graphics, sounds, digitized voice, and video.

Prerequisites for the course

- Nil

Objectives

1. To introduce the concepts of multimedia
2. To understand the functions of the various elements of multimedia
3. To understand the storage media and compression techniques
4. To be familiar with multimedia operating system and networking concepts
5. To learn the multimedia application development models

UNIT I	INTRODUCTION	9

Introduction to multimedia - Characteristics - Utilities - Creation - Uses - Promotion - Digital Representation - Media and Data streams - Properties of multimedia systems - Basic Sound, Image and Video Concepts - Multimedia Architecture - Multimedia Documents.

SUGGESTED ACTIVITIES :

- Multimedia – in Class
- In Class activity – simple exercises on display device

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT II	ELEMENTS OF MULTIMEDIA	9

Multimedia Building Blocks: Text - Graphics - Video Capturing - Sound Capturing and Editing - Introduction to 2D and 3D Graphics - surface characteristics and texture - lights - Animation: key frames and Tweening techniques - Principles of animation - Techniques of animation - 3D animation - File formats.

SUGGESTED ACTIVITIES :

- Manipulate animation
- In Class activity – simple exercises on 2D & 3D

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT III	STORAGE AND COMPRESSION	9

Visual Display Systems - CRT - video adapter card - video adapter cable - LCD - PDP - optical storage media - CD technology - DVD Technology - Compression Types and Techniques - CODEC - GIF coding standards - lossy and lossless - JPEG - MPEG-1 - MPEG-2 - MP3 - Fractals - MMDBS

SUGGESTED ACTIVITIES :

- Manipulate video
- Combinations of in Class & Flipped class rooms

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT IV	MULTIMEDIA OPERATING SYSTEM AND NETWORKING	9

Real time and Multimedia - Resource Management -Real time process management - Multimedia file system - Unix multimedia extension - Windows multimedia extensions - Application subsystem - Transport Subsystem - Quality of service and resource management.

SUGGESTED ACTIVITIES :

- Manipulate multimedia

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT V	MULTIMEDIA APPLICATION DEVELOPMENT	9

Software life cycle - ADDIE Model - conceptualization - content collection and processing - story - flowline - script - storyboard - implementation - multiplatform issues - Authoring - Metaphors - Testing - report writing - documentation - Case study: Web Application - Console Application - Distributed Application - Mobile Application - Games consoles - iTV - Kiosks – Education.

SUGGESTED ACTIVITIES :

- Manipulate Console Applications
- In Class activity – simple case study

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)

1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

1. Design a multimedia architecture for handling the stream. (Analyze)
2. Work with the various elements of multimedia system.(Apply)
3. Select storage media and compression technique.(Understand)
4. Develop animation, images, Sound using Multimedia Tools(Understand)
5. Develop a multimedia applications.(Understand)

Text Books

1. Parekh R, "Principles of Multimedia", Tata McGraw-Hill, 2013 (Unit I, II, III)
2. Ralf Steinmetz, KlaraNahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education, 2009.

Reference Books

1. Villamil and Louis Molina, "Multimedia: An Introduction", Prentice Hall, New Delhi 1998.
2. Tay Vaughan, "Multimedia: Making It Work", McGraw-Hill Professional, 2006.
3. Deitel&Deitel, "Internet & World Wide Web - How to Program", Prentice Hall, Fourth Edition, 2008.
4. Banerji Ashok &GhoshAnanda Mohan, "Multimedia Technologies", TMH, New Delhi 2010.
5. Li, Ze-Nian& Drew-Mark S, "Fundamentals of Multimedia", Phi Learning Private Limited, New Delhi 2012.
6. K. R. Rao, Zoran S. Bojkovic, DragoradA.Milovacovic, D. A. Milovacovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Prentice Hall, First Edition, 2002.
7. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", Pearson, 2004.

Web Resources

1. https://ctl.wiley.com/principles-of-multimedia-learning/

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for…(Apply)

Course Outcome 1 (CO1):

1. List the 4 phases in UP. (Remember)
2. Examine the steps for finding Use Case. (Apply)
3. What is a POS system? Give the components of POS system. (Understand)

Course Outcome 2 (CO2):

1. Show with an example how to name an association in UML with its guidelines (Apply)
2. Interpret the meaning of Generalization. (Understand)
3. Differentiate aggregation and composition.(Analyze)

Course Outcome 3 (CO3):

1. Define Package. Draw UML notation for Package(Remember)

2. Distinguish sequence diagram and collaboration diagram. (Understand)
3. Compare and Contrast asynchronous and synchronous message. (Analyze)

Course Outcome 4 (CO4):

1. What is the need for State Diagram? (Understand)
2. Name the basic elements of a Deployment diagram. (Remember)

Course Outcome 5 (CO5):

1. Differentiate coupling and cohesion. (Understand)
2. Examine the benefits of controller. (Apply)
3. Point out the benefits of strategy pattern. (Analyze)

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3		3								3		
2	3	3		2	3								3		
3	2	3	3	3	3								3		
4		3	3	3	3								3		
5		3	3	3	3								3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Design a multimedia architecture for handling the stream.

1. What are the properties of multimedia system? (Remember)
2. Explain how to handle the stream with multimedia architecture? (Analyze)

Course Outcome 2 (CO2): Work with the various elements of multimedia system.
1. Explain the various animation techniques. (Understand)
2. Discuss on the building blocks of multimedia. (Understand)

Course Outcome 3 (CO3): Select storage media and compression technique.
1. Explain the GIF coding standards. (Understand)
2 .Write about Compression Types and Techniques. (Understand)

Course Outcome 4 (CO4): Develop animation, images, Sound using Multimedia Tools.
1. Discuss on Quality of service and resource management. (Understand)
2. Explain detail about Real time process management. (Understand)

Course Outcome 5 (CO5): Develop a multimedia applications.
1. What is meant by Authoring? (Remember)
2. Define storyboard. (Understand)
3. Discuss about ADDIE Model. (Understand)

21CB5708	**WEB TECHNOLOGIES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

The world wide web has become an essential part of our daily lives, connecting people, businesses, and information from all corners of the globe. Web technologies have evolved tremendously since the first website was launched in 1991, and today, the web is a complex ecosystem that includes a wide range of technologies, tools, and platforms.

Prerequisites for the course

- 21IT3602-Object Oriented Programming with Java
- 21CS4601- Database Management Systems

Objectives

1. To understand different Internet Technologies
2. To learn java-specific web services architecture
3. To Develop web applications using frameworks
4. To enable innovation and experimentation
5. To Deliver personalized and contextual experiences

UNIT I	**WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0**	**9**

Web Essentials: Clients, Servers and Communication – The Internet – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations. Bootstrap Framework

SUGGESTED ACTIVITIES:

Create a web page with the following using HTML.

- To embed an image map in a web page.
- To fix the hot spots.
- Show all the related information when the hot spots are clicked.

SUGGESTED EVALUATION METHODS:

- Assignments
- Quiz

UNIT II	**CLIENT-SIDE PROGRAMMING**	**9**

Java Script: An introduction to JavaScript–JavaScript DOM Model-Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files.

SUGGESTED ACTIVITIES:

•Create a web page with all types of Cascading style sheets.

Client-Side Scripts for Validating Web Form Controls using DHTML.

SUGGESTED EVALUATION METHODS:

- Assignments
- Quiz

UNIT III	**SERVER-SIDE PROGRAMMING**	**9**

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC.

SUGGESTED ACTIVITIES:

•Installation of Apache Tomcat web server.

SUGGESTED EVALUATION METHODS:

- Assignments
- Quiz

UNIT IV	**PHP and XML**	**9**

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation. XML: Basic XML- Document Type Definition- XML Schema, XML Parsers and Validation, XSL

SUGGESTED ACTIVITIES:

Write programs in Java using Servlets:

- To invoke servlets from HTML forms.
- Session Tracking

SUGGESTED EVALUATION METHODS:

- Assignments
- Quiz

UNIT V	**INTRODUCTION TO ANGULAR and WEB APPLICATIONS FRAMEWORKS**	**9**

Introduction to Angular JS, MVC Architecture, understanding ng attributes, Expressions and data binding, Conditional Directives, Style Directives, Controllers, Filters, Forms, Routers, Modules, Services; Web Applications Frameworks and Tools – Firebase- Docker- Node JS- React- DjangoUI& UX

SUGGESTED ACTIVITIES:

Write programs in Java to create three-tier applications using JSP and Databases

- For conducting on-line examination.
- For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

SUGGESTED EVALUATION METHODS:

- Assignments
- Quiz

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1. Online Quizzes 2. Assignments	1.DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO 1 Construct a basic website using HTML and Cascading Style Sheets
CO 2 Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
CO 3 Develop server-side programs using Servlets and JSP
CO 4 Construct simple web pages in PHP and to represent data in XML format
CO 5 Develop interactive web applications

Text Books

1. Deitel and Nieto, Internet and World Wide Web - How to Program, Prentice Hall, 5th Edition, 2011.
2. Angular 6 for Enterprise-Ready Web Applications, DoguhanUluca, 1st edition, Packt Publishing

Reference Books

1. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011.

Web Resources

1. https://developer.mozilla.org/en-US/docs/Web
2. https://www.geeksforgeeks.org/web-technology/
3. https://dev.to/alexomeyer/top-20-web-development-learning-resources-from-beginner-to-advanced-4h8a

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2							3	3		
2	3	3	3	3	3								3		
3	3	3	3	3	3								3		
4	3	2	3	2	3							2	2		
5	3	2	3	3	3								2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Design a html registration page in which the name, password, confirm password, gender are to be validated. (Apply)
2. Mention the different internet address class and it's range. (Understand)

Course Outcome 2 (CO2):

1. How will you read the servlet parameters? Explain with examples.(Apply)
2. Write a servlet program to read the input from the forms and display the same.(Understand)

3. Build a JavaScript program to convert temperature from Celsius to Fahrenheit and vice versa(Apply)

Course Outcome 3 (CO3):

1. How to read data from web form control like Check boxes explain with an example.(Apply)
2. How can both Internal and External DTDs be used in an XML File? Show with an Example(Apply)
3. How will you pass the control and data between pages.(Apply)

Course Outcome 4 (CO4):

1. How will you handle errors and exceptions in PHP?(Apply)
2. How do you use a picture as the background in HTML?(Apply)

Course Outcome 5 (CO5):

1. How would you insert an image file named elephant.jpg at the very top of a Web page?(Apply)
2. Write an AJAX program that access details from XML and display the same(Understand)

21AI5705	DRONE TECHNOLOGY	L	T	P	
		3	0	0	3

PREAMBLE

Students able to learn and expose the design and development of UAV .also able to learn the basic algorithms on which the Drones are modelled and also analyze various methods of Drone launching.

Prerequisites for the course

- NIL

Objectives

- Understand the basic concepts of Drones and Autonomous systems.
- To know the basic algorithms on which the Drones are modelled.
- To analyze various methods of Drone launching.
- To expose students to the design and development of UAV.
- To expose students to the type of payloads used in UAV.

UNIT I	INTRODUCTION TO UAV	9

Introduction – Typical Physical Parameters of UAVs for Commercial Applications – Categories of Unmanned Vehicles – Chronological History of UAVs and Drones – Deployment Restriction on UAVs –Small Unmanned Aerial Vehicle – Types of Small UAV - Civilian Applications

of UAVs – UAVs for Combat Operations .		
Suggested Activities: • Discussion about UAVs for Combat Operations.		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT II	**COMPONENTS FOR UNMANNED AERIAL VEHICLES**	**9**
RF Components for UAV and UCAV Sensors – RF and Microwave Passive Components – RF Components for Reconnaissance and Surveillance – Receivers – Connectors and Cables for Tactical Data Link –Semi active Passive Microwave Components for UAVs – Electro-Optical Sensors for UAVs – IR and Television Cameras.		
Suggested Activities: • Implementation of Semi active Passive Microwave Components for UAVs		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT III	**DRONES AND UNMANNED AUTONOMOUS VEHICLE TECHNOLOGY**	**9**
Introduction to Drones and UAV Autonomous Technology – Example of UAV with AutonomousCapability – Military Role of Unmanned Autonomous Vehicle - Smart Components - Integrated Simulation Capability of UAV – Description and Performance of Sensors aboard Autonomous UAVs.		
Suggested Activities: • Presentation and discussion on Military Role of Unmanned Autonomous Vehicle		

SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT IV	**UAV NAVIGATION SYSTEM AND FLIGHT CONTROL SYSTEM**	**9**
Critical Requirements – UAV Navigation System – Algorithms – SINS Correction Algorithm –Requirements of UAVs Automatic Flight Control System – Software for AFCS – Programming and Adjustment of AFCS – UAV Fault Detection and Isolation – Kalman Filtering.		
Suggested Activities: • Presentation and discussion on UAV Fault Detection and Isolation		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT V	**PROPULSION SYSTEMS**	**9**
Power Sources for Commercial Drones Tactical Drones and Mini Drones – Power Sources for ElectronicDrones and Micro-UAVs - Suitability and Deployment of Appropriate Sources for UAV -Propulsion Systems for Unmanned Autonomous Vehicles		
Suggested Activities: • Implementation of Suitability and Deployment of Appropriate Sources for UAV		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
	Total Periods	**45**

Continuous AssessmentTest (20Marks)	ContinuousAssessmentTest(20|Marks)	EndSemesterExams (60Marks)
• **DESCRIPTIVEQUESTIONS**	1. ASSIGNMENT 2. ONLINEQUIZZES 3. PROBLEM SOLVINGACTIVITIES	**1. DESCRIPTIVEQUESTIONS**

Course Outcomes
Upon completion of the course, the students will be able to:
CO1:.Explain the fundamentals of Unmanned Aerial Vehicle. (Understand) CO2. Illustrate the components of UAV and its applications. (Apply) CO3. Represent the concept and role of Drones. (Apply) CO4. Illustrate the modelling and control of Drone. (Apply) CO5. Apply the various UAV Propulsion methods. (Apply)
Text Books
1. Jha, Theory, Design and Applications of Unmanned Aerial Vehicles, CRC Press, 2016.
Reference Books
1. KarstenBerns, EwaldPuttkamer, Springer, Autonomous Land Vehicles: Steps towards Service Robots,2009. (IV and V) 2. Daniel Watzenig and MartinHorn(Eds.), Automated Driving: Safer and More Efficient Future Driving, Springer,2017.

T1	Jha, Theory, Design and Applications of Unmanned Aerial Vehicles, CRC Press, 2016.	Chp 1, 2	Chp2 ,3	Chp, 3,	Chp 4	Chp5,
R1	KarstenBerns, EwaldPuttkamer, Springer, Autonomous Land Vehicles: Steps towards Service Robots, 2009. (IV and V)	Chp 3	–	Chp4	–	–
R2	Daniel Watzenig and MartinHorn(Eds.), Automated Driving: Safer and More Efficient Future Driving, Springer, 2017.	–	Chp 3	-	Chp 4	Chp5
W1	https://nptel.ac.in/courses/101104073	Module1	Module 3	Module3	Module3	Module4
W2	https://www.csm.tech/resource-details/drone-technology/	AllTopics	All Topics	All Topics	AllTopics	All Topics

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										3		
2	3	3	3										3		
3	3	3											3		
4	3	3	2										3		
5	3	2	2	2	3								3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for.(Apply)

Course Outcome 1 (CO1):

1. Write short notes on launch, recovery and retrieval equipment for UAVs as a part of UAVs system functional structure. (Understand)

Course Outcome 2 (CO2):

1. Compose the various RF Components for UAV and UCAV Sensors with examples and plot the n functions. (Apply)

Course Outcome 3 (CO3)

1. Design an Unmanned Autonomous Vehicle using basic sensors .(Apply)

Course Outcome 4 (CO4):

1. Analyze about the SINS Correction Algorithm for Unmanned Autonomous Vehicle.(Analyze)

Course Outcome 5 (CO5):

1. Develop the UAV Propulsion methods with suitable example? (Apply)

Open Elective I

Sl.no	**Course Code**	Course Name	Semester	L	T	P	C	Track
1	21AI5801	Data Analytics tools and Techniques	5	3	0	0	3	Data Analytics
2	21AI5802	DataScienceforBusiness	5	3	0	0	3	Business Intelligence
3	21AI5803	IntroductiontoDatascience	5	3	0	0	3	Data Science
4	21AI5804	IntroductiontoArtificialIntelligence	5	3	0	0	3	Artificial Intelligence
5	21AI5805	MachinelearningforEngineers	5	3	0	0	3	Machine Learning

21AI5801	**DATA ANALYTICS TOOLS AND TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

Data Analytics course syllabus includes topics and practical exercises that can teach students how to extract, analyze, and manipulate data to draw conclusions or insights. It also teaches about various Data Analytics tools and software that help in the analysis of data. It include Probability and Statistics, Data Structures and Algorithms, Data Simulation, Data Collection, and similar. Data Analytics included in almost every kind of Data Analytics program are types of Data Analytics, Statistical Analysis.

Prerequisites

- Basic concepts of Probability and statistics, linear algebra

Objective

- To impart knowledge on data analytics tools and techniques
- To provide knowledge of statistical data preparation and analysis
- To provide an overview on SAS tools
- To gain knowledge in descriptive statistics using SPSS tools
- Understand the role of informatica tool in data analytics

UNIT I	**INTRODUCTION**	**9**

Introduction-Getting data for analysis- Reading, writing and importing data-Preparing data for analysis-Evaluating quantitative data- Analyzing counts and tables- basics tools used for data analytics-perception and quantification of values-Creating distribution in data- categorization of analytical methods

SUGGESTED ACTIVITIES :

- Analyse the data using basic tools

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT II	**DATA PREPARATION ANALYSIS**	**9**

Data Preparation – editing – Coding –Data entry – Validity of data – Qualitative Vs. Quantitative data analyses – Applications of Bivariate and Multivariate statistical techniques, Factor analysis, Discriminant analysis, Cluster analysis, Multiple regression and Correlation, Multidimensional Scaling – Conjoint Analysis – Application of statistical software for data analysis.

SUGGESTED ACTIVITIES :

- Implement the different statistical techniques
- In Class activity – simple exercises on statistical software for data analysis

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT III	**STATISTICAL ANALYSIS USING SAS**	**9**

Overview-Program structure- Basic operations - Dataset operations-Basic Statistical Procedure-Arithmetic mean- standard deviations-Frequency Distributions-Cross Tabulations-T-Tests-Correlation Analysis-Linear Regression-Bland Altman Analysis-Chi-Square-Fishers Exacts Test-Repeated Measure Analysis-one way Anova- Hypothesis testing

SUGGESTED ACTIVITIES :

- Analyse the statistical data using sas

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT IV	PREDICTIVE ANALYSIS USING SPSS	9
Introduction- Data preparations-Data transformation-Descriptive Statistics-Independent sample T-Test-Paired sample T-Test-one way- Anova-Linear Regression- Multiple Regression-Chi-square Test-Reliability Analysis and its types-cronbach's alpha assumptions		
SUGGESTED ACTIVITIES : • Implementation of Chi-Square test		
SUGGESTED EVALUATION METHODS: • Assignment Problems • Quizzes		
UNIT V	**INFORMATICA**	**9**
Introduction- Mapping –informatica cloud- MDM-ETL- Transformations- Source Qualifier-Aggregator- Router-Joiner- Rank Transformation- sequence generator-Transaction control-Normalizer-performance Tuning- BDM-Partitioning in informatica		
SUGGESTED ACTIVITIES : • Project submission		
SUGGESTED EVALUATION METHODS: • Implementation of projects		
	Total Periods	**45**

Suggestive Assessment methods

Continuous Assessment Test (20Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO501.1: Able to read, write and perform basic operations using data analytics tools
- CO501.2: Apply correlation and regression analysis using data analytics tools.
- CO501.3: Able to carry out Data analytics operations using SAS tools.
- CO501.4:Understand the usage of SPSS tool in analytics
- CO501.5:Able to build data warehouse using ETL

Text Books

1. Alan.C.Elliott, Wayne A wood ward, "SAS Essentials, Mastering SAS for data analytics, Willey, second Edition 2016

2.Peter Bruce and Andrew Bruce "Practical Statistics for Data Scientists", O'Reilly Media Inc, First Edition, 2017.

3. James D.Miller , "Statistics for Data Science", Packt Publishers, First Edition 2017.

4.MauritsKaptein, Edwin van den Heuvel, "Statistics for Data Scientists: An introduction to

probability, statistics, and data analysis", Springer, 2020

Reference

1.G. K. Gupta, "Introduction to Data Mining with Case Studies", Prentice Hall of India, Easter Economy Edition,2014
2.MehmedKantardzic, "Data mining concepts, models, methods and algorithms", Wiley IEEE Press, 2nd edition,2011
3.Ian Witten, Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann,Third edition, 2011
4.George M Marakas, "Modern Data Warehousing, Mining and Visualization", Prentice Hall, 2003.

Web Resources

1. https://www.coursera.org/collections/math-skills-statistics-data-science
2. https://www.udacity.com/course/intro-to-statistics--st101
3. https://www.udacity.com/course/data-scientist-nanodegree--nd02

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2							2				2		
2			3									3	1		
3	1		2										3		
4	3	2	2						1				3		
5	2	2	3									1	3		

T1	Alan.C.Elliott, Wayne A wood ward, "SAS Essentials, Mastering SAS for data analytics, Willey, second Edition 2016	Chp 1,Chp 2,Chp 4,Chp10	Chp 6,Chp 9	Chp5, Chp 6,Chp 7,Chp 11	Chp 6,Chp 13,Chp 14	
R1	Ian Witten, Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann,Third edition, 2011	Chp 1	Chp4, 5			Chp 10
W 1	https://www.udacity.com/course/data-scientist-nanodegree--nd02	All Topics			All Topics	All Topics

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the basic tools used for data analytics(Remember)
2. How to read, write, import and creating distribution in data? (Apply)

COURSE OUTCOME 2:

1.Write the steps to Create an application for statistical data analytics using multivariate statistical techniques(Apply)

3. List out the difference between regression and correlation (understand)

COURSE OUTCOME 3:

1. What are the steps followed to Perform T-Test and Chi-square test for any .csv data?(Apply)

2. Explain one way Anova- hypothesis testing in data analytics(Remember)

COURSE OUTCOME 4:

1. What are the steps available for Prepare a data and preform T-test using SPSS tool(Apply)

2. Describe cronbach's alpha assumptions(understand)

COURSE OUTCOME 5:

1. How to create flat file and relational sources using the source analyser(understand)?
2. How to configure clients and repositories in informatica?(remember)

21AI5802	DATA SCIENCE FOR BUSINESS	L	T	P	C
		3	0	0	3
Preamble					

This course includes the content to use the data to improve the decision-making abilities, and communicate those decisions to others. This course covers the foundational data science principles, and **Data Science for Business** tools for using data to make the most effective decisions.

Prerequisites

- Basic knowledge on probability and Statistics

Objective

- To provide overview on business problem and its data science solutions.
- To understand the predictive metrics for business to increase the baseline performance
- To apply the concept of clustering and classifications for business problem to achieve better growth
- To evaluate the base line performance and evaluation metrics for making business decisions
- Using various business strategy in data science management with the case studies

UNIT I	INTRODUCTION	9

Introduction to Data Analytic Thinking- Basic Business Problem and Data science Solutions- from Business plan to Data Mining Tasks-Supervised and Unsupervised Methods- comparison of supervised and unsupervised method-Data Mining Processes for business understandings- Data warehousing

SUGGESTED ACTIVITIES :

- Discussion on data science solution for various business problems

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT II	BUSINESS DATA EXPLORATION	9

Fundamental Concepts- Identifying and segmenting informative attribute- Finding correlation- Tree induction- Supervised segmentations with Tree structured models- Visualizing Segmentations- Probability Estimation- Addressing the Churn Problem with Tree induction.

SUGGESTED ACTIVITIES :

- Presentation on Churn Problem with Tree induction

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT III	DATA MODELLING FOR BUSINESS	9

Fundamental concepts- Finding "optimal" model parameters based on data- objective function- loss function- Generalization- Fitting and over fitting- cross validations- Tree Pruning- Finding Similarity and Distances- Clustering as similarity based Segmentation- Solving a Business problem Versus Data Exploration using supervised segmentations- Evaluating Classifiers

SUGGESTED ACTIVITIES :

- Implementation of different clustering and classification models for business applications

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT IV	**MAKING BUSINESS DECISIONS**	**9**

Evaluation Metrics – Plain accuracy and its problems- The confusion Matrix- Problem with unbalanced classes- Problem with unequal costs and benefits- Baseline performance- Implications for Investments in Data summary

SUGGESTED ACTIVITIES :

- Presentation on evaluation metrics for making business decisions.

SUGGESTED EVALUATION METHODS:

- Assignment Problems
- Quizzes

UNIT V	**BUSINESS STRATEGIES**	**9**

Thinking Data- Analytically, Redux- Achieving Competitive Advantage- Sustaining Competitive Advantage- Unique Intellectual Property- Unique Intangible Collateral Assets- Data Scientist and Data science Management- Data science Business case studies

SUGGESTED ACTIVITIES :

- Project submission

SUGGESTED EVALUATION METHODS:

- Project Review

	Total Periods	**45**

Suggestive Assessment methods

Continuous Assessment Test (20Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO502.1: Understand the basic business problems using data science methods
- CO502.2: Formulate real-world business problem using predictive model techniques
- CO502.3: Solve business problem using classification and clustering techniques.
- CO502.4:Formulate cost and benefits for business problem in data science
- CO502.5: Design a business strategy with unique thinking by using Data science for business

Text Books

1. Foster Provost and Tom Fawcett, " Data Science for Business", O'REILLY", First edition, 2013
2. Thomas Mailund,"Data Analysis, Visualization, and Modelling for the Data Scientist", 2017
3. Peter Bruce,AndrewBruce"Practical Statistics for Data Scientist",O'Reilly Media, First Edition, 2017

Reference

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data,EMC Education Services,2015
2. Joel Grus ,Data Science from Scratch, O'Reilly Media ,First Edition,2015

Web Resources

1. https://elitedatascience.com/data-science-resources
2. https://analyticsindiamag.com/5-best-data-science-resources-that-beginners-can-download-for-free/
3. https://www.ibm.com/in-en/analytics/hadoop/big-data-analytics
4. https://datascience.foundation/sciencewhitepaper/big-data-analytics-idea-data-types-and-reference-architecture

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
1	3	3											1	3	
2	3	3	3	3	3								1	3	
3	3	3	3	3	3									3	
4	3	3	3	3	3									3	
5	3	3	3	3										3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40

ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Mention the five key data science business problem(understand)
2. How data science is used to solve real world business problem?(Apply)

COURSE OUTCOME 2:

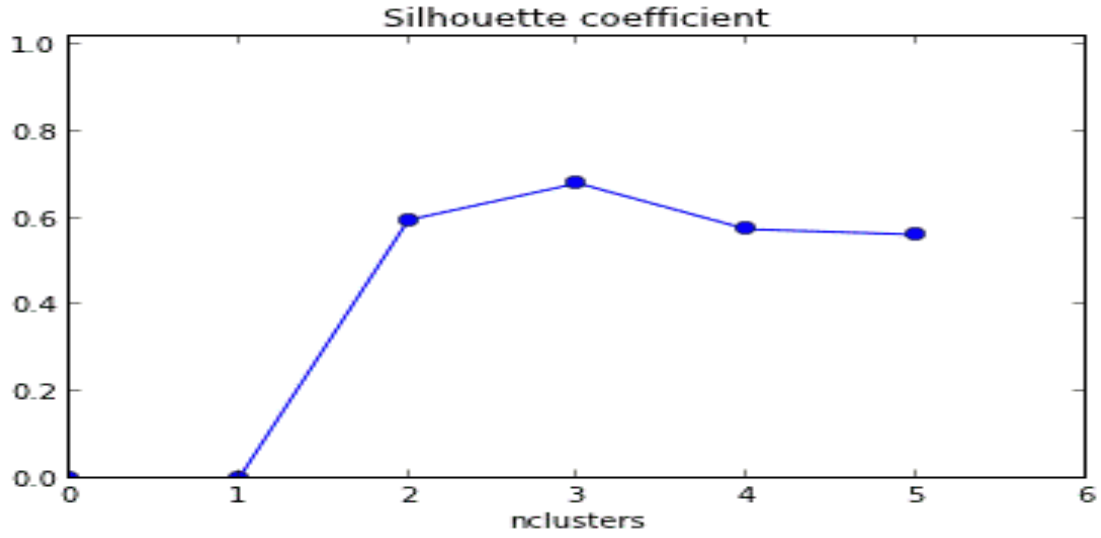
1. Consider a business problem and apply tree induction algorithm to find out the solution(apply)
2. What are the fundamental concept used for predictive modeling? (understand)

COURSE OUTCOME 3:

1. How to choose evaluation metrics for classifiers? (understand)

2. What should be the best choice of no. of clusters based on the following results?

(apply)



COURSE OUTCOME 4:

1. How to calculate confusion metrics for binary classification? (understand)

2. A company called X Education sells online courses. Anytime someone comes to their website, they either enroll in course or do not. Those who are not getting enrolled even after seeing the course information are called leads.Now, to attract those leads back to their courses company tries different strategies like e-mail marketing or special discount etc. problem is that if, for example, the company have 50 leads, and it sends out an email to all 100 of them, it is possible that only 10 or 15 of them will enroll. Thus, there is a loss of money and effort on the

company's behalf which take us to a cost-benefit analysis.Provide a solution for the above problem(apply)

COURSE OUTCOME 5:

1. What is unique intellectual property? (understand)
2. How Amazon uses data science to personalize shopping experiences and improve customer satisfaction .What is amazon's business strategy? (remember)

21AI5803	INTRODUCTION TO DATA SCIENCE	L	T	P	C
		3	0	0	3

Preamble

This course encompasses the analysis and evaluation of data using mathematics, statistics, andcomputer science. The main goal of this course is to gather useful data for forecasting, trend analysis, product development, and strategic decision-making.

Prerequisites for the course

Basic concepts of Probability, Statistics and Python Programming

Course Objectives

1. To Impart Knowledge on Data Science
2. To learn about Machine Learning and Big Data.
3. To Understand the concepts of No-SQL
4. To Understand the Working of Text Mining
5. To Introduce the Fundamentals of Data Visualization.

UNIT I	DATA SCIENCE- AN INTRODUCTION	9

Benefits– Facets-DS Process-Ecosystem-Hadoop-Defining Research Goals and Creating A Project Chater-Retrieving Data-Cleansing-Integrating-Transforming Data-Exploratory Data Analysis-Build Models-Building Applications

SUGGESTEDACTIVITIES

- **Discussion about data science Models**

SUGGESTEDEVALUATIONMETHODS

- Assignment Problems
- Quizzes

UNIT II	MACHINE LEARNING	9

Machine learning Introduction-Applications for machine learning - Python tools used - Modelling Process- Engineering Features – Training Model – Validating – Predicting New Observation - Types of machine learning-Semi Supervised learning

SUGGESTEDACTIVITIES

Discussion about the machine learning models

SUGGESTEDEVALUATIONMETHODS

- Assignment Problems
- Quizzes

UNIT III	BIG DATA AND No-SQL	9

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating— Big Data Use Cases- Characteristics of Big Data Applications -ACID: the core principle of relational databases - The BASE principles - NoSQL database types – Neo4j: a graph database – Cypher - Connected data example in an enterprise

SUGGESTEDACTIVITIES

Tutorial session on no-sql database types

SUGGESTEDEVALUATIONMETHODS

- Assignment Problems
- Quizzes

UNIT IV	TEXT MINING	9

Text mining – Text mining Techniques – Bag of words – Stemming and Lemmatization – Decision tree classifier – Classifying Reddit posts – Natural Language Toolkit – Data Science Process – Presentation and Automation

SUGGESTEDACTIVITIES

Presentation on data science process

SUGGESTEDEVALUATIONMETHODS

- Assignment Problems
- Quizzes

UNIT V	DATA VISUALISATION	9

Data Visualization – Purpose – Visualization usages - Design and Development -Identifying trends - Patterns – Structure – Relationships – Information Design and Visualization

SUGGESTEDACTIVITIES

Project submission

SUGGESTEDEVALUATIONMETHODS

- Assignment Problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTION QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO503.1: Apply the Fundamental Knowledge on Data Science and Data Types. **(Understand)**

CO503.2. Explain the basics of machine learning and model building. **(Apply)**

CO503.3. Understanding How You Can Adapt Algorithms to Work Inside Databases. **(Understand)**

CO503.4. Infer The Importance of Text Mining and Data Visualization. **(Apply)**

CO503.5. Familiarize with AI and Its Basics. **(Understand)**

Text Books

1. Davy Cielen, Arno D. B. Meysman Mohamed Ali, Introducing Data sciences, Manning Publications, First Edition,2016
2. Francesco CoreaAn Introduction to Data, Springer, First Edition,2019
3. Zheng,Data Visualization in Business Intelligence, First Edition ,2017

Reference Books

1. Cole NussbaumerKnaflic , Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley, First Edition ,2017
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, First Edition ,2016
3. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013

Web Resources

1. https://srdas.github.io/Papers/DSA_Book.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/APA%20Lecture%20notes.pdf
3. https://people.smp.uq.edu.au/DirkKroese/DSML/DSML.pdf

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3

1	3	2		1	1			1	2			1	2		
2	3	2		1	1			1	1			1	2		
3	3	2		1	1			1	1			1	2		
4	3	2	2	1	1			1	2			1	2		
5	3	2	2	1	1			1	1			1	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the differences between supervised and unsupervised learning? (Remember)
2. How do you build a random forest model? (Apply)

COURSE OUTCOME 2:

1. How should you maintain a deployed model? (Remember)
2. How do you find RMSE and MSE in a linear regression model? (Apply)

COURSE OUTCOME 3:

1. How can you select k for k-means? (Apply)
2. Which of the following machine learning algorithms can be used for inputting missing values of both categorical and continuous variables? (Understand)

COURSE OUTCOME 4:

1. What do you understand about true positive rate and false-positive rate? (Remember)
2. What are the feature vectors? (Remember)

COURSE OUTCOME 5:

1. Explain how gradient descent is used to fit parameterized models. (Remember)
2. Explain betweenness centrality in detail. (Remember)

21AI5804	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3
Preamble					

The fundamental ideas and methods of artificial intelligence are covered in this course. The subarea of computer science known as artificial intelligence is focused on developing the software and hardware necessary to enable computers to perform actions that would be regarded as intelligent if it is similar to those carried out by people. The students in this course will learn general problem-solving techniques that they can use to solve a variety of issues in the real world. Students can discover how computers can reason, interact, solve problems, and learn.

Prerequisites for the course

Logical Thinking ability

Course Objectives

1. To discuss the core concepts and algorithms of AI,
2. To apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems
3. To have in-depth knowledge in PROLOG.
4. To understand analyze the structures and algorithms of a selection of techniques

UNIT I	INTRODUCTION TO AI	9

Artificial Intelligence - The History of AI – AI and Society - Agents - Knowledge-Based Systems - Propositional Logic - Resolution - Horn Clauses - Computability and Complexity - Applications and Limitations

UNIT II	FIRST-ORDER PREDICATE LOGIC	9

Syntax - Quantifiers and Normal Forms - Proof Calculi - Automated Theorem Provers – Applications - Limitations of Logic - The Search Space Problem - Decidability and Incompleteness - The Flying Penguin - Modeling Uncertainty

UNIT III	LOGIC PROGRAMMING WITH PROLOG	9

PROLOG Systems and Implementation - Simple Examples - Execution Control and Procedural Elements – Lists - Self-modifying Programs - Constraint Logic Programming - Search, Games and Problem Solving - Uninformed Search - Heuristic Search - Games with Opponents - Heuristic Evaluation Functions - State of the Art

UNIT IV	MACHINE LEARNING AND NEURAL NETWORKS	9

Machine Learning and Data Mining - The Perceptron - The Nearest Neighbor Method - Decision Tree Learning - Learning of Bayesian Networks – Clustering - Neural Networks - Associative Memory - Linear Networks with Minimal Errors - The Backpropagation Algorithm - Deep Learning

UNIT V	REINFORCEMENT LEARNING	9

Introduction - The Task - Uninformed Combinatorial Search - A Learning Walking Robot - Q-Learning - Exploration and Exploitation - Approximation, Generalization and Convergence- AlphaGo - Curse of Dimensionality	
Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTION QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO504.1: Apply the fundamental knowledge on Artificial Intelligence. **(Understand)**

CO504.2. Explain the basics of First-Order Predicate Logic. (**Understand)**

CO504.3. Understanding how you can program in PROLOG. (**Apply)**

CO504.4. Infer the importance of Machine Learning and Neural Networks. (**Apply)**

CO504.5. To familiarize with Reinforcement Learning.**(Remember)**

Text Books

1.Wolfgang Ertel, Introduction to Artificial Intelligence, Springer International Publishing AG, Second Edition, 2017

2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, 2015

Reference Books

1. Peter Norvig, Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp,Morgan Kaufmann; 1st edition ,2014
2. Dr. DheerajMehrotra, Basics of Artificial Intelligence & Machine Learning, First Edition, Notion Press ,3 June 2019
3. Chandra S.S.V, Artificial Intelligence and Machine Learning, PHI Learning; 1st edition , 2014

Web Resources

1. https://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf
2. https://mrcet.com/downloads/digital_notes/IT/(R17A1204)%20Artificial%20Intelligence.pdf
3. https://www.tutorialsduniya.com/notes/artificial-intelligence-notes/
4. https://www.cet.edu.in/noticefiles/271_AI%20Lect%20Notes.pdf

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

1	3	2		1				1	1			2	2		
2	3	1		1				1	1			2	2		
3	3	2	1	1				1	1			2	2		
4	3	1	2	1			1	1	1			2	2		
5	3	1	2	1			1	1	1			2	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain the various problem solving and problem reduction methods with algorithm and example? (Remember)
2. Discuss in detail the uninformed search strategies and compare the analysis of various searches (Remember)

COURSE OUTCOME 2:

1. Write algorithm for Unification algorithm. (Remember)
2. State Representation of facts in propositional logic with an example. (Remember)

COURSE OUTCOME 3:

1. Briefly discuss about reasoning done using fuzzy logic. (Remember)
2. Discuss the Dempster-Shafer Theory. (Remember)

COURSE OUTCOME 4:

1. Write short notes on Nonlinear Planning using Constraint Posting. (Remember)
2. Write short notes on the Learning with Macro-Operators, Learning by Chunking. (Remember)

COURSE OUTCOME 5:

1. Write the applications of expert systems. (Remember)
2. Explain the need, significance and evolution of XCON expert system. (Remember)

21AI5805	Machine learning for Engineers	L	T	P	C
		3	0	0	3

Preamble

Students able to learn the fundamental ideas and methods of Machine Learning are covered in this course. The subarea of computer science known as Machine Learning is focused on developing the software and hardware necessary to enable computers to perform actions that would be regarded as intelligent if it is similar to those carried out by people

Prerequisites for the course:

- 21CS2501 - Introduction to Computing using Python

Objectives

1. To impart basic concepts and techniques in Machine Learning.
2. To familiarize the concepts of Supervised and Unsupervised learning techniques
3. To study probabilistic model based learning
4. To introduce neural networks and Deep Learning

UNITI	**INTRODUCTION TO MACHINE LEARNING**	**9**

achine learning: Supervised learning- Unsupervised learning-Reinforcement Learning- arning Process-Terminologies: Weight Space, Curse of Dimensionality, Over fitting, sting, Validation

SUGGESTEDACTIVITIES:

- Discussion aboutMachine Learning Process.

SUGGESTEDEVALUATIONMETHODS:

- Assignment problems
- Quizzes

UNITII	**SUPERVISED LEARNINGREGRESSION**	**9**

Supervised Learning- Regression-Linear regression-Gradient Descent Algorithm – Stochastic Gradient Descent Algorithm- Multivariate Regression- Logistic Regression- Linear Discriminant Analysis-Regularization- Principal Component Regression.

SUGGESTEDACTIVITIES:

- Presentation and discussion on Logistic Regression.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNITIII	**SUPERVISED LEARNINGCLASSIFICATION**	**9**

Basics of supervised learning -Classification model - Probability and Bayes learning - Naive Bayes - Bayesian Network -K-nearest neighbor- Decision tree-Random Forest-Support Vector Machine.

SUGGESTEDACTIVITIES:

- Implementation of K-nearest neighbor Clustering.

SUGGESTEDEVALUATIONMETHODS:

- Assignment problems
- Quizzes

UNITIV	**NEURAL NETWORK**	**9**

Basics of Neural Network-Understanding the biological neuron and artificial neuron-Types of activation functions- Early implementations of ANN -McCulloch Pitt's , Rosenblatt's Perceptron, ADALINE – Architectures of neural network- Learning process in ANN- Back propagation-Deep learning

SUGGESTEDACTIVITIES:

- Implementation of Learning process in ANN

SUGGESTED EVALUATION METHODS:

- **Assignment problems**
- **Quizzes**

UNITV	**UNSUPERVISED LEARNING**	**9**

Clustering-Applications-Similarity measures-Partition based clustering techniques- K means clustering, k-method clustering- Hierarchical clustering-Density based clustering-Cluster validation

SUGGESTEDACTIVITIES:

- Implementation of- K means clustering.

SUGGESTEDEVALUATIONMETHODS:

- Project submission

TotalPeriods	**45**

Suggestive Assessment Methods

Continuous AssessmentTest (20Marks)	Continuous Assessment Test(20 Marks)	EndSemesterExams(60Marks)
• **DESCRIPTIVE QUESTIONS**	• ASSIGNMENT • ONLINEQUIZZES • PROBLEM-SOLVINGACTIVITIES	• **DESCRIPTIVEQUESTIONS**

CourseOutcomes

Uponcompletionofthecourse,thestudentswillbeableto:

1. Explain the concepts of machine learning for solving various complex engineering problems.(Understand).
2. Apply the knowledge of machine learning to solve complex engineering problems based on supervised and unsupervised learning.(Apply).
3. Identify the suitable Machine learning algorithm for complex engineering problems for reaching sustained conclusions using the principles of mathematics. (Analyze).
4. Interpret the data and synthesize the information using Machine Learning algorithms and statistical methods to provide valid conclusions.(Apply).
5. Design a model for a given problem using modern tools.(Apply).

TextBooks

1. Stephen Marsland, “Machine Learning - An Algorithmic Perspective” 2nd Edition, CRC Press, 2015

ReferenceBooks

1Introduction to Machine Learning, Second Edition (Adaptive Computation and Machine Learning)

WebResources

Links for image database:

- https://onlinecourses.nptel.ac.in/noc22_ge29/preview

T1	Stephen Marsland, “Machine Learning - An Algorithmic Perspective” 2nd Edition, CRC Press, 2015	Chp 1	Chp 2	Chp 3	Chp 4	Chp 6
R1	Introduction to Machine Learning, Second Edition (Adaptive Computation and Machine Learning)	Chp 1	Chp 2	Chp13	Chp 11	Chp 4
W1	https://onlinecourses.nptel.ac.in/noc21_ee23/preview	Module 1	Module 2	Module 3	Module 4	Module 5
W2	https://www.udacity.com/course/intro-to-artificial-intelligence--cs271	AllTopics	All Topics	AllTopics	AllTopics	All Topics

COVsPOMappingandCOVsPSOMapping

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**

1	3	3	3									3		
2	3	3	3									3		
3	3	3										3		
4	3	3	2									3		
5	3	2	2	2	3							3		

COURSELEVELASSESSMENT

QUESTIONS

COURSEOUTCOME1:

1.Find the covariance and

correlation coefficient of data

X={1,2,3,4,5}and

Y={1,4,9,16,25)(Apply)

COURSEOUTCOME2:

1.Design single layer perceptron with two iteration. Consider the perceptron having with the initial weights w1=0.5, w2 = 0, learning rate α=0.2 and bias θ =0.4 for AND Boolean function. The activation function is the Step function f(x) which gives the output either 0 or 1. If value of f(x) is greater than or equal to 0, it outputs 1 or else it outputs 0.(Apply)

COURSEOUTCOME3:

1.Consider a perception to represent the Boolean function And with the initial weights w1=0.3, w2 = -0.2, learning rate α=0.2 and bias θ =0.4 as shown in Figure. The activation function used here is the Step function f(x) which gives the output value as binary. i.e., 0 or 1. If value of f(x) is greater than or equal to 0, it outputs 1 or else it outputs 0. Design a perceptron that performs the Boolean function AND & update the weights until the Boolean function gives the desired output.(Apply)

COURSEOUTCOME4:

1.Consider a boy who has a volleyball tournament on the next day, but today he feels sick. It is unusual that there is only a 40% chance he would fall sick since he is a healthy boy. Now, Find the

probability of the boy participating in the tournament. The boy is very much interested in volley ball, so there is a 90% probability that he would participate in tournaments and 20% that he will fall sick given that he participates in the tournament)(Apply)

COURSEOUTCOME5:

1.Design Back propagation using Multi-Layer Perception which has three layers like the input layer has 4 neurons, the hidden layer has 2 neurons and the output layer has a single neuron. Train the MLP by updating the weights and biases in the network. Learning rate: =0.8. Refer Q.no : 3 for the structure of MLP and their weights? (Analyze)

21IT3602	**OBJECT ORIENTED PROGRAMMING WITH JAVA**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

This course enables the student to learn the fundamentals of Java with Object Oriented Programming. They will be able to create, manipulate and operate on classes and objects to utilize them for real world problem solving with exception handling. Java swing, event handling. Multi-threading concept will be useful for them to design Graphical User Interfaces for various applications.

Prerequisites for the course

- Basics Of Programming

Objectives

- To understand the Object Oriented Programming features and Fundamentals of Java.
- To implement packages in Java and implement inheritance.
- To understand the concept of Exception handling, Interfaces and Threads in Java.
- To implement the concept of Files and String Handling in Java.
- To develop a GUI application in Java and connect a Database using Java.

UNIT I	**OOPS CONCEPTS & BASICS OF JAVA**	**9**

Object Oriented Programming Fundamentals –Structure of Java Program, Data Types, Variables, and Arrays - Operators - Introducing Classes - Methods and Classes, Constructor and Destructor-Finalize method. I/O Basics-Reading Console Input-Writing Console output-Control Statements.

Suggested Activities:

- Simple Java Programs using Java Basic Constructs and Array
- Implementation of Java programs using classes and objects
- Implement programs usingcontrolconstructsofJava
- UnderstandJVM

SUGGESTED EVALUATION METHODS:

- Assignment programs
- Quiz

UNIT II	INHERITANCE AND PACKAGES	9

Inheritance:Basics-CreatingaMultilevelHierarchy –Methodoverriding-UsingAbstractClasses-Packages: Packages- Access Protection ImportingPackages.GenericProgramming.

Suggested Activities:

- Practical-implementation of Java programs–use Inheritance, polymorphism, abstract classes. Use Java programs and implement interfaces
- Understand Dynamic binding

SUGGESTED EVALUATION METHODS:

- Assignment programs
- Quiz

UNIT III	INTERFACES, EXCEPTIONS AND THREAD	9

Interfaces Definitions and Implementations – Exception Handling: Types – Try and Catch - Throw-Multi-threaded Programming: Creating Threads – Inter Thread Communication

Suggested Activities:

- Implement the concept of thread in programming
- Understand Parallel programming

SUGGESTED EVALUATION METHODS:

- Assignment programs
- Quiz

UNIT IV	STRINGHANDLINGANDCOLLECTIONS	9

File - The Byte Streams - The Character Streams - Serialization. String Handling: Special String operations and Methods- String Buffer –Math –Utility Classes Date and Time-Collection Interfaces-Collection Classes		
Suggested Activities: • Practical Using Generic classes and Collections framework, Using Comparative interface list, stack. • Program to read a text file and display it using files. • Program to copy the contents of one file to another.		
SUGGESTED EVALUATION METHODS: • Assignment programs • Quiz		
UNIT V	**EVENTS AND GUI PROGRAMMING**	**9**
EventHandlinginJava,Eventtypes,Mouseandkeyboardevents.GUIBasics,LayoutManagement.GUIComponentswithExamples.Java DatabaseConnectivity.		
Suggested Activities: • Create interactive form using AWT /Swing and add functionality • Understand AWT and Swing • Develops imple application using JDBC		
SUGGESTED EVALUATION METHODS: • Quiz		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1.DESCRIPTIVE QUESTIONS

S.No	**ListofExperiments**	**CO**
1	Programs to define thebasicstructureofJavaProgram.	CO1
2	Programs using conditionals– if, if– else, If–elif– else statements	CO1

3	Program to defineclassand constructors.Demonstrate constructors.	CO1
4	Program to defineclass,methods and objects. Demonstrate method overloading.	CO1
5	Program to define in heritance and show methodoverriding.	CO2
6	Program to demonstrateInterfacesandPackages.	CO2
7	Develop a programtoimplementStringHandlingMethods	CO4
8	Program to demonstrateExceptionHandling.	CO2
9	Implementation of Collections	CO3
10	Program to demonstrateMultithreading.	CO3
11	Program to demonstrate I/O operations.	CO3
12	Programtodemonstrateinterfacesandclasses	C05
13	Program to demonstrateeventhandling.	CO5
14	Program to demonstrateLayoutmanagers.	CO5
15	Program to implement JDBC connectivity	CO5

Total Periods	**45Theory +30 Lab**

Laboratory Requirements

- 60SystemswithwindowsLINUXoperatingsystemwithJavaIDEorequivalent.

