

Francis Xavier Engineering College

(An Autonomous Institution)

Tirunelveli - 627 003

Tamil Nadu India

Department of Computer Science and Engineering

Curriculum and Syllabi – R 2021-UG CHOICE BASED CREDIT SYSTEM AND OBE

Vision of the Department

To become a center of excellence in Computer Science and Engineering and Research to create global leaders with holistic growth and ethical values for the industry and academics.

Mission of the Department

- To produce technocrats in the industry and academia by educating computer concepts and techniques.
- To facilitate the students to trigger more creativity and leadership skills by applying modern tools and technologies in the field of computer science and engineering
- To inculcate the spirit of ethical values contributing to the welfare of the society

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Programme Educational Objectives (PEOs)

- PEO 1 Core Competence:** Proficient Technocrats, competent to meet the challenges of the industry and the society by applying knowledge in Computer Science and Engineering principles in an efficient manner.
- PEO 2 Professionalism:** Engineering professional engaged in higher education, research and/or career in technology development and deployment in the specializations related to Computer Science and Engineering
- PEO 3 Leadership and Entrepreneurship:** Talented professionals with technical and problem solving skills to function as global leaders of engineering teams, and with eloquent and effective communication skills to pursue business opportunities beyond the control of resources.
- PEO 4 Virtues:** Technocrats who function in their profession with ethics and values with Corporate Social Responsibility.

Programme Specific Outcomes (PSOs)

- PSO₁** Apply computer science knowledge and efficient programming to analyze conceptualized problems in Cloud computing, Big Data, Artificial Intelligence and Software Systems to provide novel solutions.
- PSO₂** Design cost effective hardware or software systems in Computer Networks, Computer Architecture and Cyber Security to apply certain techniques with emerging technologies to develop engineering products.
- PSO₃** Provide modern engineering solutions in Augmented Reality, Virtual Reality and Internet of Things technologies for the revolution in engineering society to create innovative ideas into real time products.

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, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** 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 and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** 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 or leader 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 member and 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

PEO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PS 01	PS 02	PSO 3
PEO1	3	3	3	3	3	3	2	2	1	1	2	2	3	3	2
PEO2	3	3	3	3	3	1	2	1	2	2	2	3	3	3	2
PEO3	3	3	3	3	3	3	3	3	3	3	3	2	1	1	2
PEO4	2	2	2	2	2	3	3	3	3	3	2	2			3

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PROGRAMME OUTCOMES (POs)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
PEO 1	3	3	3	3	3	3	2	2	1	1	2	2
PEO 2	3	3	3	3	3	1	2	1	2	2	2	3
PEO 3	3	3	3	3	3	3	3	3	3	3	3	2
PEO 4	2	2	2	2	2	3	3	3	3	3	2	2

1→Low 2→Medium 3→High

MAPPING OF PROGRAMME SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Outcomes and the Programme outcomes is given in the following Table

PROGRAMME SPECIFIC OBJECTIVES (PSO)	PROGRAMME OUTCOMES (POs)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
PSO 1	3	3	2	1	1	1	2		1	2		2
PSO 2	3	3	2		1	1				2		2
PSO 3	3	3	2	1	1	1			1	1		2

1→Low 2→Medium 3→High

FRANCIS XAVIER ENGINEERING COLLEGE
B.E. – COMPUTER SCIENCE AND ENGINEERING
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	7.78%
2	BS	12	4	4	4					24	14.37%
3	ES	5	15	3						23	13.77%
4	PC			16	14	13	8	8		59	35.32%
5	PE					3	6	9		18	10.77%
6	OE					6	3	3		12	7.18%
7	EEC			1	2	2	3		10	18	10.77%
Total		20	21	25	24	24	23	20	10	167	100%

Minimum No of Credits to be Acquired : 167

HSSM - Humanities and Social Sciences including Management

BS - Basic Science

ES - Engineering Sciences

PC - Professional Core

PE - Professional Elective

OE - Open Elective/Programme Specific Elective for Expandable Scope

EEC - Employability Enhancement Course

FRANCIS XAVIER ENGINEERING COLLEGE

B.E. – COMPUTER SCIENCE AND ENGINEERING REGULATIONS 2021

Choice Based Credit System and Outcome Based Education

I-VIII Semester 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	1	3
Practical Courses								
1	21PY1311	Physics and Chemistry Laboratory	BS	4	0	0	4	2
2	21CS1511	Programming Practice Laboratory using C	ES	4	0	0	4	2
Total				25	13	2	9	20

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 Applications 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
2	21CS2312	Computer Hardware and Software Tools Laboratory	ES	4	0	0	4	2
Mandatory Courses								
1	21GE2M01	Indian Constitution and Cultural Heritage**	MC	2	2	0	0	0
Total				29	16	1	12	21

SEMESTER III

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA3202	Probability and Queuing Theory	BS	4	3	1	0	4
2	21CS3601	Computer Architecture	PC	3	3	0	0	3
3	21CS3602	Data Structures	PC	3	3	0	0	3
4	21CS3603	Object Oriented Programming Systems	PC	3	3	0	0	3
5	21PT3902	Verbal Ability	EEC	1	0	0	2	1
6	21HS1103	Tamil Heritage	HSSM	1	1	0	0	1
Theory cum Practical Courses								
1	21CS3604	Software Engineering	PC	3	2	0	2	3
2	21CS3501	Digital Systems	ES	4	2	0	2	3
Practical Courses								
1	21CS3611	Data Structures Laboratory	PC	4	0	0	4	2
2	21CS3612	Object Oriented Programming Systems Laboratory	PC	4	0	0	4	2
Total				30	17	1	14	25

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	21CS4601	Database Management Systems	PC	3	3	0	0	3
4	21CS4602	Design and Analysis of Algorithms	PC	3	3	0	0	3
5	21CS4603	Microprocessors and Microcontrollers	PC	3	3	0	0	3
6	21GE2M02	Environmental and Sustainable Engineering	MC	2	2	0	0	0
7	21CS4901	Technical Seminar and Comprehensive Test - I	EEC	2	0	0	2	1
8	21PT3901	Soft skills –Aptitude I	EEC	1	1	0	0	1
9	21HS2103	Technology in Tamil Culture	HSSM	1	1	0	0	1
Theory cum Practical Courses								
1	21CS4604	Operating System Concepts	PC	4	2	0	2	3
Practical Courses								
1	21CS4611	Database Management Systems Laboratory	PC	4	0	0	4	2
Total				30	21	1	8	24

SEMESTER V

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS5601	Theory of Computation	PC	3	3	0	0	3
2	21CS5602	Computer Networks	PC	3	3	0	0	3
3	21CS5603	Internet Programming	PC	3	3	0	0	3
4		Professional Elective I	PE	3	3	0	0	3
5		Open Elective -I	OE	3	3	0	0	3
6		Open Elective -II	OE	3	3	0	0	3
7	21CS5901	Technical Seminar and Comprehensive Test - II	EEC	2	0	0	2	1
8	21PT3904	Reasoning	EEC	1	0	0	2	1
Practical Courses								
1	21CS5611	Computer Networks Laboratory	PC	4	0	0	4	2
2	21CS5612	Internet Programming Laboratory	PC	4	0	0	4	2
Total				29	18	0	12	24

SEMESTER VI

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS6101	Total Quality Management	HSSM	3	3	0	0	3
2	21CS6601	Compiler Design	PC	3	3	0	0	3
3		Professional Elective II	PE	3	3	0	0	3
4		Professional Elective III	PE	3	3	0	0	3
5		Open Elective -III	OE	3	3	0	0	3
6	21PT3903	Soft skills -Aptitude II	EEC	1	1	0	0	1
Theory cum Practical Courses								
1	21CS6602	Artificial Intelligence Practices	PC	4	2	0	2	3
Practical Courses								
1	21CS6611	Mobile Application Development Laboratory	PC	4	0	0	4	2
2	21CS6911	Project Work (Phase-I)	EEC	4	0	0	4	2
Total				28	18	0	10	23

SEMESTER VII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS7601	Cloud Computing	PC	3	3	0	0	3
2	21CS7602	Cryptography and Network Security	PC	3	3	0	0	3
3		Professional Elective IV	PE	3	3	0	0	3
4		Professional Elective V	PE	3	3	0	0	3
5		Professional Elective VI	PE	3	3	0	0	3
6		Open Elective -IV	OE	3	3	0	0	3
Practical Courses								
1	21CS7611	Cloud Computing Laboratory	PC	4	0	0	4	2
Total				22	18	0	4	20

SEMESTER VIII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Practical Courses								
1	21CS8911	Project Work	EEC	20	0	0	20	10
Total				20	0	0	20	10

Minimum No of Credits to be Acquired : 167

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	21HS6101	Total Quality 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								
6	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 Applications of Fourier Series	BS	4	3	1	0	4
5	21MA3202	Probability and Queuing Theory	BS	4	3	1	0	4
6	21MA4201	Discrete Mathematics	BS	4	3	1	0	4
Practical Courses								
1	21PY1311	Physics and Chemistry Laboratory	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
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
3	21CS3501	Digital Systems	ES	4	2	0	2	3
Practical Courses								
1	21CS1511	Programming Practice Laboratory using C	ES	4	0	0	4	2
2	21EE2511	Fundamentals of Electrical and Electronics Engineering Laboratory	ES	4	0	0	4	2
3	21CS2312	Computer Hardware and Software Tools Laboratory	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	1	1	0	0	1
2	21CS4901	Technical Seminar and Comprehensive Test - I	EEC	2	0	0	2	1
3	21PT3901	Soft skills –Aptitude I	EEC	1	1	0	0	1
4	21CS5901	Technical Seminar and Comprehensive Test - II	EEC	2	0	0	2	1
5	21PT3904	Soft skills –Reasoning	EEC	1	1	0	0	1
6	21PT3903	Soft skills –Aptitude II	EEC	1	1	0	0	1
Practical Courses								
1	21CS6911	Project Work (Phase-I)	EEC	4	0	0	4	2
3	21CS8911	Project Work	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	21CS5701	Linux System Administration	5	3	0	0	3	Programming
2	21CS5702	Object Oriented Analysis and Design	5	3	0	0	3	Software Engineering
3	21CS5703	IoT and its Applications	5	3	0	0	3	Networking
4	21CS5704	Virtual and Augmented Reality	5	3	0	0	3	Graphics and Multimedia
5	21CS5705	Data Warehousing and Data Mining	5	3	0	0	3	Data Science
Professional Elective II								
1	21CS6701	Information Storage Management	6	3	0	0	3	Data Science
2	21CS6702	Java Enterprise Technologies	6	3	0	0	3	Programming
3	21IT7713	Software Testing and Tools	6	3	0	0	3	Software Engineering
4	21CS6703	Micro Controlled Based System Design	6	3	0	0	3	Computer Architecture
5	21CS6704	Wireless Network Technologies	6	3	0	0	3	Networking
Professional Elective III								
1	21CS6705	Business Intelligence	6	3	0	0	3	Data Science
2	21CS6706	Distributed and Parallel Systems	6	3	0	0	3	Computer Architecture
3	21CS6707	Mobile Computing	6	3	0	0	3	Networking

4	21IT5701	Advanced Java Programming	6	3	0	0	3	Programming
5	21CS6708	Agile Software Development	6	3	0	0	3	Software Engineering
Professional Elective IV								
1	21IT5703	Cyber Security	7	3	0	0	3	Network Security
2	21CS7701	Computational Intelligence and Optimization Techniques	7	3	0	0	3	Artificial Intelligence
3	21IT7704	Wireless Adhoc and Sensor Networks	7	3	0	0	3	Networking
4	21CS7702	Big Data Analytics	7	3	0	0	3	Data Science
5	21IT5708	C # and DOT Net Essentials	7	3	0	0	3	Programming
Professional Elective V								
1	21CS7703	Information Retrieval Systems	7	3	0	0	3	Data Science
2	21IT6707	Software Project Management	7	3	0	0	3	Software Engineering
3	21CS7704	5G Communications	7	3	0	0	3	Networking
4	21CS7705	Block Chain Technologies	7	3	0	0	3	Network Security
5	21CS7706	Full Stack Application Development	7	3	0	0	3	Programming
Professional Elective VI								
1	21CS7707	Multi-core Architectures and Programming	7	3	0	0	3	Computer Architecture
2	21CS7708	Information Security	7	3	0	0	3	Network Security
3	21CS7709	Deep Learning Essentials	7	3	0	0	3	Artificial Intelligence
4	21CS7710	Cyber Forensics and Tools	7	3	0	0	3	Network Security
5	21CS7711	Data Analytics using R	7	3	0	0	3	Programming

List of Open Electives Courses
Offered to Departments - Civil , EEE & Mech

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered from
Open Elective I								
1	21CS5801	Basics of Networking	5	3	0	0	3	CSE
2	21CS5802	Introduction to Data structures	5	3	0	0	3	CSE
3	21CS5803	Principles of Operating Systems	5	3	0	0	3	CSE
4	21CS5804	Object Oriented Programming	5	3	0	0	3	CSE
5	21CS5805	Software Engineering Practices	5	3	0	0	3	CSE
6	21CS5806	Java Programming	5	3	0	0	3	CSE
7	21CS5807	C # and .Net	5	3	0	0	3	CSE
8	21CS5808	Principles of Multimedia	5	3	0	0	3	CSE
9	21CS5809	Digital Computer Organization	5	3	0	0	3	CSE
10	21CS5810	Database Technology	5	3	0	0	3	CSE
11	21CS6801	Cloud Computing Technologies	6	3	0	0	3	CSE
12	21CS6802	Web Technology	6	3	0	0	3	CSE
13	21CS6803	Android Application Development	6	3	0	0	3	CSE
14	21CS6804	Artificial Intelligence	6	3	0	0	3	CSE
15	21CS6805	Cyber Security Essentials	6	3	0	0	3	CSE
Open Elective II								
1	21CS7801	Network Engineering and Management	7	3	0	0	3	CSE
2	21CS7802	Web Design and Management	7	3	0	0	3	CSE
3	21CS7803	Machine Learning	7	3	0	0	3	CSE
4	21CS7804	Data Science Essentials	7	3	0	0	3	CSE
5	21CS7805	Cyber Forensics	7	3	0	0	3	CSE

Note: The Prerequisite for the courses offered in Open Elective II shall be of any courses offered as Open elective I

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	1	3
Practical Courses								
1	21PY1311	Physics and Chemistry Laboratory	BS	4	0	0	4	2
2	21CS1511	Programming Practice Laboratory using C	ES	4	0	0	4	2
Total				25	13	2	9	20

Semester I

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 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 Transcendentals, 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)

- a. Solve $(D^2 - D + 1)y = \sin 2x + e^{-4x}$
- b. 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 $f(x, y) = x^3 y^2 (1-x-y)$.

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 $\phi = xy^2 + yz^3$ at the point $(2, -1, 1)$ in the direction of $\vec{i} + 2\vec{j} + 2\vec{k}$.
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 $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ 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					
The aim of this course is to impart fundamental knowledge in materials and related basic physical concepts. Which are essential in understanding and explaining engineering devices. It encompasses the application of the basic principles of physics to the development of various engineering fields.					
Prerequisites for the course					
Basic theoretical concepts of Physics in XI and XII.					
Objectives					
<ol style="list-style-type: none"> 1. To impart knowledge about electrical properties of materials. 2. To instil knowledge on physics of Semiconductor and device applications. 3. To enable the students to gain knowledge on magnetic properties. 4. To establish a sound grasp of knowledge on different optical properties of materials ,optical displays and applications. 5. To inculcate an idea of significance of nano structures, quantum confinement and ensuring nano device applications . 					
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	SEMICONDUCTORS PHYSICS	9			
Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors –Extrinsic semiconductors – N-type & P-type semiconductors (Qualitative)– variation of Fermi level with temperature and impurity concentration – Hall effect and devices.-Ohmic contacts-Schottky diode.					
UNIT III	MAGNETIC PROPERTIES OF MATERIALS AND ITS DEVICE	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. - quantum interference devices-GMR devices					
UNIT IV	OPTICAL PROPERTIES OF MATERIALS AND ITS DEVICES	9			

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

UNIT V**NANOMATERIALS AND ITS 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- Spintronic devices 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

Explain the basic properties of semiconductors including the band gap, charge carrier concentration and doping. **Understand**

CO 3

Develop the concepts of magnetic properties and their engineering applications. **Apply**

CO 4

Apply the knowledge of optoelectronic devices and circuits to implement engineering applications. **Apply**

CO 5

Learn the concepts of nano materials and compare its properties with those of bulk materials. **Apply**

Text Books

1. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Education (Indian Edition), 2019
2. S. Salivahanan,A. Rajalakshmi“Physics for Electronics Engineering and Information Science” - Tata Mc-Graw Hill Education,29 January 2018.

Reference Books

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
3. Laszlo Solymar ,Walsh,Donald,Syms and Richard R.A., Electrical properties of materials ,OXford Univ.press(Indian Edition)2015
4. B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.
5. Parag K.Lala, Quantum Computing : A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

Web Resources

1. UNIT 1 -<https://www.britannica.com/science/Fermi-Dirac-statistics>
2. UNIT 2&4 -https://onlinecourses.nptel.ac.in/noc23_mm02/preview
3. UNIT 2- <http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1>
4. UNIT 3- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934330/>
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	PS 01	PSO 2	PS 03
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

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

1. The thermal conductivity of copper at 300 K is $470.4 \text{ Wm}^{-1}\text{K}^{-1}$. Calculate the electrical conductivity of copper at 300 K. (Lorentz number = 2.45×10^{-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: Explain the basic properties of semiconductors including the band gap, charge carrier concentration and doping. . **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 $RH = + 1/pe$
Describe an experimental setup to measure the Hall voltage.
3. Describe ohmic contact with its energy band diagram.

COURSE OUTCOME 3: Develop the concepts of magnetic properties and their engineering applications. **Apply**

1. How will you differentiate magnetic materials based on their properties
2. Iron has a relative permeability of 5000. Calculate its magnetic susceptibility.
3. How magnetic principle is used in computer data storage.

COURSE OUTCOME 4: Apply the knowledge of optoelectronic devices and circuits to implement engineering applications. **Apply**

1. An LED emits green light of wavelength (λ) = 5511.11 Å. Find out the value of E_g .
2. Compare the working principle of LED with solar cell.
3. Explain the construction and working of solar cells.

COURSE OUTCOME 5: Learn the concepts of nano materials and compare its properties with those of bulk materials. . **Apply**

1. Using the concept of DOS (Density of State) expounds 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
<p>Preamble</p> <p>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.</p>					
<p>Prerequisites for the course</p> <p>Basic theoretical concepts of Chemistry in higher secondary level.</p>					
<p>Objectives</p> <ol style="list-style-type: none"> 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			
<p>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.</p>					
UNIT II	ELECTROCHEMISTRY AND CORROSION	9			
<p>Electrodes- types, Cells- types, Construction (Daniel cell) - Electrode potential- Photo electrochemical cell-working and applications – Nernst equation and its applications- Emf series & its applications.</p> <p>Corrosion- Causes- Types- Chemical, Electrochemical corrosion (galvanic, differential aeration), Corrosion control – Material selection and design aspects – Electrochemical protection – Sacrificial Anode cathodic Protection method.</p>					
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
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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 – H₂-O₂ fuel cell and microbial fuel cell; Supercapacitors: Storage principle, types and examples.

UNIT V	ENGINEERING MATERIALS	9
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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
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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. Shikha Agarwal, "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	PSO3
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					
<ul style="list-style-type: none"> NIL 					
Objectives					
<ol style="list-style-type: none"> To learn the basic constructs of C Programming. To learn arrays and strings concepts of C Programming. To learn functions in C and use pointers for storing data in the main memory efficiently. To learn structures and union concepts of C Programming 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					
<ul style="list-style-type: none"> Discussion on Logical and Algorithmic thinking Demonstration of concepts using Algorithms and Flowcharts 					
SUGGESTED EVALUATION METHODS					
<ul style="list-style-type: none"> 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					
<ul style="list-style-type: none"> 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					
<ul style="list-style-type: none"> Demonstration of programs using Nested if and Nested loops 					

	<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> Discussion and comparison of Structures and Unions Solve problems by using nested structures and union inside structures 		
SUGGESTED EVALUATION METHODS		
<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> Assignment on modes of operations using files in C Discussion on types of pre-processor directives 		
SUGGESTED EVALUATION METHODS		
<ul style="list-style-type: none"> Demonstration of programs using file operations Demonstration of programs using pre-processor directives 		
Total Periods		45
Suggestive Assessment Methods		
Continuous Assessment Test	Formative Assessment Test	End Semester Exams

(20 Marks)	(20 Marks)	(60 Marks)
1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESRIPTIVE 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. ReemaThareja, "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	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)**

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 pattern

```
1
22
333
4444
55555
```

3. Write a program to input the elements of a two dimensional array. Then from this array make two arrays: one that stores all the odd elements of the array and other that stores all 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 be positive 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 the names 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 line arguments. 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					
<ol style="list-style-type: none"> 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

- i) Listening to Conversations/ technical concepts from suggested app/prescribed modules - Submission of 5 Recorded Conversations.
- ii) Introducing oneself to the audience in a professional way - Video Recording to be submitted.
- iii) Reading 3 Passages on Technology and answering questions through Google forms.
- iv) Drafting a self introduction
- v) Teaching of Grammar Contents

Evaluation Method

- i) Listening & Speaking: Submitted Conversation will be assessed for
 - a) Language style as that of the sample audio.
 - b) Pronunciation
 - c) Intonation
 - ii) Introduction: Submitted Video Recording will be assessed for
 - a) Communication Etiquette
 - b) Language Style
 - c) Sentence Construction
 - iv) Introduction with a professional touch highlighting the skill sets required for an engineer
- Activities iii to v will be assessed through Google form tests/ written tests.

Module II	SHARING TECHNICAL INFORMATION	12
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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.

<p>Suggested Activities</p> <p>i) Listening to Technical Lectures - Suggested Youtube channels</p> <ul style="list-style-type: none"> a) Learn Engineering b) Jared Owen c) Interesting Engineering d) Practical Engineering <p>ii) Speaking / Submitting video recording / classroom presentation about an electronic/electrical/ a mechanical gadget giving importance to its specifications, descriptions, merits and demerits.</p> <p>iii) Reading articles from Newspaper/ Google News / Times Now / and other Tech News Sites</p> <p>iv) Writing reviews of a product</p> <p>v) Teaching of Grammar Contents</p>	<p>Evaluation Method</p> <p>i) Listening skills will be tested through</p> <ul style="list-style-type: none"> a) MCQs - Google Forms - 3 Sets b) Quiz - Polling - 2 set <p>ii) Speaking: Submitted Video Recording/Presentation during class hours will be assessed for</p> <ul style="list-style-type: none"> a) Language Style & Fluency b) Creation of Google Slides / Canva Slides c) Content delivery <p>Activities iii to v will be assessed through Google form tests/ written tests.</p>
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Module III	UNDERSTANDING TECHNOLOGY	12
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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.

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

<p>Suggested Activities</p> <p>i) Listening to talks related to Technology - Suggested YouTube channels</p> <ol style="list-style-type: none"> a) Auto Car India b) Lesics c) Student Energy <p>ii) Speaking / Submitting video recording / Classroom presentation on Technical issues faced in a gadget and expressing suitable solutions.</p> <p>iii) Reading articles -Extracts from reputed journals and identify problem statements and solution statements.</p> <p>iv) Writing - Identifying problems and giving solutions</p> <p>v) Teaching of Grammar Contents</p>	<p>Evaluation Method</p> <p>i) Listening skills will be tested through</p> <ol style="list-style-type: none"> a) Note making - 2 Sets <p>ii)Speaking: Submitted Video Recording / Classroom Presentation will be assessed for</p> <ol style="list-style-type: none"> a) Expression of Innovative Ideas and Solution b) Sentence Structure <p>Activities iii to v will be assessed through Google form tests/ written tests/ written exercises.</p>
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Module V	EMOTIONAL AWARENESS AND MANAGEMENT	12
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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.

<p>Suggested Activities</p> <p>i) Watching videos on types of Listening</p> <p>ii) Presentation on Emotional Intelligence</p> <p>iii) Reading Articles on High Level Cognition</p> <p>iv) Writing - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others</p> <p>v) Teaching of Grammar Contents</p>	<p>Evaluation Method</p> <p>i) Listening skills will be tested through</p> <ol style="list-style-type: none"> a) Google form test- 2 Sets <p>ii)Speaking: Submitted Video Recording / Classroom Presentation will be assessed for</p> <ol style="list-style-type: none"> a) Emotional awareness b) Communication Skills <p>Activities iii to v will be assessed through Google form tests/ written tests/ written exercises.</p>
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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
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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/UCqZQJ4600a9wIfMPbYc600Q>
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	PSO 1	PSO 2	PSO 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.

- 6) Convert the given statement to another form of the tenses as directed.
- 7) Pick out the suitable synonym for the underlined word in order to minimize plagiarism.
- 8) 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 behavior and redraft it in your own style.
- 5) Comprehend the passage and give your inputs for decision making.
- 6) Watch the video and articulate your emotions using appropriate words.
- 7) Write a note on optimism and pessimism.
- 8) Fill in the blank with the suitable modal verb.
- 9) Pick out the suitable fixed/semi-fixed expression to complete the given statement.

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 (Physics)

- To analyze the instrumental techniques used in measuring data.
- To interrogate the competency and understanding of the basic concepts found in experimental Physics.
- To learn about the electronic mechanisms and their usage in a practical manner.
- To learn the interpretation of experimental data using the equipment in the physics laboratory.
- To investigate the errors in experimental measurements and techniques.

Objectives (Chemistry)

- 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.
- To explain the concept of corrosion, its causes, and its environmental consequences.
- To acquaint students with knowledge of molecular weight determination and polymer solubility.
- To interpret chemical and physical phenomena through experimental investigations.

PHYSICS

S. No	List of Experiments	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).	1
3	Determination of planck's constant and work function using the principle of photoelectric effect	5

4	Determination of Young's modulus of the material-Non Uniform bending method.	5
5	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	4
6	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.	1
7	Determination of wavelength of spectral lines using grating – Spectrometer.	2

CHEMISTRY

1	Determination of total, temporary & permanent hardness of water by EDTA method.	1,5
2	Corrosion experiments – weight loss method.	3,5
3	Estimation of iron content of the given solution using potentiometer.	2
4	Conductometric titration of strong acid vs strong base.	2
5	Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.	4
6	Estimation of HCl using Na ₂ CO ₃ as primary standard and determination of alkalinity in water sample.	1,5
7	Determination of strength of given hydrochloric acid using pH meter.	2

List of Projects (PHYSICS)

S. No.	List of Projects	Related Experiment	CO
1	To study Infrared radiation emitted by different sources using phototransistors.	3	5
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	1
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	1

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.	7	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	6	1
7	Design a water level indicator by connecting a Buzzer, resistor and transistor in series and connect this in parallel to LED.	2	1
List of Projects (CHEMISTRY)			
1	<p>Water Analysis : Analysis of perennial Thamirabarani River water samples collected from various locations (before and after blending of industrial waste water).</p> <p>i) Determination of various physical and chemical parameters (Hardness, pH,TDS, Alkalinity) of different water samples.</p> <p>ii) From the result, give a detailed report about the water sample whether it is fit/unfit for domestic and industrial purposes.</p>	1, 6,7	1,5
2.	<p>Water Quality Monitoring : Analysis of ground water samples collected from various districts (Tirunelveli, Madurai, Tuticorin, Kanyakumari, Tenkasi etc.,).</p> <p>i) Determination of various physical and chemical parameters (Hardness, pH, TDS, Alkalinity) of different water samples.</p> <p>ii) From the result, give a detailed report about the water sample whether it is fit/unfit for domestic and industrial purposes.</p>	1,6,7	1,5
3.	<p>Household Plumbing Deterioration Monitoring : Study of Conductivity of domestic water (Home) by Arduino method to track the deterioration of household plumbing.</p> <p>i) From the observations give a detailed report about the existence of various ions in water.</p> <p>ii) Give an explanatory report on tracking the deterioration in household plumbing.</p>	2	3,5

4	<p>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.</p> <p>i) From the observations give a detailed report about the impact of air pollution on human health.</p> <p>ii) Deduce an explanatory report on environmental impact due to CO/CO₂ emissions.</p>	4	5
5.	<p>Food adulteration : Investigation of adulterants in various food stuffs (milk, chilli powder, turmeric powder, wheat flour, honey and ghee) by Chemical methods.</p> <p>i) Give a report on the presence of adulterants in the given food samples.</p> <p>ii) From the observations give a brief report about the impact of food adulteration on human health.</p>	1	5

Outcomes(Physics)

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

C01 Analyzation of new instruments and real time application in engineering materials. (Analyse)

C02 Applying the basic concepts of physics in the experiments by interrogating the data.(Apply)

C03 Applying basic knowledge to design circuits using basic components. (Apply)

C04 Acquire the basic enlightenment of the experimental data for interpretation (Apply)

C05 Solve problems individually using critical thinking collaboratively. (Analyse)

Outcomes(Chemistry)

C01 Analyze the water quality related parameters quantitatively. (Analyse)

C02 Explain the use of equipment for the measurement of conductance, electrode potential, pH of solutions, and viscosity. (Apply)

C03 Analyze the probable corrosion, corrosion rate, and corrosion mechanism of the metallic material in the given environment (Analyse)

C04 Analyze polymerization data and predict the conversion and molecular weight, which will lead to critical thinking about how to improve the setup for better polymerization.(Analyse)

C05 Apply the knowledge of practical to enhance the quality of the environment .(Apply)

Reference Books (Physics)

- 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.

Reference Books (Chemistry)

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>

Web Resources (Chemistry)

1. Water Quality standards - <https://www.youtube.com/watch?v=OlGllOZllyI>
2. Corrosion experiments – weight loss method
<https://www.youtube.com/watch?v=SMlgTWfdHb8>

PHYSICS MAPPING

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	1	1	1		1	1	1		1	1			
2	3	2	1	1	1		1	1	1		1	1			
3	3	2	1	1	1		1	1	1		1	1			
4	3	2	1	1	1		1	1	1		1	1			
5	3	2	1	1	1		1	1	1		1	1			

CHEMISTRY MAPPING**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	PS O3
1	3		1			2	2					2			
2	3	1	2			1	2					1			
3	3	2	1	1			1					1			
4	2	1	2			2	2					1			
5	2	1	2		1	2	2					1			

COURSE LEVEL ASSESSMENT QUESTIONS - PHYSICS

COURSE OUTCOME 1: The students will be able to analyzation of new instruments and real time application in engineering materials. (Analyse)

1. Determination of band gap of a Semiconductor (Forbidden energy band gap kit).
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.