Continuous Assessment Test (30Marks)	**Lab Components Assessments (20Marks)**	**End Semester Exams (50Marks)**

1.DESCRIPTIVEQUESTIONS	1. LABEXPERIMENTS 2. MODELEXAMINATION	1.DESCRIPTIVEQUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Tounderstandobject-orientedprogrammingconceptsandimplementinjava.(Understand)

CO2: TocomprehendbuildingblocksofOOPslanguagenamelyinheritanceandpackage. (Understand)

CO3: TounderstandthevariousexceptionhandlingmechanisminJava(Apply)
CO4: ToimplementcollectionconceptsandFilehandlinginOOP(Apply).
CO5: TodevelopGUIbaseddesktopapplicationinproject-basedlearning.(Apply)

Text Books

2. HerbertSchildt,"Javathecompletereference",McGrawHill,Osborne,11thEdition,2018.
3. CayS.Horstmann,"CoreJavaSE9fortheImpatient",SecondEdition,AddisonWesley,2022..

Reference Books

1. Deitel, Paul J.,andDeitel, Harvey M. .Java: How to Program.

   UnitedKingdom, Pearson,2017.

2. S.MalhotraandS.Choudhary,"ProgramminginJava",OxfordUniversityPress,2nd Edition, 2014.
3. Somashekara,M.T.,etal.ObjectOrientedProgrammingwithJava.India,PrenticeHallIndiaPvt.,Limited,2017

Web Resources

1.https://nptel.ac.in/courses/106/105/106105191/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	3									3		
2	3	3	3	3									3		
3	3	3	2	3									3		
4	3	3	2	3									3		

5	3	3	3	3									3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1

1. Write a Java Program to read the unit of electricity consumed in a house andcalculate the amount to be paid for the electricity consumed. The bill amountshould becalculated asperthegiven specification
   - For0to100unitstheperunitis₹0/-
   - For0to200units,forthefirst100unittheperunitcostiszeroandthe Next100units,theconsumershallpay₹1.5perunit.
   - For 0 to 500 units, the consumer shall pay ₹ 0 for the first 100 units, forthe next 100 units the consumer shall pay ₹ 2 per unit, for the next 300unitstheunitcostis₹3.00/-(Apply)
2. Explain in detail about the various conditional statements that are supported byJava.(Understand)
3. Differentiate variables and constants.(Analyse)

Course Outcome 2 (CO2):

1. WriteaJavaProgramtodemonsratetheparentchildrelationshipanditsattributes.(Apply)
2. WriteaJavaProgramtodemonstratePackages.(Apply)

Course Outcome 3 (CO3):

1. Howwillyouhandleexceptionwhenitisraised?
2. Explain.(Understand)WriteaJavaprogramtocreatethreeprocessesandcalculatethesumofoddandevennumbersusingmultithreading.(Apply)

Course Outcome 4 (CO4):

1. WriteaJavaProgramthatReadsaTextFileandCountstheNumberofTimesaCertainLetterAppearsintheTextFile.(Apply)

Course Outcome 5 (CO5):

1. WriteaJavaprogramtoreadastudentdetailsinMSAccessanddisplaythesame.(Apply)

21CS4611	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

Preamble

This lab enables efficient use of data to store and retrieve from the databases. By incorporating SQL, practical experience is provided to students with real time examples. Provides knowledge to interface Programming with databases to cater the needs of data driven businesses and application development

Prerequisites for the course

- 21AI3603-Data Structures

Objectives

1. To explain basic database concepts, applications and types of data models
2. To demonstrate the use of constraints and relational algebra operations
3. To implement the basics of SQL and construct queries using SQL
4. To emphasize the correlation of SQL and programming languages
5. To facilitate students in Database design and development

S.No	List of Experiments	CO
1	Student should decide on a case study and formulate the problem statement.	CO1
2	Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)Note: Student is required to submit a document by drawing ER Diagram	CO1
3	Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys)Note: Student is required to submit a document showing the tables created from ER Model.	CO2
4	Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables, Constraints	CO2

5	Practicing DDL commands, Integrity constraints, DML commands	CO3
6	Practicing DCL, TCL commands, Views and operations on views	CO3
7	Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, etc	CO3
8	Practicing Sub queries (Nested, Correlated) and Joins	CO3
9	Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.	CO3
10	Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger	CO4
11	Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.	CO4
12	Cursors- Declaring and Opening Cursor, Fetching the data, closing the cursor.	CO4
		Total Periods :60

S. No	**List of Test Projects**	**CO**
1	College Admission Management System	CO5
2	Restaurant Management System	CO5
3	Movie booking Management System	CO5
4	Vehicle Parking Management System	CO5
5	Travel Planner Management System	CO5
6	Toll Booth Management System	CO5
7	Mini mart Management System	CO5
8	Hospital Data Management System	CO5
9	Bike/ Car rental Management System	CO5
10	Banking Management System	CO5
11	Library Management System	CO5
12	Product review Management System	CO5
13	Employee payslip Management System	CO5
14	School Management System	CO5
15	Online Shopping Management System	CO5

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	**End Semester Exams (40 Marks)**
1. Exercises 2. Project File (Progress Score) 3. Viva voce	1. Exercises 2. Record note 3. Viva voce

Outcomes

Upon completion of the course, the students will be able to:

CO1 Apply the basic concepts of Database Systems and Applications

CO2 Understand and apply the relational model and relational algebra operations

CO3 Construct queries using SQL in database creation, manipulation andinteraction

CO4 Apply the programming aspects using SQL to create procedure and perform functions

CO5 Implement a project based on the Database concepts using SQL
Laboratory Requirements
Oracle/SQL
Reference Books
1. Raghurama Krishnan, Johannes Gehrke , Database Management Systems, 3rd edition,Tata McGraw Hill, New Delhi,India, 2016.
Web Resources
1. https://www.hackerrank.com/domains/sql 2. https:// www.geeksforgeeks.org/sql-tutorial/ 3. https://www.tutorialspoint.com/sql/index.htm 4. https://www.sololearn.com/learning/1060

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1		3	3										2		
2		3	3										2		
3	3	3	3		3								2		
4	3	3	3										2		
5	2	2	2		2	2			2	2	2	2	3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam	END SEM EXAM
REMEMBER		
UNDERSTAND		
APPLY	50	100
ANALYZE		
EVALUATE		
CREATE	50	

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):(Blooms Category: Apply)

1. Identifying entities, attributes and its types, keys, relationships between entities, cardinalities, generalization, and specialization for library management system.

2. A university database contains information about professors (identified by social security number, or SSN) and courses (identified by courseid). Professors teach courses; each of the following situations concerns the Teaches relationship set. For each situation, draw an ER diagram that describes it (assuming that no further constraints hold).

1. Professors can teach the same course in several semesters, and each offering must be recorded.
2. Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded. (Assume this condition applies in all subsequent questions.)
3. Every professor must teach some course.
4. Every professor teaches exactly one course (no more, no less).
5. Every professor teaches exactly one course (no more, no less), and every course must be taught by some professor.
6. Now suppose that certain courses can be taught by a team of professors jointly, but it is possible that no one professor in a team can teach the course. Model this situation, introducing additional entity sets and relationship sets if necessary.

Course Outcome 2 (CO2):(Blooms Category: Apply)

1. Consider the following relations containing airline flight information:

Flights(flno: integer, from: string, to: string, distance: integer, departs, arrives: time)

Aircraft(aid: integer, aname: string, cruisingrange: integer)

Certified(eid: integer, aid: integer)

Employees(eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft (otherwise, he or she would not qualify as a pilot), and only pilots are certified to fly. Write the following queries in relational algebra, tuple relational calculus, and domain relational calculus. Note that some of these queries may not be expressible in relational algebra

1. Find the eids of pilots certified for some Boeing aircraft.
2. Find the names of pilots certified for some Boeing aircraft.
3. Find the aids of all aircraft that can be used on non-stop flights to Chennai.
4. Identify the flights that can be piloted by every pilot whose salary is more than $100,000. (Hint: The pilot must be certified for at least one plane, large cruising range.)
5. Find the names of pilots who can operate some plane with a range greater than 3,000 miles but are not certified on any Boeing aircraft.
6. Find the eids of employees who make the highest salary.
7. Find the eids of employees who make the second highest salary.
8. Find the eids of pilots who are certified for the largest number of aircraft.
9. Find the eids of employees who are certified for exactly three aircraft.
10. Find the total amount paid to employees as salaries

2. Answer each of the following questions briefly. The questions are based on the following relational schema:

Emp(eid: integer, ename: string, age: integer, salary: real)

Works(eid: integer, did: integer, pct time: integer)

Dept(did: integer, dname: string, budget: real, managerid: integer)

a. Give an example of foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple?
b. Write the SQL statements required to create the above relations, including appropriate versions of all primary and foreign key integrity constraints.
c. Define the Dept relation in SQL so that every department has a manager.
d. Add 'John' as an employee with eid = 101, age = 32 and salary = 15, 000.
e. Write an SQL statement to give every employee a 10% raise. 6. Write an SQL statement to delete the 'Toy' department. Given the referential integrity constraints you chose for this schema, explain what happens when this statement is executed.

Course Outcome 3 (CO3):(Blooms Category: Apply)

1. (a) For the above given Employee tables, create and insert values.
(b) **Write a query to fetch the number of employees working in the department 'HR'**
(c)Write a query to find the names of employees that begin with 'S'
(d)**Write a query to fetch details of all employees excluding the employees with first names, "Sanjay" and "Sonia" from the EmployeeInfo table.**
(e)**Write a query to fetch all employees who also hold the managerial position.**
(f) Write a query to fetch the department-wise count of employees sorted by department's count in ascending order.
2. Consider the following schema:
Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)
The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in SQL:
1. Find the pnames of parts for which there is some supplier
2. Find the snames of suppliers who supply every part
3. Find the snames of suppliers who supply every red part
4. Find the pnames of parts supplied by Acme Widget Suppliers and by no one else
5. Find the sids of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part).
6. For each part, find the sname of the supplier who charges the most for that part
7. Find the sids of suppliers who supply only red parts
8. Find the sids of suppliers who supply a red part and a green part
9. Find the sids of suppliers who supply a red part or a green part

Course Outcome 4 (CO4):(Blooms Category: Apply)

1. Write Trigger logic to check whether the age is valid or not Using Message Alert in Election voting system for Raising appropriate error code and error message for ineligible

candidates.

2. Create a function that takes the name as input and returns the welcome message as output. Use anonymous block and select statement to call the function.

Course Outcome 5 (CO5):(Blooms Category: Create)

1. Write the case study for Cafeteria Management System, formulate the problem statement, model using E-R diagram and design the database using SQL.
2. Write the case study for Online Auction Management System, formulate the problem statement, model using E-R diagram and design the database using SQL.

21PT3904	REASONING	L	T	P	C
		0	0	2	1

Prerequisites for the course

- Foundational English
- Verbal Ability

Objectives

To strengthen the interpersonal skills and branding it to social network by the effective use of social media and social interactions.

UNIT I	Interpersonal Skill	6

Interpersonal Communication, Peer Communication, Image Building and Personal Branding, Delegation and compliance, Responsibility, Creation of accountability

UNIT II	Social Media	6

Effective use of social media, Types of social media, Moderating personal information, Social media for Job/Profession, Networking on social media, Maximizing network with social media

UNIT III	Social Interaction	6

Event management, Event management methods, Effective techniques for better event management, Influencing skill, Building relationships, Persistence and resilience

UNIT IV	Non Verbal Communication	6

Proximecs, Types of Proximecs, Rapport building, Negotiation Skill, Effective negotiation strategies. Conflict resolution, Styles of conflict resolution

UNIT V	Reasoning Ability	6

Analytical Reasoning Data Arrangement (Linear and circular & Cross Variable Relationship), Ordering/ranking/grouping, Selection Decision table

Total Periods	30

Suggestive Assessment Methods

Continuous Assessment Test-1 (30 Marks)	Continuous Assessment Test-2 (30 Marks)	Model Exam (40 Marks)
1. DESCRIPTIVE QUESTIONS 2. MULTIPLE CHOICE QUESTIONS	1. DESCRIPTIVE QUESTIONS 2. MULTIPLE CHOICE QUESTIONS	1. DESCRIPTIVE QUESTIONS 2. MULTIPLE CHOICE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: Improve their interpersonal skills through proper communication.
CO2: Acquire wide knowledge on social Media and its interaction
CO3: Understanding the various strategies for building relationships among peers
CO4: Improve negotiation skills in academic and social contexts
CO5: Interpret the analytic data in decision table.

Text Books

1. ETHNUS, Apti mithra, 2013, First Edition, McGraw-Hill Education Pvt. Ltd.
2. Mark G. Frank, David Matsumoto, Hyi Sung Hwang, Nonverbal Communication: Science and Applications, 2012, 1 st Edition, Sage Publications, New York.

Reference Books

1. Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler, Crucial Conversations: Tools for Talking When Stakes are High, 2001,1st edition McGraw Hill Contemporary, Bangalore.
2. Dale Carnegie, How to Win Friends and Influence People, Latest Edition,2016. Gallery Books, New York

Web Recourses

1. https://www.fresherslive.com/online-test/logical-reasoning-test/questions-and-answers
2. https://www.indiabix.com/non-verbal-reasoning/questions-and-answers/
3. https://www.indiabix.com/logical-reasoning/questions-and-answers/

CO Vs PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1									2	2		
2						1			1	2		
3						1			2	3		
4						1			1	3		
5										2		

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I Interpersonal Skill	
1	Interpersonal Communication	**1**
2	Peer Communication	**1**
3	Image Building and Personal Branding	**1**
4	Delegation and compliance	**1**
5	Responsibility	**1**
6	Creation of accountability	**1**

UNIT II Social Media		
1	Effective use of social media	**1**
2	Types of social media	**1**
3	Moderating personal information	**1**
4	Social media for Job/Profession	**1**
5	Networking on social media	**1**
6	Maximizing network with social media	**1**
UNIT III Social Interaction		
1	Event management	**1**
2	Event management methods	**1**
3	Effective techniques for better event management	**1**
4	Influencing skill	**1**
5	Building relationships	**1**
6	Persistence and resilience	**1**
UNIT-IV Non Verbal Communication		
1	Proximecs, Types of proximecs	**1**
2	Rapport building	**1**
3	Negotiation Skill	**1**
4	Effective negotiation strategies	**1**
5	Conflict resolution	**1**
6	Styles of conflict resolution	**1**
UNIT-V Reasoning Ability		
1	Analytical Reasoning Data Arrangement (Linear and circular & Cross Variable Relationship),	**2**
2	Ordering/ranking/grouping,	**2**
3	Selection Decision table	**2**

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S.No	Course Code	Course Name	Category	ContactPeriods	L	T	P	C
Theory Courses								
1	21AI6601	Robotic Process Automation	PC	3	3	0	0	3
2	21AI6602	Machine Learning Techniques	PC	3	3	0	0	3
3		Open Elective–II	OE	3	3	0	0	3
4		Professional Elective – III	PE	3	3	0	0	3
5		Professional Elective – IV	PE	3	3	0	0	3
Theory cum Practical Courses								
1	21AI6603	Cloud Computing and Big Data Analytics	PC	5	3	0	2	4
Practical Courses								
1	21AI6611	Machine learning Laboratory	PC	4	0	0	4	2
2	21PT3903	Soft Skills-Aptitude II	EEC	2	0	0	2	1
3	21AI6911	Project Work Phase–I/Internship	EEC	4	0	0	4	2
			Total	30	17	0	12	24

21AI6601	Robotic Process Automation	L	T	P	C
		3	0	0	3

Preamble

This course helps the student to basic idea of Robotic process automation. Students are introduced to the robotics process automation. Concepts like robot interaction, Multi agent system are also included as part of the course to get an overall idea on robotic process automation and its applications.

Prerequisites for the course

- 21AI3601- Artificial Intelligence and Expert System

Objectives

- To understand the basic concepts associated with the design, functioning, applications and social aspects of robots
- To study about the robotic process automation for various applications
- To implement the real robots for real time applications.
- To learn about multi agent system.
- To understand the implications of AI and other trending concepts of robotics.

UNIT I	INTRODUCTION TO ROBOTIC PROCESS AUTOMATION	9

Robotic process Automation- Benefits of RPA- AI Technologies-Traditional Automation-Robotic process automation with AI-Corporate Functions- Robotics process Automation Implementation- Process Assessment-Target Operating Model .Case Study: Automated Control- Example of process robotized in a bank.

SUGGESTED ACTIVITIES

- Discussion on Corporate functions
- Implementation of robotic process automation

SUGGESTED EVALUATION METHODS

- Quiz on AI Technologies
- Assignment on Automated control system

UNIT II	**AI-BOT**	**9**

Bot Development-Preliminaries-Installation of UiPath-Activities- Flowcharts and Sequences- Log Message-Variables-Loops and Conditionals-For Each Loop-Do While Loop and While Loop-IF/ THEN/ ELSE Conditionals-Switch-Debug-Common UiPath Functions-The UiPath Orchestrator Best Practices for Bot Development

SUGGESTED ACTIVITIES

In class activity- UI Path Installation

SUGGESTED EVALUATION METHODS

Assignment on Uipath Functions

UNIT III	**ARTIFICIAL CURIOSITY –DRIVEN LEARNING**	**9**

Role of Curiosity: Interpretation from Observation, Search or the most Coherent Interpretation, Human –Robot Interaction. Validation result by Simulation-Implementation of real robot and Validation Results.

SUGGESTED ACTIVITIES

- In-class activity –Robot Interaction.
- Flipped classroom on description about Implementation of real robot.

SUGGESTED EVALUATION METHODS

- Assignment on Role of curiosity

UNIT IV	**MULTI-AGENT REINFORCEMENT LEARNING**	**9**

Holonic Homogenous Multi-Agent Systems: Holonic Multi Agent Systems, Homogenous, Multi – Agent System, Learning to coordinate Through Interaction- Robot Control System Learning.

SUGGESTED ACTIVITIES

- In-class activity –Holonic Multi agent system
- Flipped classroom on description about Implementation of real robot.

SUGGESTED EVALUATION METHODS

- Assignment on robot control system

UNIT V	APPLICATION OF ROBOTICS	9

Customer Service- Finance-HR-Marketing-Insurance-Retail-Health Care-Telecom-IT-banking

SUGGESTED ACTIVITIES

- Flipped classroom on description about Robotic process automation for Health Care

SUGGESTED EVALUATION METHODS

- Quiz on space exploration

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 understand basic concept of robotics and its functions.

CO 2 Apply the robotic process automation for various applications.

CO 3 Implement the real robot by simulation

CO 4 Apply the multi agent reinforcement learning for robotics application

CO 5 Develop the robotic system with the progress in AI and other research trends in the field of robotics

Text Books

1. Richard DuroYuriy Kondratenko, "Advances in Intelligent Robotics and Collaborative Automation" River Publishers,2015
2. Tom Taulli ,"The Robotic Process automation Hand book, A Guide to Implementing RPA Systems" www.apress.com,2020
3. CapegeminiConsulting"Robotic process automation (RPA)"

Reference Books
1. R. Siegwart, EPFL, IllahNourbakhsh, CMU, Automation and Robotics, Ventus Publisher Aps,2014
Web Resources 1. www.geeksforgeeks.org/robotics-process-automation-an-introduction/?ref=lbp 2. https://onlinecourses.nptel.ac.in/noc21_me76/preview 3. **https://www.uipath.com/rpa/robotic-process-automation**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3													3
2	3	3		3	3										2
3	3	3		2	3										3
4	3	3		2	3										3
5	3	3		2											3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

Students will be able to Predict the suitable method for.

Course Outcome 1 (CO1):(Remember)

1. Discuss about the benefits of robotics.
2. Describe about the Robotic process automation with Artificial Intelligence.

Course Outcome 2(CO2):.(Understanding)

1. Implement the process robotized in a bank

Course Outcome 3 (CO3):(Apply)

1. Apply the robotic process for the environment understanding by the human robot interaction.

Course Outcome 4 (CO4):(Understanding)

1. List out various applications of robot in manufacturing industry

Course Outcome 5 (CO5):(Apply)

1. With schematic diagram, explain the robotic applications in welding industry
2. Create a RPA application for Customer Service to provide the Validation of checks, Customer reminders and notifications , Processing of customer feedback, Out-of-hours responses

21AI6602	Machine Learning Techniques	L	T	P	C
		3	0	0	3

Preamble

This course has been designed to introduce students about the concepts and techniques of machine learning. Comprehend the theoretical concepts and how they relate to the practical aspects of machine learning. Students will gain practical mastery over principle, algorithms and applications of machine learning through a hands-on – approach that includes working on business case studies.

Prerequisites for the course

- 21AI3601- Artificial Intelligence and Expert System
- 21AI3602- Data Science Essentials

Objectives

- To understandabout the basic concepts of machine learning.
- To implement machine leaning algorithm.
- To build tree and rule based models.
- To apply Reinforcement learning techniques

UNIT I	INTRODUCTION TO LEARNING	9

Introduction-Mean and Variance- Marginalization, Independence, Conditioning – Bayes Rule- Inductive and Analytical Learning-Explanation based Learning-Deductive Learning- Knowledge level Learning.

SUGGESTED ACTIVITIES

- Discussion about explanation based learning

SUGGESTED EVALUATION METHODS

- Quiz on knowledge level learning

UNIT II	LINEAR MODELS	9

Logistic Regression-Regression-Multi class Classification-Optimization Algorithm-Hidden Markov Model-Support Vector Regression- Binary Classification-support vector Machine. Case Study:Facial Expression classification using SVM.

SUGGESTED ACTIVITIES

- In-class activity – Support vector Regression
- Flipped classroom on description about optimization algorithm..

SUGGESTED EVALUATION METHODS

- Assignment on Hidden markov model

UNIT III	DISTANCE-BASED MODELS	9

Navie Bayes-Nearest Neighbour Estimators- Perceptron- K- means - K-nearest Neighbour Learning-Locally weighted Regression-Radial Basis Functions-Case Based Reasoning-Navie Bayes classifier-Bayesian Belief Networks-EM Algorithm. Case Study: Identifying fake news using clustering method

SUGGESTED ACTIVITIES

- In-class activity –Case based reasoning
- Flipped classroom on description aboutnavie bayes classifer

SUGGESTED EVALUATION METHODS

- Tutorial on Bayesian Belief Networks

UNIT IV	TREE AND RULE MODELS	9

Decision Trees – Learning Decision Trees – Basic decision tree learning algorithm-Inductive bias in decision tree learning-Handling training samples with missing attributes.

SUGGESTED ACTIVITIES

- In-class activity – Decision trees
- Flipped classroom on description aboutHandling training samples with missing attributes.

SUGGESTED EVALUATION METHODS

- Tutorial on decision tree learning algorithm

UNIT V	REINFORCEMENT LEARNING	9
Learning Task-Q Learning- Nondeterministic rewards and action-Temporal Diffrece Learning-Generalization in Reinforcement Learning- Relationship to Dynamic Programming– Applications In Game Playing – Applications In Robot Control.		
SUGGESTED ACTIVITIES		
• In-class activity – Reinforcement Learning		
SUGGESTED EVALUATION METHODS		
• Assignment on Applications In Game Playing		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS 2.PROBLEM BASED QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO 1 Understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO 2 Develop algorithms for learn Linear and Non-Linear Models.
CO 3 Apply the mathematical relationships within and across Machine Learning algorithms.
CO 4 Implement various machine learning algorithms for various tree and rule based models.
CO 5 Apply Reinforcement Learning Algorithm.

Text Books

1. Alex Smola and S.V.N. Vishwanathan "Introduction to Machine Learning "Cambridge University Press 2008 .
2. T. M. Mitchell, "Machine Learning", McGraw Hill, 2010.
3. Rudolph Russell, "Machine Learning: Step-by-Step Guide To Implement Machine Learning Algorithms with Python" Create Space Independent Publishing Platform,2018

Reference Books

1. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.
2. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.

Web Resources

1. **https://www.ibm.com/cloud/learn/machine-learning**
2. **https://www.coursera.org/learn/machine-learning**
3. **https://nptel.ac.in/courses/106106139**
4. **https://www.kdnuggets.com/2022/10/15-free-machine-learning-deep-learning-books.html**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PSO 2	PSO 3
1	3	3													3
2	3	3		3	3										2
3	3	3		2	3										3
4	3	3		2	3										3
5	3	3		2											3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20

APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

Students will be able to predict the suitable method for.

Course Outcome 1 (CO1): Understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

1. Discuss the difference and tradeoff between two factors of bias and variance. How these factor play a role in machine learning models. Explain.(Analyse)
2. Explain geometric models in detail with example(Remember)
3. What is supervised and unsupervised learning? Explain with the examples.(Understand)

Course Outcome 2 (CO2): Develop algorithms for learn Linear and Non-Linear Models..

1. How to develop /frame inductive learning and summarize the machine learning process?(Analyze)
2. List the advantages of SVM and how optimal Hyperplane differ from Hyper plane.(Analyse)

Course Outcome 3 (CO3): Represent mathematical relationships within and across Machine Learning algorithms

1. Explain the concepts of clustering approaches. How it differ from classification.(Understand)
2. a) If the coordinates of the objects are (0,-3) and (5,8) then what is the Chebyshev distance. b) Discuss MIN algorithm with suitable examples c) Discuss Quantitative variables evaluation in clustering algorithm

Course Outcome 4 (CO4): Implement various machine learning algorithms for various tree and rule based models

1. What do you mean by Gain and Entropy? How is it used to build the Decision tree in algorithm? Illustrate using an example.(Evaluate)
2. What are issues in decision tree learning? Explain briefly How are they overcome? a. Discuss the following issues in detail: a. Avoiding overfitting in Decision Trees b. Incorporating Continuous valued attributes c. Handling Training Examples with Missing attribute values. d. Handling Attributes with Different costs.(Understanding)

Course Outcome 5 (CO5): Apply Reinforcement Learning Algorithm.

1. Explain the Q function and Q Learning Algorithm assuming deterministic rewards and actions with example.(Understanding)
2. What is Reinforcement Learning and explain Reinforcement learning problem with neat diagram.(Understanding)

OPEN ELECVTIVE II

S.No	Course Code	Course Name	Sem	L	T	P	C	DOMAIN
1	21AI6801	Engineering Data Analytics	6	3	0	0	3	Data Analytics
2	21AI6802	Data Visualization for Engineers	6	3	0	0	3	Business Intelligence
3	21AI6803	Big data tools	6	3	0	0	3	Data Science
4	21AI6804	Introduction to Data Mining	6	3	0	0	3	Artificial Intelligence
5	21AI6805	Introduction to Deep Learning	6	3	0	0	3	Machine Learning

21AI6801	Engineering Data Analytics	L	T	P	C
		3	0	0	3

Preamble

Data Analysis & Decision Making aims to introduce the fundamentals of data models tools and methods and related topics. Students will learn how to use mathematical and software tools to analyze the data and make better decisions. The emphasis will be on

modelling and evaluating uncertainty, understanding the nature of decision-making, using data and limited information efficiently, simulating complex systems, and optimally allocating resources.

Prerequisites

- Students should have basic knowledge about data science and data analytics

Objective

- To understand the basics principles of data analytics
- To describe the role of data analytics in decision making
- To contrast and compare which analytic process is suitable for making decision on data.
- Applying various mechanisms of data analytics for decision making
- To give an overall perspective of the importance of data analytics tools used for making decision to solve the problems

UNIT I	INTRODUCTION TO DATA ANALYSIS	9

Data Analytics- Definition-Data Analytics Methods- Data Analytics Process- Data Analytic Techniques-Data Analytics Tools-Data Manipulations-Types of Data-Modifying Data-Creating Distributions from data-Measure of locations- Data Analytics in practice

SUGGESTED ACTIVITIES

- In-class activity – Types of Data

SUGGESTED EVALUATION METHODS

- Assignment on Data Analytics Tools

UNIT II	DECISION MAKING USING DATA ANALYSIS	9

Qualitative Analysis- Quantitative Analysis- Text Analysis-Statistical Analysis- Statistical Analysis System(SAS), SPSS(Statistical Package for the Social Sciences),Stat soft-Diagnostic Analysis- Identify Anomalies- Drill into the analytics- Determine causal Relationship- Predictive Analysis-Fraud Detection-Prescriptive Analysis

SUGGESTED ACTIVITIES

- In-class activity – Statistical Analysis

SUGGESTED EVALUATION METHODS

- Assignment on Predictive Analysis

UNIT III	DATA MODELLING	9

Data Requirement Specification- defining scope-Data collection- Data processing-Data Analysis-Infer and Interpret Results-Data Mining- Data Modelling

SUGGESTED ACTIVITIES

- In-class activity – Data Modelling

SUGGESTED EVALUATION METHODS

- Quiz on - Data processing

UNIT IV	DATA ANALYSIS TECHNIQUES	9

Techniques based on Mathematics and Statistics- Descriptive Analysis-Dispersion Analysis-Regression Analysis- Factor Analysis-Discriminant Analysis- Time Series Analysis- Techniques based on Artificial Intelligence and Machine Learning- ANN- Decision Trees-Evolutionary programming-Fuzzy Logic-Techniques based on Visualization and Graphs-Column, Bar, Line, Area and Pie chart-Map

SUGGESTED ACTIVITIES

- In-class activity – Decision Trees

SUGGESTED EVALUATION METHODS

- Quiz on Time Series Analysis

UNIT V	DECISION MAKING TOOLS	9

Excel- tableau- Power BI- Fine Report- R&Python-SAS-Statistical Analysis using SAS Procedures-Evaluating Quantitative data –Analyzing counts and Tables- Comparing Means using T-tests-Correlation and Regression-Logistic regression

SUGGESTED ACTIVITIES

- In-class activity – Evaluating Quantitative data

SUGGESTED EVALUATION METHODS

Assignment on Comparing Means using T-tests

Total Periods	**45**

Suggestive Assessment methods

Continuous Assessment Test (20Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO1: To familiar with the basics of data analytics techniques
- CO2: Develop the knowledge about quantitative and qualitative analytics for decision making
- CO3:Apply a framework and process for data analytics for forecasting decisions
- CO4: understand the process of various data analysis techniques for decision making
- CO5:To Interpret and recommend the use of various data analytics tools to forecasting the decisions.

Text Books

1.Albright, Winston "Business Analytics-Data Analysis and decision making"5th Edition, Cengage Learning,2015

2.James sails, GeirGripsrud, Ulf H.Olssan,RagnhildSilkoset, "Research Methods and Data Analysis for Business Decisions",2021

3.Umesh R Hodeghatta and UmeshaNayak, Business Analytics Using R - A Practical ApproachApress, 2017.

Reference

1.Jeffery D.Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, Essentials of Business Analytics, Cengage Learning, 2015

2. SandhyaKuruganti, Business Analytics: Applications To Consumer Marketing, McGraw Hill, 2015

3. Bernard Marr, Big Data: Using Smart Big Data, Analytics and Metrics to Make Better Decisions and Improve Performance, Wiley, 2015

Web Resources

1.https://www.datapine.com/blog/data-analysis-methods-and-techniques/

2.https://online.hbs.edu/blog/post/types-of-data-analysis

3.https://www.sap.com/india/products/cloud-analytics/trial.html?campaigncode=CRM-YA22-INT-1517065

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	3									3		
2	3	3	2	3									3		
3	3	2	2	2									3		
4	3	3	3	2	2								2		
5	3	3	3	2	2								2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the different types of data available for data analysis? (Remember)
2. Mention some data analytics techniques used for real-life?(Remember)

COURSE OUTCOME 2:

1.Differentiate quantitative and qualitative analysis (understand)

2.What statistical test used for finding causal relationship between two data? (understand)

COURSE OUTCOME 3:

1. Mention the challenges occurred during data collection (understand)
2. Draw a framework for preprocessing clinical data in data analytics(apply)

COURSE OUTCOME 4:

1.Define ANN. How training data and testing data are fed into the networks of ANN? (understand)

2.Mention the data analytics technique used for handling images and videos(understand)

COURSE OUTCOME 5:

1.What kind of filters are used in excel for classifying a particular data? (understand)

2.Write an R command for forecasting weather (apply)

21AI6802	Data Visualization for Engineers	L	T	P	C
		3	0	0	3

Preamble

This course will cover the fundamentals of effective data-driven storytelling. Students will learn how to detect and articulate the stories behind datasets and communicate data findings in visual, oral, and written contexts for various audiences and publics. Students will become familiar with associated tools.

Prerequisites

- Students should have Basic theoretical concepts ofdata science and data analytics

Objectives

- To Inspect and interpret the engineering data and preparing meaningful and aesthetically pleasing data reports for visualization
- Understand data representations and mappings in order to produce sensible results
- Use their perception to better understand this data
- Understand data distributions, associations and time series
- Apply the visualization techniques for various engineering applications

UNIT I	INTRODUCTION TO VISUALIZATION	9

Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Colour Scales-Colour as a Tool to Distinguish, Colour to Represent DataValues, Colour as a Tool to Highlight, Directory of Visualizations-Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

SUGGESTED ACTIVITIES

- In-class activity – Coordinate Systems

SUGGESTED EVALUATION METHODS

- Assignment on Geospatial Data

UNIT II	TIME-SERIES ANALYSIS AND FORECASTING	9

Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series , Multiple Time Series and Dose–Response Curves, Time Series of Two or More Response Variables, Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time- Series Decomposition , Case study on weather forecasting data

SUGGESTED ACTIVITIES

- Discussion about Multiple Time Series and Dose–Response Curves

SUGGESTED EVALUATION METHODS

- Assignment on weather forecasting data

UNIT III	VISUALIZING DISTRIBUTIONS	9

Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices.

SUGGESTED ACTIVITIES

- In-class activity correlation displays

SUGGESTED EVALUATION METHODS

- Assignment on multivariate analysis

UNIT IV	PROPORTION & ASSOCIATIONS	9

Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions- Nested Proportions, Mosaic Plots and Treemaps, Nested Pies ,Parallel Sets. Visualizing Associations: Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data

SUGGESTED ACTIVITIES

- In-class activity Visualizing Nested Proportions

SUGGESTED EVALUATION METHODS

- Assignment on Nested Pies ,Parallel Sets

UNIT V	**ENGINEERING APPLICATIONS**	**9**

Real time application development: Visualization for control engineering and predictive maintenance of machines – Construction data management through geo-spatial data visualization – Pollution control by visualizing air quality data – Stock Market Trend Prediction through time series analysis – Disaster management by visualizing associations.

SUGGESTED ACTIVITIES

- In-class activity Stock Market Trend Prediction through time series analysis

SUGGESTED EVALUATION METHODS

- Assignment on Pollution control by visualizing air quality data

	Total Periods	**45**

Suggestive Assessment methods

Continuous Assessment Test (20Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO1-Be familiar with key concepts, principles and methods in data visualization and story telling
- CO2 - Understand trend prediction and uncertainties
- CO3 - Visualize data distributions and proportions
- CO4–Able to understand the association rules in data analytics.
- CO5 - Visualize the data in engineering applications and advertently make visual choices

Text Books

1.Cole nussbaumerknaflic, “storytelling with data- a data visualization guide for business professionals”, Willey,2015
2. Claus O.Wilke, “Fundamentals of Data visualization”, O. Reilly Media, First Edition, march 2019
3.Ben Fry, "Visualizing data: Exploring and explaining data with the processing Environment", O'Reilly, 2008.
4. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.
5. Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011.

Reference

1.Gert H. N. Laursen and JesperThorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
2. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
3. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
4. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009.
5. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

Web Resources

1. https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/
2. https://www.kdnuggets.com/2018/06/7-simple-data-visualizations-should-know-r.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	1											
2	3	2	2	1	2										3
3	3	3	3	3	3										3
4	3	3	3	3	3							2			3
5	3	3	3	3	3	2						3			3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

What are some important features of good visualization?(Remember)

What is scatter plot? For what type of data scatter plot used for? (understand)

COURSE OUTCOME 2:

How to visualize time series data using response curves? (apply)

What techniques used for forecasting and time series modeling? (remember)

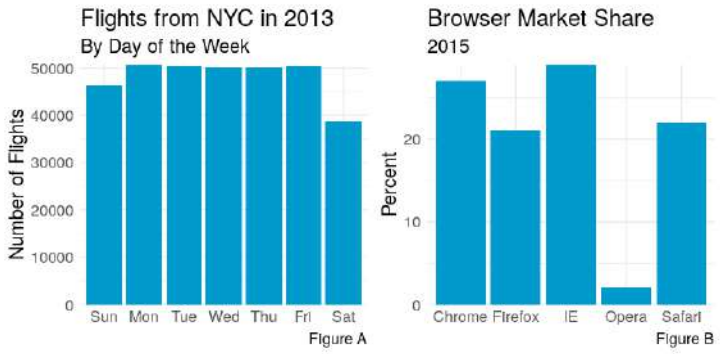
COURSE OUTCOME 3:

A researcher has collected data on three psychological variables, four academic variables (standardized test scores), and the type of educational program the student is in for 600 high school students. She is interested in how the set of psychological variables is related to the academic variables and the type of program the student is in. solve using multivariate regression analysis (Apply)

What statistical analysis can be suggested to find correlation between death rates and infection? (understand)

COURSE OUTCOME 4:

Figure A shows a bar char of the flights leaving NYC airports in 2013 for each day of the week. Figure B shows the market share of five major internet browsers in 2015.



For which of these bar charts would it be better to reorder the categories so the bars are ordered from largest to smallest?

a. Yes for Figure A. No for Figure B.
b. No for Figure A. Yes for Figure B.
c. Yes for both.
d. No for both.

How to you visualize small proportions? (understand)

COURSE OUTCOME 5:

Apply various plot features in R on sample data sets and visualize (Apply)
Explore various data preprocessing option using bench mark data sets (Apply)

21AI6803	BIG DATA TOOLS	L	T	P	C
		3	0	0	3

Preamble

This course focuses on big data technologies used for storage, analysis and manipulation of data. The student will learn about fundamentals of Hadoop, MapReduce, Pig, and Hive and have hand on training on the same It also help to develop projects and apply existing data analytics tools to gain comprehensive knowledge on Data analytics.

Prerequisites for the course

- Java programming
- Big data analytics
- Data science

Objectives

- Outline the basic Hadoop Eco System
- To gain knowledge about the extension of map reduce
- To Acquire knowledge about Hadoop distributed file system
- To have practical knowledge on map reduce application
- To have basic understanding about various big data tools including pig, Hive

UNIT I	INTRODUCTION TO HADOOP	9

Data- Data storage and analysis –Comparing with other system – RDBMS –Grid computing –Volunteer computing- A brief history of Hadoop- Apache Hadoop and Hadoop eco system

SUGGESTED ACTIVITIES

- Install and configure Hadoop
- Use web based tool to monitor Hadoop Setup

SUGGESTED EVALUATION METHODS

- Evaluation of the practical implementation
- Quizzes on topics like HDFS

UNIT II	MAP REDUCE	9

A Weather data set – Analysing the data with Unix tools- Analysing the data with Hadoop- map and reduce- java map reduce-scaling out- data flow –combiner function- running a distributed map reduce job

SUGGESTED ACTIVITIES

- Design and develop MapReduce tasks for word count, searching involving text corpus etc.
- Analysing weather data with Unix tools

SUGGESTED EVALUATION METHODS

- Evaluation of the practical implementation of map reduce
- Quizzes on map reduce

UNIT III	HADOOP DISTRIBUTED FILE SYSTEM	9

The design of HDFS- HDFS concepts- Blocks- name nodes and data nodes-HDFS Federation-HDFS High availability- The command line interface- basic file system operation- Hadoop file system interface – The java interface- Reading data from Hadoop URL- reading the data using file system API- writing data- directories- querying the file system- deleting the data

UNIT IV	MAP REDUCE APPLICATIONS	9

The configuration API- configuring the developing environment- Anatomy of map reduce job run- Classic map reduce- YARN –Failures in classic map reduce- Failure in YARN- Job scheduling- shuffle and sort – Task execution

SUGGESTED ACTIVITIES

- Discuss about difference between classic map reduce and yarn
- Configure the environment for map reduce job scheduling

SUGGESTED EVALUATION METHODS

- Evaluation of the environmental configuration for job scheduling
- Quizzes on extensions of map reduce

UNIT V	EXTENDED BIG DATA FRAMEWORKS	9

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

SUGGESTED ACTIVITIES

- Installation of NoSQL database like MongoDB
- Install and run pig

SUGGESTED EVALUATION METHODS

- Mini Project (Group) – Real time data collection, saving in NoSQL, implements analytical techniques using Map-Reduce Tasks and Result Projection.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the basic Hadoop Eco system
CO2: Write and Demonstrate simple applications involving analytics using Hadoop
CO3: Able to Execute basic file operation using HDFS
CO4: Write and Demonstrate simple applications involving analytics using MapReduce job scheduling
CO5: Simulate various big data technologies like Hadoop MapReduce, Pig, Hive, Hbase and No- SQL.

Text Books

1. Tom White, "Hadoop- The definitive Guide", Third edition, O'Reilly 2012
2. ArvindSathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.

Reference Books

3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series,2012
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012
5. Capriolo, D. Wampler, and J. Ruther glen, "Programming Hive", O_Reilly, 2012

Web Resources

- https://www.geeksforgeeks.org/opencv-overview/
- https://www.geeksforgeeks.org/opencv-overview/
- https://opencv.org/
- https://opencv.org/opencv-computer-vision-with-python/https://opencv.org/opencv-computer-vision-with-python/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1		3			3										3
2	2	3	1	3	2										3

3	1	2	3	2	2	2									2
4		2	2		3										
5	1	2			3	2			2			3			2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Discuss Why Hadoop came into an existence in processing big data? **(Understand)**
2. Justify how hadoop technology satisfies the business insights now -a –days?**(Analyze)**

COURSE OUTCOME 2:

1. Illustrate simple example of the working of map reduce **(apply)**
2. Can map reduce program be written in any language other than java **(Analyze)**

COURSE OUTCOME 3:

1. Describe when not to use Hadoop setup in recent scenario?**(Analyze)**

2.Explain the Hadoop processing of data in Cloud computing and AmazonEC2 with an examples**(understand)**

COURSE OUTCOME 4:

1.Can MapReduce be used to solve any kind of computational problems? if not, explain the cases where MapReduce is not applicable?**(Analyze)**

2.Estimate the entire process of data analysis conducted in the MapReduce programming model?**(Understand)**

COURSE OUTCOME 5:

1. Discuss the use of the FOREACH and ASSERT operator in Pig Latin?**(Understand)**
2. A start-up company wants to use Hive for storing its data. List the collection types provided by Hive for this purpose? Write a shell command in Hive to list all the files in the current directory?**(Apply)**

21AI6804	INTRODUCTION TO DATA MINING	L	T	P	C
		3	0	0	3

Prerequisites for the course

Students should have Basic knowledge in data representation

Course Objectives

1. To provides an introduction to the multidisciplinary field of data mining
2. To introduces techniques for preprocessing the data before mining.
3. To provide a solid introduction to data warehouse, OLAP and data generalization.
4. To presents methods for mining frequent patterns, associations, and correlations in transactional and relational databases and data warehouses
5. To discusses methods for graph and structural pattern mining, social network analysis and multirelational data mining

UNIT I	DATA REPRESENTATION	9

Data Warehouse - A Multidimensional Data Model - Data Warehouse Architecture - Data Warehouse Implementation - From Data Warehousing to Data Mining - Data Cube Computation and Data Generalization - OLAP Technology - Attribute-Oriented Induction - Class Description

SUGGESTED ACTIVITIES

- In-class activity Classification of Data Mining Systems

SUGGESTED EVALUATION METHODS

- Quiz onCluster Analysis

UNIT II	DATA MINING	9

Data Mining –Relational Databases – Data warehouse - Data Mining Functionalities –Cluster Analysis - Classification of Data Mining Systems - Data Mining Task Primitives - Integration of a Data Mining System - Major Issues in Data Mining

SUGGESTED ACTIVITIES

- In-class activity Data Reduction

SUGGESTED EVALUATION METHODS

- Quiz onConcept Hierarchy Generation

UNIT II	**DATA PREPROCESSING**	**9**

Data Preprocessing - Descriptive Data Summarization -Measuring the central tendency - Data Cleaning – Missing Values - Data Integration - Transformation - Data Reduction - Data Discretization - Concept Hierarchy Generation

SUGGESTED ACTIVITIES

- Discussion about Constraint-Based Association Mining

SUGGESTED EVALUATION METHODS

- Quiz onMultidimensional Association Rules

UNIT III	MAPPING AND ASSOCIATION	9

Basic Concepts and a Road Map - Frequent Pattern Mining - Efficient and Scalable Frequent Itemset Mining Methods - Mining Various Kinds of Association Rules - Multidimensional Association Rules - Constraint-Based Association Mining - Metarule-Guided Mining of Association Rules

SUGGESTED ACTIVITIES

- Discussion about OLAP Technology

SUGGESTED EVALUATION METHODS

- Assignment onAttribute-Oriented Induction

UNIT V	CLASSIFICATION AND PREDICTION	9

Classification by Decision Tree Induction - Bayesian Classification - Rule-Based Classification - Classification by Backpropagation -Prediction- Evaluating the Accuracy of a Classifier or Predictor - Ensemble Methods

SUGGESTED ACTIVITIES

- Discussion about Support Vector Machines

SUGGESTED EVALUATION METHODS

- Assignment onEnsemble Methods

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTION QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO603.1: Apply the fundamental knowledge on Data Mining.**(Understand**)

CO603.2. Explain the basics of Data Warehouse. **(Apply)**

CO603.3. Understanding how you can adapt algorithms to use rules in Data Mining**(Understand)**

CO603.4. Infer the importance of classification and prediction**. (Apply)**

CO603.5. To familiarize with Mining Multidimensional Data. **(Understand)**

Text Books

1. Jiawei Han &Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers,Second Edition, 2006
2. Tan, Steinbach &Kumar,Introduction to Data Mining, Pearson; 1st edition, 2016

Reference Books

1.Foster Provost & Tom Fawcett, Data Science for Business: What you need to know about data mining and data-analytic thinking, O'Reilly Media; 1st edition, 2013

2. Ben KlemensModelingwith Data, Princeton University Press,1st edition, 2008

3. Ian H. Witten &EibeFrank,Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann; 3rd edition, 2011

Web Resources

1. https://rstudio-pubs-static.s3.amazonaws.com/162265_9c6aca3804ce468c8f4c46ac79a0b625.html
2. https://www.vssut.ac.in/lecture_notes/lecture1428550844.pdf
3. https://mrcet.com/pdf/Lab%20Manuals/IT/DATA%20WAREHOUSING%20AND%20DATA%20MINING%20(R18A0524).pdf
4. https://backbencher.club/data-mining-and-data-warehousing/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	2		1				1	1			2	2		
2	3	2		1				1	1			2	2		
3	3	2		1				1	1		1	2	2		
4	3	2	2	1			1	1	1		1	2	2		
5	3	2	2	1			1	1	1		1	2	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Describe the taxonomy of data mining tasks. (Apply)
2. Explain the various data mining repositories on which mining can be performed. (Remember)

COURSE OUTCOME 2:

1. List out the OLAP operations and explain the same with an example. (Apply)
2. Describe about dimension modeling in detail. (Remember)

COURSE OUTCOME 3:

1. Explain parametric and non-parametric methods of data reduction. (Remember)
2. Discuss data discretization and concept hierarchy generation. (Remember)

COURSE OUTCOME 4:

1. Discuss the classification by decision tree induction. (Remember)
2. Explain density-based clustering methods in detail. (Remember)

COURSE OUTCOME 5:

1. Explain spatial mining and time series mining. (Remember)
2. Discuss about some of the case studies in data mining applications. (Remember)

21AI6805	INTRODUCTION TO DEEP LEARNING	L	T	P	C
		3	0	0	3

Preamble:
The students assimilate concepts in Machine learning such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.

Prerequisites for the course:

21MA3205 – Probability and Statistics
21IT3602 – Object Oriented Programming with Java
21CS2501 – Introduction to computing using Python

Objectives

1. To adequately understand deep learning on real-world datasets
2. To offer sufficient understanding of neural networks
3. Toadequately comprehendthe basics of deep learning
4. To give real-time systems with complete knowledge of deep learning methods and packages

UNIT I	MACHINE LEARNING	9

Introduction to Machine Learning- Learning Algorithms - Capacity,Overfitting and Underfitting - Hyper parameters and Validation Sets - Maximum Likelihood Estimation - Bayesian Statistics - Supervised and Unsupervised Learning Algorithms - Stochastic Gradient Descent - Building a Machine Learning Algorithm – Challenges in Deep Learning

SUGGESTED ACTIVITIES:

- PPT on challenges in deep learning

SUGGESTED EVALUATION METHODS:

- Seminar Discussions

UNIT II	NEURAL NETWORKS	9

Introduction-The Basic Architecture of Neural Networks-Practical Issues in Neural Network Training-Unconventional Neural Architectures-Common Neural Architectures-Reinforcement Learning-Generative Adversarial Networks

SUGGESTED ACTIVITIES:

- PPT on Reinforcement Learning

SUGGESTED EVALUATION METHODS:

- Assignment

UNIT III	CONVOLUTIONAL NEURAL NETWORKS	9

The Basic Structure of a Convolutional Network-Training a Convolutional Network-Visualization and Unsupervised Learning-Case Studies of Convolutional Architectures-Applications of Convolutional Networks

SUGGESTED ACTIVITIES:

- Tutorial ProblemsConvolutional Networks

SUGGESTED EVALUATION METHODS:

- Assignments

UNIT IV	RECURRENT NEURAL NETWORKS	9

The Architecture of Recurrent Neural Networks-The Challenges of Training Recurrent Networks-Long Short-Term Memory (LSTM)-Gated Recurrent Units (GRUs)-Echo-State Networks-Applications of Recurrent Neural Networks

SUGGESTED ACTIVITIES:

- Tutorial Problems Long Short-Term Memory

SUGGESTED EVALUATION METHODS:

- Assignments on Applications of Recurrent Neural Networks

UNIT V	DEEP NEURAL NETWORKS	9

Back propagation: The Gory Details-Setup and Initialization Issues-The Vanishing and Exploding Gradient Problems-Gradient-Descent Strategies-Parameter-Specific Learning Rates-Gradient Clipping-Cliffs and Higher-Order Instability-Acceleration and Compression

SUGGESTED ACTIVITIES:

- Case study problems in Cliffs and Higher-Order

SUGGESTED EVALUATION METHODS:

- Seminars

Total Periods	**45 Periods**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. Descriptive Questions 2. Problem solving Questions	1.Assignment 2. Descriptive type questions	1. Descriptive Questions 2. Problem solving Questions

Outcomes

Upon completion of the course, the students will be able to:
CO1 Characterize the machine learning algorithms as supervised learning and unsupervised learning and
CO2Examine the basics of neural network problems
CO3Analyse the concept of reinforcement learning
CO4 Assess the concepts in recurrent neural models and its methods
CO5Decipher the principles of Deep neural networks and its applications

Text Books

1. Charu C. Aggarwal – Neural Networks and Deep Learning. A Textbook, 2018.
2. Ian Goodfellow, YoshuaBengio, Aaron Courville - Deep Learning, 2017.