COURSE OUTCOME 2: The students will be able to apply the basic concepts of physics in the experiments by interrogating the data.(Apply)

1. Determination of wavelength of spectral lines using grating – Spectrometer.

COURSE OUTCOME 3: The students will be able to apply basic knowledge to design circuits using basic components. (Apply)

1. **Design a circuit for finding unknown resistance and specific resistance of a given coil of wire.**

COURSE OUTCOME 4: The students will be able to acquire the basic enlightenment of the experimental data for interpretation (Apply)

1. Determine the thermal conductivity of a given bad conductor (Glass) using Lee's disc method. (Given: $M = 800 \times 10^{-3} \text{ Kg}$, $S = 370 \text{ JKg}^{-1}\text{K}^{-1}$).

COURSE OUTCOME 5: The students will be able to solve problems individually using critical thinking collaboratively. (Analyse)

1. Determination of planck's constant and work function using the principle of photoelectric effect
2. 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 CONTENT AND LECTURE SCHEDULE - PHYSICS

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 Young's modulus of the material-Non Uniform bending method.	1
5	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	1
6	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.	1
7	Determination of wavelength of spectral lines using grating – Spectrometer.	1

COURSE LEVEL ASSESSMENT QUESTIONS - CHEMISTRY

COURSE OUTCOME 1: Analyze the water quality related parameters quantitatively. (Analyze)

1. Estimate 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.

What is the permissible limit of alkalinity in drinking water?

COURSE OUTCOME 2: Explain the use of equipment for the measurement of conductance, electrode potential, pH of solutions, and viscosity. (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?

COURSE OUTCOME 3: Analyze the probable corrosion, corrosion rate, and corrosion mechanism of the metallic material in the given environment (Analyze)

1. Determine the rate of corrosion of the given material by weight loss method.

COURSE OUTCOME 4: Analyze polymerization data and predict the conversion and molecular weight, which will lead to critical thinking about how to improve the setup for better polymerization.(Analyze)

1. Determine the molecular weight of polyvinyl alcohol by using Ostwald's Viscometer.

COURSE OUTCOME 5:Apply the knowledge of practical to enhance the quality of the environment .(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?

COURSE CONTENT AND LECTURE SCHEDULE - CHEMISTRY

S.NO	TOPIC	NO OF WEEKS REQUIRED
1	Determination of total, temporary & permanent hardness of water by EDTA method.	1
2	Corrosion experiments - weight loss method	1
3	Estimation of iron content of the given solution using potentiometer	1
4	Conductometric titration of strong acid vs strong base	1
5	Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer	1
6	Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample	1
7	Determination of strength of given hydrochloric acid using pH meter.	1

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	C05
9.	Grocery Checklist Management System	Ex. 1 to 10	C05
10.	Diary Management System	Ex. 1 to 10	C05
11.	Retail Shop Inventory Management System	Ex. 1 to 10	C05
12.	Pharmacy Inventory System	Ex. 1 to 10	C05
13.	Library Book Management System	Ex. 1 to 10	C05
14.	Student Subject Selection System	Ex. 1 to 10	C05
15.	Student Leave Application System	Ex. 1 to 10	C05

Suggestive Assessment Methods

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

Course Outcomes

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

C01	Implement program using control statements
C02	Implement arrays and perform string operations
C03	Develop reusable modules, store data in main memory effectively using pointers
C04	Form heterogeneous data using structures, union and files
C05	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/>

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										1		
3	3	3	3										2		
4	3	3	3										2		
5	2	2	2			1			2	2	2	1	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: (Blooms Category: Apply) (Problem Source: Code chef)

Problem Statement:

Pooja would like to withdraw X \$US from an ATM. The cash machine will only accept the transaction if X is a multiple of 5, and Pooja's account balance has enough cash to perform the withdrawal transaction (including bank charges). For each successful withdrawal the bank charges 0.50 \$US dollars. Calculate Pooja's account balance after an attempted transaction.

Input Constraints:

Positive integer $0 < X \leq 2000$ - the amount of cash which Pooja wishes to withdraw.

Nonnegative number $0 \leq Y \leq 2000$ with two digits of precision - To represent Pooja's initial account balance.

Output Constraints:

Output the account balance after the attempted transaction, given as a number with two digits of precision. If there is not enough money in the account to complete the transaction, output the current bank balance.

Example:

TYPE	INPUT	OUTPUT
Successful Transaction	30 120.00	89.50

Incorrect Withdrawal Amount (not multiple of 5)	42	120.00	120.00
Insufficient funds	300	120.00	120.00

COURSE OUTCOME 2: (Blooms Category: Apply) (Problem Source: Code chef)**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. $1 \leq T \leq 1000$

Output Constraints:

For each test case, display the Ship Class depending on ID, in a new line.

Example:

INPUT	OUTPUT
3	Battleship
B	Cruiser
C	Destroyer
D	

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	

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED FOR EXERCISES	NO OF HOURS REQUIRED FOR PROJECT
1	Simple Statements	2	1
2	Decision Making Statements	2	1
3	Looping Statements	2	1
4	One Dimensional And Two Dimensional Arrays	2	1
5	Strings	2	1
6	Functions: User Defined Functions And Recursive Functions	2	1
7	Functions And Pointers	2	1
8	Structures And Pointers	2	1
9	Structures And Unions	2	1
10	Files Concept	2	1
11	Project Implementation & Integration	0	15
Total		20	25
Total Hours Required		45	

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 Applications 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
2	21CS2312	Computer Hardware and Software Tools Laboratory	ES	4	0	0	4	2
Mandatory Courses								
1	21GE2M01	Indian Constitution and Cultural Heritage	MC	2	2	0	0	0
Total				29	16	1	12	21

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
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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

i) Visit to the Library - Reading articles on emerging trends and taking down notes in the prescribed format - Submission through FAST FORMS - Minimum 2

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.

iii) Create a Technical Blog based on their course of study

iv) Teaching of Grammar Contents

Evaluation Method

i) Content & Structure

ii) Submission: Fast form Document
Submitted document will be assessed for

a) Communication Etiquette

b) Language Style

c) Sentence Construction

iii) Create a channel and post the Tech Blog they have created

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

MODULE 4	REPORT WRITING I	6
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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	Evaluation Method
i) Drafting reviews and reports on Industries -	i) Content & Structure
a) Profile & Products b) Trending technology adopted c) Careers d) Latest news Min - 2 Industries	
ii) Teaching of Grammar Contents	Activity ii will be assessed through Google form tests/ written tests.

MODULE 5	REPORT WRITING II	6
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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.

<p>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</p>	<p>Evaluation Method i) Content & Structure ii) Relevance of the question framed, Question structure Activity iii will be assessed through Google form tests/ written tests.</p>
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Total Periods	30
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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:

C01	Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more. (Apply)
C02	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)
C03	Articulate appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world. (Apply)
C04	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)
C05	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	PSO 1	PSO 2	PSO 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.
- 6) 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.
- 2) Listen to the strategies of GD and answer the given questions.
- 3) Read and submit a recording of technical content following the strategies of speed reading.
- 4) Write Job application with a cover letter for the given job description.
- 5) Write paragraphs expressing opinion on the given topic.
- 6) 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 Laplace Transforms with applications to various engineering problems. This course will cover the following main topics: Construction of analytic function, Taylors and Laurent's series, Poles and Residues, Half range sine series, Harmonic analysis, Fourier Series Solutions of one dimensional wave and heat flow equation and Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients.					
Prerequisites for the course					
21MA1201 - Matrices and Advanced Calculus					
Objectives					
<ol style="list-style-type: none"> 1. To introduce to the concept of Analytical function 2. To familiarize with Complex integration 3. To introduce Fourier series analysis which is central to many applications in engineering field and its use in solving boundary value problems 4. To acquaint the student with PDE and Fourier series techniques in solving wave and heat flow problems used in various situations. 5. To improve the knowledge of Laplace transforms. 					
UNIT I	ANALYTIC FUNCTIONS	9+3			
Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions – Harmonic function – Harmonic Conjugate - Construction of analytic function by Milne Thomson's method and bilinear transformation - transformation $w = 1/z$.					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Tutorial Problems on Construction of analytic function by Milne Thomson's method and bilinear transformation. 					
UNIT II	COMPLEX INTEGRATION	9+3			
Complex numbers and its conjugate - Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its higher order derivatives (without proof) and its applications – Taylors and Laurent's series – Types of Singularities – Poles and Residues – Cauchy's residue theorem (without proof).					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Tutorial Problems on Taylor's series, Laurent's series and Cauchy's residue theorem. 					
UNIT III	FOURIER SERIES	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 for Fourier series - Engineering Applications.					

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Fourier series of Odd and even functions, Half range sine and cosine series, Harmonic analysis.

UNIT IV	PDE AND APPLICATIONS OF FOURIER SERIES	9+3
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Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – Fourier Series Solutions of one dimensional equation of heat conduction - Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Fourier Series Solutions of one dimensional wave equation and heat conduction equation.

UNIT V	LAPLACE TRANSFORMS	9+3
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Properties of Laplace Transform – Inverse transforms – Convolution theorem (Without Proof) – Partial fraction - Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only - Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Laplace transform using partial fraction, Convolution theorem and solving ODE.

Total Periods	45 + 15 = 60 Periods
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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:**

- C01 : Apply Cauchy-Riemann equations to problems of fluid mechanics, thermodynamics and electro-magnetic fields. (Apply)
- C02: Solve complex valued integral functions using residues. (Apply)
- C03: Construct the Fourier series expansion of the periodic function. (Apply)
- C04: Solve the problems of one dimensional wave and heat equation. (Apply)
- C05: Apply Laplace Transform technique to solve the given ordinary differential equation. (Apply)

Text Books

1. B. S. Grewal, "Higher Engineering Mathematics", 45rd edition, 2017.
2. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley & Sons. Singapore, 15th edition, 2017.

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. Advanced Engineering Mathematics , H. K. DASS, S. CHAND and Company Limited, New Delhi, 22nd revised edition, 2018.

Web Resources

1. https://youtu.be/LGxE_yZYigI
2. Analytic functions - <https://youtu.be/b5VUnapu-qs> <https://youtu.be/8jPr6rGstYk>
3. Complex Integration - <https://youtu.be/4yC4IXcMKJg>
4. Fourier series - https://youtu.be/LGxE_yZYigI
5. Applications of fourier series - <https://youtu.be/YfGHNdVeyB4>
6. Laplace Transform - <https://youtu.be/c9NibpoQjDk>

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			
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. Construct an analytic function whose imaginary part is $v = e^x(x \cos y - y \sin y)$
2. Find the bilinear transformation that maps the points $Z = 0, -1, i$ on to the points $i, 0, \infty$.

COURSE OUTCOME 2 (CO 2) : (Apply)

- 1) Solve $\int \frac{e^{2z}}{(z+1)^4} dz$ using Cauchy's Integral formula where C is $|z| = 2$.
- 2) Compute $\int \frac{2z-1}{z(z+1)(z-3)} dz$ using Cauchy's Residue theorem where C is $|z| = 2$.

COURSE OUTCOME 3 (CO 3) : (Apply)

- 1) Construct Fourier series for $f(x) = x$ in $(-\pi, \pi)$.
- 2) Construct Fourier series for $f(x) = x^2$ in $(-l, l)$.

COURSE OUTCOME 4 (CO 4) : (Apply)

- 1) Identify the PDE $u_{xx} = a^2 u_{tt}$
- 2) A tightly stretched string with fixed end points $x = 0, x = l$ is initially at rest in its equilibrium position. If it is vibrating, giving each point a velocity $\lambda x(l - x)$. Find the displacement of the string at any time 't'.

COURSE OUTCOME 5 (CO 5) : (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 $\frac{\cos at - \cos bt}{t}$.

21EE2503	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3
Prerequisites for the course					
<ul style="list-style-type: none"> • Engineering Physics • Engineering Mathematics 					
Course Objectives					
The course will enable students to:					
<ul style="list-style-type: none"> • 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)					

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1.DESCRPTION QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS	1.ASSIGNMENT 2.ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	1.DESCRPTION 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	PO1 0	PO1 1	PO1 2	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.

- Calculate the equivalent resistances for the two resistance 7 ohms and 12 ohms connected in series.
 - 7 ohms
 - 9 ohms
 - 12 ohms
 - 19 ohms
- Which equipment is used to measure the current?
 - ammeter
 - voltmeter
 - wattmeter
 - 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
2. 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
as
 - a. chopper
 - b. rectifier
 - c. motor
 - d. transistor
2. 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
2. 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

2. _____ 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	2	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					
<ul style="list-style-type: none"> ● Problem Solving Techniques, Logical Thinking 					
Objectives					
<ol style="list-style-type: none"> 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. 6. 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
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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
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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
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Laboratory Requirements

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

Suggestive Assessment

Continuous Assessment Test (20 Marks)	Lab Components Assessments (20 Marks)	End Semester Exams (60 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

- Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second Edition,Shroff/O’Reilly Publishers, 2016

Reference Books

- Charles Dierbach, “Introduction to Computer Science using Python”, Wiley India Edition, 2016.

Web Resources

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

List of experiments

S.N O	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 20 ^o C, 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	<p>Python Programs using looping statements</p> <p>a) Implement Python Script to generate first N natural numbers.</p> <p>b) Implement Python Script to check given number is palindrome or not.</p> <p>c) Implement Python script to print factorial of a number.</p> <p>d) Implement Python Script to check given number is Armstrong or not.</p> <p>e) Square the Digits :</p> <p>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.</p> <p>Sample :</p> <p>Input :</p> <p>13</p> <p>Explanation : ('^' denotes power in this explanation)</p> <p>Step 1 : $1^2 + 3^2 = 1 + 9 = 10$</p> <p>Step 2 : $1^2 + 0^2 = 1 + 0 = 1$</p> <p>Step 3: $1^2 = 1$</p> <p>1 repeats hence output should be "1"</p> <p>Output:</p> <p>1</p> <p>Input:</p> <p>7</p> <p>Explanation:</p> <p>Step 1 : $7^2 = 49$</p> <p>Step 2 : $4^2 + 9^2 = 16 + 81 = 97$</p> <p>Step 3 : $9^2 + 7^2 = 81 + 49 = 130$</p> <p>Step 4: $1^2 + 3^2 + 0^2 = 1 + 9 + 0 = 10$</p> <p>Step 5 : $1^2 + 0^2 = 1 + 0 = 1$</p> <p>Step 6: $1^2 = 1$</p> <p>1 repeats hence output should be "1"</p> <p>Output:</p> <p>1</p>	CO2
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4	<p>Python Programs using Functions</p> <p>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.</p> <p>b) Have the function Codel and Username Validation(str) take the str parameter being passed and determine if the string is a valid username according to the following rules:</p> <ol style="list-style-type: none">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. <p>If the username is valid then your program should return the string true, otherwise return the string false.</p> <p>Examples</p> <p>Input: "aa_" Output: false Input: "u_hello_world123" Output: true</p>	CO2
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5	<p>Python Programs using List</p> <p>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').</p> <p>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 a Output: 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</p> <p>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 a Output: 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</p> <p>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.</p>	CO3
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6	<p>Python Programs using String, Tuples, Numpy array and Pandas.</p> <p>a)Accepts a string and calculate the number of upper case letters and lower case letters.</p> <p>b)Write a python program to check whether the given string is palindrome or not.</p> <p>c)Create all possible strings by using 'a', 'e', 'i', 'o', 'u'. Use the characters exactly once.</p> <p>d)Python Program to Sort a List of Tuples in Increasing Order by the Last Element in Each Tuple</p> <p>e) Use mtcars.csv dataset do the following:</p> <p>What is the type of each variable of the mtcars data set?</p> <ul style="list-style-type: none">○ Divide the column that has the car name into columns that contain the make and model of the car.○ Do all observations have a make and model value? If there are missing values, can you fix them? (Hint, use Google to help you.)○ 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○ 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.	C03
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	<p>f) Write a python program to sort the DataFrame first by 'name' in descending order, then by 'score' in ascending order.</p> <p>Sample Python dictionary data and list labels:</p> <pre>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']}</pre> <p>labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']</p> <p>Values for each column will be: name : "Suresh", score: 15.5, attempts: 1, qualify: "yes", label: "k"</p> <p>Expected Output:Original rows:</p> <table border="1"> <thead> <tr> <th></th> <th>name</th> <th>score</th> <th>attempts</th> <th>qualify</th> </tr> </thead> <tbody> <tr><td>a</td><td>Anastasia</td><td>12.5</td><td>1</td><td>yes</td></tr> <tr><td>b</td><td>Dima</td><td>9.0</td><td>3</td><td>no</td></tr> <tr><td>c</td><td>Katherine</td><td>16.5</td><td>2</td><td>yes</td></tr> <tr><td>d</td><td>James</td><td>NaN</td><td>3</td><td>no</td></tr> <tr><td>e</td><td>Emily</td><td>9.0</td><td>2</td><td>no</td></tr> <tr><td>f</td><td>Michael</td><td>20.0</td><td>3</td><td>yes</td></tr> <tr><td>g</td><td>Matthew</td><td>14.5</td><td>1</td><td>yes</td></tr> <tr><td>h</td><td>Laura</td><td>NaN</td><td>1</td><td>no</td></tr> <tr><td>i</td><td>Kevin</td><td>8.0</td><td>2</td><td>no</td></tr> <tr><td>j</td><td>Jonas</td><td>19.0</td><td>1</td><td>yes</td></tr> </tbody> </table> <p>Sort the data frame first by 'name' in descending order, then by 'score' in ascending order:</p> <table border="1"> <thead> <tr> <th></th> <th>name</th> <th>score</th> <th>attempts</th> <th>qualify</th> </tr> </thead> <tbody> <tr><td>a</td><td>Anastasia</td><td>12.5</td><td>1</td><td>yes</td></tr> <tr><td>b</td><td>Dima</td><td>9.0</td><td>3</td><td>no</td></tr> <tr><td>c</td><td>Katherine</td><td>16.5</td><td>2</td><td>yes</td></tr> <tr><td>d</td><td>James</td><td>NaN</td><td>3</td><td>no</td></tr> <tr><td>e</td><td>Emily</td><td>9.0</td><td>2</td><td>no</td></tr> <tr><td>f</td><td>Michael</td><td>20.0</td><td>3</td><td>yes</td></tr> <tr><td>g</td><td>Matthew</td><td>14.5</td><td>1</td><td>yes</td></tr> <tr><td>h</td><td>Laura</td><td>NaN</td><td>1</td><td>no</td></tr> <tr><td>i</td><td>Kevin</td><td>8.0</td><td>2</td><td>no</td></tr> <tr><td>j</td><td>Jonas</td><td>19.0</td><td>1</td><td>yes</td></tr> </tbody> </table>		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		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	
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7	<p>Python Programs using Dictionary</p> <p>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()</p> <p>b) Write a Python Program to multiply all the items in a dictionary.</p>	CO3																																																																																																														
8	<p>Python Programs using Files</p> <p>a) Write Python script to display file contents.</p> <p>b) Write Python script to copy file contents from one file to another.</p> <p>c) Write a Python program to count the number of lines, words, letters, blank spaces in a file.</p>	CO4																																																																																																														

9	<p>Python Programs using Exceptions</p> <p>Write a Python program to solve the following: (Use Exception Handling)</p> <p>You are given a string . Your task is to find out whether is a valid regex or not.</p> <p>Input Format</p> <p>The first line contains integer , the number of test cases.</p> <p>The next lines contains the string .</p> <p>Constraints: $0 < T < 100$</p> <p>Output Format</p> <p>Print "True" or "False" for each test case without quotes.</p> <p>Sample Input</p> <pre>2 .*\+ .*+</pre> <p>Sample Output</p> <pre>True False</pre> <p>Explanation</p> <p>.*\+ : Valid regex.</p> <p>.*+ : Has the error multiple repeat. Hence, it is invalid.</p>	C04
10	<p>Calculation of the Area : Don't measure</p> <p>Monte Hall : 3 doors and a twist</p> <p>Sorting : Arrange the books</p>	C02
11	<p>Searching : Find in seconds</p> <p>Anagram</p> <p>Lottery Simulation - Profit or Loss</p>	C02
12	<p>Simulate a password generator</p> <p>Simulate a grade book for a teacher</p> <p>Rock Paper and Scissor.</p>	C02
13	<p>Python Program for:</p> <p>Converting an Image to Black and White/Grayscale</p> <p>Blurring an Image, Edge Detection and Reducing the Image Size</p>	C05

CO Vs PO Mapping and CO Vs PSO Mapping

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
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:**

- 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:
 - For 0 to 100 units the per unit is ₹ 0/-
 - 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.
 - 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)
- 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 $\max(|X-Z|, |Y-Z|)$ 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 X and Y.

Output Format

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

Constraints

$1 \leq T \leq 1000$

$1 \leq X, Y \leq 1000$

$X \leq Y$

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					
Preamble					
Engineering drawing is an important tool for all Engineers and for many others professionals. It is the language of Engineers. Engineering Drawing communicates all needed information from the engineer who designed a part to the workers who will manufacture it.					
Objectives					
<ol style="list-style-type: none"> 1. To understand the importance of the drawing in engineering applications 2. To improve their visualization skills so that they can apply these skill in developing new products 3. To expose them to existing standards related to technical drawings 4. To develop graphic skills for communication of concepts, ideas and design of engineering products 5. Train to practice engineering graphics through drafting software. 					
CONCEPTS AND CONVENTION(not for examination)					
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout of drawing sheets – Lettering and Dimensioning					
UNIT I	PROJECTION OF POINTS AND LINES	9			
General Principles of orthographic projection – First Angle Projection, projection of points in four quadrants – Projection of straight lines located in the first quadrant – inclined to both planes					
UNIT II	PROJECTION OF SOLIDS	10			
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	10			
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	8			
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.					
UNIT V	PERSPECTIVE PROJECTIONS	8			
Perspective projection of prisms, pyramids and cylinders by visual ray method.					

S.No	List of Experiments	CO
1.	Introduction to drafting commands in AutoCAD. Creation of simple geometry and editing practice.	C112.1, C112.6
2.	Projection of simple Geometric objects and engineering components using AutoCAD	C112.2, C112.6
3.	Construction of simple objects and components sectional views using AutoCAD	C112.3, C112.6
4.	Isometric projection of simple components-flange, cylinder, chimney, lamp shades, valve, Brackets using AutoCAD	C112.4, C112.6
5.	Creating a Perspective Projection of solids using AutoCAD	C112.5, C112.6
Total Periods		45 Theory + 15 Lab Hours

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:

CO1: Apply the principles of first angle projection in construction of points and lines.

CO2: Apply the principles of change of position method in projection of simple solids.

CO3: Develop projections of sectioned solids and their developmental surface.

CO4: Develop isometric views from orthographic projections

CO5: Construct the perspective projections of simple solids

CO6: Develop orthographic, isometric and perspective projection and development of surfaces using drafting software.

Text Books

1. Venugopal K. and Prabhu Raja V., "Engineering drawing + Autocad", New Age International (P) Limited (2022)
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. Parthasarathy N.S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, (2015)
3. Shah M.B. and Rana B.C., "Engineering Drawing", Pearson Education (2009)
4. N.D.Bhatt, "Engineering Graphics", Charotor Publishing House, 53RD Edition 2019

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

Web Recourses

1. <http://nptel.ac.in/courses/112103019>
2. <https://archive.nptel.ac.in/courses/112/105/112105294/>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PS 01	PSO 2	PSO 3
1	3	1	1	2									3	2	
2	3	1	1	1	1								3	2	
3	3	1	1	1	1								3	2	
4	2	2	1	1	1								3	1	
5	2	2	1	1	1								3	2	
6	2	2	2	2	2								3	3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	MODEL	END SEM EXAM
REMEMBER				
UNDERSTAND				
APPLY	15	15	20	50
ANALYZE				
EVALUATE				
CREATE				

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Apply the principles of first angle projection in construction of points and lines. (Apply)

1. Draw the projections of the following points on a common reference line. (Apply)

A, 35 mm above HP and 25 mm in front of VP

B, 40 mm below HP and 15 mm behind VP

C, 50 mm above HP and 25 mm behind VP

D, 45 mm below HP and 25 mm behind VP

E, 30 mm behind VP and on HP

2. A line CD measuring 80 mm is inclined at an angle of 30° to HP and 45° to VP. The point C is 20 mm above HP and 30 mm in front of VP. Draw the projections of the straight line. (Apply)

COURSE OUTCOME 2: Apply the principles of change of position method in projections of solid problems and draw graphically

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

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

COURSE OUTCOME 3: Develop projections of sectioned solids and their developmental surface.

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

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. (A)

COURSE OUTCOME 4: Develop isometric views from orthographic projections

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. (A)

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. (A)

COURSE OUTCOME 5: Construct the perspective projections of simple solid

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

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. (APPLY)

COURSE OUTCOME 6: Students will be able to Develop Orthographic ,isometric and perspective projection and Development of surfaces using drafting software

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. (APPLY)
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. (APPLY)

21EE2511	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.	C01
2	Verification of Kirchoffs laws for DC circuits.	C01
3	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	C01
4	Fluorescent lamp wiring.	C01
5	Stair case wiring.	C01
6	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	C02
7	Measurement of energy using single phase energy meter.	C02
LIST OF EXPERIMENTS (BASIC ELECTRONICS LAB)		
8	Study of Electronic components and equipments- Resistor Color Coding	C02
9	Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.	C02
10	Study of logic gates AND, OR, EX-OR and NOT.	C03
11	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	C04
12	P-N Junction Diode Characteristics	C05
13	Measurement of ripple factor of HWR	C05
14	Input and Output Characteristics of Transistor in CB Configuration.	C05
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", Vikas Publishing 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	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							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 simulate Kirchoffs 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.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
BASIC ELECTRICAL LABORATORY		
1	Verification of ohms law.	2
2	Verification of Kirchoffs laws for DC circuits.	2
3	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	2
4	Fluorescent lamp wiring.	1
5	Stair case wiring.	1
6	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	2

7	Measurement of energy using single phase energy meter.	2
BASIC ELECTRONICS LABORATORY		
8	Study of Electronic components and equipments- Resistor Color Coding	1
9	Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO	2
10	Study of logic gates AND, OR, EX-OR and NOT.	2
11	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	2
12	P-N Junction Diode Characteristics	2
13	Measurement of ripple factor of HWR	2
14	Input and Output Characteristics of Transistor in CB Configuration.	2

21CS2312	COMPUTER HARDWARE AND SOFTWARE TOOLS LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Basic Knowledge about computer system
- Knowledge about hardware and software.

Objectives

1. Understand the basic hardware components
2. Gain knowledge about installation of operating systems
3. Understand hardware assembling and troubleshooting
4. Learn about MS Office tools.
5. Understand computer networking.

S.No	List of Experiments	CO
1	a) Study of desktop computer, motherboard and its interfacing components. b) Install and configure computer drivers and system components.	C01
2	Disk formatting, partitioning and Disk operating system commands	C01
3	a) Install, upgrade and configure Windows/Linux operating systems. b) Installation of Dual OS using Virtual Machine	C02
4	a) Installation Antivirus and configure the antivirus. b) Installation of printer and scanner software.	C02

5	a) Assembly and Disassembly of hardware. b) Troubleshooting and Managing Systems	C04
6	a) Recovering the root file system after corruption. b) Create a FAT32 formatted partition on a disk in Windows 7, and convert the partition to NTFS	C04
7	Remote desktop connections and file sharing.	C03
8	Study of basic network commands. Establish network connections, Configure IP address and Domain name system.	C03
9	a) Create an advertisement page in Word b) Create a Mail Merge Letter and a macro for inserting a picture and formatting the text in Word	C05
10	Create a report in Excel containing the pay details of the Employee	C05
11	Create a simple bar chart to high light the sales of a company for 5 different periods	C05
12	Create a macro which creates a line chart using the data in the worksheet	C05
13	a) Make a presentation and apply the following: a. Add audio and video effects b. Apply various Color Schemes c. Apply various animation schemes.	C05
14	a) Create a simple Database / Tables using MS-Access b) Mail Merge with MS – Access	C05

Total Periods : 60

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	End Semester Exams (40 Marks)

Outcomes:

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

C01 Identify the basic hardware components**C02** Install and configure Windows and Linux operating systems.**C03** Install and configure software packages and drivers**C04** Assemble and troubleshoot hardware devices**C05** Install and work with office automation software**Laboratory Requirements:**

- MS office
- System with windows

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										2			
4	3	3										2			
5	3	3									2	2			

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
<p>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.</p>		
UNIT II	UNION EXECUTIVE AND STATE EXECUTIVE	8
<p>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.</p>		
UNIT III	SCIENCE, MANAGEMENT AND INDIAN KNOWLEDGE SYSTEM	7
<p>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</p>		
UNIT IV	CULTURAL HERITAGE AND PERFORMING ARTS	7
<p>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</p>		
Total Periods		30
Suggestive Assessment Methods		
Continuous Assessment Test		End Semester Exams
(100 Marks)		
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	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 01	PS 02	PS 03
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	21MA3202	Probability and Queuing Theory	BS	4	3	1	0	4
2	21CS3601	Computer Architecture	PC	3	3	0	0	3
3	21CS3602	Data Structures	PC	3	3	0	0	3
4	21CS3603	Object Oriented Programming Systems	PC	3	3	0	0	3
5	21PT3902	Verbal Ability	EEC	1	0	0	2	1
6	21HS1103	Tamil Heritage	HSSM	1	1	0	0	1
Theory cum Practical Courses								
1	21CS3604	Software Engineering	PC	3	2	0	2	3
2	21CS3501	Digital Systems	ES	4	2	0	2	3
Practical Courses								
1	21CS3611	Data Structures Laboratory	PC	4	0	0	4	2
2	21CS3612	Object Oriented Programming Systems Laboratory	PC	4	0	0	4	2
Total				30	17	1	14	25

21MA3202	PROBABILITY AND QUEUING THEORY	L	T	P	C
		3	1	0	4

Preamble:

The course consists of topics in Random variables, Random Processes and Queuing theory with applications to various engineering problems. This course will cover the following main topics: Probability distributions, Correlation and Linear regression, Classification of random processes, Classification of Markov Process, Markovian and Non-Markovian queues.