Reference Books

1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by AurélienGéron
2. "Deep Learning with Python" by François Chollet
3. Applied Deep Learning: A Case-Based Approach to Understanding Deep Neural Networks" by Umberto Michelucci

Web Resources

1. https://www.geeksforgeeks.org/neural-networks-a-beginners-guide/
2. https://www.coursera.org/learn/convolutional-neural-networks
3. https://www.udacity.com/course/deep-reinforcement-learning-nanodegree--nd893
4. https://www.coursera.org/courses?query=recurrent%20neural%20network
5. https://youtu.be/pLPr4nJad4A

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1			1						1	3		
2	1	2	1			1						1	3		
3	1	1	2			1						1	3		
4	1	2	1			1						1	3		
5	1	2	1			1						1	3		

BLOOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	30	30	05	05	20
UNDERSTAND	20	20	10	10	20
APPLY	20	20	05	05	20
ANALYZE	20	20	05	05	20
EVALUATE	10	10			20

CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1): (Apply).

Consider a data set in which the two points {(−1, −1),(1, 1)} belong to one class, andthe other two points {(1, −1),(−1, 1)} belong to the other class. Start with perceptronparameter values at (0, 0), and work out a few stochastic gradient-descent updates withα = 1. While performing the stochastic gradient-descent updates, cycle through thetraining points in any order.

(a) Does the algorithm converge in the sense that the change in objective function becomes extremely small over time?

(b) Explain why the situation in (a) occurs.

COURSE OUTCOME 2 (CO 2) : (Apply)

Consider an activation volume of size 13×13×64 and a filter of size 3×3×64. Discusswhether it is possible to perform convolutions with strides 2, 3, 4, and 5. Justify youranswer in each case.

COURSE OUTCOME 3(CO 3) : (Apply)

Consider the well-known game of rock-paper-scissors. Human players often try to usethe history of previous moves to guess the next move. Would you use a Q-learning ora policy-based method to learn to play this game? Why? Now consider a situation inwhich a human player samples one of the three moves with a probability that is anunknown function of the history of 10 previous moves of each side. Propose a deeplearning method that is designed to play with such an opponent. Would a well-designeddeep learning method have an advantage over this human player? What policy shoulda human player use to ensure probabilistic parity with a deep learning opponent?

COURSE OUTCOME 4(CO 4) : (Apply)

Consider a social network with a large volume of messages sent between sender-receiverpairs, and we are interested only in the messages containing an identifying keyword,referred to as a hashtag. Create a real-time model using an RNN, which has thecapability to recommend hashtags of interest to each user, together with potentialfollowers of that user who might be interested in messages related to that hashtag.Assume that you have enough computational resources to incrementally train an RNN.

COURSE OUTCOME 5(CO 5) : (Apply)

Discusses two variants of back propagation, which use the pre-activationand the post activation variables,

respectively, for the dynamic programming recursion.Show that these two variants of back propagation are mathematically equivalent.

PROFESSIONAL ELECTIVE III

1.	21AI6701	Java programming for AI	6	3	0	0	3	AI
2.	21IT6708	Data Wrangling	6	3	0	0	3	Data Science
3.	21CS7708	5G communications	6	3	0	0	3	Networking
4.	21IT6707	Software Project Management	6	3	0	0	3	Software Engineering
5.	21AI6702	Image Processing and pattern Recognition	6	3	0	0	3	Image Processing
6.	21CS6601	Compiler Design	6	3	0	0	3	Computation and Programming
7.	21CS7709	Block Chain Technologies	6	3	0	0	3	Recent Trends

21AI6701	JAVA PROGRAMMING FOR AI	L	T	P	C
		3	0	0	3

Preamble

Java is a powerful programming language that is used to create Artificial Intelligence applications. It is a high-level language, meaning it is easier for humans to read & write code in it. Java is also an object-oriented language, which allows for easier development of AI algorithms.

Prerequisites for the course

- Artificial intelligence
- Java programming

Objectives

- To understand the primary representational constructs in java
- To acquire knowledge on problem spaces and search
- To build a predicate calculus and unification problem solver
- To understand a logic based reasoning system
- To acquire knowledge about experts system shell

UNIT I	OBJECT-ORIENTED PROGRAMMING	9

Introduction to O-O representation and Design- Object orientation –Classes and Encapsulation-polymorphism- Inheritance- interfaces- Scoping and access-The java standard library

SUGGESTED ACTIVITIES

- 1.Role play for encapsulation and polymorphism`

SUGGESTED EVALUATION METHODS

- Implement primary representational constructs using java
- Implement java with oop emerged program

UNIT II	PROBLEM SPACES AND SEARCH	9

Abstraction and generality in java- Search Algorithm- Abstracting problem states –Traversing the solution space.

SUGGESTED ACTIVITIES

- Perform traversing problem using java
- Apply search algorithm for simple applications

SUGGESTED EVALUATION METHODS

- Apply search algorithm on a problem space
- Plot a framework with different problem states using search algorithm

UNIT III	PREDICATE CALCULUS AND UNIFICATION IN JAVA	9

Introduction to the task- a review of the predicate calculus and unification- building a predicate calculus problem solver in java-Design discussion- conclusion: Mapping logics into objects

SUGGESTED ACTIVITIES		
• Perform a predicate calculus problem solver in java • Mapping task logics into objects		
SUGGESTED EVALUATION METHODS		
• Use java framework to Build a task using predicate calculus and unification • Build a problem solver in java for centralized air conditioning system		
UNIT IV	**LOGIC BASED REASONING**	**9**
Introduction Reasoning in Logic as Searching an And/or Graph -The Design of a Logic-Based Reasoning System -Implementing Complex Logic Expressions -Logic-Based Reasoning as And/or Graph Search -Testing the Reasoning System		
SUGGESTED ACTIVITIES		
• Discuss about reasoning system • Discussion about Complex Logic Expression		
SUGGESTED EVALUATION METHODS		
• Use the Java framework to create depth-first, breadthfirst, and best-first solutions for the Missionary and Cannibal problem • Use the Java framework for implementing complex logic expression		
UNIT V	**EXPERT SYSTEM SHELLS**	**9**
Introduction: Expert Systems -Certainty Factors and the Unification Problem Solver - Adding User Interactions - Design Discussion -Case Studies: JESS and other Expert System Shells in Java-Introduction JESS Other Expert system Shells Using Open Source Tools		
SUGGESTED ACTIVITIES		
• Case Studies on JESS • Discussion about open source tools for an expert system		
SUGGESTED EVALUATION METHODS		
• Demonstrate user interaction for any problem statement using java • Discussion about certainty factors and the unification problem solver		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes
Upon completion of the course, the students will be able to:
CO1:implement primary representational constructs in java **CO2:**Apply various search algorithm for simple applications **CO3:**Apply a predicate calculus and unification problem solver in java **CO4:**Implement logic based reasoning system **CO5:**Implement experts system shell using open source
Text Books
1. George F Luger, William A stubble field, " AI algorithms, Data structures, and idioms in prolog, Lisp and java , Pearson Education, 2009 2. S.Russell and P.Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
Reference Books
1. Bratko, ―Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011 2. R.Szeliski,- computer vision: algorithms and application || springer 2011 3. Wolfgang Ertel& Nathanael T. Black," Introduction to Artificial Intelligence", Second Edition, Springer,2018
Web Resources • https://hackernoon.com/16-best-resources-to-learn-ai-machine-learning-in-2019-f95c4f59018b • https://learndigital.withgoogle.com/digitalgarage/course/elements-artificial-intelligence • https://www.udemy.com/course/artificial-intelligence-iii-in-java/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2							1		
2	3	2	2			2							1		
3	3	2	2			2							2		
4	3	2	2			2							2		
5	3	2	2			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10

UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Create an inheritance hierarchy for a heating and air conditioning system for a building using centralized heating/cooling sources. Attempt to make the overall control parallel and asynchronous. Capture your design with an inheritance diagram. **(Apply)**

2.Create an inheritance hierarchy for an elevator control system. Take, for example a fifteen-story building and three elevators. Capture your design with an inheritance diagram**(Apply)**

COURSE OUTCOME 2:

1.Use the Java framework to create depth-first, breadthfirst and best-first solutions for the Missionary and Cannibal problem. Three missionaries and three cannibals come to the bank of a river they wish to cross. There is a boat that will hold only two, and any of the group is able to row. If there are ever more missionaries than cannibals on any side of the river the cannibals will get converted. Devise a series of moves to get all the people across the river with no conversions**(Apply)**

2. Use the Java framework of to create depth-first, breadthfirst, and best-first solutions for the Water Jugs problem: There are two jugs, one holding 3 and the other 5 gallons of water. A number of things can be done with the jugs: they can be filled, emptied, and dumped one into the other either until the poured-into jug is full or until the poured-out-of jug is empty. Devise a sequence of actions that will produce 4 gallons of water in the larger jug. (Hint: use only integers.) **(Apply)**

COURSE OUTCOME 3:

1. Representing predicate calculus expressions as Java objects simplifies our implementation, but makes it hard to write the expressions. Write a “front end” to the problem solver that allows a user to enter logical expressions in a friendlier format. Approaches could include using java **(Apply)**

2.Review the recursive list-based unification algorithm. Run that algorithm on the predicate pairs of friends (George, X, Y), friends(X, fred, Z), and friends(Y, bill, Tuesday). Which pairs unify, which fail and why? (**Apply)**

COURSE OUTCOME 4:

1. Implement a factory pattern for generating solutionNodes, and compare it to the approach taken in the chapter. A factory would be a class, named solutionNodeFactory with methods that would take any needed variables and return an instance of the class solutionNodes.**(Apply)**

2. Write a interactive front end to the logical reasoner that will read in a logical knowledge-base from a file using java and then enter a loop where users enter goals in the same language, printing out the results, and then prompting for another goal.**(Apply)**

COURSE OUTCOME 5:

1.Modify the definition of the nextSolution method of the classes ESSimpleSolutionNode and ESAndSolutionNode to fail a line of reasoning if the certainty factor falls below a certain value (0.2 or 0.3 are typical values). Instrument your code to count the number of nodes visited and test it both with and without pruning.**(Apply)**

2. Build a front-end to support user interaction around askable predicates. In particular, it should keep track of answers that have been received, and avoid asking the same question twice. This means it should keep track of both expressions and substitutions that have been asked. An additional feature would be to support asking users for actual substitution values, and adding them to the substitution set**(Apply)**

21IT6709	**DATAWRANGLING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Preamble					
Thiscoursefocusesontheprinciples,techniques,andtoolsinvolvedintransformingraw,unstructured,orincompletedataintoaformatsuitableforanalysisanddecision-making.Studentswilllearndatapre-processing,transformation,integration,andqualityassurancemethods. Practical exercises using popular tools like Pandas, and dplyr will enhance their skills inimplementing data wrangling techniques. The course aims to develop students' ability to handlecomplexdata,derive insights,andcommunicate resultseffectively.					
Prerequisitesforthecourse					

- 21CS2501–IntroductiontoComputingusingPython
- 21IT4603–DataBaseSystems

Objectives

1. Tounderstandtheimportanceofdatawranglinginanalysisanddecision-making.
2. Tounderstandthetechniquestopre-process,andtransformdataeffectively.
3. Tolearntechniquesforintegratingandmergingdiversedatasources.
4. Toanalysetheproficiencyofparsingandextractingdatafromvariousformats.
5. Toapplyadvanceddatawranglingtechniquestosolvereal-worldchallenges.

UNITI	INTRODUCTIONTODATAWRANGLING	9

Overview - Data wrangling process - Data cleaning - pre-processing techniques - Data qualityassessment - handling missing values - Dealing with outliers and noisy data - Exploratory dataanalysisandvisualization

UNITII	DATATRANSFORMATIONANDINTEGRATION	9

Datatransformationtechniques:normalization,scaling,andfeatureengineering-**Dataintegration:** merging, joining, and concatenating datasets - Handling data inconsistencies andresolvingconflicts - Dataaggregation andsummarization-datareshapingandpivoting

UNITIII	DATAPARSING ANDEXTRACTION	9

Structuredandunstructureddata-Techniquesforparsing-extractingdatafromvariousfileformats-Webscraping-dataextractionfrom websites -ExtractingdatafromdatabasesandAPIs -Handlingsemi-structureddata.

UNITIV	DATAWRANGLING TOOLS	9

Datawranglinglibrariesandpackages-customfunctionsfordatawranglingtasks-automatingdatawranglingprocesses-handlinglargedatasetsandmemoryoptimizationtechniques

UNITV	ADVANCEDDATAWRANGLINGTECHNIQUES	9

Handling time series data and temporal data wrangling - working with geospatial data - location-basedservices-handlingmultilingualtextdata-handlingdatainconsistencies-resolvingconflicts - Strategies for dealing with complex data structures - **Case Study:** Data Wrangling inHealthcare - ImprovingPatientOutcomeAnalysis

TotalPeriods	**45**

SuggestiveAssessmentMethods

ContinuousAssessmentTest (20Marks)	**FormativeAssessmentTest (20Marks)**	**EndSemesterExams (60Marks)**
1.DESCRIPTIVEQUESTIONS	1. ASSIGNMENT 2. MCQ	1.DESCRIPTIVEQUESTIONS

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1–Understandthedatawranglingtechniquestoclean,pre-process,andtransformdata.

CO2–Understandthediversedatasourcestocreatecomprehensive datasets.

CO3–Analyzedatatoderivemeaningfulinsightsandmakeinformeddecisions.

CO4–Applydatawranglingtoolsfor complexdatastructurestoresolveinconsistencies.

CO5–Evaluateandeffectivelycommunicatedatawranglingresultsthroughvisualizationsandreports.

TextBooks

1. WesMcKinney,"PythonforDataAnalysis",O'ReillyMedia,2ndEdition,2017**(UnitI–III)**
2. JacquelineKazilandKatharineJarmul"DataWranglingwithPython",O'ReillyMedia,1stEdition2016 **(Unit IV& V)**

ReferenceBooks

1. Jacques Joubert "Data Wrangling with Python: Tips and Tools to Make Your Life Easier",PacktPublishing, 1st Edition,2019
2. TimWilliams"DataWranglingwithPython:CreatingPandasDataFrames",O'ReillyMedia,1st Edition,2016
3. Dr. Paula Groves Price "Practical Data Wrangling: Expert Techniques for TransformingYourData", Apress,1st Edition,2020
4. Michael Grogan "Data Wrangling with Python Cookbook: Over 100 practical recipes ondatapre-processing,wrangling,andexplorationusingPython",PacktPublishing,1stEdition, 2019

WebResources

1. www.udemy.com/course/data-wrangling-and-manipulation-with-pandas
2. www.datacamp.com/courses/data-wrangling-with-python

COVs.POMappingandCOvs.PSOMapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	2	2	2	1	2									2
2	2	2	2	1	2									2
3	2	2	1	1	2	1								2

21CS7704	5G COMMUNICATIONS	L	T	P	C
		3	0	0	3

Preamble

This course is to understand the engineering aspects of this rapidly developing field, as well as emerging systems for the support of broadband mobile internet. 5G wireless technology is meant to deliver higher multi-Gbps peak data speeds, ultra-low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users. Higher performance and improved efficiency empower new user experiences and connects new industries.

Prerequisites for the course

21IT7704 - Wireless Adhoc and Sensor Networks

Objectives

1. To understand the concept of 5G
2. To understand about the RF front end for 5G.
3. To have knowledge on the various 5G wave forms.
4. To be familiar in the Networking of 5G.
5. To Understand the emergence of the applications and evaluation of 5G

UNIT I	INTRODUCTION AND ROAD MAP TO 5G	9

Historical trend and evolution of LTE technology to beyond 4G – Key building blocks of 5G –5G use cases and System Concepts – The 5G Architecture – IoT: relation to 5G.

UNIT II	RF FRONT END FOR 5G	9

4	2	2	1	1	2	1								2
5	2	2	1	1	2	1								2

Millimeter Wave Communications: Hardware technologies for mmW systems – Architecture and Mobility – Massive MIMO: Resource allocation and transceiver algorithms for massive MIMO -Fundamentals of baseband and RF implementations in massive MIMO-Beamforming.

UNIT III	5G WAVE FORMS AND CHANNEL MODELS	9

5G Radio Access Technologies: Design principles - multi-carrier with filtering – Non orthogonal Multiple Access - Radio Access for V2X Communication -Radio access for massive machine-type communication - 5G wireless propagation channel models: Modelling requirements and scenarios–The METIS channel models.

UNIT IV	NETWORKING IN 5G	9

Coordinated multi-point transmission in 5G: Joint Transmission CoMP Enablers-Distributed cooperative transmission - JT CoMP with advanced receivers - Relaying and network coding in 5G: multi-flow wireless back hauling-Buffer aided relaying.

UNIT V	EVALUATION OF 5G AND 5G APPLICATIONS	9

Machine-type communications: Fundamental techniques for MTC - Massive MTC - Ultra-reliable low-latency MTC - Device-to-device (D2D) communications - Multi-hop D2D communications -Multi-operator D2D communication-Simulation methodology: Evaluation methodology–Calibration-New challenges in the 5G modelling.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
DESCRIPTIVE QUESTIONS	ASSIGNMENT ONLINE MCQ	DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand the use cases and System Concepts 5G.
CO2 Understand the key and enabling technologies that help in the development of 5G.
CO3 Apply the Radio Access Technologies in 5G wave forms and channel models.
CO4 Analyze the core concepts of networking in 5G.
CO5 Apply the 5G Modelling techniques to solve the challenges in 5G Applications.

Text Books

1. Wei Xiang, Kan Zheng, Xuemin(Sherman) Shen,-5G Mobile Communications, Springer,2017.(Unit I – V)

Reference Books

1. Afif Osseiran, JoseF. Monserrat and Patrick Marsch, -5G Mobile and Wireless Communications Technology, Cambridge University Press,2016.
2. Jonathanrodriguez, -Fundamentals of 5G mobile networks, John Wiley &Sons, Ltd, 2015.

BLOOMSLEVELASSESSMENTPATTERN

BLOOMS CATEGORY	CAT1	CAT2	FAT1	FAT2	END SEME XAM
REMEMBER					
UNDERSTAND	30	30	10	10	30
APPLY	40	40	10	10	40
ANALYZE	30	30	5	5	30
EVALUATE					
CREATE					

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	3	2		1									3	
2	3	3	2		1									3	
3	3	3	2		1									3	
4	3	3	2		1									3	
5	3	3	2		1									3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20

EVALUATE					
CREATE					

21IT6707	SOFTWAREPROJECTMANAGEMENT	L	T	P	C
		3	0	0	3

Preamble

Thiscourseaimstoequipparticipantswithessentialprojectmanagementskills,tools,and techniques specifictosoftwareprojects.Itemphasizestheimportanceofeffectiveplanning,communication, risk management, and quality assurance in software project delivery. This courseencourages active participation, collaboration, and the application of theoretical concepts throughcase studies. By the end of this course, the students can expect an enriching learning experiencethatpreparesthemforsuccessfulsoftwareprojectmanagement.

Prerequisitesforthecourse

21IT3604–IntegratedSoftwareEngineering

Objectives

1. Tounderstandthematuritymodelsandtheprocessofsoftwareprojectmanagement.
2. Tounderstandthemanagementrenaissanceofthesoftwareproject.
3. Toapplytheworkflows andestimations intheprojectplan.
4. Toanalyzetheprocessautomationsandevolutionoforganizations.
5. Todevelopsoftwareproductusingconventionalandmodernprinciplesofsoftwareprojectman agement.

UNITI	SOFTWAREPROCESSMATURITY	9

SoftwarematurityFramework,PrinciplesofSoftwareProcessChange,SoftwareProcessAssessment,TheInitialProcess,TheRepeatableProcess,TheDefined Process,TheManagedProcess, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM),CMMI,PCMM, PSP,TSP).

UNITII	SOFTWAREPROJECTMANAGEMENTRENAISSANCE	9

ConventionalSoftwareManagement,EvolutionofSoftwareEconomics,ImprovingSoftwareEconomics, The old way and the new way.Life-Cycle Phases and Process artifacts Engineeringand Production stages, inception phase, elaboration phase, construction phase, transition phase,artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-basedsoftwarearchitectures.

UNITIII	PROJECTPLANNING	9

Software process workflows, Iteration workflows, Major milestones, minor milestones, periodicstatusassessments.ProcessPlanningWorkbreakdownstructures,Planningguidelines,Timelines-GANTTChartscostandscheduleestimatingprocess,iterationplanningprocess,Pragmaticplanning.

UNITIV	PROJECTORGANIZATIONS	9

Line-of-businessorganizations,projectorganizations,evolutionoforganizations,processautomation. Project Control and process instrumentation The seven-core metrics, managementindicators,qualityindicators,life-cycleexpectations,Pragmaticsoftwaremetrics,metricsautomation.		
UNITV	**SOFTWAREMANAGEMENTPRACTICES**	**9**
SCRUM-CCPDS-RCaseStudyandFutureSoftwareProjectManagementPracticesModernProjectProfiles, Next-Generationsoftware Economics,Modern ProcessTransitions.		
	TotalPeriods	**45**

SuggestiveAssessmentMethods

ContinuousAssessmentTest(20 Marks)	**Formative Assessment Test(20Marks)**	**End Semester Exams(60Marks)**
1.DESCRIPTIVEQUESTIONS	1. ASSIGNMENT 2. MCQ	1.DESCRIPTIVEQUESTIONS

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1–Understandthematuritymodelsandtheprocessofsoftwareprojectmanagement.

CO2–Understandthemanagementrenaissanceofthesoftwareproject.

CO3–.Applytheworkflowsandestimationsinprojectplan.

CO4–Analyzetheprocessautomationsandevolutionoforganizationsofvariousprojectorganizations.

CO5–Designsoftwareproductusing conventional and modernprinciplesof softwareprojectmanagement

TextBooks

1.BobHughes,MikeCotterel,RajibMall,“SoftwareProjectManagement”,6thEdition,McGraw-Hill,2018

ReferenceBooks

1. RobertK.Wysocki,“EffectiveSoftwareProjectManagement”WileyPublication,2011.

2. WalkerRoyce,”SoftwareProjectManagement”,Addison-Wesley,1998.

3. GopalaswamyRamesh,“ManagingGlobalSoftwareProjects”McGrawHillEducation(India), FourteenthReprint2013

WebResources

1. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/

COVs.POMappingandCOvs.PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	3							2	2	2	
2	2	2	3	2							3	2	2	
3	3	2	2	2							2	2	2	
4	3	2	3	2							2	2	2	
5	3	2	3	2							2	2	2	

BLOOMSLEVELASSESSMENTPATTERN

BLOOMS CATEGORY	CAT1	CAT2	FAT1	FAT2	END SEMEXAM
REMEMBER					

UNDERSTAND	60	40	10	5	50
APPLY	20	20	10	10	30
ANALYZE	20	40	5	10	20
EVALUATE					
CREATE					

21AI6702	Image Processing and pattern Recognition	L	T	P	C
		3	0	0	3

Preamble

- The aim of this course is to provide students with knowledge and abilities to understand Image processing techniques and a Pattern recognition.

Prerequisites for the course

- 21CS5701 Computer Graphics

Objectives

1. To recognize the image, its representations and properties
2. To be familiar with images pre processing applications Techniques.
3. To Understand the techniques used in Neural network for pattern recognition.
4. To learn the techniques about cluster analysis.

UNIT I	Introduction	9

Image representation and image analysis tasks - Image representations - Image digitization:SamplingQuantization-Digital image properties- Color images: Color spaces,Color perceived by humans,Palette images, Color constancy.

SUGGESTED ACTIVITIES

Demonstrate image analysis, for both quantitative and qualitative measure.

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SUGGESTED EVALUATION METHODS

Assignment and puzzle in image representation.		
UNIT II	**Image pre-processing**	**10**
Pixel brightness transformations: Position-dependent brightness correction, Gray-scale transformation - Geometric transformations: Pixel co-ordinate transformations, Brightness interpolation,Local pre-processing - Image restoration.		
SUGGESTED ACTIVITIES		
• Demonstrate Pixel co-ordinate transformations& Brightness		
SUGGESTED EVALUATION METHODS		
• Quiz in pixel ,Assignment .		
UNIT III	**Pattern Recognition**	**10**
Introduction – Significance and potential function of the pattern Recognition system – configuration pattern Recognition system – Representation of pattern and approaches to their Machine recognition – Paradigm Application – Supervised and unsupervised Learning pattern recognition.		
SUGGESTED ACTIVITIES		
• Discuss about minimum distance classifier • Demonstrate the potential function of the pattern Recognition system.		
SUGGESTED EVALUATION METHODS		
• Assignment in Illustrate the one dimension pattern space		
UNIT IV	**Neural Network for Pattern recognition**	**8**
Multilayer Perceptron : Pattern mappings in multilayer perceptron , Radial Basis Function Networks: RBF Network Training , Comparison of RBF Networks ,Hamming Net , Kohonen self – organizing Feature map		
SUGGESTED ACTIVITIES		
• Demonstrate Hamming set.		
SUGGESTED EVALUATION METHODS		
• Assignment on problem solving		
UNIT V	**Cluster Analysis**	**8**
Introduction – Clustering with known and unknown number of classes – Evaluation of clustering results by various Algorithms – Graph Theoretical methods		
SUGGESTED ACTIVITIES		
• Discuss about types of clustering Algorithms		

SUGGESED EVALUATION METHODS	
• Puzzle.	
Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Describe Digital image fundamentals and outline different image enhancement techniques (Apply)

CO2: Apply segmentation techniques on Digital Images (Apply)

CO3: Apply the pattern and approaches to Machine recognition approach (Apply)

CO4:Apply Neural Network for Pattern recognition(Apply)

CO5: Analyze clustering results by various Algorithms.(Apply)

Text Books

1. **Image Processing, Analysis, andMachine Vision**Fourth Edition**Milan Sonka***The University of Iowa, Iowa City***Vaclav Hlavac***Czech Technical University, Prague***Roger Boyle** *Prifysgol Aberystwyth, Aberystwyth*

2. Pattern Recognition and Image Pre processing second edition revised andexpanded K.J Ray Liu University of Maryland

Reference Books

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1.Pattern Recognition and Machine LearningChristopher M. Bishop F.R.Eng.Assistant Director Microsoft Research Ltd Cambridge CB3 0FB, U.K. cmbishop@microsoft.com http://research.microsoft.com/_cmbishop

2. IMAGE PROCESSING AND PATTERN RECOGNITION Fundamentals and Techniques FRANK Y. SHIH

Web Resources

1. https://neptune.ai/blog/image-processing-
2. https://www.tutorialspoint.com/image processing /index.htm
3. https://www.v7labs.com/blog/pattern-recognition-guide
4. https://www.geeksforgeeks.org/pattern-recognition-introduction/
5. https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		
5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

Acquire some RGB images. Develop software to convert them into YIQ and HSI representations.Subject them to various degrees of noise and convert back to RGB for display.

Course Outcome 2 (CO2): (Apply)

1.Give examples of situations in which brightness transformations, geometric transformations, smoothing, edge detection, and/or image restorations are typically applied.

Course Outcome 3 (CO3): (Apply)

Give the Sample vector z1=(0,0)

Z2=(-1,-1)

Z3=(2,2)

Z4=(4,0)

Z5=(4,1)If they are presented numerical order repeatedly,give the sequence of weight vectors and the solution generated by using fixed increment correction rule.

Course Outcome 4 (CO4): (Apply)

Consider a multilayer network with N inputs,K hidden units , and M Output Units. Write down an expression for the ttal number of weights and biases in the network.

Course Outcome 5 (CO5): (Apply)

1. .From the mean and covariance of the normally distributed multi variate problems,we can estimate the center and the shape of the cluster given relative values of m,c11,c12,c21,c22.Draw the center and the shape of the clusters for different cases:

Case 1:

M^t=[0 0]

C11=C22=1

C12=C21=0

Case 2:

M^t=[2 0]

C11 >C22

C12=C21=0

Case 3:

M^t=[0 0]

C11<C22

C12=C21=0

21CS6601	COMPILER DESIGN	L	T	P	C
		3	0	0	3

Preamble

This course emphasizes programming language translation and compiler design concepts. This Course describes the theory and practice of compilation, in particular, language recognition symbol table management, the lexical analysis, parsing , semantic analysis and code generation and optimization phases of compilation, and design a compiler for a concise programming language

Prerequisites for the course

- 21CS5601-Theory of Computation

Objectives

1. To learn the various phases of compiler and techniques for tokenization
2. To learn the various parsing techniques
3. To understand intermediate code generation and run-time environment
4. To learn to implement front-end of the compiler
5. To learn to implement code generator

UNIT I	INTRODUCTION TO COMPILERS - LEXICAL ANALYSIS	9

Structure of a compiler – Grouping of phases into passes- Language Processing System- Compiler construction tools -Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

Suggested Activities:

- Constructs for phases of compiler
- LEX tool for tokenization
- Problems based on conversion from NFA to DFA, Epsilon NFA to DFA

SUGGESTED EVALUATION METHODS:

- Assignment problems

- Quizzes

UNIT II	SYNTAX ANALYSIS	9

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

Suggested Activities:

- CFG for C language constructs
- Push down automata for Parsing
- programs using YACC for parsing

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT III	INTERMEDIATE CODE GENERATION	9

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

Suggested Activities:

- Semantic rules for three-address code for a programming language like C.
- Implementation of three-address code generation
- Type checking semantic rules for a programming language like C

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT IV	RUN-TIME ENVIRONMENT AND CODE GENERATION	9

Source Language Issues - Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Basic blocks and flow graphs - DAG construction-Issues in Code Generation - Design of a simple Code Generator- Code generator using DAG

Suggested Activities:

- Storage Organization and Storage Allocation Strategies for a programming language like C
- Simple code generator for a programming language like C
- Partitioning of Basic blocks and flow graphs.
- Template based code generation.
- Simple code generator for a programming language like C.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT V	CODE OPTIMIZATION	9

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks-Global Data Flow Analysis.

Suggested Activities:

- Applying optimization techniques in a flow graph locally and globally
- Peephole optimization techniques.
- Global Data Flow Analysis.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ 3.PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO1 Understand the Lexical Analysis phase and issues in all phases of compiler. (Understand)
- CO2 Apply different parsing algorithms to develop the parsers for a given grammar. (Apply)
- CO3 Apply syntax-directed translation to generate intermediate code for programming constructs. (Apply)
- CO4 Implement a simple code generator by understanding of its Runtime Environment (Apply)
- CO5 Apply optimization techniques in code generation (Apply)

Text Books

- Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education Limited, 2014**.(UNIT I TO V)**

Reference Books

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002. **(UNIT I TO V)**
2. Steven S. Muchnick, Advanced Compiler Design and Implementation||, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003. **(UNIT I TO V)**
3. Keith D Cooper and Linda Torczon, Engineering a Compiler||, Morgan Kaufmann Publishers Elsevier Science, 2004. **(UNIT I TO V)**
4. V. Raghavan, Principles of Compiler Design||, Tata McGraw Hill Education Publishers, 2010. **(UNIT I TO V)**

Web Resources

https://onlinecourses.nptel.ac.in/noc21_cs07/preview
https://www.geeksforgeeks.org/introduction-of-compiler-design/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2	PSO 3
1	3	3	3									2	3		
2	3	3	3	3									3		

3	3	3		3									3		
4	3	3	3	3									3		
5	3	3	3										3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	10	10	30
UNDERSTAND	20	10	10	10	30
APPLY	60	80	5	5	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Understand the Lexical Analysis phase and issues in all phases of compiler. (Understand)

1. What are the different phases of compiler? (Remember)
2. Define the issues in the design of Lexical Analysis. (Understand)
3. Trace the output of each of the phases of compiler for the expression position:= initial+rate*60. (Apply)

Course Outcome 2 (CO2): Apply different parsing algorithms to develop the parsers for a given grammar. (Apply)

1. What is the role of the Parser? (Remember)
2. Compare Top down and bottom up parsing Techniques. (Understand)
3. Explain how the Predictive parsing can be constructed. (Apply)
4. Construct SLR Parsing Table for a Grammar.(Apply)

Course Outcome 3 (CO3): Apply syntax-directed translation to generate intermediate code for programming constructs. (Apply)

1. Discuss about Syntax Directed Translation. (Understand)
2. What are the forms of Intermediate representation? (Remember)
3. Explain the specification of Simple Type checker. (Understand)
4. Generate a three address code for a source program by applying syntax directed definition

Course Outcome 4 (CO4): Implement a simple code generator by understanding of its Runtime Environment (Apply)

1. What are the issues in the design of code generator? (Remember)
2. Explain the various Storage Allocation strategies.(Understand)
3. How storage can be organized? (Understand)
4. Generate a target code for the three address code and generate a DAG representation.(Apply)

Course Outcome 5 (CO5): Apply optimization techniques in code generation

1. What is Peephole optimization? (Remember)
2. Illustrate with an example the Principal Sources of optimization.(Understand)
3. Draw the DAG for the expression a:=b*c+b*c. (Apply)

21CS7705	BLOCK CHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

Preamble

A blockchain is a permanent, sequential list of transaction records distributed over a network. Each block in the chain contains a hash of the previous block, along with a timestamp and transaction data.Bitcoin and other cryptocurrencies use blockchain technology to record transactions. Blockchain for business applications can include recording of contracts, medical records, monetary transactions and much more.

Prerequisites for the course

- 21CS5602 - Computer Networks

Objectives

1. To learn the concept of blockchain
2. To learn the applications and design methodology of blockchain
3. To learn the working of ethereum account.
4. To learn the concept of decentralized applications,mining and whisper.
5. To learn swarm and the advanced trends in blockchain

UNIT I	BLOCKCHAIN TECHNOLOGY	9

Blockchain Evolution –Structure –Characteristics - Blockchain stack- Decentralized computation platform-Decentralized Storage Platform-Decentralized Messaging Platform-Smart Contracts-Decentralized Applications-Domain Specific BlockChain Applications-Benefits-Challenges.		
UNIT II	**BLOCKCHAIN COMPONENTS AND APPLICATION**	**9**
Blockchain Application Templates-application components-Design Methodology for BlockchainApplications- Application Templates- Setting up Ethereum Development Tools-Ethereum Clients – Ethereum Languages-TestRPC-MistEthereum Wallet-MetaMask-Web3 JavaScriptAPI-Truffle.		
UNIT III	**ETHEREUM ACCOUNTS**	**9**
Ethereum Accounts-keypairs-working with EOA Accounts-Working with Contract Accounts-SmartContract- structure- setting up and interacting with a contract using GethClient-Setting up and interacting with a Contract using Mist Wallet-Smart Contract Examples-smart contract patterns.		
UNIT IV	**DECENTRALIZED APPLICATIONS, MINING, WHISPER**	**9**
Decentralized applications-implementing Dapps - Case studies- Mining-Consensus on Blockchain Network- Mining stages-Block validation-Stetting up Mining Node-State Storage in Ethereum-Whisper-Protocol-Whisper Routing approaches-API.		
UNIT V	**SWARM, ADVANCED TOPICS**	**9**
Swarm architecture and concepts-incentive mechanism in swarm—Swarm setup-working-case study. Advanced topics on block chain		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
DESCRIPTIVE QUESTIONS	ASSIGNMENT ONLINE MCQ	DESCRIPTIVE QUESTIONS
Course Outcomes		
Upon completion of the course, the students will be able to:		
CO1 Understand the concept of blockchain CO2 Understand the applications and design methodology of blockchain		

CO3 Apply the methods needed to create account in ethereum

CO4 Analyze the applications in decentralized mining and Whisper Routing approaches

CO5 Analyze the swarm architecture and Advanced topics on block chain

Text Books

1. Arshdeep Bahga, Vijay Madisetti, "Block Chain Applications- A Hands-On Approach"UniversityPress,2017.

Reference Books

1. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press,2019.
2. Josh Thompson,'Blockchain:TheBlockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform,2017.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs44

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	1						1			3	
2	3	1	2	1	1						1			3	
3	3	1	2	1	1						1			3	
4	3	1	2	1	1						1			3	
5	3	1	2	1	1						1			3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	5	20
APPLY	40	40	5	10	50
ANALYZE		30	5	5	20

EVALUATE					
CREATE					

Professional Elective– IV

1.	21AI6703	Machine Learning Operations (Industry Supported Course)	6	2	0	1	3	AI
2.	21AI6704	Recommendation systems	6	3	0	0	3	Data Science
3.	21IT7704	Wireless Adhoc and Sensor Networks	6	3	0	0	3	Networking
4.	21IT7713	Software Testing and tools	6	3	0	0	3	Software Engineering
5.	21CS5704	Virtual and Augmented Reality	6	3	0	0	3	Image Processing
6.	21CS7710	Full Stack Application Development	6	3	0	0	3	Computation andProgramming
7.	21IT6711	Quantum Computing	6	3	0	0	3	Recent Trends

21AI 6703	**Machine Learning Operations** **(Industry Supported Course)**	**L**	**T**	**P**	**C**
		2	**0**	**1**	**3**

Preamble

- **This course enables the student to learn the fundamentals of MLops with Python programming. They will be able to create, manipulate and operate on classes and objects to utilize them for real world problem solving and will be able to deploy an end to end system of MLOps.**

Prerequisites

- **Basics Of Programming**

Objectives

- To understand the Machine Learning algorithms, features and Fundamentals of MLops.
- To implement MLOps architecture efficiently.
- To understand the end to end architecture of an MLOps system.
- To develop an ML model optimize, deploy and visualize it on the dashboard.

UNIT I	INTRODUCTION TO MLOPS AND ITS KEY CONCEPTS	6

Overview of MLOps and its importance - Key concepts: DevOps vs. MLOps

Understanding the machine learning lifecycle - Database Management systems - What is Artificial Intelligence - Machine Learning - Deep Learning - Types of Machine Learning - Concept of Regression, Classification - Supervised Learning - Unsupervised Learning

Suggested Activities:

- Practical Implementation of basic regression & Classification programs
- Understand the structure of the MLOps

SUGGESTED EVALUATION METHODS:

- Assignment programs
- Quiz

UNIT II	VERSION CONTROL FOR ML AND ML ALGORITHMS	6

Branching strategies for ML projects - Handling large datasets - Machine Learning Algorithms - - Random Forest - Support Vector Machine - KNN - Unsupervised Learning : PCA - realtime implementation of the above algorithms - Data Preprocessing.

Hands on Algorithms

Suggested Activities:

- Implement ML Algorithms
  - Support Vector Machine
  - Random Forest
  - KNN
  - Unsupervised Learning : PCA
- Dataset preprocessing

SUGGESTED EVALUATION METHODS:

- Assignment programs
- Quiz

UNIT III	TRAINING, TESTING AND MODEL ANALYSIS	6

Training - testing - validation for machine learning models - Deployment strategies and best practices - performance analysis - Graphical representations - Hands on Training - Testing and Deployment

Suggested Activities:

- Practical usage of ML models
- Training the model
- Testing the model
- Performance analysis of multiple algorithms
- Deployment strategies to be applied

UNIT IV	CONTINUOUS INTEGRATION AND DEPLOYMENT (CI/CD) , DESIGN DASHBOARDS& INTEGRATIONS	6

Setting up CI/CD pipelines for ML projects - Dashboards - types of Databases - MySQL - Data reading - exporting - Building tables - read data - Dashboard connections - Python DB interactions.

Suggested Activities:

- Build CI/CD pipelines
- Build MySQL DB
- DB integrations

SUGGESTED EVALUATION METHODS:

- Assignment programs
- Quiz

UNIT V	MODEL MONITORING AND MANAGEMENT	6

Introduction to model monitoring - Implementing monitoring tools for ML models - DBMS - Grafana Visualization - Hands on Visualization - Hands on End to End development and deployment of the problem statement

Suggested Activities:

- DB Integration
- Dashboard Integration
- End to development, Deployment and Visualization of a problem statement

SUGGESTED EVALUATION METHODS:

- Assignment programs

- Quiz

S.No	List of Experiments	CO
1	Programs on SVM	CO2
2	Programs on Random Forest	CO2
3	Programs on KNN	CO2
4	Programs on Unsupervised Learning : PCA	CO2
5	Programs on Dataset Handling	CO3
6	Programs on Training, Testing, Graphical visualization and deployment	CO3
7	Programs on Performance analysis	CO3
8	Programs on MySQL DB handling	C04
9	Programs python - DB connections	CO4
10	Programs to integrate ML - DB - Grafana .	CO5
11	Task to build Grafana Dashboards	CO5
12	Build real time MLOps systems for end to end product deployment and monitoring purposes	CO5

Total Periods	**30Theory+30Lab**

Laboratory Requirements

- 60 Systems with windows/LINUX operating system with python IDLE.

Suggestive Assessment

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (20 Marks)**	**End Semester Exams (50 Marks)**
1.DESCRIPTIVE QUESTIONS	1. LAB EXPERIMENTS 2. MODEL EXAMINATION	1.DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: To understand the structure of MLOps.(Understand)
CO2: To build ML algorithms and their version controls (Apply)
CO3: To train, test, visualize graphically, deploy and make performance analysis of the model (Apply)
CO4: To build CI/CD platforms and dashboard structures (Apply).

CO5: To Develop and deploy MLOps systems completely using the above strategies and integrate with DB and visualize using Dashboard .(Apply)

Text Books

1. "Building Machine Learning Powered Applications: Going from Idea to Product" by Emmanuel Ameisen:

a. Description: This book provides practical insights into transitioning from machine learning models to real-world, production-ready applications. It covers various aspects of the machine learning pipeline, including data collection, feature engineering, model training, deployment, and monitoring. The author shares valuable experiences and best practices for implementing MLOps in a production environment.

2. "Data Science on AWS" by Chris Fregly and Antje Barth:

a. Description: While not exclusively focused on MLOps, this book covers a broad range of topics related to building end-to-end data science solutions on Amazon Web Services (AWS). It includes sections on deploying machine learning models at scale, integrating with AWS services, and managing the entire machine learning lifecycle. The authors provide practical guidance on implementing MLOps practices within the AWS ecosystem.

Reference Books

1. Building Machine Learning Pipelines" by Hannes Hapke and Catherine Nelson:

a. Description: This book emphasizes the importance of building effective machine learning pipelines. It covers topics like data preparation, model training, deployment, and monitoring, offering insights into creating robust and scalable MLOps workflows.

2. Production-Ready Machine Learning" by Matthew D. Russell and Jerry Overton:

a. Description: Focused on the practical challenges of deploying machine learning models to production, this book provides real-world examples and best practices. It covers topics such as model governance, monitoring, and maintaining ML systems in production environments.

3. Machine Learning Engineering" by AndriyBurkov:

a. Description: While not exclusively about MLOps, this book provides valuable insights into the engineering aspects of machine learning. It covers topics such as data engineering, model training, and deployment, offering a holistic view of the end-to-end machine learning process.

4. Building Machine Learning Powered Applications: Unleash the Power of Artificial Intelligence by Creating, Training, and Deploying" by Michael Manapat:

a. Description: This book covers the practical aspects of building machine learning applications and deploying them into production. It includes case studies and examples that help readers understand the challenges and solutions in operationalizing machine learning.

Web Resources

https://nptel.ac.in/courses/106/105/106105191/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	2	3	3									3		
2	3	3	3	3									3		
3	3	3	2	3									3		
4	3	3	2	3									3		

5	3	3	3	3									3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	Lab Components	Model Exam	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 : Introduction to MLOps and its key concepts

Participants will gain an overview of MLOps and understand its significance, including key concepts such as the difference between DevOps and MLOps. They will also explore the machine learning lifecycle, database management systems, and fundamental concepts in artificial intelligence, machine learning, deep learning, and types of machine learning with a focus on regression and classification.

Course Outcome 2 : Version Control for ML and ML Algorithms

This module covers version control strategies for ML projects, handling large datasets, and delves into machine learning algorithms, including Random Forest Regressor, Support Vector Machine, KNN and PCA in unsupervised learning. Participants will engage in hands-on algorithmic exercises.

Course Outcome 3 : Training Testing and model analysis

This module covers training the model, testing the model, realtime and best practices for ML model deployments including graphical representation and algorithmic performance analysis. Which enables the candidates to build a ML model, train, test, analyze the performance and deploy suitably.

Course Outcome 4 : Continuous Integration and Deployment (CI/CD) , Dashboards, DBMS & Integrations

Participants will learn to set up CI/CD pipelines for ML projects, involving training, testing, and deploying machine learning models. The module emphasizes deployment strategies, best practices, and includes hands-on training, testing, and deployment exercises. This module introduces participants to dashboards, types of databases, specifically MySQL, and covers data reading, exporting, building tables, reading data, dashboard connections, and Python DB interactions.

Course Outcome 5 : Model Monitoring and Management

Participants will be introduced to model monitoring and its implementation, including monitoring tools for ML models, database management systems, and Grafana visualization. The module includes hands-on visualization exercises and an end-to-end development and deployment project.

21AI6704	Recommendation system	L	T	P	C
		3	0	0	3

Preamble

A recommendation system is an intelligent system that predicts and suggests items that a user is likely to be interested in based on their past behaviors, preferences, and other relevant data. Recommendation systems are used in a wide range of applications, such as e-commerce, online advertising, social networking, and content personalization.

Prerequisites for the course

NIL

Objectives

1. Understanding the fundamentals of recommendation systems
2. Learning the main techniques and algorithms used in recommendation systems
3. Developing practical skills in building recommendation systems
4. Understanding the challenges and considerations involved in designing and implementing recommendation systems
5. Understanding the evaluation and metrics used in recommendation systems

UNIT I	Introduction to Recommendation System	10
Introduction- Goals of Recommender Systems - Basic Models of Recommender Systems - Domain-Specific Challenges in Recommender Systems - Neighbourhood-Based-Based Collaborative Filtering- Predicting Ratings with Neighbourhood-Based Methods- Clustering and Neighbourhood-Based Methods		
SUGGESTED ACTIVITIES		
• To explore and evaluate different types of recommendation algorithms and their effectiveness in addressing the goals of recommender systems.		
SUGGESTED EVALUATION METHODS		
• Assignments • Quiz		
UNIT II	**Content-based recommender systems**	**10**
The long-tail principle-Domain-specific challenges in recommender systems-Content-based recommender systems-Advantages and drawbacks-Basic components of content-based RSs-Feature selection - Item representation Methods for learning user profiles.		
SUGGESTED ACTIVITIES		
• To analyze and evaluate the application of content-based recommender systems in a particular domain, considering the long-tail principle and domain-specific challenges		
SUGGESTED EVALUATION METHODS		
• Assignments • Quiz		
UNIT III	**Collaborative Filtering in Recommender Systems**	**10**
Nearest-neighbourcollaborative filtering (CF)-User-based and Item-based CF comparison-Components of neighbourhood methods: Rating normalization, Similarity weight computation, Neighbourhood selection. Hybrid recommender systems-Mathematical optimization in Collaborative Filtering –Recommender System: Optimization objective		
SUGGESTED ACTIVITIES		
• To design and implement a hybrid recommender system that combines both user-based collaborative filtering (CF) and item-based CF approaches.		
SUGGESTED EVALUATION METHODS		
• Assignments • Quiz		
UNIT IV	**Context-Sensitive Recommender Systems**	**8**
Introduction to Context-Sensitive Recommender Systems - Multi-dimensional Approach- Contextual pre filtering- Post Filtering Methods-Contextual modelling-Latent factor-Factorization Machines Content based Model-Social and Trust-Centric Recommender Systems -Other Application of Context-Sensitive		

Recommender System.

SUGGESTED ACTIVITIES

- To design and present a context-aware recommender system that incorporates contextual pre-filtering and post-filtering methods.

SUGGESTED EVALUATION METHODS

- Assignments
- Quiz

UNIT V	Performance evaluation	7

Experimental settings-Working with Recommender Systems data sets examples- The cold-start problem-Evaluation metrics- Rating prediction and accuracy-Other metrics: fairness, coverage, diversity, novelty, serendipity. Evaluating Recommender Systems-General Goals of Evaluation Design- Design Issues in Offline Recommender Evaluation- Accuracy Metrics in Offline Evaluation.

SUGGESTED ACTIVITIES

To design and conduct an evaluation study to assess the effectiveness of social trust-centric recommender systems in comparison to other traditional recommender systems..

SUGGESTED EVALUATION METHODS

- Assignments
- Quiz

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS 2. ANALYZIS TYPE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES	1.DESCRIPTIVE QUESTIONS 2. ANALYZIS TYPE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand the fundamentals of recommendation systems, including the different types of recommendation systems and their applications.

CO2 Analyze and implement traditional and non-personalized recommendation systems, including collaborative filtering and content-based filtering.

CO3 Apply data mining methods to recommendation systems, including similarity measures, classification, Bayes classifiers, ensembles of classifiers, clustering, SVMs, and dimensionality reduction.

CO4 Evaluate the performance of recommendation systems using metrics such as precision, recall, F1 score, accuracy, AUC, RMSE, and MAE.

CO5 Understand the optimization principles used in recommendation systems, including convex optimization and linear optimization.

Text Books

1. • C.C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. • F. Ricci, L Rokach, B. Shapira and P.B. Kantor, Recommender systems handbook, Springer 2010..

Reference Books

6. J. Leskovec, A. Rajaraman and J. Ullman, Mining of massive datasets, 2nd Ed., Cambridge, 2012.
7. M. Chiang, Networking Life, Cambridge, 2010. (Chapter 4).

Web Resources

4. **https://www.jmlr.org/**
5. **https://recsys.acm.org/**
6. **https://grouplens.org/datasets/movielens/**
7. **http://snap.stanford.edu/**
8. **http://surpriselib.com/**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1			2							3		
2	1	2	1			2							3		
3	1	2	1			2							3		
4	1	2	1			2							3		
5	1	2	1			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20

EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

In an e-commerce platform, how can we apply neighbourhood-based collaborative filtering to recommend products to users based on their purchase history and similarities with other users, considering the scalability of the system and the need for real-time recommendations?

Considering the movie recommendation domain, how can we combine clustering techniques with neighbourhood-based collaborative filtering methods to improve the accuracy and diversity of movie recommendations, taking into account user preferences and item similarities?

Course Outcome 2 (CO2): (Apply)

How can we effectively address the long-tail problem in content-based recommender systems, where a significant portion of items has limited or no user interactions, making it challenging to provide accurate recommendations?

What are effective methods for learning and updating user profiles in content-based recommender systems, considering the dynamic nature of user preferences and the availability of diverse types of content information?

Course Outcome 3 (CO3): (Apply)

Can an in-depth analysis of nearest-neighbour collaborative filtering techniques shed light on their strengths, weaknesses, and potential improvements, allowing for a more comprehensive understanding of their applicability and effectiveness in addressing recommendation challenges?

How can we efficiently compute similarity weights between users in a large-scale collaborative filtering recommendation system, considering millions of users and their interaction patterns?

Course Outcome 4 (CO4):(Apply)

How can we address the cold-start problem in recommender systems and develop robust evaluation metrics that accurately measure the performance and effectiveness of recommendations, taking into account the unique challenges posed by new or scarce user and item data?

How can we effectively design and utilize accuracy metrics in offline evaluation of recommender systems to accurately measure the quality and accuracy of recommendations, considering factors such as user preferences, item relevance, and the dynamic nature of user interactions?

Course Outcome 5 (CO5): (Apply)

How can we effectively incorporate multiple dimensions of context into recommender systems to improve the accuracy and relevance of recommendations in dynamic and context-dependent environments?

21IT7704	WIRELESSADHOCANDSENSOR NETWORKS	L	T	P	C
		3	0	0	3

Preamble

This course provides the knowledge on wireless communication, wireless local area, personalarea, and wide area technologies, **wireless ad hoc networks:**link layer issues and mediumaccesscontrol,adhocrouting,transportlayerproblems,**wirelesssensornetworks:**architectures, medium accesscontrol,routing, andenergyefficiency.

Prerequisitesforthecourse

- 21IT4602–DataCommunicationandComputerNetworks.

Objectives

- Tounderstandthebasicconceptsof wirelessLANandPAN.
- Tounderstandthe issuesandclassificationsofMACprotocol.
- Toapplytheknowledge oftabledriven,on-demandandhybridroutingprotocols.
- Toapplythetransportlayersecurityprotocols.
- Toanalyzethevariousissuesinwirelessadhocnetworks.

UNITI	WIRELESSLANSAND PANS	9

Introduction–FundamentalsofWLANS–IEEE802.11Standards–HIPERLANStandard–Bluetooth–HomeRF.Wirelessadhocnetworks:Introduction–IssuesinWirelessAdHocNetworks.

UNITII	MACPROTOCOLS	9

Introduction – Issues in Designing a MAC protocol for Wireless Ad Hoc Networks– Design goalsof a MAC Protocol for Wireless Networks – Classifications of MAC Protocols – MAC Protocols thatuseDirectionalAntennas.

UNITIII	ROUTINGPROTOCOLS	9

Introduction–IssuesinDesigningaRoutingProtocolforWirelessAdHocNetworks– ClassificationofRoutingProtocols– **TableDrivenRoutingProtocols**:OLSR&STAR,**OnDemandRoutingProtocols**:AODV&TORA– **HybridRoutingProtocols:**ZRP&ZHLS–**Locationaware Protocols:**GPSR& GLR.		
UNITIV	**TRANSPORTLAYERPROTOCOLS**	**9**
Introduction–DesignGoalsof aTransportLayer Protocolfor AdHocWirelessNetworks– ClassificationofTransportLayerSolutions–TCPOverWirelessAdHocNetworks– OtherTransportLayerProtocolforAdHoc WirelessNetworks.		
UNITV	**SECURITYINWIRELESSADHOCNETWORKS**	**9**
Security issues in ad hoc networks - Keying Management- Security Requirements - Attacks on adhocNetworks-**SecureRouting:**SecureAODV,ARAN,SEADandMASK-Intrusiondetectionsystems.		
	TotalPeriods	**45**

SuggestiveAssessmentMethods

ContinuousAssessmentTest (20Marks)	**FormativeAssessmentTest (20Marks)**	**EndSemesterExams (60Marks)**
1.DESCRIPTIVEQUESTIONS	1. ASSIGNMENT 2. MCQ	1.DESCRIPTIVEQUESTIONS

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1–UnderstandthebasisofwirelessAd-hocnetworks.

CO2–Understandthedesign,operationandtheperformanceofMAClayerprotocolsofwirelessAd-hocnetworks.

CO3–Applytheoperationandperformanceofroutingprotocolofwirelessad-hocnetwork.

CO4– Apply thedesign,operationand the performanceoftransportlayer protocolof WirelessAd-hocnetworks.

CO5–AnalyzetheimportanceofsecurityinwirelessAd-hocnetworks.

TextBooks

1. C.SivaRamMurthy,"AdHocWirelessNetworks:ArchitecturesandProtocols",AddisDorlingKindersley (India), 2ndEdition,2012.**(UnitI –IV)**
2. FarooqAnjumandPetrosMouchtaris,"Securityforwirelessadhocnetworks",WileyIntersciencepublication,1st Edition,2010.**(Unit V)**

ReferenceBooks

1. HaiLu,YiuwingandXiaawen"AdhocandsensorWirelessNetworks:Architectures,AlgorithmsandProtocols",Benthem press, 1stEdition,2018.
2. Luigi,Gennaro,Giuseppe,YaserandClaudis,"Ad-HocNetworksandWireless",ADHOC-NOW2020Proceedings, Springer, 4thEdition,2020.

WebResources

1. https://archive.nptel.ac.in/courses/106/105/106105160/**(UnitII–Week6,UnitV–Week8)**

COVs.POMappingandCOvs.PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	2		1		1						2
2	2	2	2	2	1						1	1		2
3	2	2	2	2	1						1	1		2
4	2	2	2	2	1						1	1		2
5	2	2	2	2	1		1		1	1	1	1		2

BLOOMSLEVELASSESSMENTPATTERN

BLOOMS CATEGORY	CAT1	CAT2	FAT1	FAT2	END SEMEXAM
REMEMBER					
UNDERSTAND	70	70	15	15	70
APPLY	30	30	10	10	30
ANALYZE					
EVALUATE					
CREATE					

21IT7713	SOFTWARETESTINGANDTOOLS	L	T	P	C
		3	0	0	3

Preamble

This course is designed to enhance the knowledge of software testing for enriching their career asasoftwaredeveloper.Itacquiresappropriateskillstodesigngoodtestcases,performcodewalkthroughs, bug detection, prepare test plan document for successful tests and get exposed toTestautomation tools.

Objectives

- Tounderstandthebasicsofsoftwaretesting
- Tounderstandthetestingprocessforvarioustestcases.
- Tounderstandvarioustypesoftestingusetestprocedures
- Toapplyvarioustestcasesonmobile andwebapplications.
- ToapplyseleniumandTestNGtoolfortestautomation.

UNITI	FOUNDATIONSOFSOFTWARETESTING	9

Overview - Black-Box Testing and White-Box Testing - Software Testing Life Cycle- V-model ofSoftware Testing - Program Correctness and Verification - Reliability versus Safety-Failures -Errors and Faults (Defects)- Software Testing Principles - Program Inspections- Stages of Testing:UnitTesting, IntegrationTesting,SystemTesting

UNITII	TESTPLANNING	9

Goal of Test Planning - High Level Expectations - Intergroup Responsibilities - Test Phases - TestStrategy-ResourceRequirements-TesterAssignments-TestSchedule-TestCases-BugReporting,Metrics andStatistics.

UNITIII	TESTDESIGN ANDEXECUTION	9

TestDesignFactors-Requirementidentification-TestableRequirements-ModellingaTestDesign Process - Modelling Test Results - Boundary Value Testing - Equivalence Class Testing -PathTesting-DataFlowTesting-TestDesignPreparednessMetrics-TestCaseDesignEffectiveness-Model-DrivenTestDesign-TestProcedures-TestCaseOrganizationandTracking,BugReporting-BugLifeCycle - securecodingpracticeandinputvalidation.		
UNITIV	**ADVANCEDTESTINGCONCEPTS**	**9**

PerformanceTesting: LoadTesting,StressTesting,VolumeTesting,Fail-OverTesting-Recovery Testing - Configuration Testing - Compatibility Testing - Usability Testing, Testing theDocumentation, Security testing - security testing techniques - Testing in the Agile Environment -TestingWeb andMobile Applications.		
UNITV	**TESTAUTOMATIONANDTOOLS**	**9**
Automated Software Testing - Automate Testing of Web Applications - **Selenium:** IntroducingWeb Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different WebDrivers,UnderstandingWebDriverEvents,UnderstandingTesting.xml,AddingClasses,Packages,Methods toTest,Test Reports.TestNG		
	TotalPeriods	**45**

SuggestiveAssessmentMethods

ContinuousAssessmentTest (20Marks)	**FormativeAssessmentTest (20Marks)**	**EndSemesterExams (60Marks)**
1.DESCRIPTIVEQUESTIONS	1. MCQ 2. ASSIGNMENT	1.DESCRIPTIVEQUESTIONS

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:

CO1–Understandthebasicconceptsofsoftwaretestingandtheneedforsoftwaretesting

CO2–Understandhowtestingcanbedoneforvarioustestcases.

CO3–Understandeffectivetestcasesthatcanuncovercriticaldefectsintheapplication

CO4–Applyvarioustestcasesonmobileandwebapplications.

CO5–ApplytheSeleniumandTestNGtoolsforsoftwaretesting

TextBooks

1. UnmeshGundecha, SatyaAvasarala, "Selenium Web Driver 3 Practical Guide" - Second Edition2018

ReferenceBooks

1. GlenfordJ.Myers,CoreySandler,TomBadgett,"TheArtofSoftwareTesting",3rdEdition,JohnWiley& Sons,Inc.,2012
2. PaulC.Jorgensen,"SoftwareTesting:ACraftsman'sApproach",FourthEdition,Taylor&FrancisGroup, 2014.
3. CarlCocchiaro,"SeleniumFrameworkDesigninData-DrivenTesting",PacktPublishing,2018.
4. SatyaAvasarala,"SeleniumWebDriverPracticalGuide",PacktPublishing,2014
5. VarunMenon,"TestNGBeginner'sGuide",PacktPublishing,2013

WebResources

1. http://seleniumhq.org/
2. http://sourceforge.net/projects/sahi/
3. http://testing.org/doc/index.html

COVs.POMappingandCOvs.PSOMapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1		1								3	
2	2	2	1	1	1				3				2	
3	2	2	1	2	1				2				3	
4	2	1	2	2	1				2				3	
5	2	2	1	2	1				2				2	

BLOOMSLEVELASSESSMENTPATTERN

BLOOMS CATEGORY	CAT1	CAT2	FAT1	FAT2	END SEMEXAM
REMEMBER					
UNDERSTAND	60	60	15	15	60
APPLY	40	40	10	10	30
ANALYZE					
EVALUATE					
CREATE					

21CS5704	VIRTUAL AND AUGMENTED REALITY	L	T	P	C
		3	0	0	3

Preamble

This course provide the fundamental knowledge about virtual reality and augmented reality using the modelling and rendering aspects of a VR system. It provides knowledge and understanding in 3D analogy and modelling geometry.

Prerequisites for the course

- Engineering drawing, Computer graphics

Objectives

1. To impart knowledge on To introduce virtual reality and input and output devices

2. To acquire knowledge on computing architectures and modeling
3. To explore VR programming and human factors
4. To learn various applications of VR
5. To get exposure on augmented reality

UNIT I	INTRODUCTION TO VIRTUAL REALITY AND INPUT AND OUTPUT DEVICES	9

Introduction: The three I's of Virtual Reality - A short history of early virtual reality - Early commercial VR technology - VR becomes an industry - The five classic components of a VR system. Input devices: Three-Dimensional position trackers - tracker performance parameters - ultrasonic trackers - optical trackers - navigation and manipulation interfaces - gesture interfaces. Output devices: graphics displays - large-volume displays - sound displays.

Suggested Activities:

- Assignment on trackers and its types
- Flipped Class room – How audio video analogies are retrieved using output devices

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment Problems

UNIT II	COMPUTING ARCHITECTURES AND MODELING OF A VR SYSTEM	9

Computing architectures for VR: The rendering pipeline - The graphics rendering pipeline - The haptics rendering pipeline - PC graphics architecture - PC graphics accelerators - Graphics benchmarks - Distributed VR architectures - Multipipeline synchronization - Colocated rendering pipelines. Modeling: geometric modeling - kinematics modeling - physical and behavior modeling

Suggested Activities:

- Assignment on rendering process and pipeline
- Group discussion – Modeling 3d environments with different depth factor.

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment Problems

UNIT III	VR PROGRAMMING AND HUMAN FACTORS	9

Toolkits and scene graphs **-** WorldToolKit - Model geometry and appearance - The WTK scene graph - Sensors and action functions - WTK networking - Java 3D - Model geometry and appearance - Java 3D scene graph - Sensors and behaviors - Java 3D networking - WTK and Java 3D performance comparison –Human factors in VR: Methodology and terminology - user performance studies - VR health and safety issues - VR and society

Suggested Activities:

- Practicing WTK installation and understand – WorldToolKit's user interface functions.
- Flipped Class room- Which is best WTK or Java 3D.

SUGGESTED EVALUATION METHODS:

• Quizzes • Assignment Problems		
UNIT IV	**APPLICATIONS OF VR**	**9**
Medical applications of VR - Virtual anatomy - Triage and diagnostic - Surgery - VR in education - VR and the Arts - Entertainment applications of VR - military VR applications - Army use of VR - VR applications in the Navy - Air force use of VR - Applications of VR in Robotics - Robot programming - Robot teleoperation		
Suggested Activities: • Assignment on applications of VR in real world. • Discussion Topic- Future applications of VR in its extreme.		
SUGGESTED EVALUATION METHODS: • Quizzes • Assignment Problems		
UNIT V	**AUGMENTED REALITY**	**9**
Augmented reality: An overview: Introduction - History - Augmented reality technologies - Computer vision methods in AR - AR devices - AR interfaces - AR systems. Visualization techniques for augmented reality: data integration - Depth perception - Augmenting pictorial depth cues - Occlusion handling - Image based X-ray visualization - Scene manipulation: Rearranging real world objects - Space-distorting visualization – Context driven visualization.		
Suggested Activities: • Discussion Topic- Augmented reality in 3d gaming. • Practicing Augmented reality using android apps.		
SUGGESTED EVALUATION METHODS: • Quizzes • Assignment Problems		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS

Course Outcomes
Upon completion of the course, the students will be able to:
CO1 Identify different input and output devices used in virtual reality system (Remember)

CO2 Model the VR system(Apply)
CO3 Create scene graph using different toolkits(Apply)
CO4 Apply VR in various fields(Apply)
CO5 Apply visualization techniques for AR(Apply)

Text Books

1. Grigore C. Burdea, Philippe Coiffet, "Virtual reality technology", Wiley, Second Edition, 2006
2. "Handbook of Augmented Reality", Borko Furht, Springer, 2011.

Reference Books

1. Sherman, William R & Craig, Alan B, "Understanding Virtual reality", Elsevier India Private Limited, Noida, 2008 .

Web Resources

1. https://nptel.ac.in/courses/121106013
2. https://archive.nptel.ac.in/courses/106/106/106106138/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3		3										3
2	3	3	3		3										3
3	3	2	3	3	3										3
4	3	3		3	3										3
5	3	3		3											3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50

ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for.(Apply)

Course Outcome 1 (CO1):

1. Define Virtual reality (Remember)
2. Examine the classic components of a VR system.(Apply)
3. Differentiate graphics and large volume displays. (Analyse)

Course Outcome 2 (CO2):

1. How can you access the rendering pipeline? (Remember)
2. Whether a haptics rendering pipeline? (Apply)
3. Write about kinematics modelling. (Create)

Course Outcome 3 (CO3):

1. List the different categories of toolkit. (Remembering)
2. State the general form of java 3D scene graph (Remember)
3. How can you access the Java 3D networking class? (Apply)

Course Outcome 4 (CO4):

1. Illustrate the use of virtual anatomy. (Understand)
2. How to use VR in military application? (Apply)
3. Which application of VR is used in Robotics? (Analyse)

Course Outcome 5 (CO5):

1. Which devices were used in AR? (Apply)
2. How would you used image based x-ray visualization in VR?(Evaluate)
3. How will you create a scene manipulation for real world objects? (Create)

21CS7706	FULL STACK APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

Preamble

This course emphasizes on the development of both front end and back end portions of web application. Full stack web developers have the ability to design complete web applications and websites. They work on the frontend, backend, database and debugging of web applications or websites.

Prerequisites for the course

- 21CS4601 - Database Management Systems
- 21CS5603 - Internet Programming

Objectives

1. To understand the various components of full stack development
2. To learn Node.js features and applications
3. To develop applications with MongoDB
4. To understand the role of Angular and Express in web applications
5. To develop simple web applications with React

UNIT I	BASICS OF FULL STACK	9

Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React

Suggested Activities:

- Programming exercises on Angular, Node, Mongo DB, React
- Assignment on creating web development

SUGGESTED EVALUATION METHODS:

- Tutorials on program writing skills
- Simple web application development using all the above mentioned languages.

UNIT II	NODE JS	9

Basics of Node JS – Installation **18.16.1 LTS** – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js

Suggested Activities:

- Implementing nodeJS programs
- Implementing HTTP services in Node.js

SUGGESTED EVALUATION METHODS:

- Evaluation of the programs implemented
- Tutorials on NodeJS

UNIT III	MONGODB	9
Understanding NoSQL and MongoDB **6.0.7** – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications		
Suggested Activities: • Creating User accounts in MongoDB • Administering Databases using MongoDB		
SUGGESTED EVALUATION METHODS: • Building MongoDB Environment		
UNIT IV	**EXPRESS AND ANGULAR**	**9**
Implementing Express **4.18.1** in Node.js - Configuring routes - Using Request and Response objects – **Angular 16** - Typescript - Angular Components - Expressions - Data binding - Built-in directives.		
Suggested Activities: • Implementing Express in Node.js		
SUGGESTED EVALUATION METHODS: • Demonstration of the programs using Node.js		
UNIT V	**REACT JS**	**9**
MERN STACK – Basic React **18.2.0** applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering		
Suggested Activities: • Create applications using React		
SUGGESTED EVALUATION METHODS: • Assignments on React		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
DESCRIPTIVE QUESTIONS	ASSIGNMENT ONLINE MCQ	DESCRIPTIVE QUESTIONS
Course Outcomes		
Upon completion of the course, the students will be able to:		
CO1 Understand the various stacks available for web application development (Apply) CO2 Apply Node.js for application development (Apply) CO3 Develop applications with MongoDB (Apply) CO4 Analyze the features of Angular and Express (Apply) CO5 Develop React applications (Apply)		

Text Books

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.

Reference Books

1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
2. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018

Web Resources

1. https://www.coursera.org/specializations/full-stack-react
2. https://www.udemy.com/course/the-full-stack-web-development/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2							1	1	1	1	3		
2	3	3	3	3	2	1			2		2	3	3		
3	3	3	2	2	2	2			2		2	3	3		
4	3	3	2	2	2	1			1	1	2	2	3		
5	3	3	3	3	3	1					2	2	3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20

EVALUATE					
CREATE					

21IT6712	QUANTUMCOMPUTING	L	T	P	C
		3	0	0	3

Preamble

This course provides an introduction to the theory and practice of quantum computation. Thecontents covered include: quantum information processing, quantum algorithms, quantum errorcorrection, quantumcommunication,andcryptography.

Prerequisitesforthecourse

- 21MA1201–MatricesandAdvancedCalculus
- 21PH1301–Physicsfor Engineers
- 21CS1501–ProblemSolvingandLogicalThinkingusingC.

Objectives

- Tounderstandthebackgroundofclassicalcomputingandquantumcomputing.
- Tounderstandthefundamentalconceptsbehindquantumcomputation.
- TounderstandthedetailsofquantummechanicsandtherelationtoComputerScience.
- To analyze the knowledge of hardware and software mathematical models of quantumcomputation.
- Toanalyzethequantuminformationandthetheorybehindit.

UNITI	INTRODUCTION	9

GlobalPerspectives–QuantumBits–QuantumComputation–QuantumAlgorithms–ExperimentalQuantumInformationProcessing–QuantumInformation.		
UNITII	**MECHANICSANDCOMPUTATIONALMODELS**	**9**
Quantum Mechanics: Linear Algebra – Postulates of Quantum Mechanics – Application: Superdense Coding – Density Operator – The Schmidt Decomposition and Purifications – EPR and theBell Inequality – Computational Models: Turing Machines – Circuits – Analysis of ComputationalProblems.		
UNITIII	**QUANTUMCOMPUTATION**	**9**
Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit Model ofComputation – Simulation – Quantum Fourier Transform and Applications – Quantum SearchAlgorithms–QuantumComputers		
UNITIV	**QUANTUMINFORMATION**	**9**
Quantum Noise and Quantum Operations: Classical Noise and Markov processes – QuantumOperations – Examples – Applications – Distance Measures for Quantum Information – QuantumErrorCorrection–Entropy		
UNITV	**QUANTUMINFORMATIONTHEORY**	**9**
Quantum States and Accessible Information – Data Compression – Classical Information OverNoisy Quantum Channels – Quantum Information Over Noisy Quantum Channels – Entanglementasa Physical Resource–QuantumCryptography.		
	TotalPeriods	**45**

SuggestiveAssessmentMethods

ContinuousAssessmentTest (20Marks)	**FormativeAssessmentTest (20Marks)**	**EndSemesterExams (60Marks)**
1.DESCRIPTIVEQUESTIONS	1. ASSIGNMENT 2. MCQ	1.DESCRIPTIVEQUESTIONS

Outcomes

Uponcompletionofthecourse,thestudentswillbeableto:
CO1–Understandthebasicsofquantumcomputing. **CO2**–UnderstandthebackgroundofQuantumMechanicsandthecomputationmodels. **CO3**–Understandthequantumcomputation incircuitdesign. **CO4**–Analyzethequantumnoiseandquantumoperations. **CO5**– Analyzethequantummechanicsandcomputationmodelstosolvecomplexproblemsforclassicalcomputers.
TextBooks
1.MichaelA.Nielsen,IsaacL.Chuang,"QuantumComputationandQuantumInformation",CambridgeUniversity Press,2016.
ReferenceBooks
1. Zygelman,Bernard, "A First Introduction to Quantum Computing andInformation. Germany",Springer InternationalPublishing,2018.
WebResources 1.https://nptel.ac.in/courses/106106232 **(UnitIV–QuantumErrorCorrection(Week4))**

COVs.POMappingandCOvs.PSOMapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
1	2	2	2	1									2	2
2	2	2							1	2		2	1	1
3	2	2	2		1				1	1			2	1
4	2	2	1			1	1	1			1		2	1
5	1	1	1	1	1			1	1	1		1	2	1

BLOOMSLEVELASSESSMENTPATTERN

BLOOMS CATEGORY	CAT1	CAT2	FAT1	FAT2	END SEME XAM
REMEMBER					
UNDERSTAND	70	70	10	10	70
APPLY					
ANALYZE	30	30	15	15	30
EVALUATE					
CREATE					

21AI6603	Cloud Computing and Big Data Analytics	L	T	P	C
		3	0	0	3

Prerequisites for the course

- 21CS5602- Computer Networks
- 21AI4601- Data Analytics

Objectives

1. To learn about the basic characteristics of big data.
2. To know about the Hadoop and data visualization framework..
3. To understand the cloud delivery models, cloud framework and security management.
4. To learn about data analytics and cloud computing.

UNIT I	INTRODUCTION TO BIG DATA	4
Introduction to big data ,Characteristics of big data, Domain Specific Big data, Analytics flow of big data, Big data stack, Mapping Analytics flow to Big data stack		
SUGGESTED ACTIVITIES		
• Discussion about Characteristics of big data • In class activity- Mapping Analytics flow to Big data stack		
SUGGESTED EVALUATION METHODS		
• Assignment on Big data stack		
UNIT II	**PREDICTIVE ANALYTICS AND VISUALIZATION**	**6**
HDFS Architecture-HDFS Usage Example-Map reduce Programming Model-Hadoop YARN-Hadoop Schedulers-Hadoop MapReduce Examples: Batch Analysis of Sensor Data ,Batch Analysis of N-Gram Dataset, Find top-N words with MapReduce, Data Visualization: Framework & Libraries, Visualization Examples.		
SUGGESTED ACTIVITIES		
• Discussion about Hadoop MapReduce Examples • In class activity- Data Visualization		
SUGGESTED EVALUATION METHODS		
• Assignment on Framework & Libraries, Visualization Examples.		
UNIT III	**CLOUD COMPUTING ARCHITECTURE**	**7**
Cloud Delivery Models: The SPI Framework , SPI Evolution ,The SPI Framework vs. the Traditional IT Model , Cloud Software as a Service (SaaS), Benefits of the SaaS Model, Cloud Platform as a Service (PaaS) , Cloud Infrastructure as a Service (IaaS). Cloud Deployment Models: Public Clouds, Community Clouds ,Private Clouds ,Hybrid Clouds. Alternative Deployment Models -The Linthicum		

Model ,The Jericho Cloud Cube Model- Docker- Container, Hypervisor, kubernetes

SUGGESTED ACTIVITIES

- Discussion about Cloud Software as a Service (SaaS)
- In class activity- Hybrid Clouds. Alternative Deployment Models

SUGGESTED EVALUATION METHODS

- Quiz on Private Clouds.

UNIT IV	**SECURITY MANAGEMENT IN CLOUD COMPUTING**	**7**

Security Policy Implementation - Policy Types: Senior Management Statement of Policy, Regulatory Policies, Advisory Policies, Informative Policies. Computer Security Incident Response Team (CSIRT) - Virtualization Security Management -Virtual Threats-Hypervisor Risks- Increased Denial of Service Risk. VM Security Recommendations -Best Practice Security Techniques, VM-Specific Security Techniques -Hardening the Virtual Machine,Securing VM Remote Access.

SUGGESTED ACTIVITIES

- Discussion about Computer Security Incident Response Team (CSIRT)
- In class activity- Hardening the Virtual Machine

SUGGESTED EVALUATION METHODS

- Quiz on Securing VM Remote Access

UNIT V	**APPLICATIONS**	**6**

Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries, Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

SUGGESTED ACTIVITIES

- Discussion about HiveQL data manipulation
- In class activity- Cassandra clients

SUGGESTED EVALUATION METHODS

- Quiz on Federation in the Cloud

S.No	List of Experiments	CO
1.	Install, configure and run Hadoop and HDFS	CO1
2.	Implement File Management task in Hadoop	CO1
3.	Implement word count / frequency programs using Map Reduce .	CO1
4.	Implement a Map Reduce program that mines weather data.	CO2
5.	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows10..	CO4
6.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs	CO3
7.	File Sharing between physical machine and virtual machine	CO5
8.	Install Google App Engine. Create hello world app and other simple web applications using python/java.	CO5
9.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.	CO5
10.	Installation of Hive	CO5
11.	Implement the Hive operation tocreate,alter,anddropdatabases,tables,views,functions,andindexes .	CO5
	Total Periods	**30 Theory +30 Lab**

Laboratory Requirements

- LINUX operating system.
- Virtual Box/VM Ware3
- Java ,Hadoop ,HBase/MongoDB

Suggestive Assessment

Continuous Assessment Test	Lab Components Assessments	End Semester Exams

(30 Marks)	(20 Marks)	(50 Marks)
1. DESCRIPTIVE QUESTIONS	1. LAB EXPERIMENTS 2. MODEL EXAMINATION	1. DESCRIPTIVE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO605.1 Understand the concepts and technologies of big data analytics.
CO605.2 Apply the techniques in handing and analysis of big data.
CO605.3 Implement the concepts of cloud computing.
CO605.4 Demonstrate cloud frameworks and security management
CO605.5 Develop the cloud applications and data analytics application

Text Books

1. Big Data Analytics: A Hands-On Approach , ArshdeepBahga& Vijay Madisetti,2019.
2. Cloud Security A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz Russell Dean Vines, Wiley Publishing,2010

Reference Books

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging
2. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
3. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012

Web Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs87/preview
2. https://www.analyticsvidhya.com/trainings/all-in-one-big-data-cloud-computing-training-simpli-learn/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3											2		
2	3	3		3									3		
3	3	2		3	3								2		
4	3	3		2	3								3		
5	3	3											3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	Lab Components	Model Exam	END SEM EXAM
REMEMBER	20	10			10
UNDERSTAND	40	20			20
APPLY	40	50	50	50	50
ANALYZE		20	50	50	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Describe the concepts and technologies of big data analytics.

1. How analysis flow is to determine the analysis type for the application and Implement the algorithms using various big data tools and frameworks.(Analyse)
2. Describe the Hadoop Distributed File System (HDFS)?How the distributed file system that runs on large clusters and provides high-throughput access to data?(Understand)

COURSE OUTCOME 2: Apply the techniques in handing and analysis of big data.

1. Explain about Map reduce Programming Models and its parallel processing which is suited for massive data.(Understand)
2. Analyse the performance of Map Reduce job execution for the variety of loads within a YARN cluster.(Analyse)

COURSE OUTCOME 3: Discuss the concepts and terminologies of cloud computing.

1. Differentiate the concepts of SaaS and PaaS.(Understand)
2. Write Short notes on Cloud Deployment Models.(Remember)

COURSE OUTCOME 4: Demonstrate cloud frameworks and security management.

1. Explain in detail about different implementation of Virtualization.(Understand)
2. Describe about the security policies in detail.(Remember)

COURSE OUTCOME 5: Demonstrate cloud applications.

1. Mention some important components of Cassandra data models. Specify similarities and differences among Hadoop, HBase, Hive and Cassandra.(Analyse)
2. Explain about the four levels of federation services and its applications in detail.(Understand)

21AI6611	Machine learning Laboratory	L	T	P	C
		0	0	4	2

Prerequisites for the course

- 21AI3601- Artificial Intelligence and Expert System
- 21AI4601-Data Analytics

Objectives

- To learn the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- To understand the strengths and weaknesses of many popular machine learning approaches.
- To learn about the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

S.No	List of Experiments	CO
1	Implementation of k Nearest Neighbour criterion using various distance measures using scikit-learn.	CO1
2	Implementation of Linear regression algorithm using python.	CO1
3	Implementation of Logistic regression algorithm.	CO1
4	Implementation of naïve-bayes algorithm for word count application using scikit-learn.	CO2
5	Implementation of K-means algorithm with reference to gap analysis using python.	CO2
6	Implementation of Dimensionality reduction algorithm with Kernel trick.	CO3
7	Implementation of Support Vector Machines (SVM) technique.	CO4
8	Implementation of Random forest learning technique using scikit-learn.	CO4
9	Experiment the use of decision tree algorithm with statistical data.	CO5
10	Develop a prediction application using apriori algorithm using MLxtend.	CO5
		Total Periods : 45

List of Projects

S.No	List of Experiments	CO

1.	**Sales Forecasting using Walmart Dataset** **Speech Emotion Recognition**	CO1
2.	**Time Series Forecasting with Facebook Prophet in Python**	CO1
3.	Handwritten Character Recognition	CO1
4.	**Iris Flowers Classification**	CO2
5.	**Loan Eligibility Prediction**	CO2
6.	**Social Media Sentiment Analysis**	CO3
7.	**Music Recommendation System**	CO4
8.	**Build a Movie Recommender System**	CO4
9.	**Stock Prices Predictor using TimeSeries**	CO5
10.	**BigMart Sales Prediction**	CO5

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	**End Semester Exams (40 Marks)**
• Lab Experiment • Viva	• Practical Exam

• Model Exam • Project	

Outcomes:

Upon completion of the course, the students will be able to

CO1:Analyze the use of regression and classification algorithms.

CO2:Understand the concepts of supervised and unsupervised learning for the underlying application.

CO3:Design and implement appropriate machine learning algorithms in a range of real-world applications.
CO4: Implement the Support Vector Machine Algorithm.
CO5: Perform prediction based applications by applying the concepts of learning algorithms.

Laboratory Requirements:

- Python with ML packages

Reference Books

1. Rudolph Russell, "Machine Learning: Step-by-Step Guide To Implement Machine Learning Algorithms with Python"Create space Publishers,2018

2. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2014.

Web Resources

5. **https://www.ibm.com/cloud/learn/machine-learning**
6. **https://www.coursera.org/learn/machine-learning**
7. **https://nptel.ac.in/courses/106106139**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3											3		
2	3	3		3	3								3		
3	3	3		2	3								3		
4	3	3		2	3								3		
5	3	3		2									3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam	END SEM EXAM
REMEMBER		
UNDERSTAND		
APPLY	100	100
ANALYZE		
EVALUATE		
CREATE		

COURSE LEVEL ASSESSMENT QUESTIONS

Students will be able to predict the suitable method for.

Course Outcome 1 (CO1): Understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

1. Discuss the difference and tradeoff between two factors of bias and variance. How these factor play a role in machine learning models. Explain.(Analyse)
2. Explain geometric models in detail with example(Remember)
3. What is supervised and unsupervised learning? Explain with the examples.(Understand)

Course Outcome 2 (CO2): Develop algorithms for learn Linear and Non-Linear Models..

1. How to develop /frame inductive learning and summarize the machine learning process?(Analyze)
2. List the advantages of SVM and how optimal Hyperplane differ from Hyper plane.(Analyse)
3. **Course Outcome 3 (CO3):**Represent mathematical relationships within and across Machine Learning algorithms

3. Explain the concepts of clustering approaches. How it differ from classification.(Understand)
4. a) If the coordinates of the objects are (0,-3) and (5,8) then what is the Chebyshev distance. b) Discuss MIN algorithm with suitable examples c) Discuss Quantitative variables evaluation in clustering algorithm

Course Outcome 4 (CO4): Implement various machine learning algorithms for various tree and rule based models

1. What do you mean by Gain and Entropy? How is it used to build the Decision tree in algorithm? Illustrate using an example.(Evaluate)
2. What are issues in decision tree learning? Explain briefly How are they overcome? a. Discuss the following issues in detail: a. Avoiding overfitting in Decision Trees b. Incorporating Continuous valued attributes c. Handling Training Examples with Missing attribute values. d. Handling Attributes with Different costs.(Understanding)

Course Outcome 5 (CO5): Apply Reinforcement Learning Algorithm.

1. Explain the Q function and Q Learning Algorithm assuming deterministic rewards and actions with example.(Understanding)
2. What is Reinforcement Learning and explain Reinforcement learning problem with neat diagram.(Understanding)

21PT3903	APTITUDE - II	L	T	P	C
		0	0	2	1

Prerequisites for the course

- Basic Maths

Objectives

6. Expose the undergraduate students to solve aptitude problems using different methods and practices.
7. Expose the undergraduate students to critique and evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information.

UNIT I	MODULE I	6
Time, Speed and distance, Time and work, Problems on Trains		
UNIT II	**MODULE II**	**6**
Clocks, Blood Relations, Number Puzzles, Logical Puzzles.		
UNIT III	**MODULE III**	**6**
Concepts on Syllogisms, Problems involving Coding and Decoding methods Elementary algebra, Progression.		
UNIT IV	**MODULE IV**	**6**
Permutation and combination, Probability, Geometry, Calendar		
UNIT V	**MODULE V**	**6**
Boats and Streams, Races. Data interpretation, Data sufficiency.		
	Total Periods	**30**

Suggestive Assessment Methods

Continuous Assessment Test -1 (30 Marks)	Continuous Assessment Test -2 (30 Marks)	Model Exam (40 Marks)
MULTIPLE CHOICE QUESTIONS	MULTIPLE CHOICE QUESTIONS	MULTIPLE CHOICE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:

CO1: Solve various concepts of Time, Speed and distance, Time and work and Problems on Trains
CO2: Analyse the problems on Clocks, Blood Relations, Number Puzzles, Logical Puzzles.
CO3: Analyse the Concepts on Syllogisms, Problems involving Coding and Decoding methods Elementary algebra and Progression
CO4: Solve the problems on Permutation and combination, Probability, Geometry and Calendar
CO5: Solve the problems on Boats and Streams, Races. Data interpretation and Data sufficiency.

Text Books

1. Dr. R S Aggarwal, A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S Chand Publications.
2. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Mc Graw Hill Publications.

Reference Books

1. U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications Pvt Ltd, India.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Third Edition, Pearson Education Pvt Ltd, India, 2016.
4. Arun Sharma, How to prepare for Logical Reasoning for CAT & other Management Exams, Fifth Edition, Mc Graw Hill Publications.
5. Jaikishan and Premkishan, How to Crack Test of Reasoning in all Competitive Examinations, Revised Edition, Arihant Publications.

Web Recourses

1. https://pdf.bankexamstoday.com/raman_files/Quant%20Formula.pdf
2. https://ugcportal.com/raman-files/QT-TRICKS.pdf
3. https://www.javatpoint.com/aptitude/quantitative#speed-and-distance
4. https://www.indiabix.com/aptitude/questions-and-answers/

CO Vs PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	1										2
2	2	1										2
3	3	1										2
4	3	1										2
5	2	1										3

COURSE CONTENT AND SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I – MODULE I	

1	Time, Speed and distance	**2**
2	Time and work	**2**
3	Problems on Trains	**2**
UNIT II – MODULE II		
1	Clocks	**2**
2	Blood Relations	**1**
3	Number Puzzles	**2**
4	Logical Puzzles	**1**
UNIT-III MODULE III		
1	Concepts on Syllogisms	**2**
2	Problems involving Coding methods	**1**
3	Problems involving Decoding methods	**1**
4	Elementary algebra	**1**
5	Progression	**1**
UNIT-IV MODULE IV		
1	Permutation and combination	**2**
2	Probability	**1**
3	Geometry	**1**
4	Calendar	**2**
UNIT-V MODULE V		
1	Boats and Streams	**1**
2	Races	**1**
3	Data interpretation	**2**
4	Data sufficiency	**2**

SEMESTERVII

S.NO	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21AI7601	Deep Learning	PC	3	3	0	0	3
2	21HS4101	Principles of Management	HSSM	3	3	0	0	3
3		Professional Elective– V	PE	3	3	0	0	3
4		Professional Elective–VI	PE	3	3	0	0	3
5		Open Elective–III	OE	3	3	0	0	3
6		Open Elective–IV	OE	3	3	0	0	3
Practical Courses								
1	21AI7611	Deep learning Laboratory	PC	4	0	0	4	2
2	21AI7912	Business Analytics with Power BI	EEC	4	0	0	4	2
Total				26	18	0	8	22

21AI7601	**Deep Learning**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

This course introduces the basic concepts of Neural Networks and Deep Learning. Students will learn the basic model types used in Deep Learning and their suitability for various data domains such as text,

images, and videos. By the end of this course, students will be able to extract patterns from real-world datasets by running several classes of deep learning methods using existing code via standard API calls.

Prerequisites for the course

- 21AI6602 -Machine Learning
- 21AI4601-Data Analytics

Objectives

1. To understand the basics of deep neural networks
2. To understand CNN architectures and deep neural networks
3. To learn about applications of deep learning in AI and Data Science

UNIT I	**INTRODUCTON TO DEEP LEARNING**	**9**

Introduction to Deep Learning: Basics: Biological Neuron, Idea of computational units- Baye's rule-Learning Algorithms-Overflow and Underflow-capacity, Overfitting and underfitting-Estimators,Bias and variance.

SUGGESTED ACTIVITIES

- Implementation of Learning Algorithms

SUGGESTED EVALUATION METHODS

- Online Quiz

UNIT II	**FEEDFORWARD NETWORKS**	**9**

Deep FeedForward Networks-Gradient based Learning- The challenges with Gradient Descent-Local Minima in the Error Surface of Deep Networks-Learning Conditional Statistics-Rectified Linear Units and their generalizations-Back Propagation- Differentiation Algorithms.

SUGGESTED ACTIVITIES

- Implementation of Differentiation Algorithms.

SUGGESTED EVALUATION METHODS		
• Online Quiz		
UNIT III	**CONVOLUTIONAL NETWORKS**	**9**
Convolution Neural networks- The Convolution Operation-Variants of the Basic Convolution Function - Pooling- Efficient convolution Algorithm-Random or Unsupervised Features.		
SUGGESTED ACTIVITIES		
• Implementation of Convolution Neural networks		
SUGGESTED EVALUATION METHODS		
• Online Quiz		
UNIT IV	**DEEP GENERATIVE MODELS**	**9**
Boltzmann Machine-Recurrent Neural Network-Bidirectional RNNs,Deep Recurrent Networks-Recursive Neural Networks-Echo state networks- Optimization of Long term Dependencies- Monte Carlo Methods.		
SUGGESTED ACTIVITIES Discussion About the Deep Recurrent Networks Demonstration of Recurrent Neural Network		
SUGGESTED EVALUATION METHODS		
• Online Quiz		
UNIT V	**APPLICATIONS OF DEEP LEARNING**	**9**
Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative -Applications: Large-Scale Deep Learning - Computer - Speech Recognition -Attention Models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.		

SUGGESTED ACTIVITIES

- Implementation of Sentences classification using convolution neural network
- Discussion about the Parsing and Sentiment Analysis using Recursive Neural Networks

SUGGESTED EVALUATION METHODS

- Seminar onConvolutional Neural Networks

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROBLEM-SOLVING ACTIVITIES	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2.PROBLEM-SOLVING ACTIVITIES

Course Outcomes

Upon completion of the course, the students will be able to:

CO1:Understand the basics concepts of deep learning.(Understand)

CO2:Emphasizing knowledge on Feed Forward Networks. (Understand)

CO3:Understanding of CNN to model for real world applications. (Understand)

CO4:Apply RNN Model and Deep generative Models for various applications.(Apply)

CO5:Analyze the various challenges involved in designing deep learning algorithms for varied applications.(Analyze)

Text Books

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. NikilBudhuma”Fundamentals of Deep Learning” O’Reilly Media,2017

Reference Books
1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127
Web Resources 1. **https://www.deeplearning.ai/courses/** 2. **https://www.udacity.com/course/intro-to-tensorflow-for-deep-learning--ud187** 3. **https://www.edx.org/learn/deep-learning** 4. **https://deeplearningcourses.com/**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2			1							3		
2	3	3	2			1							3		
3	3	3	2			1							2		
4	3	3	2			1							2		
5	3	3	2			1							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20

EVALUATE					
CREATE					

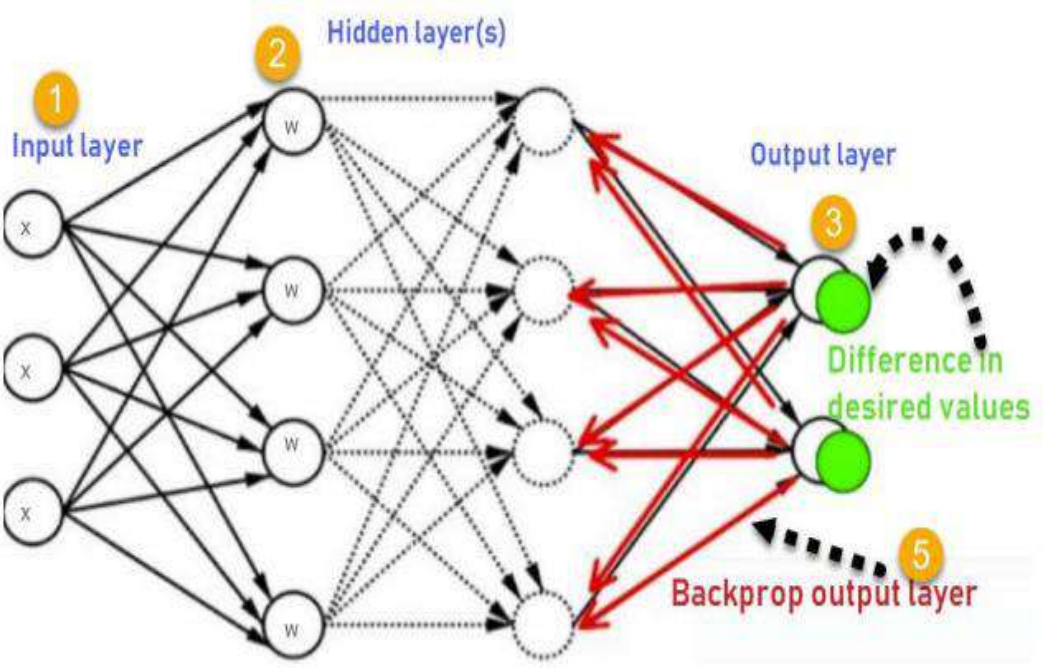
COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Understand)

1. Explain non-linear Neural Networks activation functions
2. State the Bayes rule.
3. Develop a Deep Feed forward network and explain
4. Assess the following with respect to deep learning examples. i) Random Variables. ii) Probability.

Course Outcome 2 (CO2): (Apply)

1. Explain learning conditional distributions with maximum likelihood.
2. Develop a Deep Feed forward network and explain.
3. Justify the importance of Rectified linear units in Hidden units.
4. Consider the Following diagram



Calculate the output for every neuron from the input layer, to the hidden layers, to the output layer and also Calculate the error in the outputs.

5. Explain sigmoid units for Bernoulli Output Distributions.
6. Justify the importance of Rectified linear units in Hidden units.

Course Outcome 3 (CO3): (Understand)

1. Explain the architecture of Convolutional Neural Networks (CNN)?
2. Explain optimizers. Why optimizers are required?
3. Show three basic strategies for obtaining convolution kernels without supervised training.
4. Differentiate locally connected layers, tiled convolution and standard convolution with suitable examples and diagram.
5. Construct a Convolutional network to demonstrate the effect of zero padding on network size. Explain Neuro scientific basis for Convolutional Networks
6. Evaluate variants of the basic convolution function

Course Outcome 4 (CO4): (Apply)

1. Compute the gradient in a Recurrent Neural Network
2. Discuss Recurrent Neural Networks in detail.
3. Explain how to compute the gradient in a Recurrent Neural Network
4. Prepare an example of Encoder- Decoder or sequence-to-sequence RNN architecture.
5. Explain a modeling sequences Conditioned on Context with RNNs

Course Outcome 5 (CO5): (Analyze)

1. Describe the following. i, Independent Component Analysis, ii, Slow Feature Analysis.
2. Perform the automatic image captioning using Deep neural networks.

21HS4101	Principles of Management	L	T	P	C
		3	0	0	3

Preamble

This subject is to familiarize the student with basic management concepts and behaviour processes in the organization. The course will be an introduction to the way in which a firm can develop its managerial thinking, mission and strategy.

Prerequisites for the course

- Basic management studies

Objectives

1. To enable the students to study the evolution of Management
2. To study the functions of management
3. To know about the principles of management
4. To learn the applications of the principles in an organization

5. To develop ideas on System and process of controlling		
UNIT I	**INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**	**9**
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership,– Current trends and issues in Management. Suggestive Activity: Assignment: "Management is oldest of the arts and youngest of the sciences".		
UNIT II	**PLANNING**	**9**
Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process. Suggestive Activity: Case Study on Decision Making Assignment: Why Plan Fails? "Failure to plan is planning to fail".		
UNIT III	**ORGANISING**	**9**
Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization - Human Resource Management – HR Planning, Recruitment, selection. Suggestive Activity: Assignment: Identify The Reasons For The Conflicts Between Line And StaffManagers Case Study Formal And Informal Organization		
UNIT IV	**DIRECTING**	**9**
Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication. Suggestive Activity: Assignment: Motivation is the core of management'.		
UNIT V	**CONTROLLING**	**9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control– control and performance – direct and preventive control – reporting.