Prerequisites for the course

Basic knowledge about measures of central tendencies and Probability

Objectives

The Course will enable learners:

- To apply the concept of random variable and various distribution
- To apply concept of two dimensional random variable
- To familiarize the knowledge concept of random process.
- To introduce the concept of queuing models.
- To improve their ability in advanced queuing models

UNIT I	RANDOM VARIABLES	9 + 3
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Discrete and Continuous random variables – Expectations – Moment generating functions – Discrete distributions - Binomial distributions and Poisson distributions- Continuous distributions - Uniform distributions and Normal distributions.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Random variables Moment generating functions, Distributions

UNIT II	TWO-DIMENSIONAL RANDOM VARIABLES	9 + 3
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Joint distributions two random variables – Marginal distributions and Conditional distributions – Covariance – Correlation and Linear regression for two dimensional random variables for statistical data- Method of Least Squares - Curve Fitting.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Distributions, Correlation , Regression

UNIT III	RANDOM PROCESSES	9 + 3
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Random Processes - Classification of random processes – Stationary process –Wide Sense Stationary process – Markov process – Classification of Markov Process – Markov Chain - Poisson process – Properties of Poisson process

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on WSS, Markov Chain, Poisson process.

UNIT IV	QUEUEING THEORY	9 + 3
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Markovian queues – Birth and Death processes – Single and multiple server queuing models with finite and infinite Capacity – Little’s formula - Queues with finite waiting rooms.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Single and multi server queuing models with finite and infinite Capacity

UNIT V	NON-MARKOVIAN QUEUES AND QUEUEING NETWORKS	9 + 3
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M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queue without blockage – Open Jackson networks

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on PK formula, Series queue without blockage

Total Periods	45+15 = 60 Periods
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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: Apply the fundamental knowledge of central tendencies in Probability and distributions which can describe real life phenomenon (Apply)
- CO2: Apply the basic concept of two dimensional random variable in engineering applications (Apply)
- CO3: Apply the concept of random process in engineering (Apply)
- CO4: Apply queuing models in real life phenomenon (Apply)
- CO5: Apply advanced queuing models in real life applications. (Apply)

Text Books

1. Ibe, O.C., –Fundamentals of Applied Probability and Random Processes & quot; Elsevier, 1st Indian Reprint, 2016. (CO1, CO2, CO3)
2. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., –Fundamentals of Queueing Theory & quot;, Wiley Student 7th Edition, 2017. (CO4,CO5)

Reference Books

1. Hwei Hsu, & quot; Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes & quot;, Tata McGraw Hill Edition, New Delhi, 2015.
2. Taha, H.A., & quot; Operations Research & quot;, 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., & quot; Probability and Statistics with Reliability, Queuing and Computer Science Applications & quot;, 2nd Edition, John Wiley and Sons, 2016.
4. Yates, R.D. and Goodman. D. J., & quot; Probability and Stochastic Processes & quot;; 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2016.
5. David.R. Anderson, Dennis. J. Sweeney Thomas A An Introduction to Management Science,2019.

Web Resources

1. Random variables -<https://youtu.be/COI0BUmNHT8> <https://youtu.be/UftY0e2ilM4>
2. <https://youtu.be/zujeSyREcQ4>
3. Two dimensional random variables - https://youtu.be/_WM8vzYSQhs
4. Random Processes - <https://youtu.be/vVEmNUOGKlQ>
5. Queuing theory - <https://youtu.be/xGkpXk-AnWU>
6. Non-markovian queues and queueing networks - <https://youtu.be/ZXVL3WjZODs>

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	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

COURSE OUTCOME 1 (CO 1) : (Apply)

- 1) A random variable 'X' has the following probability function

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

- Determine the value of 'a'
 - Find $P(X < 3)$, $P(X \geq 3)$, $P(0 < X < 5)$
 - Find the distribution function of X.
- 2) The weekly wages of 1000 workmen are normally distributed around a mean of Rs. 70 with Standard Deviation of Rs. 5. Estimate the number of workers whose weekly wages will be (i) Between Rs. 69 and 72 (ii) less than Rs. 69 (iii) more than Rs 72.

COURSE OUTCOME 2 (CO 2) : (Apply)

- 1) If the joint p.d.f of (x,y) is given by $p(x,y)=k(2x+3y)$, $x= 0,1,2$ & $y =1,2,3$. Find k and 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 $f(x,y) = \begin{cases} \frac{1}{8}(6-x-y); & 0 < x < 2, 2 < y < 4, \\ 0 & \text{else} \end{cases}$ find
(a) $P[X < 1 \cap Y < 3]$ and $P[X < 1/Y < 3]$.

COURSE OUTCOME 3 (CO 3) : (Apply)

- 1) The process $\{X(t)\}$ whose probability distribution under certain conditions is given by

$$P(X(t) = n) = \frac{(at)^{n-1}}{(1+at)^{n+1}}, n = 1, 2, 3, \dots$$

$$\frac{at}{1+at}, n = 0$$

Show that it is not stationary.

- 2) In a village road, buses cross a particular place at a Poisson rate of 4 per hour. If a boy start counting at 9 am. (i) What is the probability that his count is 1 by 9.30 am? (ii) What is the probability that his count is 3 by 11 am? (iii) What is the probability that his count is more than 5 by noon?

COURSE OUTCOME 4 (CO 4) : (Apply)

- 1) Arrivals at a telephone booth are considered to be Poisson with an average of 12 mins between one arrival & the next. The length of a phone call is assumed to be distributed exponentially with mean 4 mins .(i)Find the average number of persons waiting in the system.(ii)What is the probability that a person arriving at the booth will have to wait in the queue.(iii)What is the probability that it will take him more than 10 mins altogether to wait for the phone &complete his call.(iv)The telephone department will install a second booth, when convinced that an arrival has to wait on the average for atleast 3 mins for phone. By how much the flow of arrivals should increase in order to justify a second booth.
- 2) A petrol pump station has 4 pumps. The service times follow the exponential distribution with a mean of 6 mins. Cars arrive for service in a Poisson process at the rate of 30 cars/hour. (i)what is the probability that an arrival would have to wait in line.(ii)Find the average waiting time, average time spent in the system and the average number of cars in the system.(iii)for what % of time would a pump be idle on an average.

COURSE OUTCOME 5 (CO 5) : (Apply)

- 1) A car manufacturing plant uses one big crane for loading cars into a a truck. Cars arrive for loading by the crane according to a Poisson distribution with a mean of 5 cars/hour. Given that the service time for all cars is constant and equal to 6 mins determine sL , sW , Lq and Wq

2) In a network of 3 service stations 1,2,3 customers arrive at 1,2,3 from outside in accordance with Poisson process having rates 5,10,15 respectively. The service times at the 3 stations are exponential with respective rates 10, 50,100. A customer completing service at station 1 is equally likely to go to station 2, or go to station 3 or leave the system. A customer departing from service at station 2 always goes to station 3. A departure from service at station 3 is equally likely to go to station 2 or leave the system.

- i) What is the average number of customers in the system, consisting of all the three stations?
- ii) What is the average time a customer spends in the system?

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					
<ul style="list-style-type: none"> • Basic Computer Knowledge 					
Objectives					
<ol style="list-style-type: none"> 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
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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
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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	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. Varanescic 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.

21CS3602	DATA STRUCTURES	L	T	P	C
		3	0	0	3

Preamble

This subject includes the basic foundations of data structures and algorithms. It covers concepts of various data structures like stack, queue, list, tree and graph. Also, this course includes idea of sorting and searching.

Prerequisites for the course

- C Programming

Objectives

1. To provide the knowledge of algorithms, basic data structures, fundamental analysis and time complexity for the given problem
2. To Learn linear data structures – lists, stacks, and queues and legal operations permitted on them
3. To use stacks to evaluate prefix, infix, and postfix expression formats
4. To apply Tree and Graph structures to solve given problems
5. To develop skills to apply Searching, Sorting and Hashing Techniques in problem solving

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– Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

Suggested Activities: Solve hacker earth problem using linked list

SUGGESTED EVALUATION METHODS: Programming practices in the laboratory

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 – Priority Queue – De Queue – Applications of queues

Suggested Activities: Solve hacker earth problem using stack, queue

Suggested Evaluation Methods: Programming practices in the laboratory

UNIT III

NON LINEAR DATA STRUCTURES – TREES

9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – Splay trees - B-Tree - B+ Tree - Heap – Binary Heap – Applications of heap.

Suggested Activities: Program for storing data as tree structure and implementation of various

traversal techniques

Suggested Evaluation Methods: Programming practices in the laboratory

UNIT IV

NON LINEAR DATA STRUCTURES - GRAPHS

9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex –Minimum Spanning Trees – Kruskal and Prim algorithm – Shortest path algorithm – Dijkstra’s algorithm –Applications of graphs.

Suggested Activities: Program for storing data as graph structure and implementation of various traversal techniques

Suggested Evaluation Methods: Programming practices in the laboratory

UNIT V

SEARCHING, SORTING AND HASHING TECHNIQUES

9

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

Suggested Activities: Real world Application of searching, sorting and hashing

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
2.FORMATIVE MULTIPLE
CHOICE QUESTIONS

1.ASSIGNMENT
2. ONLINE MCQ
3.PROBLEM-SOLVING
ACTIVITIES

1.DESRIPTIVE QUESTIONS

Course Outcomes

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

CO1 Understand the concept of abstract data types, data structures such as arrays, linked list
(Understand)

CO2 Implement basic data structures such as stacks and queues (Apply)

CO3 Implement the non linear data structure Trees for efficient organization of data(Apply)

CO4 Solve real world problems involving Graph (Apply)

CO5 Apply Algorithm for solving problems like sorting, searching and hashing techniques (Apply)

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. Byron Gottfried. Programming With C. Fourth Edition, McGrawHill, 2018.
2. E. Horowitz & Sahni, Fundamental Data Structure, Galgotia Book Source, 1983.
3. A. Tannenbaum, Data Structure Using C, Pearson Education, 2003.

Web Resources

1. <https://www.geeksforgeeks.org/data-structures/>
2. <https://www.javatpoint.com/data-structure-tutorial>
3. <https://www.coursera.org/learn/data-structures>
4. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.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									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		5	5	5	10
UNDERSTAND	20	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE	40	25	5	5	20
EVALUATE		5	5	5	10
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

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

Course Outcome 1 (CO1):

1. Which asymptotic notations can be used to describe the upper bound and lower bound of algorithm's running time and define also? (Remember)
2. Describe the functional code for deleting a desired node in a singly linked list (Understand)

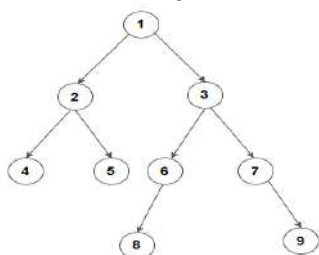
- Discuss the programming code in C language to create, insert and display the elements in a doubly linked list. (Apply)

Course Outcome 2 (CO2):

- What is the use of Recursion? (Remember)
- Write the postfix form of each of the following infix. (Understand)
 $A-B+(M/N) * (O+P)-Q/R^S*T+Z$
 $K+L-M*N+(O^P)*W/U/V*T+Q$
- Design a stack that returns minimum element in constant time (Analyze)

Course Outcome 3 (CO3):

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



- Explain the following
 - Complete Binary Tree
 - Binary Tree
 - Binary Search Tree. (Understand)
- Write an algorithm to print complete binary search tree in increasing order. (Apply)

Course Outcome 4 (CO4):

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

Course Outcome 5 (CO5):

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

21CS3603	OBJECT ORIENTED PROGRAMMING SYSTEMS	L	T	P	C
		3	0	0	3
Preamble					
This course provides the main features of Object Oriented Programming System. It focuses on the basic concepts of Java. Object-oriented programming aims to implement real-world entities like inheritance, hiding, polymorphism, etc in programming. The main aim of OOP is to bind together the data and the functions that operate on them so that no other part of the code can access this data except that function.					
Prerequisites for the course					
<ul style="list-style-type: none"> C Programming 					
Objectives					

1. To understand Object Oriented Programming and Java concepts.
2. To know the principles of inheritance and interfaces.
3. To define I/O streams and exception handling.
4. To develop a package, multithreading and generic programming applications.
5. To design and build simple Graphical User Interfaces

UNIT I

INTRODUCTION

9

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- Characteristics of Java – The Java Environment. Fundamental Programming Structures in Java – Data Types, Variables, Operators, Control Flow, Looping, Arrays, ArrayList, Strings - methods -access specifiers - constructors.

Suggested Activities:

- Implementation of simple Java programs Using Java Basic Constructs and Arrays using any standard IDE like NETBEANS / ECLIPSE
- Understanding JVM

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT II

INHERITANCE AND INTERFACES

9

Inheritance – abstract classes and methods- final methods and classes – Interfaces, differences between classes and interfaces and extending interfaces - Object cloning -inner classes.

Suggested Activities:

- Implementation of java programs – use inheritance, abstract classes, interfaces and inner classes.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT III

I/O AND EXCEPTION HANDLING

9

Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files. Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions.

Suggested Activities:

- Write java programs using Byte streams and Character streams.
- Write java programs with appropriate Exception handling.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT IV

PACKAGES, MULTITHREADING AND GENERIC PROGRAMMING

9

Packages - Importing Packages, Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication. Generic Programming – Generic classes –generic methods.

Suggested Activities:

- Implement multithreading and generic programming.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT V**APPLETS, EVENT HANDLING AND AWT****9**

Applet Basics - Applet Architecture - Applet Class and Methods – Passing parameters to Applets - Event Handling - Delegation Event Model - Event Classes - Event Listener Interfaces –Adapter Classes- AWT Classes- Working with Windows, Colors and Fonts – Layout Managers – Swing Components and Classes.

Suggested Activities:

- Develop a GUI application with appropriate event handling.