Suggestive Activity:

Assignment: Why planning and controlling are often described as the 'Siamese' twins of management.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS 2. FORMATIVE MULTIPLE CHOICE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO 1 Understand the managerial functions

CO 2 Plan the process and take decisions

CO 3 Organize the group with the charts and plans

CO 4 Lead the group with motivation and to know the communication process

CO 5 Use the controlling strategies for budget and all other performance

Text Books

1. Stephen P. Robbins & Mary Coulter, —Management||, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert —Management||, Pearson Education, 6th Edition, 2004.

Reference Books

1. Stephen A. Robbins & David A. Decenzo& Mary Coulter, —Fundamentals of Management Pearson Education, 7th Edition, 2011.
2. Robert Kreitner&MamataMohapatra, — Management, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich —Essentials of management Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, —Principles of Management, Tata McGraw Hill, 1999

Web Resources

1. https://nptel.ac.in/courses/110/105/110105146/

2. https://www.mindtools.com/pages/article/henri-fayol.htm

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1			2			2	2	2	2	2					
2			3			3	3	2	3	2					
3			2			3	2	1	3	2					
4			2			2	2	3	2	1					
5			3			3	1	1	3	1					

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Understand the managerial functions

1. Recall the types of managers. (Remember)

2. Summarize the managerial roles and skills. (Understand)

3. Explain the concept ofCurrent trends and issues in Management. (Remember)

Course Outcome 2 (CO2): Plan the process and take decisions

1. What is nature and purpose of planning? (Remember)

2. Compare the Planning Tools and Techniques. (Understand)

3. Analyze the Decision making steps and process. (Analyze)

Course Outcome 3 (CO3): Organize the group with the charts and plans

1. Narrate the Formal and informal organization. (Understand)

2.Write about Job Design. (Remember)

3. Explain the Career planning and management (Understand)

Course Outcome 4 (CO4): Lead the group with motivation and to know the communication process

1. Whatdo you mean by motivation theories? (Remember)

2. Explain the job enrichment concept.(Understand)

3. Howeffective communication can be made? (Remember)

Course Outcome 5 (CO5): Usethe controlling strategies for budget and all other performance

1. What is the System and process of controlling? (Remember)

2. Explain Productivity problems and management (Understand)

3. Explaindirect and preventive control. (Remember)

Case Study 01 on Decision Making

The day has finally come: Mr. Rajesh is to assume the position of President of Metro Manufacturing. Metro is a widely respected producer of high quality control mechanisms. When the previous president retired, Rajesh was identified as the likely choice for assuming the post. He was respected for his competence in the field and for his ability to work with employees at all levels of operations. Rajesh arrived at work early this morning, not so much to work but to think. As he sits behind his new executive desk, drinking a cup of coffee, his thoughts go back to his early days with Metro.

Twenty years ago Rajesh was just a young man right out of college with no business experience and a degree in industrial management. He was hired as an assistant foreman and was placed immediately on the production line. “Oh, those were the days”, he thought. “Seems like there was a problem that required solving every minute”. Thank goodness for the standard operating procedures manuals (SOP’s) and for a foreman who was patient enough to answer my questions, didn’t have to make too many critical decisions then. But I sure was putting out a lot of daily fires”.

As the nostalgia influence continues, Rajesh thinks back to the time when he was taken off the production line and promoted into middle management. “Things sure did change then”, he thought. As production manager, he had to think further into the future. As a foreman, Rajesh was primarily concerned with meeting daily production requirements.

Now he had to plan weeks and even months in advance. The human and communication problems remained although it seems like the reports he had to write were longer. But, as he remembers, the major changes occurred because he had to do more creative thinking. Laughing to himself he thought about the time he went to the files to pull out on SOP for an

unusual problem he had to confront and there was none. He was frustrated because he had to handle the problem with little assistance. But, as his analytical, decision-making, and conceptual ability increased, he found himself using his technical skills less and less.

Another cup of coffee provided the stimulus to think about the special promotion he made to vice-president of planning five year ago. It was a major hurdle in his life because he had been in heavy competition with five well-qualified managers. He had heard through the grapevine that he had received the position because he was able to think for himself.

But, even his past training did not fully prepare Rajesh for the demands of the job; he had to learn much of it on his own. Rather than thin months into the future, he now was required to envision years. Grinning, he remembered that at first he did not realize that there were so many people outside of production that he had to coordinate activities with. Marketing and finance had to be tied together with production. His conceptual and decision-making skills continued to increase. A long time ago, the benefits of the "good old" SOP's lost their value.

But now, as Rajesh looks at his desk plate which says "President" new thoughts run through his mind. A whole new world opens to him now. He wonders what new requirements will be placed on him. A twinge of fear moves through his body as the thoughts of the new job take hold. What skills will be now needed to be successful?

Questions

1. As the President of Metro Manufacturing, what specific skills will Rajesh need to be effective?
2. How do the demands of different levels of responsibility change as manager progresses up the hierarchy of an organization?
3. What general recommendations would you offer for Rajesh?

Case Study 02 Formal And Informal Organization

Mr. SrinivasaRaghavan, the Chairman of the Best Food ProductsCompany, was tired of being the only one in the company actually responsiblefor profits. While he had good vice-presidents in charge of finance, sales,advertising, manufacturing, purchasing, and product research, he realizedhe could not hold any of them responsible for company profits, as much ashe would like to. He often found it difficult even to hold them responsiblefor the contribution of their various areas to company profits. The salesvice-president, for example, had rather reasonably complained that hecould not be fully responsible for sales when the advertising was ineffective,when the products wanted by customers were not readily available frommanufacturing, or when he did not have the new products he needed

tomeet competition. Likewise, the manufacturing vice-president had somejustification when he made the point that he could not hold costs downand still be able to produce short runs so as to fill orders on short notice;moreover, financial controls would not allow the company to carry a largeinventory of everything.

Mr. Raghavan had considered breaking the company down into sixor seven segments by setting product divisions with a manager over eachwith profit responsibility. But he found that this would not be feasibleor economical since many of the company's branded food products wereproduced on the same factory equipment and used the same raw materialsand a sales person calling on a store or supermarket could far moreeconomically handle a number of related products than one or a few.Consequently, Mr. Raghavancame to the conclusion that the bestthing to do was to set up six product managers reporting to a productmarketing manager. Each product manager would be given responsibilityfor one or a few products and would oversee, for each product, all aspectsproduct research, manufacturing, advertising and sale thereby becomingthe person responsible for the performance and profits relating to theproducts.

Mr. Raghavan realized that he could not give these productmanagers actual line authority over the various operating departments ofthe company since that would cause each vice-president and his departmentto report to six product managers and the product marketing manager,as well as the president. He was concerned with this problem but knewthat some of the most successful larger companies in the world had usedthe product manager system. Moreover one o his friends on a universityfaculty told him that he must expect a certain amount of confusion in anyorganisation and that this might not be bad since it forced people to worktogether as teams.

Mr. Raghavan resolves to put in the product manager system in hisorganisation as outlined and hoped for the best. But he wondered how hecould avoid the problem of confusion in reporting relationships.

Questions

1. Do you agree with Mr.Raghavan's programme? State the exact problem in the case.
2. What would you do to avoid any confusion in this organisation?
3. Do you suggest any other organisation model for this business? If so, present the organisation chart of the same.

Professional Elective V

1.	21AI7701	Computer Vision	7	3	0	0	3	AI
2.	21AI7702	Sentiment Analysis	7	3	0	0	3	Data Science
3.	21AI7703	High Performance Networks	7	3	0	0	3	Networking
4.	21AI7704	Management Information System	7	3	0	0	3	Software Engineering
5.	21AI7705	Image and Video Analytics	7	3	0	0	3	Image Processing
6.	21CS7712	Information Security	7	3	0	0	3	Computation andProgramming
7.	21CS7714	Cyber Forensics and its tools	7	3	0	0	3	Recent Trends

21AI7701	**Computer vision**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Preamble					

The aim of this course is to provide the knowledge to students about Computer Vision that is concerned with the theory and technology for building artificial system that obtain information from various images or multi-dimensional data. Information about the environment could be provided by a computer vision system, acting as a vision sensor and providing high-level information about the environment and the robot. Computer Vision is inverse of computer graphics. Computer Vision seeks to generate intelligent and useful descriptions of visual scenes and sequences and of the objects that populate them, by performing operations on the signals received from video cameras.

Prerequisites for the course

- 21MA3205- Probability &Statistics
- 21MA1201 - Matrices and Advanced Calculus

Objectives

1. To understand basics of Computer vision.
2. To comprehend advanced Image processing techniques.
3. To learn the face detection and matching.
4. To analyse the images using segmentation methods.
5. To apply the image recognition techniques for various application.

UNIT I	COMPUTER VISION BASICS	9

Introduction- Image formation: Geometric Primitives -2 D and transformations,3 D transformations- 3 D rotations, photometric image formation- Lighting ,Reflectance and Shading,Optics. Digital camera- Sampling and aliasing, Color, Compression.

SUGGESTED ACTIVITIES

- Discuss about Image formation

SUGGESTED EVALUATION METHODS

- Assignment in compression technique in digital camera

UNIT II	Image Processing	9

Point Operators: Pixel transforms, color transforms,Histogram Equalization-Linear filtering: Seperable filtering Examples of linear filtering, Band pass and steerable filters goemetricTransformations:parametrictransformations,Mesh-basedwraping.Case study: Feature based Morphing.

SUGGESTED ACTIVITIES

- Demonstrate Histogram Equalization.

SUGGESTED EVALUATION METHODS

- Quizzes

UNIT III	FEATURE DETECTION AND MATCHING	9

Points and Patches: Feature detectors, Features descriptors, Feature Matching,Feature tracking- Edges: Edge detection,Edge linking- Lines:Successive Approximation, Hough transforms, Vanishing points. Case study: Rectangle detection

SUGGESTED ACTIVITIES

- Discuss about application of feature detection and matching

SUGGESTED EVALUATION METHODS

- Puzzle

UNIT IV	SEGMENTATION	9

Active contours- Snakes, Dynamic snakes and Condensation, scissors, Level sets- Split and merge- Water shed, Region Splitting, Region merging- Mean shift and mode finding: K-means and mixture of Gaussians, Normalized cuts, Graph cuts and energy based methods. Case study: Medical image processing

SUGGESTED ACTIVITIES

- Demonstration on Split and merge

SUGGESTED EVALUATION METHODS

<table>
<tr><td colspan="3">• Assignment in Edge detection</td></tr>
<tr><td>UNIT V</td><td>IMAGE RECOGNITION</td><td>9</td></tr>
<tr><td colspan="3">Object detection- Face detection- Pedestrian detection-Face Recognition- Eigen values-Active appearance and 3D shape models-Instance Recognition-category recognition-Context and scene Understanding-Recognition databases and test sets. Case Study: Location Recognition, Intelligent Photo Editing.</td></tr>
<tr><td colspan="3">SUGGESTED ACTIVITIES</td></tr>
<tr><td colspan="3">• Demonstrate Application: Edge editing and enhancement
• Discuss about the Application: Performance-driven animation</td></tr>
<tr><td colspan="3">SUGGESTED EVALUATION METHODS</td></tr>
<tr><td colspan="3">• Seminar in Edge linking</td></tr>
<tr><td colspan="2">Total Periods</td><td>45</td></tr>
<tr><td colspan="3">Suggestive Assessment Methods</td></tr>
<tr><td>Continuous Assessment Test
(20 Marks)</td><td>Formative Assessment Test
(20 Marks)</td><td>End Semester Exams
(60 Marks)</td></tr>
<tr><td>1. DESCRIPTIVE QUESTIONS
2. PROBLEM SOLVING QUESTIONS</td><td>1.ASSIGNMENT
2. ONLINE QUIZZES
3.PROBLEM-SOLVING ACTIVITIES</td><td>1.DESCRIPTIVE QUESTIONS
2. PROBLEM SOLVING QUESTIONS</td></tr>
<tr><td colspan="3">Course Outcomes</td></tr>
<tr><td colspan="3">Upon completion of the course, the students will be able to:</td></tr>
<tr><td colspan="3">CO1 Identify the basics of computer vision methods for various types of image processing techniques.(Understand)
CO2 Apply different techniques employed for the enhancement of images(Apply)
CO3 Analyze the various feature detection methods for object detection. (Apply)
CO4 Apply different segmentation techniques for various applications. (Apply)
CO5 Design an innovative image processing application in computer vision. (Apply)</td></tr>
</table>

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Text Books
1.Computer Vision: Algorithms and Applications Richard , September 3, 2010 Springer
Reference Books
8. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012
Web Resources 9. http://szeliski.org/Book 10. https://www.slideshare.net/capgemini/computer-vision-with-deep-learning-87977160

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		
5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50

ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

1.Identify the procedure that performs the computations mapping n iinputs u(1) to u(ni) to an output u(n) . This defines a computational graph where each node computes numerical value u(i) by applying a function f(i) to the set of arguments A(i) that comprises the values of previous nodes u(j), j <i, with j ∈Pa(u(i)). The input to the computational graph is the vector x, and is set into the first ninodes

u(1) to u(ni) . The output of the computational graph is read off the last (output) node u(n).

Course Outcome 2 (CO2): (Apply)

1.Apply the histogram method for the image morphing

Course Outcome 3 (CO3): ((Understand))

1.Discuss about the feature detection method for shape detection

Course Outcome 4 (CO4): (Apply)

What is image enhancement? Differentiate spatial domain and frequency domain methods. If I is input intensity and O is output intensity then write the equation for image negation and log transformation. Let the intensity range for the image is [0, L-1].

What is image enhancement? Differentiate spatial domain and frequency domain methods. If I is input intensity and O is output intensity then write the equation for image negation and log transformation. Let the intensity range for the image is [0, L-1].

What is image enhancement? Differentiate spatial domain and frequency domain methods. If I is input intensity and O is output intensity then write the equation for image negation and log

transformation. Let the intensity range for the image is [0, L-1].

Given a triangle with points (1, 1), (0, 0) and (1, 0). Apply shear parameter 2 on X axis and 2 on Y axis and find out the new coordinates of the object.

Course Outcome 5 (CO5): (Apply)

Detect the edge for the centre point using pewit operator for the following image

0	30	60
5	32	62
10	38	64

21AI7702	SENTIMENT ANALYSIS	L	T	P	C
		3	0	0	3

Preamble

Sentiment analysis is the process of classifying whether a block of text is positive, negative, or, neutral. The goal which Sentiment analysis tries to gain is to be analyzed people's opinions in a way that can help businesses expand. It focuses not only on polarity but also on emotions

Prerequisites for the course

- 21AI3601-Artifical Intelligence
- 21AI4601-Data Analytics

Objectives

- To understand representation and handling of opinions by people in different ways.
- To understand the use of CFG and PCFG in NLP
- To understand aspect oriented sentiment analysis classification
- To understand the role of semantics of sentences and pragmatics
- To analyze fake opinion detection and intention classification

UNIT I	INTRODUCTION TO SENTIMENT ANALYSIS	9

Introduction: Sentiment Analysis Applications - Sentiment Analysis Research - Sentiment Analysis as Mini NLP. The Problem of Sentiment Analysis: Definition of Opinion - Definition of Opinion Summary - Affect, Emotion, and Mood - Different Types of Opinions - Author and Reader Standpoint.

SUGGESTED ACTIVITIES

- Presentation and discussion on Sentiment Analysis as Mini NLP
- Analyze the Transducers for lexicon and rules

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes

UNIT II	SUBJECTIVITY CLASSIFICATION AND CHALLENGES	9

Sentence Subjectivity and Sentiment Classification: Subjectivity - Sentence Subjectivity Classification - Sentence Sentiment Classification - Dealing with Conditional Sentences - Dealing with Sarcastic Sentences - Cross-Language Subjectivity and Sentiment Classification..

SUGGESTED ACTIVITIES

- Presentation and discussion on Sentiment Classification
- Implementation of Language Subjectivity and Sentiment Classification

SUGGESTED EVALUATION METHODS

- Assignment problems

- Quizzes

UNIT III	ASPECT ORIENTED CLASSIFICATION	9

Aspect Sentiment Classification: - Rules of Sentiment Composition - Negation and Sentiment - Modality and Sentiment - Coordinating Conjunction But - Sentiment Words in Non-opinion Contexts

- Rule Representation - Word Sense Disambiguation and Co reference Resolution. Aspect and Entity Extraction: Frequency-Based Aspect Extraction.

SUGGESTED ACTIVITIES

- Presentation and discussion on.Syntactic Parsing, Ambiguity
- Lexicalized CFGs

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes

UNIT IV	SENTIMENT LEXICON GENERATION	9

Sentiment Lexicon Generation: Dictionary-Based Approach - Corpus-Based Approach - Desirable and Undesirable Facts. Analysis of Comparative Opinions: Problem Definition - Identify Comparative Sentences - Identifying the Preferred Entity Set - Special Types of Comparison - Entity and Aspect Extraction. Opinion Summarization and Search: Aspect-Based Opinion Summarization - Enhancements to Aspect-Based Summary

SUGGESTED ACTIVITIES

- Presentation and discussion on Analysis of Comparative Opinions.
- Implementation of Based Opinion Summarization.

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes

UNIT V	IDENTIFYING QUALITY OF OPINION	9

Detecting Fake or Deceptive Opinions: Different Types of Spam - Supervised Fake Review Detection - Supervised Yelp Data Experiment - Automated Discovery of Abnormal Patterns - Model- Based Behavioural Analysis-Group Spam Detection - Identifying Reviewers with Multiple User ids - ExploitingBusinessinReviews-SomeFutureResearchDirections.QualityofReviews: Quality Prediction as a Regression Problem.

SUGGESTED ACTIVITIES

- Presentation and discussion on Group Spam Detection
- Implementation of Automated Discovery of Abnormal Patterns

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the basics of sentiment analysis and its applications **(Understand).**

CO2: Design an innovative Sentiment analysis using supervised and unsupervised learning **(Apply)**

CO3: Discuss the challenges in sentiment analysis classification **(Apply)**

CO4: Design a tag set to be used aspect oriented sentiment analysis **(Apply)**

CO5: Analyze the opinion quality, author intention and fake opinions **(Apply)**
Text Books
1. Bing Liu "Sentiment Analysis: Mining Opinions, Sentiments and Emotions, Cambridge University Press, 2015..
Reference Books
1. Bing Liu "Sentiment Analysis and Opinion Mining, Morgan & Claypool Publishers, 2012. 2. Erik Cambria, Dipankar Das "A Practical Guide to Sentiment Analysis" Springer, 2017.
Web Resources • https://www.coursera.org/projects/twitter-sentiment-analysis • https://www.udemy.com/course/sentiment-analysis-with-lstm-and-keras-in-python

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2								1	
2	3	2	2			2								2	
3	3	2	2			2								2	
4	3	2	2			2								2	
5	3	2	2			2								2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSEOUTCOME1:.(Apply)

1. Construct suitable examples for the various relationships betweenGrammar-based LM and Statistical LM with detailed

COURSEOUTCOME2:(Apply).

1. Infer the CFG for the set of strings that contains equal number of a's and b's over Σ ={a,b}.

COURSEOUTCOME3:(Apply)

1. Compose the error E(x,) to emphasize the fact that now the error is being defined as a function of the query point x*.

COURSEOUTCOME4:(Analyze)

1. Analyze about the Word Sense Disambiguation methods by Morphological watershed method.
2. Design Marr-Hollerith edge detector used in image segmentation with necessary equations.

COURSEOUTCOME5:(Apply)

1. Implement Automated Discovery of Abnormal Patterns with real time use cases?

2.Develop the Quality Prediction as a Regression Problem.with suitable example?

21AI7703	HIGH PERFORMANCE NETWORKS	L	T	P	C
		3	0	0	3

Preamble

This course provides the main features of TCP/IP, Modes of communication, various switching mechanisms and multimedia networking applications. The main aim of this course is to implement advance networks concept of VPN, MPLS technology and analysis of network traffic modelling for evaluation of network performance. Finally this course focus on security using Firewalls and creating internet standard management framework.

Prerequisites for the course

Computer Networks

Objectives

- To develop a comprehensive understanding of multimedia networking.
- To study the types of VPN and tunnelling protocols for security.
- To learn about network security in many layers and network management.

UNIT I	INTRODUCTION	9

Review of OSI, TCP/IP, Multiplexing, Modes of Communication, Switching, Routing, SONET – DWDM – DSL – ISDN – BISDN,ATM.

Suggested Activities:

1. Capturing IP Packets Using Packet Sniffer Software. (Ethereal)

2.Implementation of Routing concept Using CISCO IP Tracer Software.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT II	MULTIMEDIA NETWORKING APPLICATIONS	9

Streaming stored Audio and Video – Best effort service – protocols for real time interactive applications – Beyond best effort – scheduling and policing mechanism – integrated services – RSVP-differentiated services.

Suggested Activities:

1.Implementing Streaming Video in YouTube.

2.Streaming Audio in You Tube.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT III	ADVANCED NETWORKS CONCEPTS	9

VPN-Remote-Access VPN, site-to-site VPN, Tunnelling to PPP, Security in VPN.MPLS -operation, Routing, Tunnelling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections.

Suggested Activities:

1.Install VPN Service in Mobile.

2.Connect two personal Computer System Using Crossover CAT6 cable and Check the peer to peer connection characteristics.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT IV	TRAFFIC MODELLING	9

Little's theorem, Need for modelling, Poisson modelling and its failure, Non - Poisson models, Network performance evaluation

Suggested Activities:

1. Analyze the flow of packets using Ethereal software..

2.Implement and analyse the network performance using NS2 Software.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT V	NETWORK SECURITY AND MANAGEMENT	9

Principles of cryptography – Authentication – integrity – key distribution and certification – Access control and: fire walls – attacks and counter measures – security in many layers. Infrastructure for network management – The internet standard management framework – SMI, MIB, SNMP, Security and administration – ASN.

Suggested Activities:

1.Implement the cryptography concept in computer.

2.Implement the security concept using password Authentication in System.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- Understand the high performance network Architectures. (Understand)
- Apply the multimedia networking in real time applications.(Apply)
- Understand the virtual Private Networks.(Understand)
- Understand the traffic modeling for QoS network models.(Understand)
- Ensure the security in high performance network applications.(Evaluate)

Text Books

1. J.F. Kurose & K.W. Ross,"Computer Networking- A top down approach featuring the internet", Pearson, 2nd edition, 2003. (UNIT I, II, V)
2. Walrand .J. Varaiya, High performance communication network, Morgan Kauffman – Harcourt Asia Pvt. Ltd. 2nd Edition, 2000. (UNIT I)

Reference Books

1. Larry L.Peterson& Bruce S.Davie, "Computer Networks: A System Approach"- The Morgan Kaufmann Publishers, Edison 4, 2007. (UNIT III)
2. Aunuragkumar, D. MAnjunath, Joy kuri, "Communication Networking", Morgan Kaufmann Publishers, 1st Edition, 2004. (UNIT IV)

Web Resources

- www.nptel.ac.in

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3													
2	3	3	3	3									3		
3	3	3	3										3		
4	3	3	3	3											
5	3	3	3	3											

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Understand the high performance network Architectures

1. Recall the architecture of OSI. (Remember)
2. Understand the role of Multiplexing. (Understand)
3. Illustrate about DWDM. (Remember)

Course Outcome 2 (CO2): Apply the multimedia networking in real time applications

1. Visualize the Best effort service. (Remember)
2. Compare the term scheduling and policing mechanism. (Understand)
3. Analyse the differentiated services. (Analyze)

Course Outcome 3 (CO3): Understand the virtual Private Networks

1. Narrate the role of VPN. (Understand)
2. Discuss about Tunnelling to PPP. (Remember)
3. Illustrate the MPLS based VPN. (Remember)

Course Outcome 4 (CO4): Understand the traffic modelling for QoS network models.

1. Analyse the need for modelling. (Analyze)
2. Analyze the parameters used to evaluate Network performance. (Analyze)

Course Outcome 5 (CO5): Ensure the security in high performance network applications.

1. Apply the principles of cryptographywith an example. (Apply)
2. Apply the concept of internet standard management framework with an example. (Apply)

		L	T	P	C
21AI7704	**MANAGEMENT INFORMATION SYSTEM**	**3**	**0**	**0**	**3**

Preamble

This Course deals with usage of information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.

Prerequisites for the course

NIL

Objectives

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To understand the importance of information in business and E commerce
- To know about the recent information systems and technologies.

UNIT I	**FUNDAMENTALS OF INFORMATION SYSTEMS**	**9**

Data, Information, Intelligence, Information Technology, Information System, evolution, types based on

functions and hierarchy, System development methodologies, Functional Information Systems, DSS, KMS, International Information System, Transaction Processing Systems..		
SUGGESTED ACTIVITIES		
• In class activity identifying Detecting and Correcting System development methodologies. • Analyze the DSS and KMS System Functions		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT II	**SYSTEM ANALYSIS AND DESIGN**	**9**
Case tools - System flow chart, Decision table, Data flow Diagram (DFD), Entity Relationship (ER), Object Oriented Analysis and Design (OOAD), UML diagram.		
SUGGESTED ACTIVITIES		
• Presentation and discussion on - Entity Relationship(ER) • Implementation of UML diagram with real-time use cases..		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT III	**DATABASES AND INFORMATION MANAGEMENT**	**9**
Organizing Data in a Traditional File Environment- The Database Approach to Using Databases to Improve Business Performance and Decision Making Data Management- Business Intelligence Infrastructure- Managing Data Resources.		
SUGGESTED ACTIVITIES		
• Presentation and discussion on Business Intelligence Infrastructure.		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		

UNIT IV	SECURING INFORMATION SYSTEMS	9
Security, Testing, Error detection, Controls, Vulnerability-Malicious software-viruses-worms- Trojan horses-Spyware-Hackers, Disaster Management, Computer Crimes-Hacking-Cyber theft-piracy- spoofing-sniffing-identify theft-internal threats, Securing the Web, Intranets and Wireless Networks..		
SUGGESTED ACTIVITIES		
• Presentation and discussion on Malicious software and Vulnerability • Implementation of Spoofing and Sniffing.		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT V	**EMERGING TECHNOLOGIES**	**9**
Role of information management in ERP, e-business, e-governance, Data Mining, Big Data Analytics, Cloud computing, CMM, Online marketing-social network marketing.		
SUGGESTED ACTIVITIES		
• Presentation and discussion on social network marketing. • Implementation of ERP with real time use cases.		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
Total Periods		**45**
Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**

1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Learn the basics of data and information system**(Understand)**

CO2: Analyze the system development methodologies**(Apply)**

CO3: Develop the database management system and its types. **(Apply).**

CO4: Apply the various technologies in information system and its security(**Apply).**

CO5: Gains knowledge on effective applications of information systems in business **(Apply).**

Text Books

1. Kenneth C. Laudon and Jane P Laudon, Management Information Systems –Managing the Digital Firm, 15 th edition, 2018.

Reference Books

1. Robert Schultheis and Mary Sumner, Management Information Systems – The Manager's View, Tata McGraw Hill, 2008
2. Panneerselvam. R, Database Management Systems, 3rd Edition, PHI Learning, 2018.2. Richard M Reese.

Web Resources

- https://onlinecourses.nptel.ac.in/noc21_ee23/preview
- https://www.coursera.org/articles/management-information-system

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2								1	
2	3	2	2			2								2	

3	3	2	2			2							2	
4	3	2	2			2							2	
5	3	2	2			2							2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

1. **COURSEOUTCOME1:(Apply)**

2. Outline the conceptual framework of Information Systems Components and Elaborately explain the components.

3. COURSEOUTCOME2:(Apply)

1. Assume a school offers community school classes after school hours the majority of the programmers are adult continuing education such as computer courses, personal finance, ballroom dancing, yoga and photography. Most of the records and course matching is done using spreadsheets. Considering the

scenario, model the information system with ER diagram to overcome potential issues that could arise with the system.

COURSEOUTCOME3:(Apply)

2. Discuss the steps in designing RDBMS applied to reality by assuming suitable no of reports in that reality
3. Discuss in detail about the need and importance of Blockchain in the current Business scenario.g.

COURSEOUTCOME4:1. (Analyze)

3. Identify an organization that has recently been in the news for some kind of IS security breach. Analyze its security plan and suggest the security measures
4. if your computer is connected through an external communication line, anyone with a similar link can potentially access it'. Do you agree or not?. What are your reasons?

COURSEOUTCOME5:(Apply)

1. If you were given a chance to act as a minister of state for it, what would be your first priority

   Implementing e- governance? Bring out your initiatives with your own Experience and examples
2. You are working for a medium –sized company that wishes to sell products business to consumers

   (B2C) on the internet. Find three firs that could be used to host your website. Identify the features, tools, and cost of each firm. Which one would you recommend?
3. Write video frame classification & various digital video formats
4.

21AI7705	Image and video analytics	L	T	P	C
		3	0	0	3
Preamble					
Image and Video Analytics focuses on the latest groundbreaking advances in image analysis and					

processing, which are based on modern methods of deep and machine learning developed for visual data. The programme aims to meet the increased need for knowledge and skills in this particular combination of subjects and defines a new professional profile that corresponds to the growing shortage of expertise in analysis, processing and interpretation of images and video that prevails in both academia and industry.

Prerequisites for the course

- 21MA3205- Probability &Statistics
- 21AI4601-Data Analytics

Objectives

1. To impart knowledge on the basic principles and concepts in digital image and video processing.
2. To understand the concepts of Image and Video Processing
3. To implement the image compression techniques.
4. To apply the image acquisition techniques for image analysis.
5. To explore and demonstrate real time image and video analytics in solving practical problems of commercial and scientific interests.

UNIT I	**DIGITAL IMAGE AND VIDEO PROCESSING**	**9**

Types of image- Scale of Image-Dimension of Images-Digitization of Images-Quantized Images-Color Images-Size of Image Data-Digital Video-Sampled Video-Video Transmission

SUGGESTED ACTIVITIES

- Discussion on dimension of images.

SUGGESTED EVALUATION METHODS

- Quiz on Types of Images

UNIT II	**IMAGE REPRESENTATION AND MODELLING**	**9**

Image Representations and Image Models: Computational Models for Early Human Vision, Random Field models, Image Modulation Models, Image Noise Models- Image and Video Classification and Segmentation: Statistical methods for Image Segmentation, Video Segmentation- Edge and Boundary Detection in images- Algorithms for Image Processing.

SUGGESTED ACTIVITIES		
• In-class activity – Numerical problems on statistical Models. • Flipped classroom on description about video features.		
SUGGESTED EVALUATION METHODS		
• Assignments on Image segmentation. • Quiz on Image Models		
UNIT III	**IMAGE COMPRESSION AND VIDEO COMPRESSION**	**9**
Loselesscoding,Wavelet Image Compression, The JPEG Lossy Image compression Standard, Multi spectural Image Coding, Spatiotemporal subband/Wavelet Video compression, Object Based Video Coding,MPEG-I and MPEG-II Video standards.		
SUGGESTED ACTIVITIES		
• Implementation of Compression Techniques.		
SUGGESTED EVALUATION METHODS		
• Quiz on Wavelet Image compression and Wavelet Video compression		
UNIT IV	**IMAGE AND VIDEO ACQUISITION**	**9**
Image scanning, Sampling and Interpolation, Video sampling and Interpolation-Image Quantization, Halftoning and printing-Perceptual criteria for Image Quality Evaluation-Image and video Indexing and Retrieval- Image and Video Communication Networks.		
SUGGESTED ACTIVITIES		
• In-class activity –Image Quantization.		
SUGGESTED EVALUATION METHODS		
• Quiz on Image and Video Communication Networks		
UNIT V	**APPLICATIONS OF IMAGE PROCESSING**	**9**
Computed Tomography-Cardiac Image Processing-Computer Aided detection for screening mammography-Fingerprint Classification and matching-Human face Recognition		

SUGGESTED ACTIVITIES

- Flipped classroom on discussion on Human Face Recognition.
- Practical – Image Classification.

SUGGESTED EVALUATION METHODS

- Assignment onFingerprint Classification and matching

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

1. Understand the requirements of Images and Videos**.(Understand)**
2. Illustrate the principles and techniques of Image models related to digital imaging system **. (Understand)**
3. Demonstrate the image compression and Video compression**.(Understand)**
4. Apply the Image and video acquisition**(Apply)**
5. Analysis of image processing in application**(Analyze)**

Text Books

1. Alan C. Bovik, "Handbook of Image and Video processing", Second Edition, Academic Press, 2005.
2. A. Murat Tekalp, "Digital Video Processing", Second Edition, Prentice Hall, 2015.

Reference Books
1. Francesco Camastra, Alessandro Vinciarelli," Machine Learning for Audio, Image and Video Analysis" Springer, 2007
Web Resources 11. **https://www.udemy.com/course/ai-and-machine-learning-for-image-and-video-processing/** 12. **https://nptel.ac.in/courses/108103174**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2								3	
2	3	3	3			2								3	
3	3	3	3			2								3	
4	3	3	3			2								3	
5	3	3	3			2								3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					

CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

1.Explain any three color models used in color image processing

Course Outcome 2 (CO2): (Apply)

1. Explain the methods or simultaneous motion estimation and segmentation techniques.

2. Explain the spatial filters used or noise reduction.

3. Explain any three Thresholding methods used in image segmentation

Course Outcome 3 (CO3): (Apply)

1.Discuss the classification of video frames.

2.Write video frame classification & various digital video formats.

Course Outcome 4 (CO4): (Apply)

1. Evaluate the perceptual criteria for Image Quality Evaluation

Course Outcome 5 (CO5): (Apply)

1. Classify the fingerprint images using statistical methods.

21CS7708	INFORMATION SECURITY	L	T	P	C
		3	0	0	3

Preamble

This course emphasizes on the information security. This course explains the concept information security, Computer Security, Risk Management, Types of security models. This Course helps the learners to know the different security models and protects sensitive information from unauthorized activities, including inspection, modification, recording, and any disruption or destruction.

Prerequisites for the course

- 21CS7602 - Cryptography and Network Security

Objectives

1. To understand the basics of Information Security 2. To know the legal, ethical and professional issues in Information Security 3. To know the aspects of risk management 4. To become aware of various standards in this area 5. To know the technological aspects of Information Security**.**		
UNIT I	**INTRODUCTION**	**9**
History, What is Information Security?-Critical Characteristics of Information- NSTISSC Security Model-Components of an Information System-Securing the Components-Balancing Security and Access-The SDLC-The Security SDLC		
UNIT II	**SECURITY INVESTIGATION**	**9**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.		
UNIT III	**SECURITY ANALYSIS**	**9**
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.		
UNIT IV	**LOGICAL DESIGN**	**9**
Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, PCI DSS (Payment Card Industry Data Security Standard), Intrusion Prevention System (IPS), Design of Security Architecture and Planning for Continuity.		
UNIT V	**PHYSICAL DESIGN**	**9**
Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
DESCRIPTIVE QUESTIONS	ASSIGNMENT ONLINE MCQ	DESCRIPTIVE QUESTIONS
Course Outcomes		
Upon completion of the course, the students will be able to:		
CO1 Understand the basics of information security techniques(Understand)		

CO2 Analyze solutions to the legal, ethical and professional issues in information security (Apply) CO3 Analyse the aspects of risk management.(Analyse) CO4 Apply security models policies for Information Security Systems(Apply) CO5 Apply the physical structure of information Security systems(Apply)
Text Books
1. Michael E Whitman and Herbert J Mattord - Principles of Information Security, Cengage Learning,4th Edition,2012.
Reference Books
1. Micki Krause, Harold F. Tipton, — Handbook of Information Security Management, Vol 1-3 CRCPress LLC, 2004. 2. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposed, Tata McGrawHill, 2003 3. Matt Bishop, — Computer Security Art and Science, Pearson/PHI, 2002.
Web Resources 1. https://nptel.ac.in/courses/106106129 2. https://www.geeksforgeeks.org/what-is-information-security/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	2									3	
2	3	3	2	3	2									3	
3	3	3	2	3	2									3	
4	3	2	3	2	3									3	
5	3	2	3	2	3									3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	20	50	5	5	50

ANALYZE	20	20	5	5	20
EVALUATE					
CREATE					

21CS7710	CYBER FORENSICS AND TOOLS	L	T	P	C
		3	0	0	3

Preamble

This Course Prime Use Of Digital Forensics in India is to Deliver Justice and Solve Complicated Cases involving Digital Complexities.

Prerequisites for the course

- 21IT5703 - Cyber Security

Objectives

1. To Understand computer forensics
2. To become familiar with forensics tools
3. To learn to analyze and validate forensics data
4. To Learn Ethical Hacking
5. To Learn Ethical Hacking in web

UNIT I	INTRODUCTION TO COMPUTER FORENSICS	9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II	EVIDENCE COLLECTION AND FORENSICS TOOLS	9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT III	ANALYSIS AND VALIDATION	9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

UNIT IV	ETHICAL HACKING	9

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing		
UNIT V	**ETHICAL HACKING IN WEB**	**9**
Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Ap plications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
DESCRIPTIVE QUESTIONS	ASSIGNMENT ONLINE MCQ	DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand the basics of computer forensics(Understand)
CO2 Apply a number of different computer forensic tools to a given scenario(Apply)
CO3 Analyze and validate forensics data(Apply)
CO4 Analyze the vulnerabilities in a given network infrastructure(Apply)
CO5 Implement real-world hacking techniques to test system security(Apply)

Text Books

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, India Edition, 2016.
2. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.

Reference Books

1. John R.Vacca, ―Computer Forensics||, Cengage Learning, 2005
2. MarjieT.Britz, ―Computer Forensics and Cyber Crime||: An Introduction||, 3rd Edition, Prentice Hall, 2013.
3. AnkitFadia ― Ethical Hacking|| Second Edition, Macmillan India Ltd, 2006
4. Kenneth C.Brancik ―Insider Computer Fraud|| Auerbach Publications Taylor & Francis Group– 2008.

Web Resources

1. https:// cybersecurity.umsl.edu/links/index.html
2. https:// www.sans.org/security-resources/
3. https:// onlinecourses.nptel.ac.in/noc23_cs127/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2										3	
2	3	3	2	2										3	
3	3	3	2	2										3	
4	3	3	2	2										3	
5	3	3	2	2										3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

Professional Elective VI

S.No	Course Code	Course Name	Sem	L	T	P	C	DOMAIN
1.	21AI7706	Speech and Language Processing	7	3	0	0	3	AI
2.	21AI7707	Knowledge Engineering and Expert System	7	3	0	0	3	Data Science
3.	21CS7602	Cryptography and Network Security	7	3	0	0	3	Networking
4.	21CS6710	Agile Software Development	7	3	0	0	3	Software Engineering
5.	21AI7708	Human Computer Interaction	7	3	0	0	3	Image Processing
6.	21CB6706	Mobile Application Development	7	3	0	0	3	ComputationandProgramming
7.	21AI7709	Cognitive Science and Analysis	7	3	0	0	3	Recent Trends

		L	T	P	C
21AI7706	**SPEECH AND LANGUAGE PROCESSING**	**3**	**0**	**0**	**3**

Preamble

Primary aim of the course is to introduce learners with essentials of natural language processing. The essentials cover linguistic aspects, core algorithms for solving basic tasks, statistical and shallow machine

learning models for several natural language processing tasks.

Prerequisites for the course

- 21AI3601-Artifical Intelligence
- 21AI4601-Data Analytics

Objectives

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications.

UNIT I	**INTRODUCTION**	**9**

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

SUGGESTED ACTIVITIES

- In class activity identifying Detecting and Correcting Spelling Errors
- Analyze the Transducers for lexicon and rules

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes

UNIT II	**WORD LEVEL ANALYSIS**	**9**

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

SUGGESTED ACTIVITIES

- Presentation and discussion on -Speech Tagging, Rule-based
- Implementation of Hidden Markov and Maximum Entropy models

SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT III	**SYNTACTIC ANALYSIS**	**9**
Context-Free Grammars, Grammar rules for English, Tree banks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.		
SUGGESTED ACTIVITIES		
• Presentation and discussion on.Syntactic Parsing, Ambiguity • Lexicalized CFGs		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT IV	**SEMANTICS AND PRAGMATICS**	**9**
Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods..		
SUGGESTED ACTIVITIES		
• Presentation and discussion on Word Sense Disambiguation • Implementation of WSD using Supervised		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		

<table>
<tr><td>UNIT V</td><td>DISCOURSE ANALYSIS AND LEXICAL RESOURCES</td><td>9</td></tr>
<tr><td colspan="3">Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill’s Tagger, WordNet, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC)</td></tr>
<tr><td colspan="3">SUGGESTED ACTIVITIES</td></tr>
<tr><td colspan="3">• Implementation of Anaphora Resolution using Hobbs and Centering Algorithm
• Implementation of Word Net, Prop Bank.</td></tr>
<tr><td colspan="3">SUGGESTED EVALUATION METHODS</td></tr>
<tr><td colspan="3">• Assignment problems
• Quizzes</td></tr>
<tr><td colspan="2">Total Periods</td><td>45</td></tr>
<tr><td colspan="3">Suggestive Assessment Methods</td></tr>
<tr><td>Continuous Assessment Test
(20 Marks)</td><td>Formative Assessment Test
(20 Marks)</td><td>End Semester Exams
(60 Marks)</td></tr>
<tr><td>1.DESCRIPTIVE QUESTIONS
2. PROGRAMING AND PROBLEM SOLVING QUESTIONS</td><td>1.ASSIGNMENT
2. ONLINE QUIZZES
3.PROBLEM-SOLVING ACTIVITIES</td><td>1.DESCRIPTIVE QUESTIONS
2. PROGRAMING AND PROBLEM SOLVING QUESTIONS</td></tr>
<tr><td colspan="3">Course Outcomes</td></tr>
<tr><td colspan="3">Upon completion of the course, the students will be able to:</td></tr>
<tr><td colspan="3">CO1:Identify any given text with basic Language features (Apply).
CO2: Design an innovative application using NLP components(Apply)
CO3: Implement a rule based system to tackle morphology/syntax of a language(Apply)
CO4: Design a tag set to be used for statistical processing for real-time applications(Apply)
CO5: Build different strategies to create various NLP applications(Apply)</td></tr>
</table>

Text Books

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

2.Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009.

Reference Books

1. Breck Baldwin, —Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.

2. Richard M Reese, —Natural Language Processing with Java, OReilly Media, 2015.

3.NitinIndurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

4.Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

Web Resources

- https://nptel.ac.in/courses/106105158
- https://www.coursera.org/learn/probabilistic-models-in-nlp

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2							1		
2	3	2	2			2							1		
3	3	2	2			2							2		
4	3	2	2			2							2		
5	3	2	2			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS	CAT 1	CAT 2	FAT 1	FAT 2	END SEM

CATEGORY					EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSEOUTCOME1:(Apply)

1.Illustrate a regular expression for the set of all the strings have odd number of 1's.

COURSEOUTCOME2:(Apply).

1. Infer the CFG for the set of strings that contains equal number of a's and b's over Σ ={a,b}.

COURSEOUTCOME3:(Apply)

1.Convince your answer of a context free grammar for the given expression(a+b) (a+b+0+1)*.

2Develop an equivalent grammar G in CNF for the grammar G1 where G1=({S,A,B},{a,b},{S □ASB| ε ,A□aAS|a, B□SbS|A|bb},S)

COURSEOUTCOME4:(Analyze)

1.Analyze about the Word Sense Disambiguation methods by Morphological watershed method..

2.Design Marr-Hollerith edge detector used in image segmentation with necessary equations.

COURSEOUTCOME5:(Apply)

1.ImplementAnaphora Resolution using Hobbs and Centering Algorithm with real time use cases?

2. Develop the WordNet, Prop Bank applications with suitable example?Apply)

21AI7707	**KNOWLEDGE ENGINEERING AND EXPERT SYSTEM**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

This course delivers the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence, solve problems in Artificial Intelligence using Python and familiarize with knowledge processing in expert systems.

Prerequisites for the course

Students should have Basic theoretical concepts of Statistics and Probability Mathematics

Course Objectives

1. To learn about theBasic Concept of Expert Systems
2. To understand the need for Probabilistic reasoning
3. To discuss why Neural networks is important
4. To have Ability to design expert system using AI tools.
5. To study the concepts of Syntax and semantics

UNIT I	**INTRODUCTION**	**9**

Introduction to AI: Intelligent agents – Perception –Natural language processing – Problem – Solving agents – Searching for solutions: Uniformed search strategies – Informed search strategies.

SUGGESTED ACTIVITIES

- Discussion about Intelligent agents .
- Implementation of Informed search strategies.

SUGGESTED EVALUATION METHODS		
• Assignment on Problem – Solving agents		
UNIT II	**LOGIC AND INFERENCE**	**9**
Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first orderlogic.		
SUGGESTED ACTIVITIES		
• Discussion about Syntax and semantics • Implementation ofLogical agents		
SUGGESTED EVALUATION METHODS		
• Assignment on Optimal and imperfect decisions		
UNIT III	**UNCERTAINITY**	**9**
Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.		
SUGGESTED ACTIVITIES		
• Discussion about Baye's rule • Implementation ofProbabilistic reasoning		
SUGGESTED EVALUATION METHODS		
• Assignment on Baye's rule		
UNIT IV	**PLANNING AND LEARNING**	**9**

Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains – Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.		
SUGGESTED ACTIVITIES		
• Discussion about Learning decision trees • In class activity- Neural networks		
SUGGESTED EVALUATION METHODS		
• Quiz on Reinforcement learning.		
UNIT V	**EXPERT SYSTEM**	**9**
Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.		
SUGGESTED ACTIVITIES		
• Discussion about Expert system tools. • In class activity- Knowledge Representation in expert systems		
SUGGESTED EVALUATION METHODS		
• Quiz on MYCIN		
Total Periods		**45**
Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**

1. DESCRIPTION QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO703.1: Study about intelligent agents and search methods. (**Understand)**

CO703.2: Implementmethodsrepresenting knowledge. (**Understand)**

CO703.3: Study about Neural Networks. (**Understand)**

CO703.4: Impart knowledge on reasoning and decision making in uncertain world. (**Apply)**

CO703.5: Construct plans and methods for generating knowledge. (**Understand)**

Text Books

1.Anil Sharma,Introduction to Artificial Intelligence & Expert Systems,Excel Books, First Edition, 2011

2.StuartRussel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Second Edition, Pearson Education, 2003 / PHI.

Reference Books

1.Simon Kendal, Malcolm Creen ,An Introduction to Knowledge Engineering, Springer, First Edition, 2007

Web Resources

1. https://www.slideshare.net/vijipriyacse/expert-system-lecture-notes-chapter-12345-drjvijipriya
2. https://gateknowledge.in/expert-systems/
3. https://www.javatpoint.com/expert-systems-in-artificial-intelligence
4. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.htm

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1				1	1			2			
2	3	2	1	1				1	1			2			

3	3	2		1				1	1			2			
4	3	2	2	1			1	1	1			2			
5	3	2	2	1			1	1	1			2			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: (Remember)

1. Explain in detail about the Natural language processing
2. Discuss in detail the Uniformed search strategies

COURSE OUTCOME 2: (Understand)

1. Write in detail about Syntax and semantics of expert systems.
2. State why Inference in first orderlogic is important

COURSE OUTCOME 3: .(Remember)

1. Briefly discuss about Axioms of probability

2. Discuss the Baye's rule and its application.

COURSE OUTCOME 4: 1. (Remember)

1. Write short notes on Neural networks.
2. Write short notes on the Learning decision trees.

COURSE OUTCOME 5: (Remember)

1. Write the applications of Expert system tools
2. Explain the need, significance and evolution of MYCIN – EMYCIN.

21CS7602	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

Preamble

Cryptography is the study of information and communication security. This course deals with prevailing weaknesses, vulnerabilities, attack methods and mitigation approaches in network security. The course focuses on Authentication, authorization, confidentiality, data integrity and non-repudiation, real time network security protocols and system security issues.