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)
DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ 3.CODING CHALLENGES	DESCRIPTIVE QUESTIONS

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

CO1 Develop Java programs using OOP principles. (Understand, Apply)

CO2 Develop Java programs with the concept's inheritance and interfaces. (Understand, Apply)

CO3 Build Java applications using I/O streams and exception handling. (Understand, Apply)

CO4 Develop Java applications with packages, multithreading and generic programming. (Apply)

CO5 Develop interactive Java programs using applet and swing. (Apply)

Text Books

1. Herbert Schildt, "Java: The Complete Reference", 10th edition, McGraw Hill Education, 2017, ISBN-10: 1259589331. (Units-1,2,3,4,5)

Reference Books

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015. (Units-1,2,3,4,5)
2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 11th Edition, Prentice Hall, 2019. (Units-1,2,3,4,5)

Web Resources

1. https://onlinecourses.nptel.ac.in/noc21_cs56

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
1	3	3	3		2							2	2		
2	3	3	3		2							2	2		
3	3	3	3		2							2	2		

4	3	3	3		2							2	2		
5	3	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			10
UNDERSTAND	40	20			20
APPLY	40	50	10	10	50
ANALYZE		20			20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Develop Java programs using OOP principles (Understand, Apply)

1. Describe the various features of the Object-Oriented Programming Language. (Understand)
2. Develop a Java application to generate student class to calculate the student performance based on the following criteria: Above 75 percentage as Distinction, 60 to 74 percentage as First Class and Below 60 percentage as Second class. (Apply)
3. Write a Java program to sort set of names stored in an array in alphabetical order. (Apply)

Course Outcome 2 (CO2): Develop Java programs with the concept's inheritance and interfaces (Understand, Apply)

1. Illustrate with suitable examples the various types of inheritance. (Understand)
2. Develop a java application for the salary calculation of the employee where employee class contains the following attributes name, id, Address, Mailid and Mobile no as members. Inherit the salary class from the employee class to calculate the salary of the employees with 20% of BP as DA, 10 % of BP as HRA, 9% of BP as PF. Generate pay slips for the employees with their gross and net salary. (Apply)
3. Design a Java interface for ADT Stack. Implement this interface using array. (Apply)

Course Outcome 3 (CO3): Build Java applications using I/O streams and exception handling (Understand, Apply)

1. Discuss in detail about I/O Streams. (Understand)
2. Write a Java program to implement user defined exception handling. (Apply)
3. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes. (Apply)

Course Outcome 4 (CO4): Develop Java applications with packages, multithreading and generic programming. (Apply)

1. Develop a java application to implement arithmetic calculator to perform addition, subtraction, multiplication and division using packages. (Apply)
2. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.(Apply)
3. Write a java program to find the minimum value from the given type of elements using a generic function (Apply)

Course Outcome 5 (C05): Develop interactive Java programs using applet and swing. (Apply)

1. Design a Scientific calculator using event-driven programming paradigm of Java. (Apply)
2. Develop a billing system for a restaurant using java Swing. (Apply)
3. Draw a smiley using java Applet. (Apply)

21PT3902	VERBAL ABILITY	L	T	P	C
		0	0	2	1
Preamble					
This 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					
<ul style="list-style-type: none"> • Foundational English 					
Objectives					
<ol style="list-style-type: none"> 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:					
<ul style="list-style-type: none"> • 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:		
<p>CO1: Identify the grammatical errors in a sentence.</p> <p>CO2: Frame sentences using the correct syntax.</p> <p>CO3: Understand the concepts stated in a sentence or paragraph and analyze using verbal reasoning.</p> <p>CO4: Construct sentences logically and make the texts semantically meaningful as a whole.</p> <p>CO5: Interpret and analyze texts on a deeper level.</p>		
Text Books		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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

21CS3604	SOFTWARE ENGINEERING	L	T	P	C
		2	0	2	3

Preamble

This course will emphasize on the software process and development methodologies, systematic application of scientific and technological knowledge, methods, and experience to the design, implementation testing, and documentation of software.

Prerequisites for the course

- C Programming
- Python Programming

Objectives

- To explore the fundamental concepts of software engineering
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design and testing methodologies
- To learn the software project management principles
- To learn the software quality management principles

UNIT I	SOFTWARE PROCESS AND DEVELOPMENT METHODOLOGY	6
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The Nature of Software-Software Process Models-Waterfall Model-Incremental Process Models - Evolutionary Process Models- Prototyping-Spiral Model-Concurrent Model –Introduction to Agility-Agile Process.

SUGGESTED ACTIVITIES:

- Activity of identifying Application Specific Product or Process View with appropriate models.
- Activity of creating their own application with appropriate model.

SUGGESTED EVALUATION METHODS:

- Assessments with MCQ
- Assignment: Selection of suitable software process model for a given software specification

UNIT II	REQUIREMENTS ENGINEERING	6
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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.

SUGGESTED ACTIVITIES:

- Activity of Using Open source tool like “aNimble” for Requirement Engineering to understand the requirement traceability and interdependency among the features and functionalities in any software project.

SUGGESTED EVALUATION METHODS:

- Assignment on requirements categorization (functional, non-functional) in a software project
- Assignment on requirements categorization (Requirement collection, considering, contradicting, Omission, commission of requirements)in a software project

UNIT III	DESIGN CONCEPTS AND TESTING	6
The Design Concepts - The Design Model - Requirements Modelling - Software Testing Fundamentals – Black Box Testing - White Box Testing - Unit Testing - Integration Testing- Debugging –Software Implementation Techniques: Coding practices-Refactoring		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Encourage the students to use Open Source tools like “Argo UML, Power Designer” for Data Modeling of any ample application. • Activity of Determine valid interfaces for all testing and design necessary stub and driver modules • Activity of getting the ideas of testing a simple online application on selected test cases 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment: Designing use case diagram and activity diagram to analyze the requirements obtained from the customer and segregate them as use cases and determine the possible set of activities from the end user. • Assignment on obtaining a mind-map on testing strategies 		
UNIT IV	SOFTWARE PROJECT MANAGEMENT	6
Team management – Team processes, Team organization and decision -making, Roles and responsibilities in a software team, Project planning and scheduling; Software measurement and estimation techniques; Risk analysis and management; Software quality assurance.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Creating team and working with simple projects • Assessing Software Risk , software quality 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Team projects can be given as demo • Identification of potential risks for software project during development/ maintenance and tabulate. 		
UNIT V	SOFTWARE QUALITY PROCESS IMPROVEMENT	6
Overview of Quality management and Process Improvement; Overview of SEI -CMM, ISO 9000, CMMI, PCMM, TQM and Six Sigma; overview of CASE tools. Software tools and environments: Project management tools; Requirement’s analysis and design modelling tools; testing tools; Configuration management tools; DevOps.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Need for organization wide standards adoption. • Learning software tools. 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Recalling the Key Performance Areas to be adhered for each level in CMM, Six Sigma. • Working with CASE Tools for any application. 		

- Assignment on selection of appropriate standards for each phase in software development.

Total Periods	45
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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	DESCRIPTIVE QUESTIONS

Course Outcomes

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

- CO1: Understand the basic concepts of different software process models.
- CO2: Analyze the Concepts of requirements engineering.
- CO3: Apply systematic procedure for software design and various testing
- CO4: Manage project schedule, estimate project cost and effort required.
- CO5: Manage the quality of the software

Text Books

2. Pressman R S, Bruce R.Maxim, Software Engineering - A Practitioner's Approach. Eighth Edition, McGraw-Hill Education, 2019.
3. Gene Kim, Jez Humble, Patrick Debois and John willis, "The Devops Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", IT Revolution Press, 2016

Reference Books

1. Ian Sommerville, "Software engineering", Pearson Education Asia, Tenth Edition, 2017.
2. Rajib Mall, –Fundamentals of Software Engineering, Fourth Edition, PHI Learning Private Limited, 2014.
3. Pankaj Jalote, –Software Engineering, A Precise Approach||, Wiley India, 2010.
4. Stephen R.Schach, –Software Engineering, Tata McGraw-Hill Publishing Company Limited, 8th Edition, 2020.
5. Crowder JA, Friess S. Agile project management: managing for success. Cham: Springer International Publishing; 2015.
6. Stellman A, Greene J. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc."; 2015.
7. Gregory J, Crispin L. More agile testing: learning journeys for the whole team. Addison-Wesley Professional; 2015.

Web Resources

- www.mhhe.com/pressman
- <https://www.geeksforgeeks.org/software-engineering/>
- <https://nptel.ac.in/courses/106/105/106105182/>

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	2	2	2				2		2	3	
2	2	3	3	2	3	2							2	3	
3	2	2	2	2	2	2	2		2		1	1	2	3	
4	2	2	3	2	2		2		2		2		2	3	
5	2	2	2	2	2	2	2		2		1	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: Students will be able to Predict the suitable method for...(Apply)

Course Outcome 1 (CO1):

- Describe the various Evolutionary Process Models with neat diagram. (Understand)
- Explain the spiral model? What is the task region in the spiral model? How does the customer wins by getting the system or product that satisfy the majority of the customer's needs and the developer wins by working to realistic and achievable budgets and deadline? (Analyze)
- What is a process model? Describe the process model that you would choose to manufacture a car and provide suitable reasons for choosing the model. (Analyze)

Course Outcome 2 (CO2):

- Classify the following as functional /non-functional requirements for a banking system
 - Verifying bank balance
 - Withdrawing money from bank
 - Completion of transactions in less than one second.
 - Extending the system by providing more tellers for the customers (Apply)

2. Explain how to manage changing requirements during the requirements elicitation process? (Understand)

3. Explain, how the requirements are validated? (Understand)

Course Outcome 3 (CO3):

1. What are the testing principles the software engineer must apply while performing the software testing? (Understand)

2. Explain how to broaden testing coverage and improve the quality of white box-testing. (Understand)

3. Consider the pseudo code for simple subtraction given below: (Apply)

(1) program 'simple subtraction'

(2) input (x,y)

(3) output (x)

(4) output (y)

(5) if $x > y$ then DO

(6) $x - y = z$

(7) else $y - x = z$

(8) endif

(9) output (z)

(10) output "end program"

Perform basis path testing and generate test cases

Course Outcome 4 (CO4):

1. Analyse how the software risks are assessed. (Analyse)

2. Discuss in detail the project structure and programming team structure of a software organization. (Understand)

3. Elaborate on the series of tasks of a Risk Analysis and management process. (Understand)

Course Outcome 5 (CO5):

1. How does ISO 9000 define quality? (Analyse)

2. How do you calculate Six Sigma? (Understand)

3. What is DevOps and what are the technologies? (Understand)

List of experiments

S.NO	NAME OF EXPERIMENTS	CO
Do the following exercises for any two applications given in the list of sample applications or any other applications:		
1	Program Analysis and Project Planning. Thorough study of the problem – Identify project scope, Objectives, Infrastructure.	C01
2	Software requirement Analysis Describe the individual Phases / Modules of the project, Identify deliverables.	C02
3	Data Modeling Use work products – Data dictionary, Use diagrams and activity diagrams, build and test class diagrams, Sequence diagrams and add interface to class diagrams.	C05
4	Software Development and Debugging Software Testing Prepare test plan, perform validation testing, Coverage analysis, memory leaks, develop test case hierarchy, Site check and Site monitor.	C03

Suggested List of Applications

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system
11. Railway reservation System
12. Hospital management system

21CS3501	DIGITAL SYSTEMS	L	T	P	C
		2	0	2	3
Preamble for the course					
This Course mainly deals about the different methods to simplify boolean algebra and the number systems conversion. This is mainly focusing on arithmetic and combinational logic circuits, Synchronous and asynchronous sequential logic circuits, Memory and programmable logic.					
Prerequisites for the course					
<ul style="list-style-type: none"> HSC Mathematics and Physics 					
Objectives					
<ol style="list-style-type: none"> To introduce different methods to simplify Boolean function and realize the logic circuits To acquire knowledge for the design of the combinational circuit and simulation using HDL To analyze and design synchronous sequential circuits To get exposure of asynchronous sequential circuits. To understand the principles of memory and programmable logic circuits 					
UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	6			
Number Systems: Decimal, Binary, 2s Complements - Boolean Algebra -Theorems and Properties of Boolean Algebra - Min Term and Max Term – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.					
Suggested Activities:					
<ol style="list-style-type: none"> Implement one's complement Using Multisim Emulator. Implement NAND gate Using Multisim Emulator. 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> Assignment problems Quizzes 					
UNIT II	ARITHMETIC AND COMBINATIONAL LOGIC	6			
Combinational Circuits: Analysis and Design Procedures – Half Adder – Full Adder – Half Subtractor – Full Subtractor – Four Bit Adder – Decoders – Encoders – Multiplexers – Demultiplexers.					
Suggested Activities:					
<ol style="list-style-type: none"> Implement Half Adder Using Multisim Emulator. Implement Half Subtractor Using Multisim Emulator. 					
SUGGESTED EVALUATION METHODS:					

- Assignment problems
- Quizzes

UNIT III
SYNCHRONOUS SEQUENTIAL LOGIC
6

Sequential Circuits : Flip-Flops : SR, JK, T,D – State Reduction and Assignment –Registers : Serial In - Serial Out, Parallel In – Parallel Out, Serial In – Parallel Out, Parallel In – Serial Out, Counters : Ripple Counter, Ring Counter, Up and Down Counter.

Suggested Activities:

1. Implement S-R Flip-flop Using Multisim Emulator.
2. Implement Ripple Counter Using Multisim Emulator.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT IV
ASYNCHRONOUS SEQUENTIAL LOGIC
6

Design Procedure, Stable and Unstable State, Cycle and Races, Race Free Assignment, State Reduction, Hazards, Essential Hazards, Pulse Mode Sequential Circuits

Suggested Activities:

1. Implement Pulse Mode Sequential Circuit Using Multisim Emulator.
2. Implement any one sequential circuit Using Multisim Emulator.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT V
MEMORY AND PROGRAMMABLE LOGIC
6

Classification of memories - ROM- PROM – EPROM – EEPROM, RAM – SRAM – DRAM – Programmable Logic Devices: PLA, PAL - Implementation of combinational logic circuits using ROM, PLA, PAL

Suggested Activities:

1. Store 16 bit addition program in your own specified location (Starting Address 1000 Use 16 bit Emulator.)
2. Retrieve Input data stored from memory location 1000 and Execute 16 bit subtraction and store the result in the RAM location 1200 using any 16 bit Emulator.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

S.No	List of Experiments	CO
1.	Verification of Boolean Theorems using basic gates.	CO1
2.	Design and implement Half/Full Adder and Subtractor.	CO2
3.	Coding combinational circuits using HDL.	CO2
4.	Design and implement shift-registers.	CO3
5.	Design and implement synchronous counters.	CO3
6.	Design and implement asynchronous counters.	CO4
7.	Coding sequential circuits using HDL	CO3
8.	Design and implement combinational circuits using MSI devices: a.) Magnitude Comparator b.) Application using multiplexers	CO5
9.	Design and implementation of a simple digital system (Mini Project).	CO5
	Total Periods	30 Theory +30 Lab

Laboratory Requirements

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Lab Components Assessments (30 Marks)	End Semester Exams (50 Marks)
1. DESCRIPTIVE QUESTIONS	1. CONDUCT OF EXPERIMENTS (20) 2. MODEL EXAM (10)	1. DESCRIPTIVE QUESTIONS

Course Outcomes

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

- CO1 Use Boolean simplification techniques to design a combinational hardware circuit. (Apply)
- CO2 Design and Implement of combinational circuits. (Apply)
- CO3 Design and Implement of sequential circuits. (Apply)
- CO4 Construct asynchronous sequential circuits. (Apply)
- CO5 Knowledge about memory concepts. (Apply)

Text Books

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", 6th Edition, Pearson Education, 2017.
2. S.Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 5th Edition, Oxford University Press, 2018

Reference Books

1. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
2. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013

3. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
Donald D.Givone, "Digital Principles and Design", Tata McGraw-Hill, 2017.