Prerequisites for the course

- 21CS5602 - Computer Networks

Objectives

- To understand OSI security architecture and classical encryption techniques.
- To acquire fundamental knowledge on the concepts of finite fields and number theory
- Todescribe the principles of public key cryptosystems.
- Tounderstand the concept of hash functions and digital signature
- To understand the various Authentication Applications and System Security

UNIT I	INTRODUCTION	9

Introduction: Services, Mechanisms and Attacks, OSI Security Architecture, Model for Network Security. Confidentiality: General Cipher model, Classical encryption techniques, private-key cipher model - block cipher and stream cipher operations, public-key cipher model, attacks on cryptosystems

Suggested Activities:

- Infer the attacks on cryptosystems.
- Applying Various cryptographic techniques for Network Security

SUGGESTED EVALUATION METHODS:

- Assignment problems on Substitution Techniques
- Quizzes

UNIT II	BLOCK CIPHERS AND STREAM CIPHERS MECHANISMS	9
Block Cipher Mechanisms: DES, Block cipher modes of operation.Introduction to Finite Fields: Groups, Rings and Fields, Modular Arithmetic, Euclid's Algorithm, Advanced Encryption Standard, Blowfish. Stream Cipher Mechanisms: RC4Stream Cipher– Diffie Hellman Key Exchange		
Suggested Activities: • Understanding the concepts of Groups, Rings, Fields, Modular Arithmetic and Euclid's Algorithm • Applying the various Block cipher and Stream cipher mechanisms for Network Security		
SUGGESTED EVALUATION METHODS: • Assignment problems onDiffie Hellman Key Exchange • Quizzes		
UNIT III	**PUBLIC KEY CRYPTOGRAPY**	**9**
Introduction to Number Theory: Prime Numbers, Fermat'sand Euler's Theorem, Testing for Primality. Public key ciphers - RSA cryptosystem, EllipticCurve Cryptography, Key Management.		
Suggested Activities: • RSA Algorithm for Encryption and Decryption • EllipticCurve Cryptographyfor Encryption and Decryption • Key Management for Public Key Cryptography		
SUGGESTED EVALUATION METHODS: • Assignment problems on RSA • Quizzes		
UNIT IV	**MESSAGE AUTHENTICATION AND INTEGRITY**	**9**
Data Integrity: Message Authentication Codes, Hash functions, MD5 Message Digest Algorithm. Non-Repudiation: Digital Signature and Digital Signature Standard. Authentication and Authorization: Biometrics, Password and ChallengeResponse,3 D Encryption.		
Suggested Activities: • Message Authentication Codes, Hash functions, MD5 Message Digest Algorithm for Data Integrity • Digital Signature and Digital Signature Standard for Non-Repudiation • Biometrics, Password and ChallengeResponse for Authentication and Authorization		
SUGGESTED EVALUATION METHODS: • Assignment on MD5 Message Digest Algorithm • Quizzes		
UNIT V	**NETWORK SECURITY PRACTICES**	**9**

Authentication Application – Kerberos, Electronic Mail Security – PGP, IP Security - IP Security Architecture. Web Security- Secure Socket Layer and Transport layer, Secure Electronic Transaction. System Security: Intruders, Malicious Software and Firewalls.	
Suggested Activities: • Analyzingauthenticationapplicationssuch as Kerberos and Electronic Mail Security for System security	
SUGGESTED EVALUATION METHODS: • Assignment on Secure Electronic Transaction • Quizzes	
Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand theneedforSecurityServicesandMechanismstothwartthethreatsandvulnerabilitiesofinformationsystems

CO2 Apply thefundamentalcryptography, encryption, anddecryptionalgorithms

CO3 Apply the different cryptographic operations of public key cryptography

CO4 ApplycryptographicalgorithmsandHashfunctionstoensuredatasecrecy anddata integrity

CO5 Analyzetheauthenticationapplications and SystemSecurity

Text Books

1.William Stallings, "Cryptography and Network Security Principles and Practices", Sixth Edition, Pearson Education, 2018.

Reference Books

1. BehrouzA.Ferouzan,"Cryptography&NetworkSecurity",TataMcGrawHill, 2007.
2. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

Web Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs90/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2										2	
2	3	3	3	2										1	
3	3	3	3	2										2	
4	3	3	2	2										1	
5	3	3	3	2										1	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to understand the need for Security Services and Mechanisms to thwart the threats andvulnerabilities of information systems

Course Outcome 1 (CO1):

1. Compare Passive and Active attack. (Understand)
2. List the two basic functions used in Encryption algorithms.(Remember)

Course Outcome 2 (CO2):Students will be able to Apply the fundamental cryptography, encryption, and decryptionalgorithms

1. Find gcd (1970, 1066) using Euclid's algorithm. (Apply)
2. Interpret the single round of DES algorithm and the key discarding process of DES. (Apply)

Course Outcome 3 (CO3):Students will be able to Apply the different cryptographic operations of public key cryptography

1. In the elliptic curve group defined by $y_2 = x_3 - 17x + 16$ over real numbers, what is P + Q if P = (0,-4) and Q = (1, 0)?(Apply)
2. Demonstrate encryption and decryption to the system with p=7, q=11, e=17, M=8 (Apply)

Course Outcome 4 (CO4):Students will be able toApply cryptographic algorithms and Hash algorithms to ensure data secrecy and data integrity

1. Apply security best practices to ensure the confidentiality, integrity, and availability of network resources. (Apply)
2. DSA specifies that if the signature generation process results in a value of *s=0*, a new value of *k* should be generated and the signature should be recalculated.(Apply)

Course Outcome 5 (CO5):Students will be able toAnalyze the authentication applications and System Security

1. Demonstrate the Kerberos authentication service.
2. Determine the Secure Electronic Transaction (SET) protocol.

21CS6708	AGILE SOFTWARE DEVELOPMENT	L	T	P	C
		3	0	0	3

Preamble

Agile is an iterative approach to project management and software development that helps teams deliver value to their customers faster and with fewer headaches. Instead of betting everything on a "big bang" launch, an agile team delivers work in small, but consumable, increments.

Prerequisites for the course

- 21CS3604 - Software Engineering

Objectives

- To understand the basic principles of agile software development.

- To learn the principles and practices associated with each of the agile development methods.
- To learn the process and activities in agile project management.
- To analyse the requirements, testing the project and review the project through agile methodology.
- To apply the principles and practices of agile software development on a project of interest and relevance to the student.

UNIT I	INTRODUCTION TO AGILE SOFTWARE DEVELOPMENT	9

Agile Software Development: Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges.

UNIT II	AGILE PRINCIPLES AND APPROACHES	9

Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases. Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality.

Agile and Scrum Principles: Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values.

UNIT III	AGILE PRODUCT MANAGEMENT	9

Agile Product Management: Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, managing the Agile approach Monitoring progress, Targeting and motivating the team, managing business involvement and Escalating issue.

UNIT IV	AGILE REQUIREMENTS, TESTING AND REVIEW	9

Agile Requirements: User Stories, Backlog Management. Agile Architecture: Feature-Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools

Agile Testing: Agile Testing Techniques, Test-Driven Development, User Acceptance Test

Agile Review: Agile Metrics and Measurements, The Agile approach to estimating and project variables, Agile Measurement, Agile Control: the seven control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy, the rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools.

UNIT V	SCALING AGILE FOR LARGE PROJECTS	9
Scaling Agile for large projects: Scrum of Scrums, Team collaborations, Scrum, estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.		
	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	1. DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand the basic concept of agile software development. (Understand)
CO2 Understand the basic agile principles and the approaches. (Understand)
CO3 Apply the agile product management method in software development. (Apply)
CO4 Analyze the requirements, testing procedures and review the project through agile software development (Analyze)
CO5 Apply agile principles in large scaling (Apply)

Text Books

1. Robert C. Martin, Agile Software Development, Principles, Patterns, and Practices Alan Apt Series (2011)

Reference Books

1. Charles G. Cobb, PMP, Making Sense of Agile Project Management: Balancing Control and Agility, John Wiley & Sons, Inc.
2. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Pearson (2010)
3. David J. Anderson, Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Pearson, (2003)
4. Mary and Tom Poppendieck, Implementing Lean Software Development - From Concept to Cash, Addison Wesley
5. Lisa Crispin, Janet Gregory - Agile Testing - A practical guide for Tester and Agile Team, Addison Wesley

Web Resources

1. https://www.agilealliance.org/agile101/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	1	2	2		1				1	1	1			2	
2	1	2	2		1				1	1	1			3	
3	1	1	1		1				1	1	3			3	
4	1	3	1		1				1	1	1			3	
5	1	1	1		1				1	1	3			1	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	40	40	10	10	20
UNDERSTAND	40	20	10	5	40
APPLY	20	20	5	5	20
ANALYZE		20		5	20
EVALUATE					
CREATE					

21AI7708	**HUMAN COMPUTER INTERACTION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

HCI is concerned with designing interactions between human activities and the computational systems that support them, and with constructing interface to afford those interactions. Interactions between users on computational artifacts occur at an interface that includes both software and hardware.

Prerequisites for the course		
• 21AI6602- Machine learning Techniques • 21AI3601- Artificial intelligenceand Expert Systems		
Objectives		
• To learn the foundations of Human Computer Interaction. • To become familiar with the design technologies for individuals and persons with disabilities. • To be aware of mobile HCI. • To learn the guidelines for user interface		
UNIT I	**FOUNDATIONS OF HCI**	**9**
The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.		
SUGGESTED ACTIVITIES		
• In class activity identifying the processing and networks. • Analyze the interactivity Paradigms.		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT II	**DESIGN & SOFTWARE PROCESS**	**9**
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.		
SUGGESTED ACTIVITIES		
• Presentation and discussion on Iteration and prototyping. • Implementation of HCI in software process.		

SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT III	**MODELS AND THEORIES**	**9**
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models- Task analysis -Dialog notations and design-Model of system..		
SUGGESTED ACTIVITIES		
• PresentationanddiscussiononCommunication and collaboration models • Implementationof Model of system.		
SUGGESTED EVALUATION METHODS		
UNIT IV	**MOBILE HCI**	**9**
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools-Case Studies.		
SUGGESTED ACTIVITIES		
• PresentationanddiscussiononMobile Information Architecture. • Inclassactivity of Elements of Mobile Design.		
SUGGESTED EVALUATION METHODS		
• Assignment problems • Quizzes		
UNIT V	**WEB INTERFACE DESIGN**	**9**
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.		
SUGGESTED ACTIVITIES		

- Implementation of Direct Selection, Contextual Tools.
- Implementation of Inlays and Virtual Pages

SUGGESTED EVALUATION METHODS

- Assignment problems
- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1:.Collect fundamental design and evaluation methodologies of HCI**(Understand)**

CO2: Design effective HCI for individuals. **(Apply)**

CO3: Design the cognitive computerized models and HCI implication for designing multimedia, e-learning web sites. **(Understand)**

CO4: Design mobile application framework using HCI tools(**Apply)**

CO5: Develop web interface using various tools (**Apply)**

Text Books

9. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004.
10. Brian Fling, "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009
11. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

Reference Books

3. Ben Shneiderman and Catherine Plaisant, Designing the User Interface: Strategies for
4. Effective Human-Computer Interaction (5th Edition), 5th ed., Pearson Addison Wesley, 2009.
5. Donald A. Norman, The Design of Everyday Things, Basic Books, 2002.
6. Alan Cooper, About Face 3: The Essentials of Interaction Design, 3rd edition, Wiley 2007.

Web Resources

- https://archive.nptel.ac.in/courses/106/103/106103115/
- https://towardsdatascience.com/what-is-mlops-everything-you-must-know-to-get-started-523f2d0b8bd8

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2							1		
2	3	2	2			2							1		
3	3	2	2			2							2		
4	3	2	2			2							2		
5	3	2	2			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20

APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSEOUTCOME1:**(Apply)**

1.Analyze how HCI ensure the following when designing, selecting, commissioning or modifying software

COURSEOUTCOME2:(Apply)

Consider the following usability objective. Theatre booking clerks with low motivation, no computing experience and no previous training, working in a small and hectic box office, are able to learn to reserve or book seats within a one hour period. What measure could be taken and which techniques would you consider Appropriate to test vsWhether this objective was met?

COURSEOUTCOME3:(Apply)

1Consider the case of preparing a group presentation for a software project. Elaborate the stages in specifying and designing UI for the same

2.Decide how the 'golden rules' and heuristic help interface designers take account of cognitive psychology? Illustrate your answer with the design of Microsoft office word?

COURSEOUTCOME4:(Apply)

1.Design a registration page for movieticket booking Registrations

2.Develop the mobile applications medium layouts with real time example .

COURSEOUTCOME5:(Apply)

1.Design a web interface for a "library management system". State the functional requirements you are considering?

2.Analyze various contextual tools in detail with examples. How are they used in design of rich web UI? Illustrate and compare with example?

		L	T	P	C
21CB6706	**MOBILE APPLICATION DEVELOPMENT**	**3**	**0**	**0**	**3**

Preamble

This course introduces students to programming technologies, design and development related to mobile applications. Topics include accessing device capabilities, industry standards, operating systems, and programming for mobile applications using an OS Software Development Kit (SDK). Upon completion, students should be able to create basic applications for mobile devices..

Prerequisites for the course

• 21CB3601 – Object Oriented Programming (Java).

Objectives

1. To understand fundamentals and identify need and scope for mobile applications.
2. To learn the technologies and frameworks for designing and deploying mobile applications in Android and iPhone marketplace for distribution.
3. To study and take into account technical constraints, communication interfaces and user interfaces.
4. To explore emerging technologies and tools used to design and implement feature-rich mobile applications.
5. To develop mobile applications for Android.

UNIT I	INTRODUCTION	9

Mobile Applications – Characteristics and Benefits –Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Web vs Mobile App.

SUGGESTED ACTIVITIES:

Practical Implementation of Android programs -To Develop an application that uses GUI components, Font and Colours

SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT II	**USER INTERFACE**	**9**
User Interface Design part 1: Views & View Groups, Views : Button, Text Field, Radio Button, Toggle Button, Checkbox, Spinner, Image View, Image switcher, Event Handling, Listeners, Layouts : Linear, Relative, List View, Grid View, Table View, Web View, Adapters. User Interface Design Part 2: Menus, Action Bars, and Notifications: Status, Toasts and Dialogs.		
SUGGESTED ACTIVITIES: Practical - implementation of Android programs – Develop an application that uses Layout Managers and event listeners.		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT III	**INTENTS AND BROADCAST RECEIVERS**	**9**
Introducing intents- Using intent to launch activities- Introducing Linkify- Using intents to Broadcast Events- Creating Intent filters and broadcast receivers –Using intent filters to services to implicit intent- Using Intent Filters for Plug-Ins and Extensibility- Monitoring Device State Changes using Broadcast Intents.		
SUGGESTED ACTIVITIES : Practical - Using intent to create a intent filters and broadcast receivers		
SUGGESTED EVALUATION METHODS: • Assignment problems • Quizzes		
UNIT IV	**CONTENT PROVIDERS AND DATA STORAGE**	**9**

Content Providers: Contents provider, Uri, CRUD access, Browser, CallLog, Contacts, Media Store, and Setting. Data Access and Storage: Shared Preferences, Storage External, Network Connection. SQLite - SQLite Databases.

SUGGESTED ACTIVITIES :

Practical - Implementations of Android programs – Creating SQLite Database

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT V	ANDROID APPLICATION DEVELOPMENT	9

Designing Real world android application –Mapping out the application flow- Application source code- Managing jobs- Sever code- Building android application without SDK.

SUGGESTED ACTIVITIES :

Practical - Implementations of Android programs – Creating Mapping Applications.

SUGGESTED EVALUATION METHODS:

- Quizzes

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS	1.Assignment 2.Online Quizzes 3.Online Problem-Solving Platforms	1.DESCRIPTIVE QUESTIONS 2. FORMATIVE MULTIPLE CHOICE QUESTIONS

Outcomes

Upon completion of the course, the students will be able to:
CO1: Understand the Concepts of Mobile Application. CO2: Analyze and Design UI in the context of mobile application. CO3: Analyze how the Android platform uses Intents. CO4: Understand the concept of Data storage and Content providers. CO5: Develop mobile applications for Android.
Text Books
1. Joseph Annuzzi, Jr.,Lauren Darcey, Shane Conder "Introduction to Android Application Development", Addision-Wesley, 4th Edition, 2015. (Unit – I) 2. Reto Meier, "Professional Android 4 Development", John Wiley and Sons, 2012. (Unit II – III) 3. W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, "Android in Action", 3 rd Edition, 2012. (Unit IV – V)
Reference Books
1. ZigurdMednieks, Laird Dornin, G.BlakeMeike and Masumi Nakamura, "Programming Android", O"Reilly, 2012.
Web Recourses 1. http://developer.android.com/guide/index.html. 2. https://swayam.gov.in/explorer?searchText=mobile+application+development

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20

APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	3	3									2	3	3	
2	3	3	3	3	2								3	2	
3	3	2	3	3	2								3		
4	3	3	3	3									3	2	2
5	3	3	3	2	2	2							3	2	1

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. How do you store and retrieve data in Android environment? (Understand)
2. Examine the Market Drivers in Mobile Application(Analyse)
3. Identify what are the features considered for a successful mobile application? (Understand)

Course Outcome 2 (CO2):

1. Identify how to interact with UI with suitable example (Understand)
2.Explain various touch events and gestures in mobiledevice. (Understand)
3. Write an android program to explain its life cycle. (Understand)

Course Outcome 3 (CO3):

1.Explain the different Android application components Activity, Services, Content Providers, Broadcast receivers, Intents (Understand)

2. Explain the important directories and files created in any Android application. Mainactivity.java, activity_main.xml, androidmanifest.xml, res folder(Layout,drawable, values sub folder (Understand)

3. Explain the different Android Layout types. (Constraint layout, linear layout, relative layout, absolute layout and frame layout. (Understand)

Course Outcome 4 (CO4):

1. How to connect a database to an android app using SQLite ? (Understand)
2. What are content providers? How to create our own content provider in android app?(Understand)
3. Write an android app to send a SMS. (understand)

Course Outcome 5 (CO5):

1. Explain: a) Google Maps b) GPS and Wifi(understand)
2. Analyse what are design issues in Apple iPhone? (Analyse)
3. Develop an alarm application that rings every

21AI7709	**COGNITIVE SCIENCE AND ANALYSIS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

This course explores the area of cognitive computing and its implications for today's world of big data analytics and evidence-based decision making. Topics covered include: cognitive computing design principles, natural language processing, knowledge representation, Students will have an opportunity to build cognitive applications, as well as explore how knowledge-based artificial intelligence and deep learning are impacting the field of data science.

Prerequisites for the course

- 21AI6602- Machine learning Techniques
- 21AI3601- Artificial intelligence and Expert Systems

Objectives

- To develop algorithms that use AI and machine learning along with human interaction and feedback.
- To help humans make choices/decisions and to understand how Cognitive computing supports human reasoning.
- To evaluating data in context and presenting relevant findings along with the evidence that justifies the answers with the help of machine learning.
- To understand the advance analytics on a path to cognitive computing.
- To apply cognitive analytics on various applications

UNIT I	FOUNDATION OF COGNITIVE COMPUTING	9
Cognitive science and cognitive Computing with AI, Cognitive Computing - Cognitive Psychology - The Architecture of the Mind - The Nature of Cognitive Psychology – Cognitive architecture – Cognitive processes – The Cognitive Modeling Paradigms - Declarative / Logic based Computational cognitive modeling – connectionist models – Bayesian models. Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures		
SUGGESTED ACTIVITIES		
• Distinguishing features of cognitive system • Discuss about the frame works of cognitive architectures		
SUGGESTED EVALUATION METHODS		
• Quizzes on cognitive modelling • Case study on Human cognition on AI		
UNIT II	**COGNITIVE COMPUTING WITH INFERENCE AND DECISION SUPPORT SYSTEMS**	**9**
Intelligent Decision making, Fuzzy Cognitive Maps, Learning algorithms: Non linearHebbian Learning – Data driven NHL - Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps.		
SUGGESTED ACTIVITIES		
• Case study on Intelligent Decision making • Quizzes on Fuzzy cognitive maps		
SUGGESTED EVALUATION METHODS		
• Implement various learning algorithm for decision making in an enterprise		
UNIT III	**COGNITIVE COMPUTING WITH MACHINE LEARNING**	**9**
Machine learning Techniques for cognitive decision making – Hypothesis Generation and Scoring - Natural Language Processing - Representing Knowledge - Taxonomies and Ontologies - Deep Learning.		
SUGGESTED ACTIVITIES		

• Demonstration of text parsing, topic modelling, text clustering and text classification. • Demonstration of Part-of-Speech tagging using spaCy.		
SUGGESTED EVALUATION METHODS		
• Evaluate the accuracy of text classification • Quizzes on ML techniques for cognitive decision making		
UNIT IV	**ADVANCED ANALYTICS**	**9**
Path to cognitive computing- Key capabilities in advanced analytics- The relationship between statistics, data mining and machine learning- using machine learning in the analytic process-predictive analytics-text analytics-image analytics –speech analytics		
SUGGESTED ACTIVITIES		
• Discuss about various type of analytics on a path to cognitive computing • Case study on machine learning techniques and tools for advanced analytics		
SUGGESTED EVALUATION METHODS		
• Estimate the relationship between the statistics, data mining and machine learning • Automate specific tasks with advanced analytics		
UNIT V	**APPLICATIONs OF COGNITIVE COMPUTING**	**9**
Cognitive Systems in health care – Cognitive Assistant for visually impaired – AI for cancer detection, Predictive Analytics - Text Analytics - Image Analytics -Speech Analytics – IBM Watson		
SUGGESTED ACTIVITIES		
• Implement a cognitive assistant for visually impaired • Implement AI for cancer detection		
SUGGESTED EVALUATION METHODS		
• Evaluating the accuracy of cognitive assistant for visually impared • Evaluating the accuracy of cancer detection		
Total Periods		**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand basics of Cognitive Computing and its differences from traditional Approaches of Computing**.(Understand)**

CO2: Plan and use the primary tools associated with cognitive computing**(Understand)**

CO3: able to understand the basics of machine learning in cognitive analytics**(Understand)**

CO4: able to understand the advanced analytics in a path of cognitive computing**(Understand)**

CO5: Plan and execute a project that leverages Cognitive Computing**(Analyze)**

Text Books

1. Hurwitz, Kaufman, and Bowles, Cognitive Computing and Big Data Analytics, Wiley, Indianapolis, IN, 2005, ISBN: 978-1-118-89662-4.

2. Masood, Adnan, Hashmi, Adnan ,Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services andTensorFlow, 2015

Reference Books

1. Peter Fingar, Cognitive Computing: A Brief Guide for Game Changers, PHI Publication, 2015

2. GerardusBlokdyk ,Cognitive Computing Complete Self-Assessment Guide, 2018

3. Rob High, TanmayBakshi, Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service, IBM Book Series, 2019

Web Resources

- https:// cloud.google.com/architecture/mlops-continous-delivery-and-automation-pipelines-in-machine learning
- http://ml-ops.org
- https://towardsdatascience.com/what-is-mlops-everything-you-must-know-to-get-started-523f2d0b8bd8

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2							1		
2	3	2	2			2							1		
3	3	2	2			2							2		
4	3	2	2			2							2		
5	3	2	2			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20

EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: (Understand)

1. Why cognitive is important in the computer science? Compare it with philosophy and explain it with example

2. ---------- Data, --------- analytics & ---------- computing acts as the core component in achieving cognitive intelligence-based analytics in larger business applications

COURSE OUTCOME 2: (Understand)

1. Investigate the business outcome from cognitive analytics

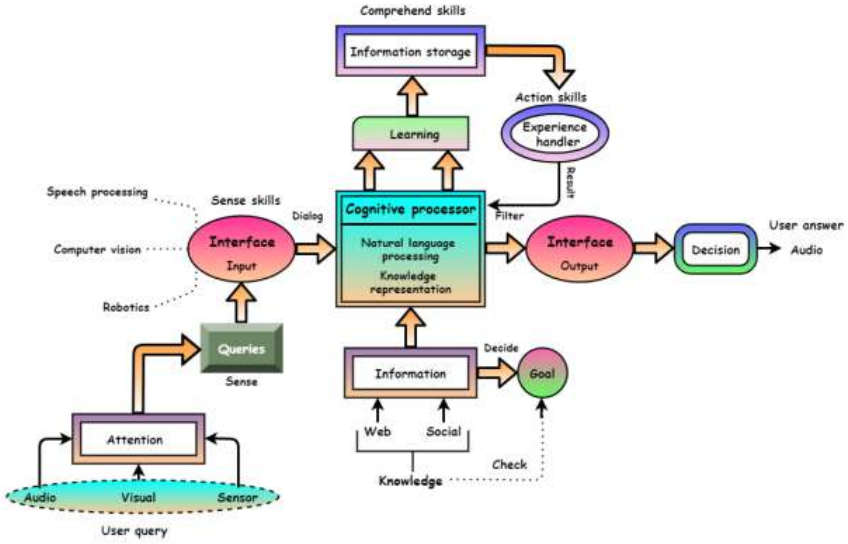
2. Discuss about Proposed cognitive computing-based human speech recognition framework for smart decision-making

COURSE OUTCOME 3: (Apply)

1. Evaluating ML algorithm with balanced and unbalanced datasets Comparison of Machine Learning algorithms
2. Perform stemming & lemmatization in python using NLTK**)**

COURSE OUTCOME 4: (Apply)

1.Based on the below diagram, infer your smart-decision making on human speech recognition frameworks of the following



2.Build a hybrid intelligence framework for collaborative decision-making in enterprises

COURSE OUTCOME 5: (Apply)

1. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data, set for clustering using k- Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

2.Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using cancer data sets

OPEN ELECTIVE III

S.no	Course Code	Course Name	Sem	L	T	P	C	DomainS
1	21AI7801	Modern Data management Principles	6	3	0	0	3	Data Analytics
2	21AI7802	Artificial Intelligence in Business	6	3	0	0	3	Business Intelligence
3	21AI7803	Introduction to R for Data Science	6	3	0	0	3	Data Science
4	21AI7804	Soft computing	6	3	0	0	3	Artificial Intelligence
5	21AI7805	AI and Robotics	6	3		0	3	Machine Learning

21AI7801	**MODERN DATA MANAGEMENT PRINCIPLES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites

- Students should have Basic knowledge on data analytics and data science

Objectives

1. To understand about Modernbig data.
2. To learn and use NoSQL big data management.
3. To learn mapreduce analytics using Hadoop and relatedtools.
4. To work with map reduce applications
5. To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I	BIG DATA TECHNOLOGY	9
What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics		
SUGGESTED ACTIVITIES		
• Discussion about web analytics		
SUGGESTED EVALUATION METHODS		
• Assignment on mobile business intelligence		
UNIT II	**NOSQL DATA MANAGEMENT**	**9**
Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharing – master-slave replication – peer-peer replication – sharing and replication – consistency – relaxing consistency – version stamps – map-reduce – partitioning and Combining – composing map-reduce calculations.		
SUGGESTED ACTIVITIES		
• Discussion about master-slave replication		
SUGGESTED EVALUATION METHODS		
• Quiz on partitioning and Combining		
UNIT III	**BASICS OF HADOOP**	**9**
Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.		
SUGGESTED ACTIVITIES		

• Discussion about HDFS concepts		
SUGGESTED EVALUATION METHODS		
• Assignment on Hadoop distributed file system (HDFS)		
UNIT IV	**MAPREDUCE APPLICATIONS**	**9**
MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job Scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.		
SUGGESTED ACTIVITIES		
• Discussion about MapReduce types		
SUGGESTED EVALUATION METHODS		
• Quiz on MapReduce workflows		
UNIT V	**BIG DATA TOOLS**	**9**
HBase – data model and implementations – HBase clients – HBase examples – praxis. Cassandra – Cassandra data model – Cassandra examples – Cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.		
SUGGESTED ACTIVITIES		
• Discussion about data model and implementations		
SUGGESTED EVALUATION METHODS		
• Quiz on HiveQL data definition		
Total Periods		**45**
Suggestive Assessment methods		
Continuous Assessment	**Formative Assessment Test**	**End Semester Exams**

Test (20Marks)	**(20 Marks)**	**(60 Marks)**
1.DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO1: Describe big data and use cases from selected business domains.
- CO52: Explain NoSQL big data management.
- CO3: Install, configure, and run Hadoop and HDFS.
- CO4: Perform map-reduce analytics using Hadoop.
- CO5:Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

Text Books

1.Peter Ghavami, “Bigdata governance- Modern data management principles for Hadoop, NOSQL and Big data Analytics”, First Edition,willey 2016

2.Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.

3. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

Reference

1.E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.

2. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.

Web Resources

1.https://www.google.com/search?q=no+sql&oq=no+sql

2.https://hadoop.apache.org/

3.https://hive.apache.org/

4.https://hbase.apache.org/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3				3		3								
2	3	3	3	3	3										2
3	3														
4	3	3	3	3	3										2
5	3	3	3				3								

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50

APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:(Remember)

1. What is big data? Mention some big data technologies.
2. Describe the use of big data in health care application

COURSE OUTCOME 2: (understand)

1. How to aggregate data using NOSQL?
2. Describe the process of master slave replications in NOSQL

COURSE OUTCOME 3: (apply)

1. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
2. Implement of Matrix Multiplication with Hadoop Map Reduce

COURSE OUTCOME 4:(understand)

1. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm
2. Describe the work flow of map reduce

COURSE OUTCOME 5: (apply)

1. Installation of Hive along with practice examples.
2. Installation of HBase, Installing thrift along with Practice examples

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I- BIG DATA TECHNOLOGY		

1	What is big data – why big data – convergence of key trends – unstructured data	1
2	industry examples of big data	1
3	web analytics – big data and marketing – fraud and big data – risk and big data	1
4	credit risk management – big data and algorithmic trading– inter and trans firewall analytics	1
5	big data and healthcare	1
6	big data in medicine	1
7	advertising and big data – big data technologies	1
8	introduction to Hadoop – open source technologies – cloud and big data	1
9	mobile business intelligence – Crowd sourcing analytics	1
UNIT-II – NOSQL DATA MANAGEMENT		
10	Introduction to NoSQL – aggregate data models	1
11	aggregates – key-value and document data models	1
12	relationships – graph databases – schema less databases	1
13	materialized views – distribution models	1

14	sharing – master-slave replication – peer-peer replication	1
15	sharing and replication – consistency	1
16	relaxing consistency – version stamps	1
17	map-reduce – partitioning and Combining	1
18	composing map-reduce calculations	1
UNIT-III – BASICS OF HADOOP		
19	Data format	1
20	Analyzing data with Hadoop	1
21	Scaling out- Hadoop streaming- Hadoop streaming	1
22	Design of HDFS- HDFS concepts	1
23	Java interface- data flow	1
24	Hadoop i/o	1
25	Data integrity- compression	1
26	Serialization	1
27	Avro- file based data structure	1
UNIT-IV – MAPREDUCE APPLICATIONS		
28	Map reduce workflows	1
29	Unit test with MR unit	1

30	Test data and local tests	1
31	Anatomy of map reduce job run	1
32	Classic map reduce	1
33	YARN job scheduling	1
34	Shuffle and sort	1
35	Task execution- map reduce types	1
36	Input formats- output formats	1
UNIT- V – BIG DATA TOOLS		
37	HBase – data models and implementations	1
38	HBase- clients	1
39	HBase- Examples	1
40	Cassandra- data model	1
41	Cassandra examples- Cassandra clients	1
42	Hadoop integration	1
43	Pig data model- pig Latin	1
44	Developing and testing pig Latin scripts	1
45	Hive-Hive QL data manipulation- Hive queries	1

21AI7802	**Artificial Intelligence in Business**	**L**	**T**	**P**	**C**

		3	**0**	**0**	**3**

Prerequisites

- Students should have knowledge in AI and Business intelligence

Objectives

1. Be exposed with the basic rudiments of Artificial intelligence system
2. To understand the AI aspects behind big data
3. To understand the business framework for AI related services
4. To apply various algorithmic techniques for marketing processes
5. Using AI applications for marketing and services

UNIT I	**INTRODUCTION TO AI**	**9**

Introduction to AI for business practices- AI and its industrial revolution- Fundamentals of AI development- Basic Marketing Techniques of AI- Historical development of AI-a Game changer AI-AI for new marketers.

SUGGESTED ACTIVITIES

- Discussion about AI and its industrial revolution

SUGGESTED EVALUATION METHODS

- Assignment on Game changer AI

UNIT II	**AI MARKETING MODEL**	**9**

Introduction to Big data- Marketing Algorithm for new Entrepreneur—Power of Marketing Algorithm in Industrial Revolution- Fundamental frameworks of NLP- Rule Base Expert System-Machine Learning- Computer Vision- Robotics

SUGGESTED ACTIVITIES

- In class activity - Fundamental frameworks of NLP

SUGGESTED EVALUATION METHODS

- Assignment on Robotics

UNIT III	AI BUSINESS FRAMEWORK	9
Business Framework layers of AI and its use cases- Automated customer services- Content creation for marketing- Media Planning- product Recommendation system using AI-Sales Volume Prediction- inbounding Logistics- CRM and Marketing		
SUGGESTED ACTIVITIES		
• In class activity - Media Planning		
SUGGESTED EVALUATION METHODS		
• Assignment on Sales Volume Prediction		
UNIT IV	**ALGORITHMIC MARKETING**	**9**
AI Marketing Matrix- Data protection and Data Integrity- Marketing Processes- Algorithmic Marketing Research- New Business models through algorithmic and AI- Challenges in Business Through Algorithmic Marketing.		
SUGGESTED ACTIVITIES		
• In class activity - New Business models through algorithmic and AI		
SUGGESTED EVALUATION METHODS		
• Assignment on Data protection and Data Integrity		
UNIT V	**BOTS**	**9**
Chat Bots- Bots as new customer interface and operating system-Bots Meets AI- Possible Limitations of AI based Bots- Twitter Bot - Data protection using Bots		
SUGGESTED ACTIVITIES		

<table>
<tr><td colspan="3">

- Discussion about Twitter Bot by Microsoft

</td></tr>
<tr><td colspan="3">SUGGESTED EVALUATION METHODS</td></tr>
<tr><td colspan="3">

- Assignment on Data protection using Bots

</td></tr>
<tr><td colspan="2">Total Periods</td><td>45</td></tr>
<tr><td colspan="3">Suggestive Assessment methods</td></tr>
<tr><td>Continuous Assessment Test
(20Marks)</td><td>Formative Assessment Test (20 Marks)</td><td>End Semester Exams (60 Marks)</td></tr>
<tr><td>1.DESCRIPTION QUESTIONS</td><td>1. ASSIGNMENTS
2.ONLINE QUIZZES
3.PROBLEM SOLVING ACTIVITIES</td><td>1.DESCRIPTION QUESTIONS</td></tr>
<tr><td colspan="3">Upon completion of the course, the students will be able to:</td></tr>
<tr><td colspan="3">

- CO512.1: Explain the fundamentals of Artificial Intelligence marketing services
- CO512.2:Link Big data with Artificial Intelligence marketing services
- CO513.3:Apply various AI business frameworks on marketing services
- CO513.4: Understand AI agents, Select and apply appropriate algorithms and AI techniques to solve complex business problems
- CO513.5: Develop applications that uses Artificial Intelligencefor marketing services.

</td></tr>
<tr><td colspan="3">Text Books</td></tr>
<tr><td colspan="3">

1.Petrer Gentsch, “AI in marketing, sales and services”, Palgrave Macmillan, Springer, 2019

2.Wolfgang Ertel & Nathanael T. Black,” Introduction to Artificial Intelligence”, Second Edition, Springer,2018

3.Rajendra Akerkar, “Artificial Intelligence for Business”, Springer, 2018

</td></tr>
<tr><td colspan="3">Reference</td></tr>
</table>

1. Doug Rose, "Artificial intelligence for Business", Chicago Lakeshore press, 2018

2.John Medicine, "Artificial Intelligence for Business- A modern Business Approach",2018

3.Alberto Artasanchez and Prateek Joshi, "Artificial Intelligence with Python: A Comprehensive Guide to Building Intelligent Apps for Python Beginners and Developers",Packt Publishing Limited ,Second Edition,2020.

Web Resources

1. https://hackernoon.com/16-best-resources-to-learn-ai-machine-learning-in-2019-f95c4f59018b
2. https://learndigital.withgoogle.com/digitalgarage/course/elements-artificial-intelligence
3. https://lecturenotes.in/subject/128/artificial-intelligence-ai
4. https://www.javatpoint.com/history-of-artificial-intelligence#
5. https://www.thebalancesmb.com/best-ai-chatbot-apps-4583959

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	3									3		
2	3	3	2	3									3		
3	3	2	2	2									3		
4	3	3	3	2	2								2		
5	3	3	3	2	2								2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:(remember)

1. What are basic marketing techniques of AI
2. Describe the historical development of AI

COURSE OUTCOME 2: (Apply)

1. Built an expert system from the selling script of multiple experts using rule based expert system
2. Describe the framework of NLP using AI

COURSE OUTCOME 3: (Remember)

1. Explain the business framework layer of AI
2. Describe a business framework of any AI application

COURSE OUTCOME 4:(remember)

1. What is AI driven marketing?
2. Why algorithmic marketing is good thing for mobile marketing?

COURSE OUTCOME 5: (remember)

1. What are the limitations of chat bots and their future scope?
2. How to you make AI based chat bots?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I- INTRODUCTION TO AI		
1	Introduction to AI for business practices	1
2	AI and its industrial revolution	1
3	Fundamentals of AI development	1
4	Fundamentals of AI development	1
5	Basic Marketing Techniques of AI	1
6	Basic Marketing Techniques of AI	1
7	Historical development of AI	1
8	A Game changer AI	1
9	AI for new marketers	1
UNIT-II – BIG DATA IN AI		
10	Introduction to Big data	1
11	Marketing Algorithm for new entrepreneur	1
12	Power of marketing algorithm	1
13	Power of marketing algorithm in industrial revolution	1
14	Fundamental framework of NLP	1

15	Rule base expert system	1
16	Machine learning	1
17	Computer vision	1
18	Robotics	1
UNIT-III AI BUSINESS FRAMEWORK		
19	Business framework layer of AI	1
20	Business framework layer of AI- use cases	1
21	Automated customer services	1
22	Content creation for marketing	1
23	Media planning	1
24	Product recommendation system using AI	1
25	Sales volume prediction	1
26	Inbounding logistics	1
27	CRM and marketing	1
UNIT-IV – ALGORTHIMIC MARKETING		
28	AI marketing matrix	1
29	Data protection	1
30	Data integrity	1
31	Marketing processes	1
32	Marketing processes	1

33	Algorithmic marketing research	1
34	Algorithmic marketing research	1
35	New Business model through algorithmic and AI	1
36	Challenge in business through algorithmic marketing	1
UNIT- V		
37	Introduction to chat bots	1
38	Chat bots	1
39	Bots as new customer interface	1
40	Bots as operating system	1
41	Bots meets AI	1
42	Bots meets AI	1
43	Limitation of AI based Bots	1
44	Twitter Bot	1
45	Data protection using Bots	1

21AI7803	**INTRODUCTION TO R FOR DATA SCIENCE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Prerequisites for the course					

Students should have Basic Introduction to Data Science, Statistics		
Course Objectives		
1. To Impart Knowledge on How to Work with Basics of R Programing 2. To UnderstandAbout How to Integrate Documentation and Analysis in A Single Document 3. To Learn the Necessary Components and Programming of An R Package 4. To Understand the Explore More Advanced Features of the R Programming Language, In Particular, Functional Programming **5.** To Introduce R Programming with Large Datasets.		
UNIT I	**INTRODUCTION TO R PROGRAMMING**	**9**
Expressions - Basic Data Types - Data Structures - Control Structures – Functions - Working with Vectors and Vectorizing Functions - Advanced Functions - How Mutable Is Data Anyway - Functional Programming - Function Operations		
SUGGESTED ACTIVITIES		
• Discussion about Data Structures • In class activity- Working with Vectors and Vectorizing Functions		
SUGGESTED EVALUATION METHODS		
• Assignment on Function Operations		
UNIT II	**FUNCTIONAL PROGRAMMING**	**9**
Working with Vectors and Vectorizing Functions -If Else – Vectorizing Functions – Infix Operators - Advanced Functions - Functional Programming - Function returning function - Anonymous Function - Function Operations		
SUGGESTED ACTIVITIES		
• Discussion about Functional Programming • In class activity- Anonymous Function		

SUGGESTED EVALUATION METHODS		
• Assignment on Vectorizing Functions		
UNIT III	**DATA MANIPULATION AND VISUALIZATION**	**9**
Basic Graphics - Grammar of Graphics - The ggplot2 Package - Figures with Multiple Plots – Subsample Your Data - Running Out of Memory - Too Large to Plot - Too Slow to Analyze - Too Large to Load – Subsampling - Hex and 2D Density Plots		
SUGGESTED ACTIVITIES		
• Discussion about ggplot2 Package • In class activity- Subsampling		
SUGGESTED EVALUATION METHODS		
• Assignment on Figures with Multiple Plots		
UNIT IV	**SUPERVISED LEARNING**	**9**
Machine Learning - Supervised Learning –Regression vs Classification – Inference vs Prediction – Linear Regression - Specifying Models - Validating Models –Cross Validation - Naive Bayes – Case Study		
SUGGESTED ACTIVITIES		
• Discussion about Supervised Learning • In class activity- Linear Regression		
SUGGESTED EVALUATION METHODS		
• Assignment on Regression vs Classification		
UNIT V	**UNSUPERVISED LEARNING**	**9**

Dimensionality Reduction – Principal component Analysis – Multi dimensional Scaling - Clustering – k-Means – Hierarchical - Association Rules - Rescaling for k-Means Clustering – Dealing with Missing Data – Case Study

SUGGESTED ACTIVITIES

- Discussion about Principal component Analysis
- In class activity- Association Rules

SUGGESTED EVALUATION METHODS

- Assignment on k-Means Clustering

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTION QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO608.1: Apply the fundamental knowledge on Introduction to R Programming. **(Understand)**

CO608.2. Explain the basics of Reproducible Analysis and Data Manipulation. **(Apply)**

CO608.3. Understanding how you can Visualize Data and Large Datasets. **(Understand)**

CO608.4. Infer the importance of Supervised and Unsupervised Learning**(Apply)**

CO608.5 Familiarizewith fundamentals of Advanced R Programming**(Understand)**

Text Books

1 Thomas Mailund Aarhus, Beginning Data Science in R: Data Analysis, Visualization, and Modelling for the Data Scientist, Springer Science+Business Media New York, First Edition,2017

2 Robert L. Kabacoff, R in Action., Second Edition, Dreamtech Press, First Edition,2015

Reference Books

1. Hadley Wickham and Garrett Gorlemund,R for Data Science. O'Reilly, First Edition,2016
2. Design.NormanMatloff, The Art of R Programming - A Tour of Statistical Software, No Starch Press, First Edition,2011
3. Hands-On Programming with R: Write Your Own Functions and Simulations, Garrett Grolemund, Shroff/O'Reilly First Edition,2014

Web Resources

1. https://www.stats.ox.ac.uk/~evans/Rprog/LectureNotes.pdf
2. http://www.gvpcew.ac.in/Material/IT/2%20IT%20-%20UNIT-1%20Start%20Learning%20R.pdf
3. https://www.tutorialspoint.com/r/r_tutorial.pdf
4. https://rstudio-pubs-static.s3.amazonaws.com/162265_9c6aca3804ce468c8f4c46ac79a0b625.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1				1	1			2	2		
2	3	2		1				1	1			2	2		
3	3	2		1				1	1			2	2		
4	3	1	2	1			1	1	1		1	2	2		
5	3	2	2	1			2	1	1		1	2	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:(Apply)

1. Elaborate the process of working with different data files. Write about filechoose () function.
2. List the inbuilt summary functions to apply on vectors. Create a vector and apply all functions on it. Understand

COURSE OUTCOME 2: (Understand)

1. Define basic classification based on data model, with examples. Understand
2. Explain Covariance and Correlation with example. Infer the relation among attributes with respect to correlation coefficient.

COURSE OUTCOME 3: (Understand)

1. Describe the limitations of the perception model. How to create and evaluate a data model. Describe with one case study.
2. List out the applications of Machine learning with example. Discuss about a consistent learner and what it means for a set of training examples to be linearly separable.Understand

COURSE OUTCOME 4(Analyse)

1. How can you identify, the best fit data model from the given dataset? Remember
2. Describe the prediction model in terms of the following measures for best fit: Residual standard error, Multiple R-squared, F-statistic, p-value.

COURSE OUTCOME 5: (Apply)

1. How would you get the multiple plots in single window?
2. Elaborate how to export a graph using graphics parameters. How to export the text data to plot with example.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
INTRODUCTION TO R PROGRAMMING(9 HOURS)		
1	Expressions	1
2	Basic Data Types	1
3	Data Structures	1
4	Control Structures	1
5	Functions	1
6	Working with Vectors and Vectorizing Functions - Advanced Functions	1
7	How Mutable Is Data Anyway	1
8	Functional Programming	1
9	Function Operations	1
FUNCTIONAL PROGRAMMING(9 HOURS)		
10	Working with Vectors and Vectorizing Functions	1

11	If Else	1
12	Vectorizing Functions	1
13	Infix Operators	1
14	Advanced Functions	1
15	Functional Programming	1
16	Function returning function	1
17	Anonymous Function	1
18	Function Operations	1
DATA MANIPULATION AND VISUALIZATION(9 HOURS)		
19	Basic Graphics	1
20	Grammar of Graphics	1
21	The ggplot2 Package	1
22	Figures with Multiple Plots	1
23	Subsample Your Data	1
24	Running Out of Memory	1
25	Too Large to Plot- Too Slow to Analyze - Too Large to Load	1
26	Subsampling	1
27	Hex and 2D Density Plots	1
SUPERVISED LEARNING(9 HOURS)		

28	Machine Learning	1
29	Supervised Learning	1
30	Regression vs Classification	1
31	Inference vs Prediction	1
32	Linear Regression	1
33	Specifying Models	1
34	Validating Models	1
35	Cross Validation	1
36	Naive Bayes – Case Study	1
UNSUPERVISED LEARNING(9 HOURS)		
37	Dimensionality Reduction	1
38	Principal component Analysis	1
39	Multi dimensional Scaling	1
40	Clustering	1
41	k-Means	1
42	Hierarchical	1
43	Association Rules	1
44	Rescaling for k-Means Clustering	1
45	Dealing with Missing Data – Case Study	1

21AI7804	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Preamble:

The students standardized the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.

Prerequisites for the course:

21CS1501 – Problem solving and Logical Thinking using C

Objectives

1. To educate the principles of feed-forward neural networks to the pupil.
2. To offer sufficient understanding of feedback neural networks
3. To adequately understand fuzzy and neuro-fuzzy systems
4. To give real-time systems with complete knowledge of fuzzy logic control

UNIT I	ARTIFICIAL NEURAL NETWORK	9

Introduction-Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network - Important Terminologies of ANNs

SUGGESTED ACTIVITIES:

- PPT Demonstration on soft computing

SUGGESTED EVALUATION METHODS:

- Seminar Discussions

UNIT II	SUPERVISED LEARNING NETWORKS	9

Perceptron networks – Adaptive Linear Neuron (Adaline)- Multiple Adaptive Linear Neurons - Back-Propagation Network - Testing Algorithm of Back-Propagation Network - Radial Basis Function Network - Time Delay Neural Network - Functional Link Networks - Wavelet Neural Networks

SUGGESTED ACTIVITIES:

- Analysing training and testing algorithm

SUGGESTED EVALUATION METHODS:

- Assignments

UNIT III	FUZZY LOGICS	9

Fuzzy logic - Fuzzy sets – Properties of fuzzy set - Fuzzy setsoperations - Fuzzy Relations - Tolerance and Equivalence Relations - Truth values and Tables in Fuzzy Logic - Fuzzy Arithmetic - Noninteractive Fuzzy Sets		
SUGGESTED ACTIVITIES: • Tutorial Problems on truth values fuzzy logics		
SUGGESTED EVALUATION METHODS: • Assignments		
UNIT IV	**PROPOSITIONS AND INFERENCES**	**9**
Fuzzy propositions - Formation of fuzzy rules- Decomposition of rules – Aggregation of fuzzy rules - Fuzzy Inference Systems –Methods of FIS – MamdaniFIS,TakagiSugeno model –Fuzzy logic control systems - Embedded Fuzzy Sets		
SUGGESTED ACTIVITIES: • Tutorial Problems on neuro-fuzzy hybrid systems		
SUGGESTED EVALUATION METHODS: • Assignments		
UNIT V	**GENETIC ALGORITHMS AND HYBRID SYSTEMS**	**9**
Genetic algorithm - Basic Terminologies in Genetic Algorithm - Operators in genetic algorithm - Stopping condition for genetic algorithm flow- Neuro-fuzzy hybrid systems - Characteristics and Classification of Neuro-fuzzy hybrid systems - Genetic neuro hybrid systems -Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems		
SUGGESTED ACTIVITIES: • Case study problems in genetic programming		
SUGGESTED EVALUATION METHODS: • Seminar on Terminologies in Genetic Algorithm		
Total Periods		**45 Periods**
Suggestive Assessment Methods		
Continuous Assessment Test	**Formative Assessment Test**	**End Semester Exams**

(20 Marks)	(20 Marks)	(60 Marks)
1. Descriptive Questions 2. Problem solving Questions	1.Assignment 2. Descriptive type questions	1. Descriptive Questions 2. Problem solving Questions

Outcomes

Upon completion of the course, the students will be able to:

CO1: Analyse about applications for ANN approaches.

CO2: Examine different designs of neural networks

CO3: Critique fuzzy logics rules

CO4:Identify and choose an appropriate fuzzy system to address the issue and develop a solution.

CO5: Analyse the fundamental concepts of Genetic Algorithm and design the genetic algorithms for optimization engineering problems.

Text Books

1. S. N. Sivanandam and S. N.Deepa, Principles of soft computing – John Wiley & Sons, 2007.
2. Timothy J. Ross, Fuzzy Logic with engineering applications , John Wiley & Sons, 2016.

Reference Books

1. N. K. Sinha and M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications- Academic Press /Elsevier. 2009.
2. R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
3. Driankov D., Hellendoorn H. and Reinfrank M., An Introduction to Fuzzy Control- Narosa Pub., 2001.

Web Resources

1. **Introduction to Soft Computing - https://youtu.be/K9gjuXjJeEM**
2. **Artificial Neural Networks - https://youtu.be/quCEmM2JBbk**
3. **Fuzzy Logic - https://youtu.be/a2i-lHS-c_I**
4. **Fuzzy systems - https://youtu.be/Bw8au5f7VRI**
5. **Genetic Algorithms and hybrid systems - https://youtu.be/Fs5ZIjp1hUk, https://youtu.be/70En3RrxFQw**

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1			1						1	2		
2	1	2	1			1						1	2		
3	1	1	2			1						1	2		
4	1	2	1			1						1	2		
5	1	2	1			1						1	2		

BLOOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	30	30	05	05	20
UNDERSTAND	20	20	10	10	20
APPLY	20	20	05	05	20
ANALYZE	20	20	05	05	20
EVALUATE	10	10			20

CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1) : (Apply).