Web Resources

1. <https://www.oreilly.com/library/view/fundamentals-Of-digital/9781118969304/9781118969304c01.xhtml>
2. <https://www.quora.com/What-is-digital-system>
3. https://en.wikipedia.org/wiki/Digital_Systems
4. https://www.nyu.edu/classes/bello/FMT_files/7_digital.pdf
5. <https://nptel.ac.in/courses/117/105/117105080/>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
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	Average Marks of Experiment	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 OUTCOME 1: Students will be able to Predict the suitable method for...(Apply)

Course Outcome 1 (CO1):

1. Apply DeMorgan's theorem.

$[(x+y)' + (x+y)']' = x+y$ (Apply)

2. What is meant by self-Complementing Code and convert $(0.6875)_{10}$ to Binary. (Remember)

3. Develop XOR gate using only 4 NAND gates. (Create)

Course Outcome 2 (CO2):

1. Deduce the Truth table for full sub tractor. (Evaluate)
2. Differentiate Demux and Decoder. (Analyse)
3. Develop a full adder with 4 X1 MUX. (Create)

Course Outcome 3 (CO3):

1. What is the operation of JK Flip flop and write down its Characteristic equation. (Remember)
2. Difference between Moore and Mealy state machines. (Analyse)
3. How many Flip Flops are required to build a binary counter that counts from 0 to 1023. (Analyse)

Course Outcome 4 (CO4):

1. Compare critical race and non-critical race (Evaluate)
2. What happens when a hazard happens in a logical circuit? (Remember)
3. Discuss in detail the procedure for reducing the flow table with an example. (Understand)

Course Outcome 5 (CO5):

1. Differentiate EPROM and EEPROM (Analyse)
2. Mention few applications of PLA and PAL. (Understand)
3. Compare SRAM and DRAM. (Analyse)

21CS3611	Data Structures Laboratory	L	T	P	C
		0	0	4	2

Preamble:

- Data Structure provides an efficient way of storing and organising data in the computer so that it can be used efficiently.
- Data Structures are widely used in almost every aspect of Computer Science
- Data Structures enable the programmers to handle the data in an efficient way
- It plays a vital role in enhancing the performance of a software or a program as the main function of the software is to store and retrieve the user's data as fast as possible

Prerequisites for the course

- 21CS1501 – Problem Solving and Logical Thinking using C
- 21CS1511 – Programming Practice Laboratory using C

Objectives

1. To gadget linear and non-linear data structures
2. To figure out the different operations of search trees
3. To enforce graph traversal algorithms
4. To get enlightened to sorting and searching algorithms

S.No	List of Experiments	CO
1	Implementation of Singly Linked Lists.	CO1

2	Implementation of Doubly Linked Lists.	C01
3	Implementation of Stack.	C02
4	Implementation of Evaluation of postfix expression.	C03
5	Implementation of queue.	C04
6	Implementation of Binary Search Tree and Tree Traversal	C04
7	Implementation of AVL Tree.	C04
8	Implementation of Graph Traversals.	C02
9	Implementation of searching.	C05
10	Implementation of sorting algorithms.	C05
11	Implementation of shortest path algorithm.	C04

S.No.	List of Projects	Related Experiment	CO
1.	Student Record Maintenance	EXP 2	C01
2.	Library Management System	EXP1,2	C01
3.	Phone Book	EXP 2	C01
4.	Pac-Man Game	EXP 1	C01
5.	Suduko	EXP 3	C02
6.	Movie Ticket Booking	EXP 4	C03
7.	Bus Reservation System	EXP 4	C03
8.	Dictionary	EXP 5,6	C04
9.	Travel Planner	EXP 7	C04
10.	Snakes And Ladders Game	EXP 7	C04
11.	Travelling Salesman	EXP 11	C04
12.	Voting System	EXP 9	C05
13.	Tic-Tac-Toe	EXP 7	C05
14.	Chess Game	EXP 7	C05

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	End Semester Exams (40 Marks)
Model Exam Mini Project	End semester Practical Examination

Outcomes

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

C01	Apply list data structures to solve problems.
C02	Apply stack data structures to solve problems.
C03	Apply queue data structures to solve problems.

CO4	Apply tree and graph data structures to solve problems.
CO5	Apply sorting and searching algorithms to solve problems.
Laboratory Requirements	
<ul style="list-style-type: none"> • C compiler • System with windows 	
Reference Books	
<ol style="list-style-type: none"> 1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2003. 2. Reema Thareja , "Data Structures Using C", Second Edition, Oxford University Press, 2014. 3. Sahni, Sartaj., Anderson-Freed, Susan., Horowitz, Ellis. Fundamentals of data structures in C. United States: Silicon Press, 2007. 	
Web Resources	
<ol style="list-style-type: none"> 1. Data Structures Using C - https://nptel.ac.in/courses/106102064 2. Data Structures- https://www.digimat.in/nptel/courses/video/106105171/L01.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	3	3											3		
3	3	3											3		
4	3	3	3										3		
5	3	3											3		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z^4yz^5 + 3x^3yz + 2xy^5z - 2xyz^3$ b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations

COURSE OUTCOME 2: Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks

COURSE OUTCOME 3: Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion and Deletion at End of SLL d. Perform Insertion and Deletion at Front of SLL e. Demonstrate how this SLL can be used as STACK and QUEUE f. Exit

COURSE OUTCOME 4: Design, Develop and Implement a Program in C for the following Operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using BFS method c. Check whether a given graph is connected or not using DFS method.

COURSE OUTCOME 5: Implement the binary search using recursion without the slice operator. Recall that you will need to pass the list along with the starting and ending index values for the sublist. Generate a random, ordered list of integers and do a benchmark analysis.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED FOR EXERCISES	NO OF HOURS REQUIRED FOR PROJECT
1	Implementation of Singly Linked Lists.	2	1
2	Implementation of Doubly Linked Lists.	2	1
3	Implementation of Stack.	2	1
4	Implementation of Evaluation of postfix expression.	2	1
5	Implementation of queue.	2	1
6	Implementation of Binary Search Tree and Tree Traversal	2	1
7	Implementation of AVL Tree.	2	1
8	Implementation of Graph Traversals.	2	1
9	Implementation of searching.	2	1
10	Implementation of sorting algorithms.		
11	Implementation of shortest path algorithm.	2	1
12	Project Implementation & Integration	0	15
Total		20	25
Total Hours Required		45	

21CS3612	OBJECT ORIENTED PROGRAMMING SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- 21CS1511 – Programming Practice Laboratory using C
- 21CS2501 – Introduction to Computing using Python

Objectives

1. To build java programming skills for real-world applications.
2. To understand and develop java packages.
3. To understand and apply the principles of inheritance, interface and abstract class in java applications.
4. To apply the concepts of ArrayList, abstract class, file processing, exception handling, multi-threading and generic programming.
5. To develop java applications using event handling

S.No	List of Experiments	CO
1	Program to implement Classes, Constructors, Overloading and Access Control	CO1
2	Programs to implement Inheritance.	CO2
3	Program using Interfaces and Abstract Classes	CO2
4	Program to implement String Operations	CO3
5	Program using ArrayList	CO3
6	Program using File Concepts.	CO3
7	Program to implement Exception Concepts	CO3
8	Program using Packages	CO4
9	Program using Threads	CO4
10	Program using Generics	CO4
11	Program using event-driven programming paradigm	CO5

S.No.	List of Projects	Related Experiment	CO
15.	Currency Conversion system	EXP 1,2,7,11	CO1- CO5
16.	ATM System	EXP1,2,8,9,11	CO1-

			CO5
17.	Airline Reservation System	EXP 1,2,3,6,7,8,9,11	CO1- CO5
18.	Library Management System	EXP 1,2,3,4,5,6,7,8,9,11	CO1- CO5
19.	Restaurant Billing System	EXP 1,2,3,4,6,7,8,9,11	CO1- CO5
20.	Inventory System	EXP 1,2,3,4,5,6,7,8,9,11	CO1- CO5
21.	College management system	EXP 1,2,3,4,6,7,8,9,11	CO1- CO5
22.	Number Guessing Game	EXP 1,2,3,6,7,8,9,10,11	CO1- CO5
23.	Electricity billing system	EXP 1,2,3,6,7,8,9,11	CO1- CO5
24.	Healthcare management System	EXP 1,2,3,4,5,6,7,8,9,11	CO1- CO5
25.	Blood Donation System	EXP 1,2,3,6,7,8,9,11	CO1- CO5
26.	Quiz Application	EXP 1,2,3,4,6,7,8,9,11	CO1- CO5
27.	Stock management system	EXP 1,2,3,4,5,6,7,8,9,11	CO1- CO5
28.	Payroll Management System	EXP 1,2,3,6,7,8,9,11	CO1- CO5
29.	Exam Seating Arrangement System	EXP 1,2,3,6,7,8,9,11	CO1- CO5

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	End Semester Exams (40 Marks)
60	40

Outcomes

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

C01	Develop and implement Java programs for real-world applications using classes , objects and methods.
C02	Understand and apply the principles of inheritance, interface and abstract class in java applications
C03	Implement the concepts of Strings, Array List, file processing, and exception handling.
C04	Develop and implement packages ,thread concepts and generic programming in java

	applications
CO5	Develop Applications using Event-driven programming paradigm.

Laboratory Requirements

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH:

HARDWARE:

Intel Desktop Systems: 36 nos

Printers: 02

SOFTWARE:

Microsoft Windows 10

Net Beans 8.0.2, JDK 7.0.

Reference Books

1. Herbert Schildt, "Java: The Complete Reference", 10th edition, McGraw Hill Education, 2017, ISBN-10: 1259589331.
2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 11th Edition, Prentice Hall, 2019.

Web Recourses

1. <https://searcharchitecture.techtarget.com/definition/object-oriented-programming-OOP>
2. https://en.wikipedia.org/wiki/Object-oriented_programming
3. <https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/>
4. https://www.webopedia.com/TERM/O/object_oriented_programming_OOP.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	2					2	1	1		1	3	3	2
2	3	2	2					2	1	1		1	3	3	2
3	3	2	2					2	1	1		1	3	3	2
4	3	2	2					2	1	1		1	3	3	2
5	3	2	2					2	1	1		1	3	3	2

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Develop and implement Java programs for real-world applications using classes, objects and methods.

- Write a program to define a class for the student result processing system.

COURSE OUTCOME 2: Understand and apply the principles of inheritance, interface and abstract class in java applications.

- Develop a java application for the salary calculation of the employee where employee class contains the following attributes name, id, Address, Mail id and Mobile no as members. Inherit the salary class from the employee class to calculate the salary of the employees with 20% of BP as DA, 10 % of BP as HRA, 9% of BP as PF. Generate pay slips for the employees with their gross and net salary
- Design a Java interface for ADT Stack. Implement this interface using array
- Write a Java Program to create a class named StudentInfo with the following data members (i)name (ii)address (iii) branch (iv)department Method: (i)display() to show the student details Derive a subclass from the super class and name it StudentRegular.Further,extend this class and create another class StudentETC that will inherit the methods and variables of class StudentInfo and having the following data Members (i)marks (ii)attendance Method:display() to show marks and attendance along with other details.

COURSE OUTCOME 3: Implement the concepts of Array List, file processing, and exception handling.

- Write a program to perform string operations using ArrayList. Write functions for the following a. Append - add at end b. Insert – add at particular index c. Search d. List all string starts with given letter.
- Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
- Write a Java program to implement user defined exception handling.

COURSE OUTCOME 4: Develop and implement packages,thread concepts and generic programming in java applications.

- Develop a java application to implement arithmetic calculator to perform addition, subtraction, multiplication and division using packages.
- Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
- Write a java program to find the minimum value from the given type of elements using a generic function.

COURSE OUTCOME 5: Develop Applications using Event-driven programming paradigm.

- Design a Scientific calculator using event-driven programming paradigm of Java.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF WEEKS REQUIRED
1	Program to implement Classes, Constructors, Overloading and Access Control	1 st week
2	Programs to implement Inheritance.	1 st week
3	Program using Interfaces and Abstract Classes	2 nd week
4	Program to implement String Operations	2 nd week
5	Program using ArrayList	3 rd week
6	Program using File Concepts.	3 rd week
7	Program to implement Exception Concepts	4 th week
8	Program using Packages	4 th week
9	Program using Threads	5 th week
10	Program using Generics	5 th week
11	Program using event-driven programming paradigm	6 th week

21HS1103	TAMIL HERITAGE	L	T	P	C
		2	0	0	1
<p>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.</p>					
<p>Prerequisites for the course: The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.</p>					
UNIT I	LANGUAGE AND LITERATURE	6			
<p>Language Families in India-Draavidian 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.</p>					
UNIT II	HERITAGE-ROCK ART PAINTINGS TO MODERN ART-SCULPTURE	6			
<p>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.</p>					
UNIT III	FOLK AND MARTIAL ARTS	6			
<p>Therukoothu, Karakattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance-Sports and Games of Tamils.</p>					
UNIT IV	THINAI CONCEPT OF TAMILS	6			
<p>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.</p>					
UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	6			
<p>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.</p>					
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 திருவள்ளூர் 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, ஓயிலாட்டம், 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 அச்ச வரலாறு					
Total Periods				30	

எதிர்பார்க்கும் படிப்பின் முடிவுகள்

C01	மாணவர்கள் தமிழ் மொழி மற்றும் இலக்கியத்தின் தன்மைகள் குறித்து அறிந்து கொள்வார்.
C02	தமிழ் மரபு சார்ந்த நுண்கலைகளையும் அதன் நுட்பங்களையும் புரிந்து கொள்வார்.

C03	நிகழ்த்து கலைகளின் வகைகளையும் அதன் பண்பாட்டுச் சூழலையும் அறிந்து கொள்வர்.
C04	பழந்தமிழரின் வாழ்க்கைச் சூழல்களை அறிந்து கொள்வர்.
C05	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	21CS4601	Database Management Systems	PC	3	3	0	0	3
4	21CS4602	Design and Analysis of Algorithms	PC	3	3	0	0	3
5	21CS4603	Microprocessors and Microcontrollers	PC	3	3	0	0	3
6	21GE2M02	Environmental and Sustainable Engineering	MC	2	2	0	0	0
7	21CS4901	Technical Seminar and Comprehensive Test - I	EEC	2	0	0	2	1
8	21PT3901	Soft skills –Aptitude I	EEC	1	1	0	0	1
9	21HS2103	Technology in Tamil Culture	HSSM	1	1	0	0	1
Theory cum Practical Courses								
1	21CS4604	Operating System Concepts	PC	4	2	0	2	3
Practical Courses								
1	21CS4611	Database Management Systems Laboratory	PC	4	0	0	4	2
Total				30	21	1	8	24

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
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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
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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
<ol style="list-style-type: none"> 1. Understanding harmony in the Family- the basic unit of human interaction 2. Understanding values in human-human relationship; meaning of <i>Nyaya</i> (justice) and program for its fulfillment to ensure <i>Ubhay-tripti</i> (mutual happiness) 3. Trust (<i>Vishwas</i>) and Respect (<i>Samman</i>) as the foundational values of relationship 4. Understanding the meaning of <i>Vishwas</i>; Difference between intention and competence 5. Understanding the meaning of <i>Samman</i> (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): <i>Samadhan, Samridhi, Abhay, Sah-astitva</i> (Resolution, Prosperity, fearlessness, co-existence) as comprehensive Human Goals 		
<p>Suggested Activities:</p> <p>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.</p>		
MODULE 4	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	9
<ol style="list-style-type: none"> 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 (<i>Sah-astitva</i>) of mutually interacting units in all-pervasive space 4. Holistic perception of harmony at all levels of existence 		
<p>Suggested Activities:</p> <p>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.</p>		
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
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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 O3
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			

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 fulfilment of comprehensive human goals.
- 10) What is the comprehensive human goal? Explain how this is conducive to sustainable happiness and prosperity for all.