A fuzzy set for a major storm event in Calgary, Alberta, could be described as arainstorm in a subdivision that raised the level of the storm-water pond to within70% of its design capacity. The membership function for a major storm set couldbe described as having full membership when 70% of the pond volume has beenreached but varies from zero membership to full membership at 40% capacity and70% capacity, respectively. Draw a typical membership function as it is described.

COURSE OUTCOME 2 (CO 2) : (Apply)

According to Boyle's law, for an ideal gas at constant temperature t, pressure isinversely proportional to volume, or volume is inversely proportional to pressure When we consider different sets of pressures and volumes under the same temperature, we can apply the following rule: IF x1 is p1v1 AND x2 is p2v2, THEN t is

a constant. Here p is pressure and v is volume of the gas considered. Reduce thisrule to canonical form**.**

COURSE OUTCOME 3(CO 3) : (Apply)

Using your own intuition and your own definitions of the universe of discourse,

plot fuzzy membership functions for the following variables:

(a) age of people

(i) very young

(ii) young

(iii) middle-aged

(iv) old

(v) very old

(b) education of people

(i) fairly educated

(ii) educated

(iii) highly educated

(iv) not highly educated

(v) more or less educated.

COURSE OUTCOME 4(CO 4) : (Apply)

When constructing a CMU wall, there is a direct correlation between the CMU block width (W), length (L) and wall strength (S). The following two rules apply:

Rule 1: IF W is small, and L is small, THEN S is small.

Rule 2: IF W is large and L is small, THEN S is medium.

Use symmetric triangles to construct the MFs. For the width W, use a triangle centered on the interval [0, 8] inches for Small, and use a triangle centered on the interval [4, 10] inches for Large. For the length L, use a triangle centered on the interval [0, 16] inches for Small. For the strength S, use a triangle centered on the interval [0, 4] ksi for Small, and use a triangle centered on the interval [1, 5] ksi for Medium.

COURSE OUTCOME 5(CO 5) : (Apply)

Consider a hyperbolic tangent function. Maximize it within the range $0 < x < 22/7$ using a C program. Apply two-point crossover and tournament selection process.

21AI7805	**AI and ROBOTICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

The aim of this course Data Visualization for Engineers is to provide students with knowledge and abilities to understand how to apply Artificial Intelligence in Robotics

Prerequisites for the course

- NIL

Objectives

1. To Understand the Space robotics and the AI approach
2. To use theSensing Techniques to Reactive Robots
3. Understand the Topological Path Planning techniques .
4. Implement the toy detector method
5. To learn how to build robot.

UNIT I	**Robotic Paradigms**	**10**

Robotics: Space robotics and the AI approach – Tele operation - The Seven Areas of AI - Hierarchical Paradigm - Attributes of the Hierarchical Paradigm - Representative Architectures : Nested Hierarchical Controller, NIST RCS - Attributes of Reactive Paradigm.

SUGGESTED ACTIVITIES

- Demonstrate the Hierarchical Paradigm a transitive,or Z-like, flow of events through the primitives

SUGGESTED EVALUATION METHODS

• Assignment		
UNIT II	Sensing Techniques for Reactive Robots	**10**
Steps in Designing a Reactive Behavioral System - Logical sensors - Behavioral Sensor Fusion - Designing a Sensor Suite - Proprioceptive Sensors - Proximity Sensors - Computer Vision - Range from Vision.		
SUGGESTED ACTIVITIES		
• Demonstrate the components of a robotics paradigm		
SUGGESTED EVALUATION METHODS		
• Quizzes		
UNIT III	Navigation	**9**
Topological Path Planning : Relational Methods, Associative Methods - Metric Path Planning: Cspace Representations, Graph Based Planners , Wavefront Based Planners , Interleaving Path Planning and Reactive Execution-Localization and Map Making:Bayesian, Dempster-Shafer Theory, HIMM.		
SUGGESTED ACTIVITIES		
• List and discuss the criteria for evaluating a path planner.		
SUGGESTED EVALUATION METHODS		
• Puzzle		
UNIT IV	**Object Recognition Using Neural Networks and Supervised Learning**	**8**
Object Recognition Using Neural Networks and Supervised Learning - Technical requirements - image recognition process : training and deployment Process, Artificial neurons- Build the toy/not toy detector - Using the neural network		
SUGGESTED ACTIVITIES		
• Demonstrate the difference between the features of a real neuron and an artificial neuron		
SUGGESTED EVALUATION METHODS		
• Assignment		

UNIT V	Robot Assembling	**8**

Principle of robotics and AI Technical requirements - Subsumption architecture - Setup of Raspberry Pi 3 , catkin workspaces - Assembling the tracks - Mounting the tracks - Arm base assembly – Wiring.

SUGGESTED ACTIVITIES

- Demonstrate to setting up the robot

SUGGESTED EVALUATION METHODS

- Project

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand the Space robotics and the AI approach **(Understand)**

CO2 Apply theSensing Techniques to Reactive Robots**(Apply)**

CO3 Apply the Topological Path Planning techniques **(Apply)**

CO4 Apply the Build the toy/not toy detector**(Apply)**

CO5 Identify to setup robot(**Apply)**

Text Books

1.Artificial Intelligence for Robotics Francis X.Govers

2. Introduction to AI Robotics Robin R.Murphy
Reference Books
1.Albus, J., and Proctor, F.G., "A Reference Model Architecture for Intelligent Hybrid Control Systems," proceedings of the *International Federation of Automatic Control*, San Francisco, CA, June 30–July 5, 1996. 2.Allocca, J. A., and Stuart, A., *Transducers: Theory and Application*, Prentice-Hall, 1984.
Web Resources 1. https://www.javatpoint.com/robotics-and-artificial-intelligence 2. https://data-flair.training/blogs/ai-robot/ 3. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm 4. https://builtin.com/artificial-intelligence/robotics-ai-companies 5. https://www.intel.com/content/www/us/en/robotics/artificial-intelligence-robotics.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		
5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20

APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

Consider the frame problem. Suppose the World Model for a Strips-based robot consisted of 100 facts. Each fact requires 1KB ofmemory storage. Every time a new object is added to the world model, it increases the model by 100 (a linear increase). One object, 100 facts, 100KB of storage; two objects, 200 facts, 200KB. How many objects would fill 64KB of memory?

Course Outcome 2 (CO2): (Apply)

Consider an obstacle avoidance behavior which consists of a perceptual schema that provides a polar plot of range and motor schema which directs the robot to the most open sector. List all the logical sensors covered in this chapter that can be used interchangeably for the perceptual schema. Which of these are logically redundant? Physically redundant?

Course Outcome 3 (CO3): (Apply)

Look up and define *neural networks*. How are they being used for robotics? What makes them different from other approaches? Who are the researchers using neural networks?

Course Outcome 4 (CO4): (Analyse)

What is image enhancement? Differentiate spatial domain and frequency domain methods. If

I is input intensity and O is output intensity then write the equation for image negation and log

transformation. Let the intensity range for the image is [0, L-1].

What is image enhancement? Differentiate spatial domain and frequency domain methods. If

I is input intensity and O is output intensity then write the equation for image negation and log

transformation. Let the intensity range for the image is [0, L-1].

What is image enhancement? Differentiate spatial domain and frequency domain methods. If

I is input intensity and O is output intensity then write the equation for image negation and log

transformation. Let the intensity range for the image is [0, L-1].

Analyse the framework provided to investigate the properties of neural networks. Try several activation functions, or different settings for convolutions to see what changes in the training process.

Course Outcome 5 (CO5): (Apply)

Compare diagram of the three-layer subsumption architecture to the Three Laws of Robotics postulated by Isaac Asimov. Is there a correlation? Why is there one, or why not?

OPEN ELECTIVE IV

S.no	Course code	Course Nmae	**Sem**	L	T	P	C	Domain
1	21AI7806	Introduction to Predictive Analytics	**7**	3	0	0	3	Data Analytics
2	21AI7807	Business Analytics	**7**	3	0	0	3	Business Intelligence
3	21AI7808	ETL Tools	**7**	3	0	0	3	Data Science
4	21AI7809	AI in health care	**7**	3	0	0	3	Artificial Intelligence
5	21AI7810	Intelligent Automation	**7**	3	0	0	3	Machine Learning

21AI7806	**Introduction to Predictive Analytics**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Preamble

This course delivers the knowledge about the Python competently for processing, analysing, modelling, and visualising various kinds of data, with a focus on time series for various scripting, data-manipulation and plotting tasks with data in a variety of formats, applied powerful tools for optimisation, regression, classification, and clustering, in useful practical settings on a variety of data sets.

Prerequisites

- Students should have Basic practical knowledge in python , data analytics and data science

Objectives

- To explain terminology, technology and applications of predictive analysis
- To apply data preparation techniques and generate appropriate association rules.
- To discuss various descriptive models, their merits, demerits and application with python.
- To describe various predictive modelling methods using python
- To introduce the text mining tools, technologies and case study which is used in day-to day analytics cycle with python

UNIT I	INTRODUCTION TO PREDICTIVE ANALYSIS	9

Overview of Predictive Analytics- Setting Up the Problem - Data Understanding- Single Variable- Data Visualization in One Dimension- Data Visualization, Two or Higher Dimensions The Value of Statistical Significance- Pulling It All Together into a Data Audit.

SUGGESTED ACTIVITIES

- Discussion about Data Visualization .

SUGGESTED EVALUATION METHODS

- Quiz on Data Visualization in One Dimension

UNIT II	DATA PREPARATION AND ASSOCIATION RULES	9

Data Preparation using python- Variable Cleaning- Feature Creation- Item sets and Association Rules Terminology- Parameter Settings- How the Data Is Organized- Measures of Interesting Rules Deploying Association Rules- Problems with Association Rules using python- Building Classification Rules from Association Rules using python.

SUGGESTED ACTIVITIES

- Discussion about the Building Classification Rules from Association Rules using python.

SUGGESTED EVALUATION METHODS

- Assignment on Association Rules

UNIT III	**DESCRIPTIVE MODELLING**	**9**
Descriptive Modeling- Data Preparation Issues with Descriptive Modeling- Principal Component Analysis- Clustering Algorithms- Interpreting Descriptive Models- Standard Cluster Model Interpretation		
SUGGESTED ACTIVITIES		
• In class activity - Principal Component Analysis		
SUGGESTED EVALUATION METHODS		
• Assignment on Clustering Algorithms		
UNIT IV	**PREDICTIVE MODELLING**	**9**
Decision Trees- Logistic Regression -Neural Network Model – K-Nearest Neighbours – Naive Bayes – Regression Models - Linear Regression - Other Regression Algorithms.		
SUGGESTED ACTIVITIES		
• In class activity - Neural Network Model		
SUGGESTED EVALUATION METHODS		
• Assignment on Linear Regression		
UNIT V	**TEXT MINING**	**9**
Motivation for Text Mining- A Predictive Modelling Approach to Text Mining- Structured vs. Unstructured Data- Why Text Mining Is Hard- Data Preparation Steps- Text Mining Features Modeling with Text Mining Features- Regular Expressions- Case Studies:- Survey Analysis.		
SUGGESTED ACTIVITIES		

- In class activity - Structured vs. Unstructured Data

SUGGESTED EVALUATION METHODS

- Assignment on Data Preparation Steps.

Total Periods	**45**

Suggestive Assessment methods

Continuous Assessment Test (20Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- CO 1:Explain terminology, technology and applications of predictive analysis with python
- CO 2: Apply data preparation techniques to effectively interpret big data using python
- CO 3: Analyse various descriptive models using python for effective outomes of data
- CO 4: Describe principles of predictive analytics and apply them to achieve real, pragmatic solutions.
- CO 5: Illustrate the features and applications of text mining

Text Books

1.Sabastian Raschka,"python machine learning-unlock deeper insights into machine learning with the vital guide to cutting edge predictive analytics", PACKT publishing,2015

2.Dean Abbott, "Applied Predictive Analytics-Principles and Techniques for the Professional Data Analyst", Wiley, 2014

3. Jiawei Han and MichelineKamber, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

Reference

1. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. An Introduction to Statistical Learning with Applications in R Springer 2013
3. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014
4. Anasse Bari, Mohammad Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, 2017.

Web Resources

1. https://www2.insightsoftware.com/definitive-guide-to-predictive-analytics/introduction-to-predictive-analytics
2. https://monkeylearn.com/blog/text-mining-python/
3. https://blog.bigml.com/2016/09/28/logistic-regression-versus-decision-trees/#

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3				3		3						3		
2	3	3	3	3	3								3		
3	3														
4	3	3	3	3	3										
5	3	3	3				3						3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS	CAT 1	CAT 2	FAT 1	FAT 2	END SEM

CATEGORY					EXAM
REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: (remember)

1. What are the four types of analytics?
2. What is data visualization? What are the two basic types of visualization?

COURSE OUTCOME 2: (apply)

Create an association rule using python

1. How do you prepare data for Apriori in python?

COURSE OUTCOME 3: (apply)

1. Implement a k-means clustering algorithm for weather data to find out the similarity using python
2. Mention the types of clustering algorithm used for data analysis

COURSE OUTCOME 4:(apply)

1. Implement a decision tree algorithm with an example using python
2. Implement a neural network with simple dataset using python

COURSE OUTCOME 5: (remember)

1. Describe the predictive modeling approach for text mining
2. Create and train your own text mining model in python

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I- INTRODUCTION TO PREDICTIVE ANALYSIS		
1	Overview of predictive analytics	1
2	Setting up the problem	1
3	Data understanding	1
4	Single variable of analytics	1
5	Data visualization in one dimension	1
6	Two or higher dimension data visualization	1
7	The value of statistical significance	1
8	Pulling it all together into data audit	1
9	Pulling it all together into data audit	1
UNIT-II DATA PREPAPRATION AND ASSOCIATION RULES		
10	Data preparation using python	1
11	Variable cleaning	1
12	Feature creation	1
13	Item sets and Association rules terminology	1
14	Measure of interesting rules	1
15	Deploying association rules	1
16	Problem with association rules using python	1

17	Building classification rule using association rules with python	1
18	Building classification rule using association rules with python	1
UNIT-III –DESCRPTIVE MODELLING		
19	Descriptive modeling	1
20	Data preparation issues with descriptive modeling	1
21	Principal component analysis	1
22	Principal component analysis	1
23	Clustering algorithm	1
24	Clustering algorithm	1
25	Interpreting descriptive models	1
26	Standard cluster model	1
27	Cluster model interpretation	1
UNIT-IV – PREDICTIVE MODELLING		
28	Decision Tree	1
29	Logistic regression	1
30	Neural network model	1
31	Neural network model	1
32	k- nearest neighbor	1

33	Naïve Bayes	1
34	Regression model	1
35	Linear regression	1
36	Other regression algorithm	1
UNIT- V TEXTMINING		
37	Motivation for Text mining	1
38	A predictive model approach to text mining	1
39	Structured vs unstructured data	1
40	Why text mining is hard?	1
41	Data preparation steps	1
42	Text mining features modeling	1
43	Feature modeling with text mining features	1
44	Case studies	1
45	Survey analysis	1

21AI7807	Business Analytics	L	T	P	C
		3	0	0	3

Preamble

The business analytics course syllabus is aimed to impart knowledge about business analytics, business management, and key analytical skills to make business decisions. Students are equipped with the knowledge of business, economics, and data management through the subjects like organizational behavior, data management, data visualization, financial management, etc. Business Analytics by definition is data analysis to find out patterns or insights. Business Analytics is the combination of three domains – Business, Data Analytics & Programming.

Prerequisites

- Students should have Basic concepts of data science for business and data analytics

Objectives

1. To understand the Analytics Life Cycle for big data.
2. To comprehend the process of acquiring Business Intelligence
3. To understand various types of analytics for Business Forecasting techniques for big data
4. To model the Analytical CRM for Structured and unstructured data.
5. To understand the relationship between big data and business analytics

UNIT I	INTRODUCTION TO BUSINESS ANALYTICS	9

Analytics and Data Science – Big data Analytics Life Cycle – Types of Business Analytics – Business Problem in big data- Definition of business intelligence – Data Collection – Data Preparation – Hypothesis Generation – Modelling – Validation and Evaluation – Interpretation – Deployment and Iteration

SUGGESTED ACTIVITIES

- In class activity - Types of Business Analytics

SUGGESTED EVALUATION METHODS

- Assignment on Data Collection and Data Preparation

UNIT II	BI FOR BIGDATA	9

Data Warehouses and Data Mart - Knowledge Management for big data – Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence and Big data Analytics – OLAP –, Analytic functions on big data platforms		
SUGGESTED ACTIVITIES		
• In class activity - Decision Support Systems		
SUGGESTED EVALUATION METHODS		
• Assignment on Business Intelligence and Big data Analytics		
UNIT III	**BUSINESS FORECASTING**	**9**
Introduction to Business Forecasting and Predictive analytics for big data - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling – Machine Learning for Predictive analytics in big data		
SUGGESTED ACTIVITIES		
• In class activity - Data Mining and Predictive Analysis Modelling		
SUGGESTED EVALUATION METHODS		
• Assignment on Machine Learning for Predictive analytics in big data		
UNIT IV	**ANALYTICAL CRM IN BIGDATA**	**9**
Customer database management –corporate customer data, structured and unstructured data, developing a customer database, data – integration, warehousing and marts in the CRM context, knowledge management, Analytics for – CRM strategy and tactics, customer lifecycle, structured and unstructured data, Big data analytics in CRM, analytical insights.		
SUGGESTED ACTIVITIES		
• In class activity - Customer database management		
SUGGESTED EVALUATION METHODS		
• Quiz on Big data analytics in CRM		
UNIT V	**BUSINESS ANALYTICS VS BIGDATA**	**9**

<table>
<tr><td colspan="3">Relationship between Big Data and business analytics Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data.</td></tr>
<tr><td colspan="3">SUGGESTED ACTIVITIES</td></tr>
<tr><td colspan="3">• Discussion about Hadoop</td></tr>
<tr><td colspan="3">SUGGESTED EVALUATION METHODS</td></tr>
<tr><td colspan="3">• Quiz on integration of big data with traditional data</td></tr>
<tr><td colspan="2">Total Periods</td><td>45</td></tr>
<tr><td colspan="3">Suggestive Assessment methods</td></tr>
<tr><td>Continuous Assessment Test (20Marks)</td><td>Formative Assessment Test (20 Marks)</td><td>End Semester Exams (60 Marks)</td></tr>
<tr><td>1.DESCRIPTION QUESTIONS</td><td>1. ASSIGNMENTS
2.ONLINE QUIZZES
3.PROBLEM SOLVING ACTIVITIES</td><td>1.DESCRIPTION QUESTIONS</td></tr>
<tr><td colspan="3">Course Outcomes</td></tr>
<tr><td colspan="3">Upon completion of the course, the students will be able to:</td></tr>
<tr><td colspan="3">• CO 1:Explain the real world business problems and model with analytical solutions for big data
• CO 2Identify the business processes for extracting Business Intelligence from big data
• C0 3Apply predictive analytics for business fore-casting
• C0 4Analyse CRM data base management system for business analytics
• C0 5Use Applications that relates big data and business analytics</td></tr>
<tr><td colspan="3">Text Books</td></tr>
<tr><td colspan="3">1.GERT H.N.Laursen, Jasper Thorlud, “Business analytics for managers”, Willey, second edition, 2017
2.R. Evans James, Business Analytics, 2017
3.R N Prasad, SeemaAcharya, Fundamentals of Business Analytics, 2016</td></tr>
<tr><td colspan="3">Reference</td></tr>
</table>

1. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016
2. VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.
3. Mahadevan B, "Operations Management -Theory and Practice",3rd Edition, Pearson
4. Education, 2018

Web Resources

1.https://www.247.ai/insights/business-intelligence-and-big-data#

2.https://www.oracle.com/scm/scm-and-hr/

3.https://www.forbes.com/sites/bernardmarr/2016/02/23/the-9-best-marketing-and-sales-analytics-every-manager-should-know-about/?sh=7ca4e5186b25

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3													
2	3	3													
3	3	3	3												
4	3	3	3	3				2	2				3		
5	3	3	3	3				2	2				3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10

UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:(remember)

1. What are the life cycle phases of data analytics?
2. In which phase of data analytics lifecycle analytic plan framing the business problem as an analytics challenge can be achieved?

COURSE OUTCOME 2: (Remember)

1. What is data mart vs. data warehouse?
2. What is OLAP data mart?

COURSE OUTCOME 3: (Remember)

1. What is predictive analytics in business analytics?
2. How business forecasting and predictive analytics are merging?

COURSE OUTCOME 4: (apply)

1. illustrate the framework for social customer relationship management
2. What is MDM? Explain the process of MDM for some test cases

COURSE OUTCOME 5: (remember)

1. What are the 5 v's of big data?
2. How to deal with human generated data in big data analytics?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I- INTRODUCTION TO BUSINESS ANALYTICS		
1	Analytics and data science	1
2	Big data analytics life cycle	1
3	Types of business analytics	1
4	Business problem in big data	1
5	Definition of business intelligence	1
6	Data collection- data preparation	1
7	Hypothesis generation- modeling	1
8	Validation and evaluation	1
9	Interpretation-deployment and iteration	1
UNIT-II – BI FOR BIG DATA		
10	Data warehouse	1
11	Data mart	1
12	Knowledge management for big data	1
13	Types of decisions	1
14	Decision making process	1
15	Decision support system	1
16	Business intelligence and big data analytics	1

17	OLAP	1
18	Analytical functions on big data	1
UNIT-III – BUSINESS FORECASTING		
19	Introduction to business forecasting	1
20	Predictive analytics for big data	1
21	Logic and data driven model	1
22	Logic and data driven model	1
23	Data mining modeling	1
24	Predictive analysis modeling	1
25	Machine learning	1
26	Machine learning for predictive analysis in big data	1
27	Machine learning for predictive analysis in big data	1
UNIT-IV – ANALYTICAL CRM IN BIG DATA		
28	Customer data base management	1
29	Corporate customer data	1
30	Structured and unstructured data	1
31	Develop a customer database	1
32	Data- integration	1
33	Warehousing and marts in the CRM contest	1

34	Knowledge management	1
35	CRM strategy and tactics, customer life cycle	1
36	Big data analytics in CRM- analytical insights	1
UNIT- V – BUSINESS ANALYTICS VS. BIG DATA		
37	Relationship between big data and business analytics	1
38	Relationship between big data and business analytics	1
39	Dealing with human generated data	1
40	Defining big data	1
41	Architectural foundation	1
42	Analytical data warehouse	1
43	Hadoop	1
44	Data in motion and streaming data	1
45	Integration of big data with traditional data	1

21AI7808	ETL Tools	L	T	P	C
		3	0	0	3

Preamble

This course delivers the knowledge about data extraction process from the various source system and load them into a single depository effectively, comparison ETL testing with manual testing, data warehousing with ETL(Extract, transform and Load) testing, ETL testing specification, and documentation.

Prerequisites for the course

Students should have Basic theoretical concepts of Data Warehousing and Data Mining

Course Objectives

1. To plan and design your ETL system
2. To Build the development/test/production suite of ETL processes
3. To impart knowledge on how to build a comprehensive data-cleaning subsystem
4. To mapstructure data into dimensional schemas for the most effective delivery to end users, business-intelligence tools, data-mining tools, OLAP cubes, and analytic applications
5. To understand about how to tune the overall ETL process for optimum performance

UNIT I	REQUIREMENTS, REALITIES, AND ARCHITECTURE	9

Requirements – Archiving and Lineage - Architecture - The Back Room - The Front Room - The Mission of the Data Warehouse- Designing the Staging Area - ETL Data Structures - Dimensional Data Models - Planning and Design Standards

SUGGESTED ACTIVITIES

- Discussion about ETL Data Structures

SUGGESTED EVALUATION METHODS

- Quiz on Dimensional Data Models

UNIT II	DATA FLOW	9

Extracting - The Logical Data Map - Integrating Heterogeneous Data Sources - Mainframe Sources - Flat File - XML Sources - Web Log Sources - ERP System Sources - Extracting Changed Data - Cleaning and Conforming - Design Objectives - Cleaning Deliverables - Screens and Their Measurements- Conforming Deliverables		
SUGGESTED ACTIVITIES		
• In class activity- - ERP System Sources		
SUGGESTED EVALUATION METHODS		
• Assignment on XML Sources		
UNIT III	**DIMENSION AND FACTS**	**9**
Basic Structure of a Dimension - Date and Time Dimensions - Slowly Changing Dimensions - Multivalued Dimensions and Bridge Tables - Basic Structure of a Fact Table - Fundamental Grains - Preparing for Loading Fact Tables - Fact less Fact Tables – Aggregations - Delivering Dimensional Data to OLAP Cubes		
SUGGESTED ACTIVITIES		
• In class activity- Aggregations		
SUGGESTED EVALUATION METHODS		
• Assignment on Data to OLAP Cubes		
UNIT IV	**ETL OPERATIONS**	**9**
Development - Time Is of the Essence - Using Database Bulk Loader Utilities - Managing Database Features - Increasing ETL Throughput – Operations - Scheduling and Support - Migrating to Production - Achieving Optimal ETL Performance - Purging Historic Data - Tuning ETL Processes - ETL System Security – Short and Long Term Archiving and Recovery		
SUGGESTED ACTIVITIES		

• In class activity- Short and Long Term Archiving and Recovery		
SUGGESTED EVALUATION METHODS		
• Assignment on Tuning ETL Processes		
UNIT V	**METADATA**	**9**
Defining Metadata - Business Metadata - Technical Metadata - ETL Job Metadata - Metadata Standards and Practices - Real-Time ETL Systems - Defining Real-Time ETL - Real-Time Data Warehousing Review - Categorizing the Requirement - Real-Time ETL Approaches		
SUGGESTED ACTIVITIES		
• In class activity- Real-Time ETL Systems		
SUGGESTED EVALUATION METHODS		
• Quiz on Real-Time Data Warehousing		
Total Periods		**45**

Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTION QUESTIONS	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO702.1: Apply the fundamental knowledge on ETL Tools. **(Remember)**

CO702.2 Explain the basics of Data Flow. **(Remember)**

CO702.3. Understanding Concept of Designing ETL Development.**(Understand)**

CO702.4 Infer the importance of Meta Data. **(Understand)**

CO702.5 To familiarize with Real-Time ETLApproaches. **(Apply)**

Text Books

1. Ralph Kimball & Joe Caserta, The Data WarehouseETL Toolkit, Wiley Publishing, 1st edition, 2004

2. Ralph Kimball,Kimball's Data Warehouse Toolkit Classics, Wiley; 3rd edition 2013

Reference Books

1. Bob Becke Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy ,The Data Warehouse Lifecycle Toolkit: Practical Techniques for Building Datawarehouse and Business Intelligence Systems, Wiley; Second edition ,2008
2. Essential Pentaho ETL: A self-study reference and practice book for ETL beginners, Aryan KavanGowda , First Edition, 2020
3. Roland Bouman (Author), Matt Casters, Pentaho Kettle Solutions: Building Open Source ETL Solutions with Pentaho Data, Wiley, First Edition, 2010

Web Resources

1. https://www.javatpoint.com/etl-tools
2. https://www.guru99.com/etl-extract-load-process.html
3. https://www.geeksforgeeks.org/etl-process-in-data-warehouse/
4. https://www.tutorialspoint.com/sap_bods/etl_introduction.htm

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2		1				1	1		1	2	2		
2	3	2		1				1	1		1	2	2		
3	3	2		1				1	1		1	2	2		
4	3	2	2	1			1	1	1		1	2	2		

5	3	2	2	1	1		1	1	1		1	2	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:(Remember)

1. Explain what are the ETL testing operations includes?
2. What are the various tools used in ETL?

COURSE OUTCOME 2: (Remember)

1. Explain what fact less fact schema is and what is Measures?

COURSE OUTCOME 3: (Understand)

1. Explain what is the difference between OLAP tools and ETL tools?
2. How you can extract SAP data using Informatica?

COURSE OUTCOME 4: (Understand)

3. Explain what is data purging?
4. Explain what are the differences between Unconnected and Connected lookup?

COURSE OUTCOME 5: (Apply)

1. In case you have non-OLEDB (Object Linking and Embedding Database) source for the lookup what would you do?
2. What are the various tools used in ETL?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
REQUIREMENTS, REALITIES, AND ARCHITECTURE (9 HOURS)		
1	Requirements	1
2	Archiving and Lineage	1
3	Architecture - The Back Room	1
4	The Front Room	1
5	The Mission of the Data Warehouse	1
6	Designing the Staging Area	1
7	ETL Data Structures	1
8	Dimensional Data Models	1
9	Planning and Design Standards	1
DATA FLOW (9 HOURS)		
10	Extracting	1
11	The Logical Data Map	1
12	Integrating Heterogeneous Data Sources	1
13	Mainframe Sources - Flat File	1

14	XML Sources - Web Log Sources	1
15	ERP System Sources	1
16	Extracting Changed Data	1
17	Cleaning and Conforming - Design Objectives - Cleaning Deliverables	1
18	Screens and Their Measurements- Conforming Deliverables	1
DIMENSION AND FACTS (9 HOURS)		
19	Basic Structure of a Dimension	1
20	Date and Time Dimensions	1
21	Slowly Changing Dimensions - Multivalued Dimensions	1
22	Bridge Tables	1
23	Basic Structure of a Fact Table	1
24	Fundamental Grains	1
25	Preparing for Loading Fact Tables - Fact less Fact Tables	1
26	Aggregations	1
27	Delivering Dimensional Data to OLAP Cubes	1
ETL OPERATION (9 HOURS)		
28	Development	1

29	Time Is of the Essence	1
30	Using Database Bulk Loader Utilities	1
31	Managing Database Features	1
32	Increasing ETL Throughput – Operations - Scheduling and Support	1
33	Migrating to Production	1
34	Achieving Optimal ETL Performance	1
35	Purging Historic Data - Tuning ETL Processes	1
36	ETL System Security – Short- and Long-Term Archiving and Recovery	1
METADATA (9 HOURS)		
37	Defining Metadata	1
38	Business Metadata	1
39	Technical Metadata	1
40	ETL Job Metadata	1
41	Metadata Standards and Practices	1
42	Real-Time ETL Systems - Defining Real-Time ETL	1
43	Real-Time Data Warehousing Review	1
44	Categorizing the Requirement	1
45	Real-Time ETL Approaches	1

21AI7809	AI IN HEALTHCARE	L	T	P	C
		3	0	0	3

Preamble

- AI in healthcare is a transformative field that combines artificial intelligence and healthcare to revolutionize medical practice, research, and patient care.
- It leverages the power of AI algorithms to analyze vast amounts of health data, enabling accurate diagnoses, personalized treatment plans, and improved patient outcomes.
- While offering immense potential, the integration of AI in healthcare also raises ethical considerations such as data privacy, algorithm bias, and the need for healthcare professionals to interpret and validate AI-generated insights.

Prerequisites for the course

- Basic Knowledge of Healthcare
- Fundamental Knowledge of Artificial Intelligence and Machine Learning

Objectives

- Understanding the role of AI in healthcare
- Developing proficiency in AI techniques
- Data requirements and pre-processing in healthcare
- Addressing ethical and regulatory considerations
- Applying AI in healthcare scenarios.

UNIT I	Introduction to AI and Machine Learning	10

Introduction to AI-Examining AI- Machine learning –Machine Learning – Supervised Learning-Working Principle of ML- Performing Machine Learning: Specifying Problem, Preparing Data, Choosing and Applying Learning Method, Accessing Results, Optimization and Reporting.

SUGGESTED ACTIVITIES

- Specifying a Machine Learning Problem: In this activity, students can choose a healthcare-related problem that can be addressed using machine learning. They should clearly define the problem statement, identify the desired outcome, and determine the data requirements.

SUGGESTED EVALUATION METHODS

- Assignments
- Quiz

UNIT II	**Machine Learning in Healthcare**	**10**

Supervised Learning Algorithm- Decision Tree-Linear and Logistic Regression-SVM-Deep Learning-Unsupervised Learning-Natural Language Processing-Lexical Analysis, Syntactic Analysis, Techniques Used within NLP.

SUGGESTED ACTIVITIES

- Students can work on a sentiment analysis project using NLP techniques. They can collect a dataset of customer reviews or social media comments related to a specific product or service and apply NLP techniques to classify the sentiment expressed in the text (positive, negative, or neutral). The activity can involve data preprocessing, feature extraction, model training using machine learning algorithms, and evaluating the sentiment analysis performance.

SUGGESTED EVALUATION METHODS

- Assignments
- Quiz

UNIT III	**MODEL EVALUATION**	**10**

Model Development and Workflow-Evaluation Metric-Parameters and Hyperparameter-Hyperparameter Tuning Algorithms:Grid Search, Random Seach-Multivariate Testing-Types of Test

SUGGESTED ACTIVITIES		
• Students can develop a machine learning model using logistic regression to predict the likelihood of diabetes diagnosis based on clinical features such as age, BMI, blood pressure, and glucose levels. They can evaluate the model's accuracy and explore the impact of different evaluation metrics on its performance.		
SUGGESTED EVALUATION METHODS		
• Assignments • Quiz		
UNIT IV	**Ethics of Health Intelligence**	**8**
Ethics: Data Ethics, Ethics of Intelligence , Prediction Ethics: Preventing Algorithms from Immoral-Unintended Consequences- Health Intelligence-Machines Affect –Employing Data Ethics		
SUGGESTED ACTIVITIES		
• Students can critically evaluate the ethical principles involved, such as data privacy, informed consent, data anonymization, and the potential for unintended consequences, to arrive at a well-rounded ethical analysis.		
SUGGESTED EVALUATION METHODS		
• Assignments • Quiz		
UNIT V	**Future of Healthcare**	**7**
Evidence, Personalized Medicine-Connected Medicine-Medication Adherence-Virtual and Augmented Reality-Block chain: Incentivized Wellness, Patient Record Access- Robots, Smart Places: Smart Home, Smart Hospitals		
SUGGESTED ACTIVITIES		
• Students can explore the field of personalized medicine and genomics by working on a project that focuses on identifying genetic markers associated with a specific disease or		

treatment response.

SUGGESTED EVALUATION METHODS

- Assignments
- Quiz

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Gain a comprehensive understanding of the applications and potential impact of AI in healthcare **(Apply)**

CO2 Develop proficiency in machine learning techniques and their application in healthcare data analysis and prediction. **(Apply)**

CO3 Understand the concept of personalized medicine and how connected healthcare technologies can improve patient care and outcomes.**(Apply)**

CO4 Understand the concept of personalized medicine and how connected healthcare technologies can improve patient care and outcomes. **(Apply)**

CO5 Explore the potential of emerging technologies in healthcare, such as virtual reality and blockchain, and their impact on patient experiences and data security. **(Apply)**

Text Books

1. "Artificial Intelligence in Medicine" by Anthony C. Chang and others.

2. Machine Learning and AI for Healthcare by ArjunPanesar.

Reference Books

1. Deep Learning in Healthcare: Paradigms and Applications" edited by S. S. Iyengar and B. N. Shankar.
2. Artificial Intelligence in Precision Health: From Concept to Applications" edited by D. P. Dhanapal and D. V. Laurence
3. Big Data Analytics in Healthcare: Advances and Challenges" edited by NilanjanDey and others.

Web Resources

1. https://www.healthit.gov/sites/default/files/9-6-applications-ai-healthcare.pdf
2. https://med.stanford.edu/content/dam/sm/precision-health/documents/artificial-intelligence/AI-in-Healthcare-Key-Concepts-Benefits.pdf
3. **https://www.forbes.com/sites/forbestechcouncil/2022/08/15/artificial-intelligence-in-healthcare-a-comprehensive-guide/?sh=5899de451f56**
4. **https://www.who.int/news-room/q-a-detail/ai-in-healthcare**
5. https://hbr.org/2019/03/artificial-intelligence-in-healthcare-the-hope-the-hype-the-promise-the-peril

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1			2							3		
2	1	2	1			2							3		
3	1	2	1			2							3		
4	1	2	1			2							3		
5	1	2	1			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

1. How can machine learning algorithms be effectively applied to predict patient readmission rates in a hospital setting, and what are the key factors that contribute to readmissions?

Course Outcome 2 (CO2): (Apply)

1. How can decision tree algorithms be effectively utilized to predict the likelihood of patient readmission in a healthcare setting, considering various clinical and demographic factors?

2. How can deep learning techniques, such as convolutional neural networks (CNNs) or recurrent neural networks (RNNs), be applied to medical image analysis for accurate diagnosis and detection of abnormalities?

3. In an unsupervised learning scenario, how can clustering algorithms be employed to identify distinct patient subgroups based on electronic health record (EHR) data, and how can this information be utilized for personalized treatment plans or disease management strategies?

Course Outcome 3 (CO3): (Apply)

1. In the context of developing an AI model for predicting disease progression, what evaluation metric(s) would be appropriate to assess the model's performance, considering factors such as sensitivity, specificity, and false positive/negative rates?

2. How can multivariate testing techniques be applied in a healthcare study to analyze the effectiveness of different treatment interventions, taking into account various patient characteristics and outcomes?

Course Outcome 4 (CO4): (Apply)

1. How can we ensure the ethical use of artificial intelligence in healthcare, particularly when it comes to making predictions about patient outcomes or treatment recommendations, to avoid biases and discrimination?

Course Outcome 5 (CO5): (Apply)

2. How can we ensure patient adherence to medication regimens in the era of connected medicine and remote healthcare monitoring, considering factors such as privacy concerns, technological barriers, and patient engagement?

3. What are the ethical implications and potential risks associated with the use of virtual and augmented reality technologies in healthcare, particularly in terms of patient privacy, informed consent, and the blurring of boundaries between virtual and real-world experiences?

21AI7810	Intelligent Automation	L	T	P	C
		3	0	0	3

Preamble

- The aim of this course is to provide students with knowledge and abilities to free up time and resources while speeding up existing processes and creates ability to identify different solution .

Prerequisites for the course

- Nil

Objectives

- To learn the use of automation technologies artificial intelligence, business process management streamline and scale decision-making across organizations.
- Intelligent automation simplifies processes, frees up resources and improves operationalefficiencies, and it has a variety of applications.
- To understand the scenario of Automation
- To learn the technique about Hyperparameter Optimization.
- To learn need of IA in a business imperative

UNIT I	Introduction to Intelligent Automation	8

Understanding the power of IA - Differentiating IA from AI - Unique characteristics of IA - A framework for explaining the power of IA -Vision, Execution , Language , Thinking & learning.

SUGGESTED ACTIVITIES

Demonstrate the Unique characteristics of IA

.

SUGGESTED EVALUATION METHODS

Assignment , puzzles

UNIT II	IA FOR ORGANIZATIONS	10
challenges of implementing IA -Management support, vision, governance, and structure - Talent management - organizations thrive with IA : Democratization of IA, Convergence of technologies - IA generated by IA - Symbiosis of people and IA - Preparing for the long-term trends		
SUGGESTED ACTIVITIES		
• Demonstrate the different ways of challenges implemented by IA		
SUGGESTED EVALUATION METHODS		
• Quiz ,Assignment		
UNIT III	**IA AND SOCIETY**	**10**
optimistic scenario - pessimistic scenario - Preparing for both scenarios - Evolving skills- Sharing the wealth, Rethinking "work", Reinventing education, Building a new society.		
SUGGESTED ACTIVITIES		
Demonstrate pessimistic scenario		
SUGGESTED EVALUATION METHODS		
• Assignment		
UNIT IV	**Hyperparameter Optimization**	**8**
Optimizing for Multiple Objectives- BlackboxHyperparameter Optimization : Model-Free Blackbox Optimization Methods - Bayesian Optimization - Multi-fidelity Optimization - Applications to AutoML - Open Problems and Future Research Directions		
SUGGESTED ACTIVITIES		
• Demonstrate Model-Free Blackbox Optimization Methods		
SUGGESTED EVALUATION METHODS		
• Quizzes		

<table>
<tr><td>UNIT V</td><td>INTELLIGENT BUSINESS STRATEGIES</td><td>9</td></tr>
<tr><td colspan="3">Increasing companies' efficiency - Building new business strategies with IA - New digital business building - Improving the employee experience - Boosting the customer experience : A responsive and omnichannel focus on customer service , Customized offers and innovative products,– Avoiding losses - Building a society more resilient to crises.</td></tr>
<tr><td colspan="3">SUGGESTED ACTIVITIES</td></tr>
<tr><td colspan="3">• Discuss the customer experience</td></tr>
<tr><td colspan="3">SUGGESED EVALUATION METHODS</td></tr>
<tr><td colspan="3">• Assignment</td></tr>
<tr><td colspan="2">Total Periods</td><td>45</td></tr>
<tr><td colspan="3">Suggestive Assessment Methods</td></tr>
<tr><td>Continuous Assessment Test

(20 Marks)</td><td>Formative Assessment Test

(20 Marks)</td><td>End Semester Exams

(60 Marks)</td></tr>
<tr><td>1. DESCRIPTIVE QUESTIONS
2. PROBLEM SOLVING QUESTIONS</td><td>1.ASSIGNMENT
2. ONLINE QUIZZES
3.PROBLEM-SOLVING ACTIVITIES</td><td>1.DESCRIPTIVE QUESTIONS
2. PROBLEM SOLVING QUESTIONS</td></tr>
<tr><td colspan="3">Course Outcomes</td></tr>
<tr><td colspan="3">Upon completion of the course, the students will be able to:</td></tr>
<tr><td colspan="3">CO1:Understanding Intelligent Automation Technologies (Understand)
CO2: Apply IA to thrive organizations (Apply)
CO3: Illustrate both optimistic scenario - pessimistic scenario (Apply)
CO4:Apply Optimization Methodsfor Multiple Objectives using model free blackbox optimization (Apply)
CO5: Understand how to boosting the customer experience (Apply)</td></tr>
</table>

Text Books

1. INTELLIGENT AUTOMATION Welcome to the World of HYPERAUTOMATION IAN BARKIN – JOCHEN WIRTZ PASCAL BORNET
2. Automated MachineLearning Frank Hutter • Lars Kotthoff • Joaquin Vanschoren Editors

Reference Books

.

1. Intelligent Automation Simplified by DebanjanaDasgupta (Author)
2. Intelligent Automation And Systems Engineering Si-long A – MahyarAmoouzegar BurghardB.Rieger Editors

Web Resources

1. https://www.slideshare.net/SlideTeam1/intelligent-automation-powerpoint-presentation-slides
2. https://www.youtube.com/watch?v=R0Sn7zX4ZzA
3. https://www.sketchbubble.com/en/presentation-intelligent-process-automation.html
4. https://flevy.com/browse/flevypro/intelligent-process-automation-ipa-2770
5. https://www.google.com/aclk?sa=l&ai=DChcSEwjoi4rYjPn-AhWjmWYCHbBAB8AYABAAGgJzbQ&sig=AOD64_2d9AUQBu_aQcZv3iy7h_hVmD7PHg&q&adurl&ved=2ahUKEwjTi4PYjPn-AhVySGwGHTL1DI4Q0Qx6BAgIEAE

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		

5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

How can we triple our global budget for education, help restore our planet from pollution, or eliminate hunger forever?

Course Outcome 2 (CO2): (Apply)

Illustrate Barriers due to change management

Course Outcome 3 (CO3): (Apply)

List of recent global studies on the impact of automation and artificial intelligence on the future of employment

Course Outcome 4 (CO4): (Apply)

Does hyper-parameter optimization really improve performance over using default values?

Course Outcome 5 (CO5): (Apply)

Illustrate the need of AI in the telecommunication industry

21AI7611	**Deep learning Laboratory**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Prerequisites for the course

- 21AI6611 - Machine Learning Laboratory

Objectives

6. To understand the tools and techniques to implement deep neural networks
7. To apply different deep learning architectures for solving problems
8. Design and implement various machine learning algorithms in a range of real-world application.

S.No	**List of Experiments**	**CO**
1	Classification with Multilayer Perceptron using Scikit	CO1
2	Hyper-Parameter Tuning in Multilayer Perceptron	CO1
3	Deep learning packages Basics:Tensorflow,Keras,Theano and PyTorch	CO1
4	Classification of MNIST Dataset Using CNN	CO2
5	Parameter Tuning in CNN for image classification	CO2
6	Sentiment Analysis for analyzing customer feedback using CNN	CO2
7	Face Emotion Recognition using CNN	CO2
8	Object Detection for self-Driving cars using Transfer Learning of CNN Architecture	CO2
9	Recommendation system for tourism scenic spots using Deep Learning	CO3
10	Dimensionality Reduction for IRIS Data set using Deep Learning	CO3
		Total Periods : 45

List of Projects

S.No	List of Experiments	CO
11.	Image Classification using CIFAR-10 Dataset	CO1,CO2,CO3
12.	Human Face Detection	CO1,CO2,CO3

13.	Music genre Classification System	CO1,CO2,CO3
14.	Gender Recognition Using Voice	CO1,CO2,CO3
15.	Color Detection system	CO1,CO2,CO3
16.	Crop Disease Detection	CO1,CO2,CO3
17.	Coloring Old Black and White Photos	CO1,CO2,CO3
18.	Language Translator using Deep learning	CO1,CO2,CO3
19.	Hand Gesture Recognition System	CO1,CO2,CO3
20.	Lane detection and Assistance System	CO1,CO2,CO3

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	End Semester Exams (40 Marks)
• Lab Experiment • Viva • Model Exam • Project	• Practical Exam

Outcomes:

Upon completion of the course, the students will be able to:

CO1: Understand the tools and techniques to implement deep neural networks

CO2: Apply different convolution Neural Network for solving problems

CO3: Design and implement various Deep learning algorithms in a range of real-world application.

Laboratory Requirements:

- Python with Deep learning packages

Reference Books

3. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
4. NikilBudhuma"Fundamentals of Deep Learning" O'Reilly Media,2017
5. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127

Web Resources

13. **https://www.deeplearning.ai/courses/**
14. **https://www.udacity.com/course/intro-to-tensorflow-for-deep-learning--ud187**
15. **https://www.edx.org/learn/deep-learning**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3		3		3								3		
2	3		3		3								3		
3	3		3		3								3		
4	3		3		3								3		
5	3		3		3								3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam	END SEM EXAM
REMEMBER		
UNDERSTAND		
APPLY	100	100
ANALYZE		
EVALUATE		
CREATE		

COURSE LEVEL ASSESSMENT QUESTIONS

Students will be able to predict the suitable method for.

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Understand)

1. Explain the architecture of Convolutional Neural Networks (CNN)?
2. Explain optimizers. Why optimizers are required?
3. Show three basic strategies for obtaining convolution kernels without supervised training.
4. Differentiate locally connected layers, tiled convolution and standard convolution with suitable examples and diagram.
5. Construct a Convolutional network to demonstrate the effect of zero padding on network size. Explain Neuro scientific basis for Convolutional Networks
6. Evaluate variants of the basic convolution function

Course Outcome 2 (CO2): (Apply)

1. Compute the gradient in a Recurrent Neural Network
2. Discuss Recurrent Neural Networks in detail.
3. Explain how to compute the gradient in a Recurrent Neural Network

4. Prepare an example of Encoder- Decoder or sequence-to-sequence RNN architecture.
5. Explain a modeling sequences Conditioned on Context with RNNs

Course Outcome 3 (CO3): (Analyze)

1. Describe the following. 1. i, Independent Component Analysis, ii, Slow Feature Analysis.
2. Perform the automatic image captioning using Deep neural networks.

21AI7912	Business Intelligence with power BI	L	T	P	C
		0	0	4	2

Preamble

This course focuses on business intelligence with power BI tools used for storage, analysis and manipulation of data us.The student will learn about fundamentals of intelligence tools and have hand on training on the same Italso help to develop projects and apply existing data analytics tools to gain comprehensive knowledgeon Data analytics on business. This will enable the students to develop modular applications related tothe field of engineering.

Prerequisites for the course

- 21MA3205-Probability and Statistics
- 21AI4601-Data Analytics

Objectives

- To understand the analytic modelling behind business intelligence.
- To understand the knowledge of using POWER BI tools for analytics
- To generate dashboards for the data using POWER BI tools
- To visualize the data and do modelling using POWER BI.

1.

S. No	List of Experiments	CO
1	Import the legacy data from different sources such as (Excel,SqlServer, Oracle etc.) and load in the target system.	CO1
2	Perform the Extraction Transformation and Loading (ETL)process to construct the database in the Power BI.	CO1

3	Small business data reviews using power BI	CO2
4	Web scraping using Power BI from job portals	CO2
5	Data Analysis using Time Series Analysis	CO3
6	Production data sentimental analysis using power BI	CO3
7	Exploratory data analysis using Power BI for US Census Data	CO4
8	Exploratory data analysis using Power BI for latest Netflix data	CO4
9	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	CO5
10	Twitter sentimental analysis	CO5

S.No.	List of Projects	Related Experiment	CO
1.	Product Sales data analysis	Ex. 1 to 10	CO3,CO4,CO5
2.	Financial Performance Data Analysis	Ex. 1 to 10	CO3,CO4,CO5
3.	Airport Performance Analysis	Ex. 1 to 10	CO3,CO4,CO5
4.	Customer Analysis	Ex. 1 to 10	CO3,CO4,CO5
5.	Marketing Campaign Insights Analysis	Ex. 1 to 10	CO3,CO4,CO5
6.	Health Care Sales Analysis	Ex. 1 to 10	CO3,CO4,CO5
7.	Inventory Stock Analysis	Ex. 1 to 10	CO3,CO4,CO5
8.	Retail analysis	Ex. 1 to 10	CO3,CO4,CO5

9.	Product Sales data analysis	Ex. 1 to 10	CO3,CO4,CO5
10.	Movie sales Visualization	Ex. 1 to 10	CO3,CO4,CO5

Suggestive Assessment Methods

Lab Components Assessments
(100 Marks)

- LabExperiment(40)
- ModelExam& Project(60)

Course Outcomes

Upon completion of the course, the students will be able to:

CO1	Define how BI tools will help to analyse and organize data
CO2	Link business intelligence with data analytics using Power BI
CO3	Apply data analytics using Power BI
CO4	Perform the Exploratory data analytics using Power BI
CO5	Apply the visualization concept using power BI

Laboratory Requirements

- Power BI Tools
- Systemwithwindows
- Internet

Reference Books

Efraim Turban, Ramesh Sharda, DursunDelen, "Decision Support and Business Intelligence

Systems", 9th Edition, Pearson 2011

"Business Intelligence – Grundlagen und praktischeAnwendungen: Eine Einführung in die IT"

by Hans-Georg Kemper and Henning Baars.

Web Resources

https://www.google.com/search?q=tableau+tutorial+point+pdf+free+download
https://www.tutorialspoint.com/msexcel/index.htm
https://www.tutorialspoint.com/powerbi/index.htm
https://www.tutorialspoint.com/googledatastudio/index.htm

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3											1		
2	3	3		3	3								1		
3	3	3		3	3								2		
4	3	3		2	3								2		
5	3	3		3									3		

BLOOMSLEVELASSESSMENTPATTERN

BLOOMSCATEGORY	ModelExam	ENDSEMEXAM
REMEMBER		
UNDERSTAND		
APPLY	50	100
ANALYZE		
EVALUATE		
CREATE	50	

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE LEVEL ASSESSMENT QUESTIONS
Course Outcome 1 (CO1):

1. How business intelligence BI systems are used for reporting and data analytics?(understand)

2. What are the five stages of BI?(Remember)

Course Outcome 2 (CO2):

1. Analyze small business data set using Power BI (analyze)
2. Visualize the Production data set using Power BI (apply)

Course Outcome 3 (CO3):

1. For any health care, do extraction , transformation and finally visualizing the output using
2. Power BI.(apply)
3. What is the difference between power bi and Tableau prep builder? (understand)

Course Outcome 4 (CO4):

1. Generate a visualizing report for Book reviews using Power BI(Apply)
2. How do connect Power BI with GoogleDashboards?(understand)

Course Outcome 5 (CO5):

1. How power BI differ from other BI tools? (analyze)
2. Create a dashboard for any Business applications using power BI

BUSINESS INTELLIGENCE
(Specialization/Minor)

List of Minor Courses

Sl.No	Course code	Course Name	Sem	L	T	P	C	Offered By
1.	21AI4S01	Predictive Business Analytics	4	3	1	0	4	AI&DS
2.	21AI5S01	Business Intelligence Tools	5	3	0	2	4	AI&DS
3.	21AI6S01	Big Data Analytics For Business	6	3	0	0	3	AI&DS
4.	21AI7S01	Artificial Intelligence for Business	7	3	0	0	3	AI&DS
5.	21AI8S01	Project Work	8	0	0	0	4	AI&DS

21A14S01	PREDICTIVE BUSINESS ANALYTICS	L	T	P	C
		3	1	0	4

Preamble

The key phrase to describe all of the initiatives to use data analysis to enhance business decision making is "predictive analytics." This idea serves as the foundation for this course's (also known as Data Mining's) primary focus, which is on machine learning tools, models, and software methodologies.

Prerequisite

- 21AI3602-Data Science Essentials
- 21AI4601-Data Analytics

Objectives

- To provide knowledge on business framework for predictive analytics
- To understand the principles behind predictive business analytics
- To comprehend the various business methods and techniques
- To provide basic knowledge in marginal expense calculation for business
- To know about various trends and challenges in business

UNIT I	INTRODUCTION TO BUSINESS ANALYTICS	9+3

Introduction to analytics- Business Intelligence vs. Analytics vs. Decision –predictive business analytics and decision management-Building the business case of predictive Business Analytics-selecting a desired target state-Adopting a PBA framework-developing the framework

SUGGESTED ACTIVITIES:

- Practical on Visualization of Business data
- Seminar on Business Data management and Indexing

SUGGESTED EVALUATION METHODS:

- Assignment Problem
- Quizzes

UNIT II	PRINCIPLES AND PRACTICES	9+3

Guiding principles in developing predictive business analytics-demonstrate a strong cause effect relationship- incorporate a balanced set of financial, non-financial, internal and external measure- ensure data integrity- integrate into the management process- developing a predictive business analytics function- deploying the business analytics function-case studies

SUGGESTED ACTIVITIES:

- Practical- Find Internal measure and developing a predictive business analytics

SUGGESTED EVALUATION METHODS:

- Assignment Problem
- Tutorial Problem
- Quizzes

UNIT III	BUSINESS METHODS AND TECHNIQUES	9+3

Integrating business methods and techniques- Irrational decision making-Increasing the return on investment from information assets- Emerging needs of analytics-Integration of business intelligence, business analytics, and Enterprise business management		
SUGGESTED ACTIVITIES: • Implementation of Enterprise business management • Applications of Business data analysis techniques		
SUGGESTED EVALUATION METHODS: • Assignment Problem • Quizzes		
UNIT IV	**PREDICTIVE ACCOUNT FORECASTS**	**9+3**
Predictive accounting and marginal expense analytics- an accounting framework and taxonomy- coexisting accounting methods- predictive accounting involves marginal expense calculations- problem with budgeting- four types of budget spending		
SUGGESTED ACTIVITIES: • Practical- Data analytics for budget spending		
SUGGESTED EVALUATION METHODS: • Tutorial problems • Assignment problems • Quizzes		
UNIT V	**TRENDS AND CHALLENGES**	**9+3**
CFO Trends- Resistance to change and presumption of Existing capabilities- Organizational challenges- Early adopters and laggards- two types of employees- inequality of decision rights- maximizing predictive business analytics: Top Down and Bottom up leadership		
SUGGESTED ACTIVITIES: • Implementation of Business data		
SUGGESTED EVALUATION METHODS: • Tutorial problems		
• Project demonstration • Assignment problems • Quizzes		
	Total Periods	**45 + 30**
Suggestive Assessment methods		

Continuous Assessment Test (30Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTION QUESTIONS	1. ASSIGNMENTS 2.ONLINE QUIZZES 3.PROBLEM SOLVING ACTIVITIES	1. DESCRIPTION QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

- Describe the basic knowledge of predictive analytics in business.
- Analyze various principles of analytics model for business prediction
- Integrate various business methods for business
- Apply marginal expense calculation to forecast budget for a business
- Analyze various trends and challenges in predictive business analytics

Text Books

1.Lawrence S Maisel, Gray Cokins "predictive business analytics", First edition, Willey, 2014

3. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.

Reference

1. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014
2. Anasse Bari, Mohammad Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, 2017.

Web Resources

1. https://www.predictiveanalyticstoday.com/what-is-predictive-analytics/
2. onlinecourses.swayam2.ac.in/imb20_mg19/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	3	3	3												3
2	3	3	3										3	3	3
3	3	3	3	3									3	3	3
4	2	2	3	3	3								3	3	3

5	2	3	3	3									3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDETSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL
ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What is the difference between business analytics and predictive analytics? Find similarities and patterns, finds relationships among different dimensions or factors to assess the potential opportunities and risks? (remember)
2. Mention the example of predictive analytics in business early detection of allergic reactions? (understand)

COURSE OUTCOME 2:

1. Explain the cause effect relationship of business analytics and cause-and-effect relationship, one event leads to another event .(understand)
2. Implement likelihood of future outcomes based on historical data for business analytics(Apply)

COURSE OUTCOME 3:

1. Compare business intelligence, business analytics and enterprise businessmanagement(understand)
2. Implement the emerging need of analytics in business predicting model (analyze)

COURSE OUTCOME 4:

1. Create a business application plan for budget in predictive accounting?(analyze)
2. How do you calculate marginal expense for a business model?(understand)

COURSE OUTCOME 5:

1. Discuss about top down and bottom up leadership (understand)
2. Build a mathematical model that captures important trends that Predictive analytics useshistorical data to predict future events.(Analyze)

21AI5S01	BUSINESS INTELLIGENCE TOOLS	L	T	P	C
		3	0	2	4

Preamble

This course focuses on business intelligence tools used for storage, analysis and manipulation of data us. The student will learn about fundamentals of intelligence tools and have hand on training on the same It also help to develop projects and apply existing data analytics tools to gain comprehensive knowledge on Data analytics on business. This will enable the students to develop modular applications related to the field of engineering.

Prerequisites for the course

- Probability and statistics
- Data science essentials

Objectives

1. To Understand the methodology and technique of business intelligence
2. To understand the analytic modeling behind MS EXCEL
3. To understand the knowledge of using tableau tools for analytics

4. To generate reports for the data using data studio tools
5. To visualize the data modeling concepts using POWER BI.

UNIT I	INTRODUCTION TO BUSINESS INTELLIGENCE	9

Definition of Business intelligence- Business intelligence scenarios- perspectives in Business intelligence – Business intelligence views on business process- goals of business intelligence- business intelligence Tasks and analysis formats

SUGGESTED ACTIVITIES

- Discussion on case studies of business intelligence
- Basic introduction about various business intelligence user interface

SUGGESTED EVALUATION METHODS

- Quizzes on business intelligence tasks and analysis formats
- Assignment on business intelligence views on business process

UNIT II	MS EXCEL	9

Getting started with excel-working with data- working with charts-describing data- probability distribution-statistical interface- Tables-Regression and correlation-Multiple regression

SUGGESTED ACTIVITIES

- Demonstrate the use of concatenation and data validation
- Demonstrate the use of conditional formatting using various data set

SUGGESTED EVALUATION METHODS

- Demonstration of programs using sorting and filtering
- Demonstration on cleaning data with text functions

UNIT III	TABLEAU	9

Introduction to visualization and tableau- working with single and multiple data sources-simplifying and sorting data-measure names and measure values-table calculation-customizing data-statistics- chart forms-Dashboard

SUGGESTED ACTIVITIES

- Comparison study on the various types of data preparation techniques
- Demonstrate various join operation using tableau

SUGGESTED EVALUATION METHODS

- Demonstration of aggregated data using tableau builder tool
- Demonstration of various pivoting operations
- Quiz on basics of Tableau prep builder user interfaces

UNIT IV	R STUDIO	9

Introduction to R studio- creating variables and assigning data- using vectors and factors – using lists-using data classes-Looping statements- decision support statements-if/else- using function

SUGGESTED ACTIVITIES

- Discussion and comparison of various business intelligence tools with R studio
- Demonstrate various programs for looping statements

SUGGESTED EVALUATION METHODS

- Demonstration of vectors and factors using R studio
- Quizzes on how to use decision support statements

UNIT V	POWER BI	9

Power BI introduction- power BI Architecture-Compare with other BI tools-Data Modeling-Dash board options-Visualization-Excel Integration-DAX basics in power BI-sharing power BI dash boards-Administration Role

SUGGESTED ACTIVITIES

- Assignment on Power BI architecture
- Comparisons of power BI with other BI tools
- Demonstrate how to create Dash boards

SUGGESTED EVALUATION METHODS

- Demonstration of programs for creating dash board
- Demonstration of various visualization option in power BI

	Total Periods	**45**
S.NO	**LIST OF EXPERIMENTS**	**CO**
1	Web scraping using MS Excel from job portals	**CO1,CO2**
2	Data scrubbing using MS Excel for Data. World datasets	**CO1,CO2**
3	Exploratory data analysis using Tableau for US Census data	**CO3**
4	Exploratory data analysis using data studio for latest Netflix data	**CO4**
5	Amazon product reviews using power BI	**CO5**
6	Twitter sentimental analysis	**CO5**
	Total Periods	**45 Theory+30 lab**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (20 Marks)**	**End Semester Exams (50 Marks)**
1. DESCRIPTIVE QUESTIONS	1. LAB EXPERIMENTS 2. MODEL EXAMINATION	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Introduce the concept and components of business intelligence tools(Understand)
CO2 Applying data analytics using Ms-Excel(Apply)
CO3 Define how BI tools will help to analyse and organize data using tableau(Apply)
CO4 Link business intelligence with data analytics using data studio (Apply)
CO5 applying the visualization concept using power BI (Apply)

Text Books

1. Wilfred Grossmann , Stefanie Rinderle-Ma, "Fundamentals of business intelligence", springer 2015
2. Kenneth N. Berk ,Patrick Carey ,"Data analysis with Microsoft excel", Brooks/COLE cencage learning, 2007
3. Seema Acharya, subhashini chellapan, "Pro tableau"- step by step guide A press, 2017
4. Eric pimple, "Data visualization and exploration with R" A practical guide to R, R studio, for data visualization, exploration and data science application, Geo spatial service, 2017
5. 'Rob collie' & 'Avi singh', "power pivot and power BI"- The Excel user's guide to DAX, power query, power BI and power pivot in Excel 2010-2016. : Holy Macro! Books, PO Box 541731 Merritt Island FL 32954 USA 2016

Reference Books

1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2011
2. "Business Intelligence – Grundlagen und praktische Anwendungen: Eine Einführung in die IT" by Hans-Georg Kemper and Henning Bars.

Web Resources

- https://www.google.com/search?q=tableau+tutorial+point+pdf+free+download
- https://www.tutorialspoint.com/msexcel/index.htm
- https://www.tutorialspoint.com/powerbi/index.htm
- .https://www.tutorialspoint.com/googledatastudio/index.htm

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		
5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. How business intelligence BI systems are used for reporting and data analytics?(understand)
2. What are the five stages of BI?(Remember)

Course Outcome 2 (CO2):

1. Data on soft drink sales shown in Table have been saved in a text fi le. The file has five variables and ten cases. The first variable is the name of the soft drink brand; the next three variables are company sales in millions of 192-ounce cases for the years 2000, 2001, and 2002. (Source: http://www.bevnet.com/ news/2002/03-01-2002-softdrink.asp,

Beverage Marketing Corporation.) The final column indicates the year of origin for each brand

Brand	Cases2000	Cases2001	Cases2002	Origin
Coca-Cola	3198.0	3189.6	3288.9	1886
Pepsi	2188.0	2163.9	2156.4	1898
Mountain Dew	810.3	853.7	862.7	1946
Dr Pepper	747.4	740.0	737.4	1885
Sprite	713.9	703.3	687.9	1961
Gatorade	355.8	375.0	422.8	1965
7 Up	276.0	261.6	243.4	1929
Tropicana	301.2	307.7	292.9	1954
Minute Maid	218.0	226.5	285.3	1946
Aquafina	105.0	151.4	203.0	1994

i. Create range names for each of the five data columns in the workbook.
ii. Create two new columns displaying the change in sales from 2000 to 2002 and the ratio of the 2000 sales to the 2002 sales. Assign range names to these two new columns. Sort the list in descending order of the difference in sales (analyze)

2. A data distribution has a median value of 22, a first-quartile value of 20, and a third-quartile value of 30. Five observations lie outside the interval from the first to the third quartile, with values of 17, 18, 40, 50, and 75. a. Draw the boxplot for this distribution. b. Is the skewness positive, negative, or zero? Excel (apply)

Course Outcome 3 (CO3):

1. For any health care, do extraction , transformation and finally visualizing the output using Tableau.(apply)
2. Perform market basket analysis to determine the product that together garnered the maximum sales of a company data (apply)

Sub-Category

Sub-Categor..	Accesso..	Applianc..	Art	Binders	Bookcas..	Chairs	Copiers	Envelop..	Fasteners	Furnishi..	Labels	Machines	Paper	Phones	Storage
Accessories		514	944	1,767	249	703	57	316	270	1,106	411	128	1,587	1,014	955
Appliances	514		569	1,068	130	403	36	181	165	624	210	84	937	620	572
Art	944	569		1,760	258	736	79	282	270	1,083	434	134	1,558	1,013	973
Binders	1,767	1,068	1,760		473	1,383	152	625	508	2,073	754	282	3,049	1,918	1,842
Bookcases	249	130	258	473		207	26	89	68	293	106	30	428	300	270
Chairs	703	403	736	1,383	207		64	242	211	896	315	120	1,226	809	760
Copiers	57	36	79	152	26	64		29	19	93	39	15	146	104	81
Envelopes	316	181	282	625	89	242	29		78	389	137	41	568	325	346
Fasteners	270	165	270	508	68	211	19	78		324	125	51	454	315	290
Furnishings	1,106	624	1,083	2,073	293	896	93	389	324		532	176	1,908	1,328	1,230
Labels	411	210	434	754	106	315	39	137	125	532		66	734	470	456
Machines	128	84	134	282	30	120	15	41	51	176	66		255	159	159
Paper	1,587	937	1,558	3,049	428	1,226	146	568	454	1,908	734	255		1,771	1,695
Phones	1,014	620	1,013	1,918	300	809	104	325	315	1,328	470	159	1,771		1,105
Storage	955	572	973	1,842	270	760	81	346	290	1,230	456	159	1,695	1,105	
Supplies	262	151	248	441	69	189	16	77	74	245	81	39	368	232	214
Tables	374	204	349	722	87	282	26	129	106	419	169	49	613	410	409

Course Outcome 4 (CO4):

1. Generate a visualizing report by performing the following operations Creating a scatterplot Adding a regression line to a scatterplot ,Plotting categories , Labelling the graph , Legend layouts, Creating a facet, Theming , Creating bar charts , Creating violin plots , Creating density plots for the following data using R

1	Country Name	Country Code	2010	2011	2012	2013	2014	2015	2016	2017
2	Aruba	ABW	101669	102053	102577	103187	103795	104341	104822	105264
3	Afghanistan	AFG	28803167	29708599	30696958	31731688	32758020	33736494	34656032	35530081
4	Angola	AGO	23369131	24218565	25096150	25998340	26920466	27859305	28813463	29784193
5	Albania	ALB	2913021	2905195	2900401	2895092	2889104	2880703	2876101	2873457
6	Andorra	AND	84449	83751	82431	80788	79223	78014	77281	76965
7	Arab World	ARB	356508908	364895878	373306993	381702086	390043028	398304960	406452690	414491886
8	United Arab Emirates	ARE	8270684	8672475	8900453	9006263	9070867	9154302	9269612	9400145
9	Argentina	ARG	41223889	41656879	42096739	42539925	42981515	43417765	43847430	44271041
10	Armenia	ARM	2877311	2875581	2881922	2893509	2906220	2916950	2924816	2930450

2. How do connect R studio with Google ads?(understand)

Course Outcome 5 (CO5):

1. Create a stacked column chart using power BI (apply)
2. Create a calendar heat map using power BI

21AI6S01	BIG DATA ANALYTICS FOR BUSINESS	L	T	P	C
		3	0	0	3

Preamble

This course focuses on big data technologies used for analysis and manipulation of data using for business. The student will learn about fundamentals of Predictive analytics and have hand on training on the same It also help to develop projects and apply existing data analytics tools to gain comprehensive knowledge on Data analytics on business. This will enable the students to develop modular applications related to the field of engineering.

Prerequisites for the course

- MS Excel
- Probability and statistics

Objectives

1. To know the fundamentals of business analytics and big data.
2. To explore big data analytics pattern
3. To perform batch analysis for various applications
4. To know the fundamentals of data bases and framework for business
5. To provide an overview about text and multimedia analytics

UNIT I	INTRODUCTION TO SMARTER WORLD	9

Smarter business- who is using big data- how companies are using big data-focus to reap the rewards- the smart strategy board- the pear tree metaphor-smart analytics and Google- measure and metrics of data- types of data- the new forms of data- anatomy of big data

SUGGESTED ACTIVITIES

- Discussion on smarter world
- Comparison of various big data approaches used for business

SUGGESTED EVALUATION METHODS

• Quizzes on big data approaches • Assignment on various case studies of big data used for business		
UNIT II	**BIG DATA ANALYTICS PATTERN**	**9**
Characteristics of big data –Domain specific example of big data-analytics flow for big data-Big data stack-mapping analytics flow to big data stack- case study: weather data analysis- analytics patterns		
SUGGESTED ACTIVITIES		
• Demonstrate the analytics flow of big data • Discussion about how to map analytics flow to big data stack		
SUGGESTED EVALUATION METHODS		
• Demonstration of weather data analysis • Quiz on analytics pattern		
UNIT III	**BATCH ANALYSIS**	**9**
Hadoop and map reduce- map reduce programming model- Hadoop YARN -Hadoop Schedulers- Hadoop map reduce example- Batch analysis for sensor data- Batch analysis for N-Gram data set- Find top N words with map reduce-PIG- loading data- data types in pig- data filtering and analysis- storing results- debugging operators- pig examples- case study: batch analysis of new articles		
SUGGESTED ACTIVITIES		
• Implementation of Hadoop and map reduce for N-Gram data set • Demonstrate data filtering and analysis using pig		
SUGGESTED EVALUATION METHODS		
• Demonstration of program for processing a large data set using pig • Demonstration of batch analysis for stock data.		
UNIT IV	**SERVING DATA BASES AND WEB FRAMEWORK FOR BUSINESS**	**9**
Relational databases- MySQL- Non relational databases- Cassandra- Mango DB- python web application frame work Django architecture- starting development with Django- Case study: Django application for viewing customer churn analysis		
SUGGESTED ACTIVITIES		
• Discussion about relational and non-relational data base • Demonstrate various programs using Mango DB		
SUGGESTED EVALUATION METHODS		
• Demonstration of Django application for weather data set • Demonstration of Django application for social network analysis		
UNIT V	**ADVANCED ANALYTICS FOR BUSINESS**	**9**
Text categorization- Text clustering- concept extraction- Sentimental analysis-E-Governance- document summarization-customer feedback analysis- speech and video analytics- face recognition- visual analytics- combined analytics		
SUGGESTED ACTIVITIES		
• Demonstrate program for sentimental analysis • Assignment on various text categorization methods		
SUGGESTED EVALUATION METHODS		
• Demonstration of programs for face recognition • Demonstration of programs for speech analytics		
	Total Periods	**45**
Suggestive Assessment Methods		

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: To acquire the Basics terms and concepts of smarter business in big data
CO2: To attain a pattern for big data analytics
CO3: Able to perform batch analysis using Hadoop and map reduce
CO4: Implementation of data bases and frameworks for business applications
CO5: To know the basic knowledge about various text and multimedia analytics approaches

Text Books

1. Bernard Marr, "Big data using smart big data- analytics and metrics to make better decision and improve performance", Willey, First edition, 2015
2. Majid Nabavi, David L.Olson, Introduction to Business Analytics, Business Expert Press, 2018
3. Umesh R Hodeghatta and Umesha Nayak, Business Analytics Using python - A Practical ApproachApress, 2017.

Reference Books

1. Jeffery D.Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, Essentials of Business Analytics, Cengage Learning, 2015
2. Sandhya Kuruganti, Business Analytics: Applications To Consumer Marketing, McGraw Hill, 2015

Web Resources

- https://www.liverpool.ac.uk/study/postgraduate-taught/taught/business-analytics-and-big-data-msc/overview/
- https://www.selecthub.com/big-data-analytics/big-data-business-analytics/
- https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2			2							1		
2	3	2	2			2							1		
3	3	2	2			2							2		
4	3	2	2			2							2		
5	3	2	2			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

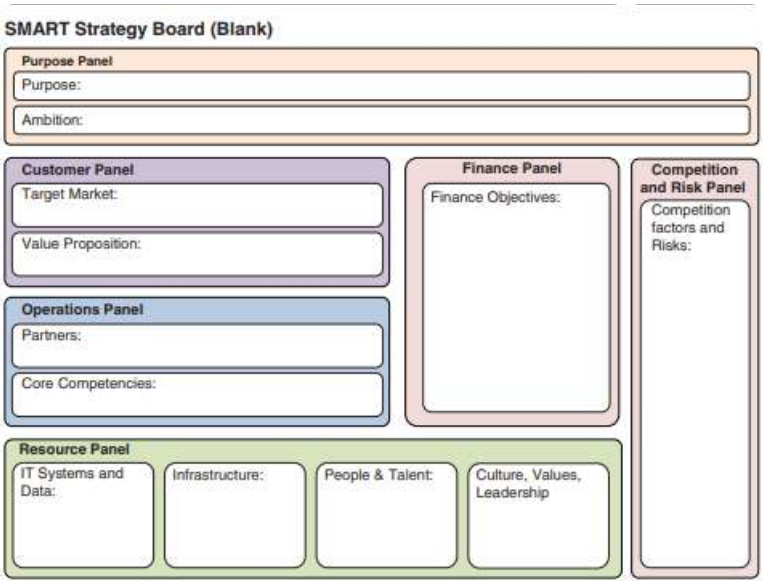
BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Fill up the smart strategy board for your own business ideas (apply)



2. Assume any three types of dataset and complete filling the details to answer the smart question for business plans (apply)

	Data set 1	Data set 2	Data set 3
• Name of data set			
• Describe type of data			
• Location & Ownership: internal/external			
• Format: Structured/Unstructured			
• What is that data collection method?			
• Where is the data stored or located?			
• Describe Data Volumes			
• Describe Data Velocity/Frequency/ Recency			
• Describe Data Veracity/Quality			
• How will the data be analysed?			
• Costs associated with capturing, storing and analysing the data			

COURSE OUTCOME 2:

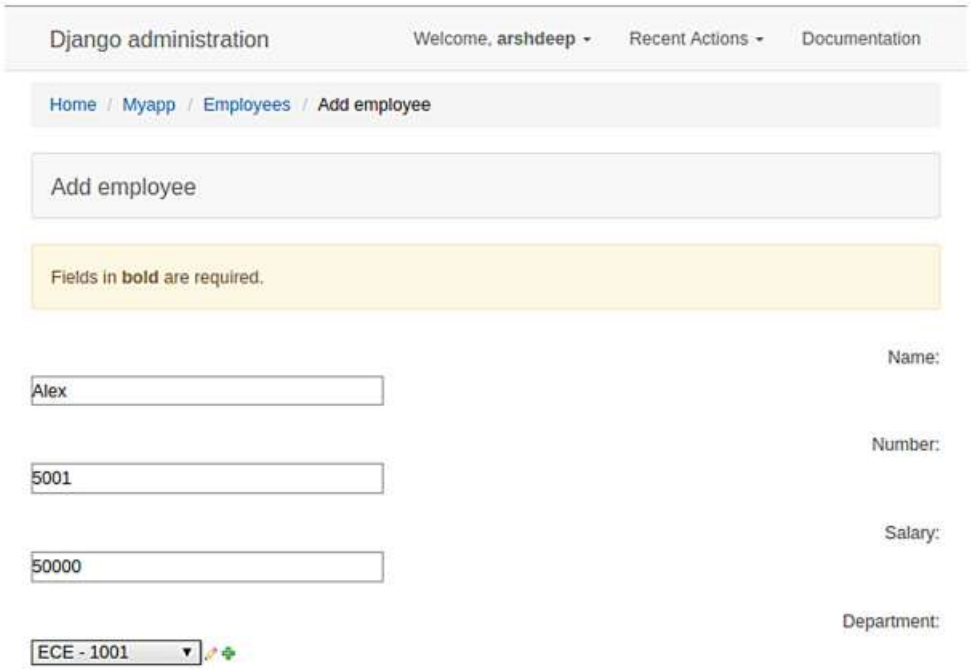
1. Elaborate the big data analytics flow for real time fleet tracking in logistics and transportation domain (analyze)
2. Build a regression model for predicting drug response using big data stack and data analytics flow (apply)

COURSE OUTCOME 3:

1. Perform batch analysis for sensor data using Hadoop and map reduce (apply)
2. Perform batch analysis for news articles using pig (apply)

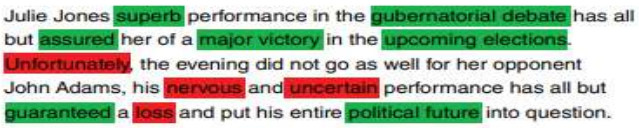
COURSE OUTCOME 4:

1. Demonstrate a Django application for book recommendation system
2. Create the Django template for employee web page like the example below



COURSE OUTCOME 5:

1. In the below example, positive and negative sentiment are associated with words. Perform text summarization and elaborate how to classify the polarity of the text.



2. Perform the steps in text analytics for new articles recommendation (apply)

21AI7S01	ARTIFICIAL INTELLIGENCE FOR BUSINESS	L	T	P	C
		3	0	0	3
Preamble					

This course aims to provide the students with a foundation of upcoming technology using their business. The focus is to develop the skills in students, and to improve their proficiency in applying the knowledge of artificial intelligence to solve business analytics problems. This will enable the students to develop modular applications related to the field of engineering.

Prerequisites for the course

- ARTIFICIAL INTELLIGENCE

Objectives

1. To learn the business innovation with AI.
2. To develop critical thinking in business process modelling.
3. To analyse a business use case using AI.
4. To learn recommendation techniques are used in business.
5. To learn embedding AI in to business processes.

UNIT I	INTRODUCTION TO BUSSINESS INNOVATION	9

Introduction to business innovation with AI-Benefits of AI- Ethics and Privacy issues-AI and predictive analytics- Application areas-Clustering or Segmentations-Psychographic Personas-Business process modelling-Change management processes-Business process agility-Data analytics business agility-Decentralized decision making-Finer granularity in business response

SUGGESTED ACTIVITIES

- Discussion on Artificial intelligence for business
- Demonstrate how artificial intelligence works for business

SUGGESTED EVALUATION METHODS

- Demonstrate real time artificial intelligence business applications

UNIT II	INTELLIGENT BUSINESS PROCESS	9

Business analysis and requirements modelling-Critical thinking in BPM -Strategizing for business optimization-Digital business strategy for AI –Business agility in decision making-Leadership in business optimization-Business Optimization initiatives-Developing a business case for AI-imposed disruptions to business-Business disruption prediction framework

SUGGESTED ACTIVITIES

- Discussion on Business process
- Group -Discussion on business response

SUGGESTED EVALUATION METHODS

- Demonstration of data analytics using business agility
- Demonstration of Covid -19 pandemic and digital business

UNIT III	DIGITAL BUSINESS PROCESSES	9

Collaborative digital business- Complexities of collaborative digital business-visualization and business processes-Leadership and culture change in Business- HR management- Training business people- Business compliance and quality-Cyber security in BO- Cyber security as a business decisions-Cyber security analysis using business analysis

SUGGESTED ACTIVITIES

- Discussion on digital business
- Comparison study on the business optimization and digital business
- Discussion on cyber security analysis

SUGGESTED EVALUATION METHODS		
• Demonstration of digital business framework • Demonstration of business agility of decision making		
UNIT IV	**RECOMMENDATION ENGINES**	**9**
Recommendation techniques: Content based recommendations, collaborative recommendations-Applications of recommendation Engines in Business-Collection of data –storing the data-Analysing the data-Business use case- Embedding AI in to Business processes- Artificial intelligence for growth-AI for Customer service-Applying AI for Marketing		
SUGGESTED ACTIVITIES		
• Discussion on collection of data, storing and analysing the data • Solve problems by using business case of recommendation engines		
SUGGESTED EVALUATION METHODS		
• Demonstration of collaborative and content based recommendations		
UNIT V	**AI IN BUSINESS**	**9**
Embedding analytics in business process – Preparing the data- data analytics types and relevance in BO-Descriptive analysis- Predictive analysis-Collaborative digital business process- Complexities of collaborative digital business - Applications for NLP in business: Customer service, Reputation monitoring, Market Intelligence-Sentiment technology in business		
SUGGESTED ACTIVITIES		
• Assignment on AI in business for marketing • Discussion on Marketing intelligence		
SUGGESTED EVALUATION METHODS		
• Demonstration of applications for NLP in business • Demonstration of sentiment technology in business		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING QUESTIONS

Course Outcomes

Upon completion of the course, the students will be able to:

CO1 Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. (Apply)
CO2 Apply structured thinking to unstructured problems (Apply)
CO3 Implement data analytics for business optimization. (Analyse)
CO4 Implement recommendation systems for business optimization(Apply)
CO5 Apply NLP in business (Apply)

Text Books

1. Artificial intelligence for business , Rajendar Akerkar ,2019
2. Artificial intelligence and Machine learning for business ,Steven Finlay,2018
3. Artificial intelligence for business Optimization ,Bhuvan unhelkar,2021

Reference Books
1. Artificial intelligence business: Commercial uses of Artificial intelligence Patrick henry Winston, Karen.A.Predergast,2019
Web Resources 1. https://www.coursera.org/lecture/wharton-ai-fundamentals-non-data-scientists/ai-for-business-introduction-nOPzM 2. https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML 3. https://www.coursera.org/lecture/deep-learning-business/1-0-introduction-to-deep-learning-for-business-gPIRl 4. https://emerj.com/ai-sector-overviews/use-cases-recommendation-systems/ 5. https://www.youtube.com/watch?v=N_eHmaRf9T4

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3			2							1		
2	3	3	3			2							1		
3	3	3	3			2							2		
4	3	3	3			2							2		
5	3	3	3			2							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): (Apply)

1. Why do we need Artificial Intelligence?

2.Give some real-world applications of AI using business.

Course Outcome 2 (CO2): (Apply)

1. How is KNN different from k-means clustering?
2. How would you handle an imbalanced dataset?

Course Outcome 3 (CO3): (Apply)

1. How do you ensure you're not overfitting with a model?
2. What evaluation approaches would you work to gauge the effectiveness of a machine learning model?
3. Given two strings, A and B, of the same length n, find whether it is possible to cut both strings at a common point such that the first part of A and the second part of B form a palindrome.

Course Outcome 4 (CO4): (Apply)

1. Does the data model use predictive analytics and machine learning to produce the recommendations?
2. Does the Recommendation Engine work in real-time?
3. A data set is given to you and it has missing values which spread along 1 standard deviation from the mean. How much of the data would remain untouched?

Course Outcome 5 (CO5): (Apply)

1. What is the problem you plan to solve with AI?
2. What is overfitting? How can it be overcome in Machine Learning?

List of value added courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Value Added Courses								
1	21AI4V01	Data Exploration and Visualization		2	0	0	2	1
2	21AI6V01	NLP Application using Python		2	0	0	2	1

21AI4V01	DATA EXPLORATION AND VISUALIZATION	L	T	P	C
		0	0	2	1

Preamble

The principle so statisticaldataexplorationandvisualizationarecoveredinthiscourse.Tothoroughlyand statically analyze the data, fit models and create specialized graphs. By the end of course theStudentswillbeabletocollect,harvestdatafromvarietyofsources,fusethem,Cleanthedata,analyze it,makeinsightfulchartsandplots,makerecommendationsandgeneratereports.

Prerequisites for the course

- 21AI3603-DataStructures
- 21MA3205-Probability&Statistics

Objectives

- To learn and develop skills to both design and critique Data Exploration
- To learn and Perform the data Exploration and Analysis for categorical data
- To Acquire core skills for visual analysis
- Understand visual perception and core skills for visual analysis

S.NO	LIST OF EXPERIMENTS	CO
1	Study Of Explore WEKA Data Exploration /Machine Learning Toolkit	CO1
2	Download the open source software of your interest. Document the distinct Features and functionality of the software platform. You may choose WEKA or R or java.	**CO1**
3	Design, Implement SVM for classification with proper data set of your choice. Comment on Design and Implementation for Linearly nonSeparable Dataset.	**CO2**
4	Implement Naïve Bayes Classifier and K-Nearest Neighbor Classifier on Data set of your choice. Test and Compare for Accuracy and Precision.	**CO2**
5	Implement K-Means Clustering and Hierarchical clustering on proper data set of your choice. Compare their Convergence.	**CO3**
6	Generate a proper 2-D data set of N points. Split the data set into Training Data set and TestData set. i) Perform linear regression analysis with Least Squares Method.	**CO3**

	ii) Plot the graphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error	
7	Implement the Weka visualization with proper data set of your choice.	**CO4**
8	Implement CustomSql Queries using Weka Visual toolvisualization with proper data set of your choice.	**CO4**
9	Credit Risk Assessment – The German Credit Data	**CO5**
10	Implement Apriori algorithmwith proper data set of your choice.Test and Compare for confidence level.	**CO5**
	Total Periods	**30 hours**

Suggestive Assessment Methods

Lab Components Assessments
(100 Marks)

- LabExperiment(40)
- ModelExam & Project(60)

Course Outcomes

Upon completion of the course, the students will be able to:

CourseOutcome1(CO):

- Developskillsto learn weka environment and carry out the Data Exploration(**APPLY)**

CourseOutcome2(CO2):

- Implement the Clustering techniques and predictive modeling approach (**APPLY)**

CourseOutcome3(CO3):

- Implement the classifiers for real world use cases(**APPLY)**

CourseOutcome4(CO4):

- Apply thevisualizationfordeviationanalysis. (**APPLY)**

CourseOutcome5(CO5)

- Apply the advanced analytical methods and perform exploration(**APPLY)**

Text Books

1. ColeNussbaumerKnaflic,Storytellingwithdata, Wiley,FirstEdition,2015
2. BenFry,"Visualizingdata:Exploringandexplainingdatawiththeprocessingenvironment",O'Reilly,FirstEdition,2008.

3. EdwardR.Tufte,"Thevisualdisplayofquantitativeinformation",SecondEdition,GraphicsPress, FirstEdition,2001.

Web Resources

1.https://neptune.ai/blog/data-exploration-and-visualization-best-tools
2.https://towardsdatascience.com/8-best-data-visualization

tools-3.that-every-data-scientist-should-know

2287c9c45cc4

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3		1	2							3	3	3
2	3	3	3										3	3	3
3	3	3	3	2									3	3	3
4	3	3	3	2									3	3	3
5	3		3										3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam
REMEMBER	
UNDERSTAND	
APPLY	100
ANALYZE	
EVALUATE	
CREATE	

COURSE LEVEL ASSESSMENT QUESTIONS

CourseOutcome1 (CO1):

1. Write the Various Weka Platform tools?(Apply)

CourseOutcome2(CO2):

1. Performthe dataanalysisand Clustering for the sampledataset(Analyze)

CourseOutcome3(CO3):

1. Perform data preprocessing tasks and find the Accuracy and Precision..(Apply)

CourseOutcome4(CO4):

1. Visualizedatausinganyplottingframeworkforsampledataset.(Analyze)

CourseOutcome5(CO5):

1. ImplementtheApriori algorithm and find confidence level .(Apply)

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
1.	Study Of Explore WEKA Data Exploration /Machine Learning Toolkit	3
2.	Download the open source software of your interest. Document the distinct Features and functionality of the software platform. You may choose WEKA or R or java..	3
3.	Design, Implement SVM for classification with proper data set of your choice. Comment on Design and Implementation for Linearly nonSeparable Dataset.	3
4.	Implement Naïve Bayes Classifier and K-Nearest Neighbor Classifier on Data set of your choice. Test and Compare for Accuracy and Precision.	3
5.	Implement K-Means Clustering and Hierarchical clustering on proper data set of your choice. Compare their Convergence	3
6	Generate a proper 2-D data set of N points. Split the data set into Training Data set and TestData set. i) Perform linear regression analysis with Least Squares Method. ii) Plot the graphs for Training MSE and Test MSE and commenton Curve Fitting and Generalization Error	3
7	Implement the Weka visualization with proper data set of your choice.	3

8.	Implement CustomSql Queries using Weka Visual tool visualization with proper data set of your choice.	3
9.	Credit Risk Assessment – The German Credit Data	3
10.	Implement Apriori algorithm with proper data set of your choice. Test and Compare for confidence level.	3

21AI6V01	NLP APPLICATION USING PYHON	L	T	P	C
		0	0	2	1

Preamble

Natural-language processing (NLP) is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to fruitfully process large amounts of natural language data (Wikipedia). This rapidly improving area of artificial intelligence covers tasks such as speech recognition, natural-language understanding, and natural language generation.

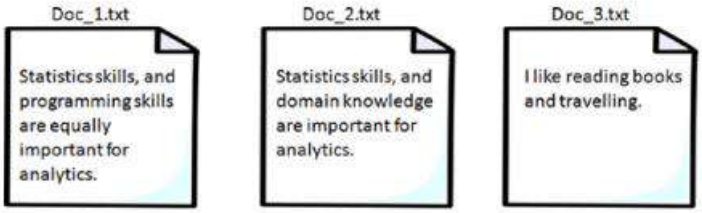
Prerequisites for the course

- Introduction to computing using python
- Data science essentials

Objectives

- To learn the fundamentals of data extraction
- To apply various data preprocessing methods for text processing
- To learn the techniques for converting the text into features
- To apply the advanced NLP techniques for text analysis
- To implement industrial applications for text processing

S.NO	LIST OF EXPERIMENTS	CO
1	**Extracting the data:** Text data collection using API's, Reading PDF file, reading word document, reading JSON object, Reading HTML page and html parsing, string handling and web scraping	**CO1**
2	Perform text extraction for the Global social media research summary by smart insights using their API's	**CO1**
3	**Data preprocessing:** Lower casing, punctuation removal, stop words removal, Text standardization, spelling correction, Tokenization, stemming, lemmatization, exploratory data analysis.	**CO2**
4	This is introduction to NLP','It is likely to be useful, to people ','Machine learning is the new electricity', 'There would be less hype around AI and more action going forward','python is the best tool!','R is good langauage','I like this book','I want more books like this'	**CO2**

	For the above text statement, perform the following preprocessing operations: **Remove stop words, remove punctuation, convert it into lowercase, standardize the text, spelling correction & tokenization**	
5	**Converting text to features:** one Hot encoding, count vectorizer, N-grams, co-occurrence matrices, Hash vectorizer, Term frequency- Inverse document frequency (TF-IDF), word embedding, implementing fast text	**CO3**
6	For the below three documents, convert text into features 	**CO3**
7	**Advanced NLP:** Noun phrase extraction, Text similarity, parts of speech tagging, information extraction, NER-entity recognition, topic modelling, text classification, sentimental analysis, word sense disambiguation, speech recognition- speech to text, text to speech, language detection and translation	**CO4**
8	Perform customer sentiment analysis and prediction for a product or brand or service.	**CO4**
9	**Implementing industrial application:** consumer complaint classification, customer reviews sentiment prediction, data stitching using record linkage, text summarization for subject notes, document clustering, search engine and learning to rank	**CO5**
10	Perform text classification on 20 news groups dataset	**CO5**
	Total Periods	**30 hours**

Suggestive Assessment Methods

Lab Components Assessments
(100 Marks)

- LabExperiment(40)
- ModelExam & Project(60)

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: To Extract the text data from various sources.
CO2: To apply various pre-processing techniques for text analysis
CO3: To tag a given text with basic Language features
CO4: To design a tag set to be used for statistical processing for real-time applications
CO5: To apply NLP techniques for different types of Industrial applications.

Text Books

1. Akshay kulkarani, Adharsha sivanandha, "Natural language processing-recipes", unlocking text data with machine learning and deep learning using python, APress, 2019

2. Manohar Swaminathan," Mastering machine learning with python in six steps: A practical implementation guide to predictive data analytics using python, APress,2017

Web Resources

- https://towardsai.net/p/nlp/natural-language-processing-nlp-with-python-tutorial-for-beginners-1f54e610a1a0
- https://likegeeks.com/nlp-tutorial-using-python-nltk/
- https://www.justintodata.com/use-nlp-in-python-practical-step-by-step-example/
- https://towardsdatascience.com/7-nlp-techniques-you-can-easily-implement-with-python-dc0ade1a53c2?gi=f34deee9ab72

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3		1	2							3	3	3
2	3	3	3										3	3	3
3	3	3	3	2									3	3	3
4	3	3	3	2									3	3	3
5	3		3										3	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam
REMEMBER	
UNDERSTAND	
APPLY	100
ANALYZE	
EVALUATE	
CREATE	

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Extract the content/data from Census data (e.g., http://www.census.gov/data.html) (apply)
2. Create your own app in the Twitter developer portal, and get the keys mentioned below.

Once you have these credentials, you can start extracting data.

Keys needed:

• **consumer key:** Key associated with the application (Twitter, Facebook, etc.).

• **consumer secret:** Password used to authenticate with the authentication server (Twitter, Facebook, etc.)
• **access token:** Key given to the client after successful authentication of above keys.
• **access token secret:** Password for the access key (apply)

COURSE OUTCOME 2:

1. perform stemming for the following sentences: 'I like fishing','I eat fish','There are many fishes in pound'(apply)

2.perform lemmatization for the following sentences: 'I like fishing','I eat fish','There are many fishes in pound', 'leaves and leaf'

COURSE OUTCOME 3:

1. convert text to feature using One Hot encoding for the following sentence: "I am learning NLP" (apply)

2. convert text to feature using One count vectorizing for the following sentence: "I love NLP and I will learn NLP in 2month"] (apply)

COURSE OUTCOME 4:

1**.**you want to analyze the "who" in a sentence. ("John is learning natural language processing") using python (apply)

2. for a customer analysis, Apply text similarity for the following problem:

We will have multiple tables in the database, and sometimes there won't be a common "ID" or "KEY" to join them – scenarios like the following:

• Customer information scattered across multiple tables and systems.
• No global key to link them all together.
• A lot of variations in names and addresses (apply)

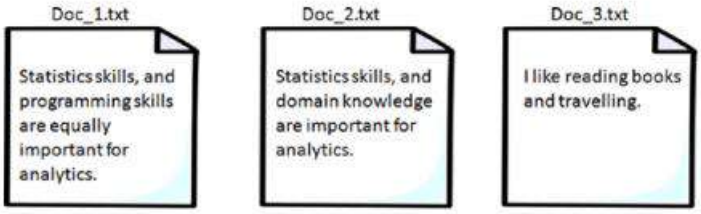
COURSE OUTCOME 5:

1.Each week the Consumer Financial Protection Bureau sends thousands of consumers' complaints about financial products and services to companies for a response. Classify those consumer complaints into the product category it belongs to using the description of the complaint. (apply)

2. Text summarization of article/document using different algorithms in Python (apply)

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
1.	**Extracting the data:** Text data collection using API's, Reading PDF file, reading word document, reading JSON object, Reading HTML page and html parsing, string handling and web scraping	3
2.	Perform text extraction for the Global social media research summary by smart insights using their API's	3

3.	**Data preprocessing:** Lower casing, punctuation removal, stop words removal, Text standardization, spelling correction, Tokenization, stemming, lemmatization, exploratory data analysis.	3
4.	This is introduction to NLP','It is likely to be useful, to people ','Machine learning is the new electricity', 'There would be less hype around AI and more action going forward','python is the best tool!','R is good langauage','I like this book','I want more books like this' For the above text statement, perform the following preprocessing operations: **Remove stop words, remove punctuation, convert it into lowercase, standardize the text, spelling correction & tokenization**	3
5.	**Converting text to features:** one Hot encoding, count vectorizer, N-grams, co-occurrence matrices, Hash vectorizer, Term frequency- Inverse document frequency (TF-IDF), word embedding, implementing fast text	3
6	For the below three documents, convert text into features 	3
7	**Advanced NLP:** Noun phrase extraction, Text similarity, parts of speech tagging, information extraction, NER-entity recognition, topic modelling, text classification, sentimental analysis, word sense disambiguation, speech recognition-speech to text, text to speech, language detection and translation	4
8.	Perform customer sentiment analysis and prediction for a product or brand or service.	2
9.	**Implementing industrial application:** consumer complaint classification, customer reviews sentiment prediction, data stitching using record linkage, text summarization for subject notes, document clustering, search engine and learning to rank	4
10.	Perform text classification on 20 news groups dataset	2

LIST OF NPTEL COURSES

S.No	Course Id	Course Name	Duration	Start date	End date	Exam date	Enrollment End date	Replacement Suggested	UG/ PG	Applicable NPTEL Domain
1.	noc24-cs29	Getting Started With Competitive Programming	12 Weeks	Jan 22, 2024	Apr12, 2024	Apr 21, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs29/preview
2.	noc24-cs01	Foundations of Cryptography	12 Weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs01/preview
3.	noc24-cs04	Privacy and Security in Online Social Media	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 28, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs04/preview
4.	noc24-cs05	Basics of Computational Complexity	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 21, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs05/preview
5.	noc24-cs07	Secure Computation: Part I	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs07/preview
6.	noc24-cs12	Affective Computing	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs12/preview
7.	noc24-cs18	Compiler Design	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 27, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs18/preview

8.	noc24-cs25	Embedded Systems Design	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs25/preview
9.	noc24-cs30	GPU Architectures And Programming	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 27, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs30/preview
10.	noc24-cs32	Introduction to Automata, Languages and Computation	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs32/preview
11.	noc24-cs33	Introduction to Embedded System Design	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs33/preview
12.	noc24-cs34	Introduction To Industry 4.0 And Industrial Internet Of Things	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 21, 2024	Jan 29, 2024	Open Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs34/preview
13.	noc24-cs44	Programming in Modern C++	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 28, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs44/preview
14.	noc24-cs46	Selected Topics in Algorithms	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 20, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs46/preview
15.	noc24-cs52	Reinforcement Learning	12 weeks	Jan 22, 2024	Apr12, 2024	Apr 21, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs52/preview

16.	noc24-cs56	Social Networks	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 28, 2024	Jan 29, 2024	Professional Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs56/preview
17.	noc24-cs61	Digital Design with Verilog	12 weeks	Jan 22, 2024	Apr 12, 2024	Apr 21, 2024	Jan 29, 2024	Open Elective	UG	https://onlinecourses.nptel.ac.in/noc24_cs61/preview