COURSE OUTCOME 4(CO4): Understanding Harmony in the Nature and Existence-Whole existence as Coexistence

- 1) What is sanskaar? Explain its effects or the conformance of the human order.
- 2) Explain the harmony in nature.
- 3) Define harmony in nature and how you will create it. Explain with examples.
- 4) What are the four orders of nature? Briefly explain them.
- 5) Present the difference and similarity between a human being and an animal. Give examples to support your answer.
- 6) "Other than human order, the three orders are mutually fulfilling to each other". Explain with examples.
- 7) 'Existence is coexistence'. Give your opinion.
- 8) How is the activity in human order different from that of animal and plant order?
- 9) Explain the concept of holistic perception of harmony in existence.
- 10) Explain how there is recyclability and self regulation in nature.

COURSE OUTCOME 5(CO5):Implications of the above Holistic Understanding of Harmony on Professional Ethics.

- 1) How does right understanding provide the basis for ethical human conduct? Give two examples.
- 2) What is ethical human conduct? Explain in terms of values, policies and character with appropriate examples.
- 3) What do you understand about the definitiveness of ethical human conduct? Why is this definitiveness desirable?
- 4) Describe briefly the criteria for evaluation of holistic technology. Support your answer with an example.
- 5) Give a critical review of the current management models in the profession.
- 6) Elaborate on the meaning of swatwa (innateness), swatantrata (self organization) and swarajya(self expression). How are they related?
- 7) What do you mean by professional ethics?
- 8) What do you understand by competence in professional ethics? Give two examples of its implications in industry.
- 9) What are the implications of value based living at all four levels of living? Explain.
- 10) What is utility value and artistic value? How are both important in human life? Explain with example.

21MA4201	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

Preamble:

This is an introductory course in discrete mathematics. The goal of this course is to introduce students to ideas and techniques from discrete mathematics that are widely used in science and engineering. This course teaches the students techniques in how to think logically and mathematically and apply these techniques in solving problems. To achieve this goal, students will learn logic and proof, sets, functions, as well as algorithms and mathematical reasoning. Key topics involving relations, graphs, trees, and computability are covered in this course.

Prerequisites for the course:

Basic knowledge in set theory and venn-diagram.

Objectives

The Course will enable learners:

1. To extend student's logical and mathematical maturity and ability to deal with abstraction
2. To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems
3. To understand the basic concepts of graph theory
4. To familiarize the applications of algebraic structures
5. To understand the concepts and significance of lattices and Boolean algebra which are

widely used in computer science and engineering		
UNIT I	LOGICS	9 + 3
Propositional logic – Truth table – laws of logic- logical connectives - Tautological implications - logical equivalence - Propositional equivalences - Predicates and quantifiers – Rules of inference – Direct and Indirect Proof method		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> Tutorial Problems on logical equivalence, Predicates, quantifiers, Inferences. 		
UNIT II	COMBINATORICS	9 + 3
Mathematical induction – Counting principle – Permutation and Combinations - Strong induction and well ordering principle - The basics of counting – The pigeonhole principle – Inclusion and exclusion principle and its applications.		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> Tutorial Problems on basics of counting and pigeonhole principle, Inclusion and exclusion. 		
UNIT III	GRAPHS	9 + 3
Graphs - Basic definitions of graph – Graph models – Graph terminology and special types of graphs – Hand shaking theorem - Matrix representation of graphs – Adjacency matrix and Incidence matrix - graph isomorphism		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> Tutorial Problems on Matrix representation of graphs, Graph isomorphism 		
UNIT IV	ALGEBRAIC STRUCTURES	9 + 3
Algebraic systems – Definition Semi groups and monoids – Definition of Sub-Semi groups and sub-monoids - Groups – Properties of Groups - Subgroups – Left and Right Cosets – Lagrange’s theorem		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> Tutorial Problems on Groups , sub groups, cosets. 		
UNIT V	LATTICES AND BOOLEAN ALGEBRA	9 + 3
Relation - Reflexive relation - antisymmetric relation – transitive relation - Partial ordering relation – Posets - Hasse diagram – Lattices as Posets - Lattices as algebraic systems – Sub lattices - Boolean algebra.		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> Tutorial Problems on Lattices as Posets, Lattices, Boolean algebra. 		
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: Apply the concepts of truth table to test the logic of a program. (Apply)
- CO2: Solve the engineering problems using principle of inclusion & exclusion (Apply)
- CO3: Apply the knowledge of Graph terminology in real life phenomena (Analyze)
- CO4: Apply the algebraic structures such as groups and subgroups. (Apply)
- CO5: Apply the knowledge of Boolean Algebra in real life phenomena (Apply)

Text Books

T1 Rosen, K.H., "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017

Reference Books

- R1** Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 33th Reprint 2018
- R2** Thomas Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications,2016
- R3** Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", new Edition, Pearson Education Asia, Delhi, 2016
- R4** Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 9rd Edition, 2017.
- R5** Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2016

Web Recourses

1. Logics - <https://youtu.be/xlUFkMKSB3Y>
2. Combinatorics - <https://youtu.be/mLY2ZAPdTbg>
3. Graphs - https://youtu.be/nf9e0_ylGdc
4. Algebraic structures - https://youtu.be/4V_KYo6sMJs
5. Lattices - https://youtu.be/qPtGlrB_sXg

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			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)

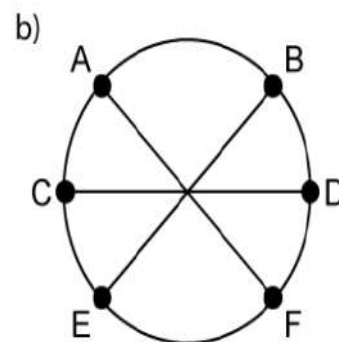
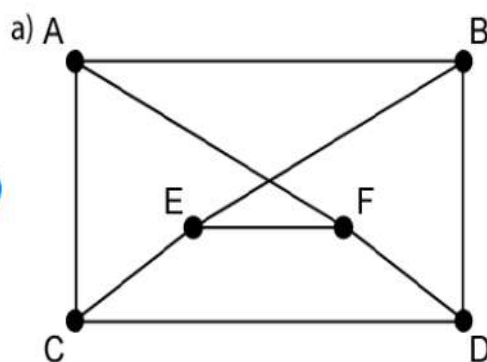
- Without constructing the truth tables, simplify $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$.
- Show that the premises "one student in this class knows how to write programs in JAVA" and "Everyone who knows how to write programs in JAVA can get a high paying job" imply a conclusion "Someone in this class can get a high paying job".

COURSE OUTCOME 2 (CO 2) : (Apply)

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

COURSE OUTCOME 3 (CO 3) : (Analyze)

- If a connected graph G is an Euler graph then all vertices of G are of even degree. (Apply)
- Classify the Isomorphism between the following graphs. (Analyze)



COURSE OUTCOME 4 (CO 4) : (Apply)

1. Show that $(Q^+, *)$ is an abelian group where $*$ is defined by $a * b = \frac{ab}{2}$.
2. Show that intersection of two subgroups of a group is a subgroup.

COURSE OUTCOME 5 (CO 5) : (Apply)

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

$$a \leq b \Leftrightarrow a \wedge b' = 0 \Leftrightarrow a' \vee b = 1 \Leftrightarrow b' \leq a$$

21CS4601	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3
Preamble					
This course provides the fundamental knowledge about database concepts and its realisation 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					
<ul style="list-style-type: none"> • Data structures 					
Objectives					
<ol style="list-style-type: none"> 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					
<ul style="list-style-type: none"> • Discussion about the overview of databases 					
SUGGESTED EVALUATION METHODS					
<ul style="list-style-type: none"> • 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					

<ul style="list-style-type: none"> Demonstrate the use of SQL queries 		
SUGGESTED EVALUATION METHODS		
<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> Solve problems regarding normalization 		
SUGGESTED EVALUATION METHODS		
<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> Discussion on types of concurrency control techniques 		
SUGGESTED EVALUATION METHODS		
<ul style="list-style-type: none"> 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		
<ul style="list-style-type: none"> Perform insertion and deletion operations on B trees and B+ trees 		
SUGGESTED EVALUATION METHODS		
<ul style="list-style-type: none"> Assignment on storage techniques Comparison report on parallel and distributed database 		
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.DESRIPTIVE QUESTIONS
Outcomes		
Upon completion of the course, the students will be able to:		

CO1 Understand the basic concepts of Database Systems in Database design using ER Modelling
 CO2 Apply SQL queries to interact with the database
 CO3 Apply normalization on database design to eliminate anomalies
 CO4 Analyze database transactions and can control them by applying ACID properties
 CO5 Understand the concepts of indexing, hashing and query processing

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	PSO 1	PS 02	PS 03
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) select S.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)

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

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 (C01):

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 (C02):

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 (C03):

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 $n = 3$; $(W_1, W_2, W_3) = (3, 5, 7)$; $(P_1, P_2, P_3) = (3, 7, 12)$; $M = 4$. (Apply)

Course Outcome 4 (C04):

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 (C05):

1. Explain Sum of subset problem? (Apply)
2. Explain 0/1 Knapsack problem with respect to branch and bound method. (Apply)

21CS4603	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C	
		3	0	0	3	
Preamble						
This course provides the main features of 8086 Microprocessor Architecture, addressing modes, Instruction set, and 8086 bus system structure. This course mainly focuses on Microcontroller 8051 architecture and interfacing with real-time applications.						
Prerequisites for the course						
<ul style="list-style-type: none"> Digital Systems 						
Objectives						
<ol style="list-style-type: none"> To understand the Architecture of the 8086 microprocessor. To learn the design aspects of I/O and Memory Interfacing circuits. To interface microprocessors with supporting chips. To study the Architecture of 8051 microcontrollers. To design a microcontroller-based system 						
UNIT I	THE 8086 MICROPROCESSOR				9	
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.						
Suggested Activities:						
<ul style="list-style-type: none"> 8086 Addition program using Emulator 8086 subtraction program using Emulator 						
SUGGESTED EVALUATION METHODS:						
<ul style="list-style-type: none"> Assignment MCQ 						
UNIT II	8086 SYSTEM BUS STRUCTURE				9	
8086 signals – Basic configurations – System bus timing – System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.						
Suggested Activities:						
<ul style="list-style-type: none"> Implementation of System design using RAM and ROM Memory of user configuration. 						
SUGGESTED EVALUATION METHODS:						
<ul style="list-style-type: none"> Assignment MCQ 						
UNIT III	I/O INTERFACING				9	
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface, and Alarm Controller.						

Suggested Activities:		
<ul style="list-style-type: none"> • Implementation of LED interfacing using 8086. • Implementation of Traffic light interfacing using 8086. 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT IV	MICROCONTROLLER	9
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.		
Suggested Activities:		
<ul style="list-style-type: none"> • 8051 Addition program using Emulator • 8051 Subtraction program using Emulator 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT V	INTERFACING MICROCONTROLLER	9
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC - Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors		
Suggested Activities:		
<ul style="list-style-type: none"> • Stepper Motor Interface using 8051 • Square wave Generation using 8051 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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 QUIZZES	1. DESCRIPTIVE QUESTIONS
Course Outcomes		
Upon completion of the course, the students will be able to:		
CO1 Understand and execute programs based on 8086 microprocessor. (Understand, Apply)		
CO2 Design Memory Interfacing circuits. (Apply)		
CO3 Design and interface I/O circuits. (Apply)		
CO4 Understand and execute programs based on 8051 microprocessor. (Understand, Apply)		
CO5 Design and implement 8051 microcontroller-based systems. (Apply)		
Text Books		
1. Yu-Cheng Liu, Glenn A.Gibson, — Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India. (UNIT I-III)		

2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, —The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson education. (UNIT IV-V)

Reference Books

1. A. K. Ray, K.M.Bhurchandi, - Advanced “Microprocessors and peripherals” 3rd edition, Tata McGraw-Hill. (UNIT I, III, IV, V)

Web Resources

https://onlinecourses.nptel.ac.in/noc22_ee12/

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	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 (CO1): Understand and execute programs based on 8086 Microprocessor. (Understand, Apply)

1. Predict the output of the following program.

MVI A,50 H

ORA A

PUSH PSW

HLT (Understand)

2. Explain the operations of following instructions with suitable example

MOV AX, BX

ADD AX, BX

HLT (Understand)

3. Illustrate the different types of addressing modes of 8086. (Apply)

Course Outcome 2 (CO2): Design Memory Interfacing circuits. (Apply)

1. Tabulate the difference between the minimum and maximum mode. (Remember)
2. List the pins that are used to indicate the type of transfer in minimum mode. (Understand)
3. Analyze the difference between loosely coupled and tightly coupled multiprocessors. (Analyze)

Course Outcome 3 (CO3): Design and interface I/O circuits. (Apply)

1. Define the term memory mapped I/O. (Understand)
2. Illustrate the various modes of Timer. (Apply)
3. Illustrate the role of the DMA Controller. (Apply).

Course Outcome 4 (CO4): Understand and execute programs based on 8051 microprocessor. (Understand, Apply)

1. Explain the formats of the PSW register of 8051 microcontrollers in detail. (Understand)
2. Write a program to generate the square wave using an 8051 microcontroller. (Apply)
3. Write a program to generate the Triangular wave using 8051 microcontrollers (Apply)

Course Outcome 5 (CO5): Design and implement 8051 microcontroller-based systems. (Apply)

1. Illustrate the Operation of LCD Interface with 8051 Microcontroller. (Apply)
2. Illustrate the Operation of LED Interface with 8051 Microcontroller (Apply)
3. Illustrate the Operation of stepper motor interfacing. (Apply)

21GE2M02	ENVIRONMENTAL AND SUSTAINABLE ENGINEERING	L	T	P	C
		2	0	0	0
<p>Preamble</p> <p>To inculcate knowledge on the environment and all sorts of biotic and abiotic components related to its ecosystem, climate changes and challenges faced due to global warming and the importance of renewable sources of energy. Inspire students to find ways in contributing personally and professionally thereby rectifying environmental and social problems.</p>					
<p>Prerequisites for the course</p> <ul style="list-style-type: none"> • Basic theoretical concepts of biological science in higher secondary level • Basic theoretical concepts of Engineering Chemistry 					
<p>Objectives</p> <ul style="list-style-type: none"> • To make the students conversant with the interdisciplinary and holistic nature of the environment • To make the students understand the impacts of environmental degradation and to minimise vulnerability to future disasters • To enrich the students with the significance of natural resources and environment on the quality of life • To have an increased awareness among students to create a quest on issues in areas of sustainability • To have a thorough understanding of the concepts of sustainable habitat 					
UNIT I	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY	7			
<p>Environment: Definition, Scope and Importance of environment studies. Ecosystem: Structure and function of an ecosystem - Producers - Consumers – Decomposers- Types – Characteristic features: Forest ecosystem - Desert ecosystem - Pond ecosystem-Ocean ecosystem.</p> <p>Biodiversity - Value of biodiversity - Hot-spots of biodiversity- Threats to biodiversity - Endangered and Endemic species - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</p> <p>Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.</p>					
UNIT II	ENVIRONMENTAL POLLUTION & DISASTER MANAGEMENT	6			
<p>Pollution: Definition - Causes - Effects - Control measures of air pollution - Water pollution: (Sewage water treatment by activated sludge and trickling filter process) - Marine pollution - Noise pollution - Soil pollution - Solid waste management - E-waste management.</p> <p>Disaster management: Causes - Effects - Control measures of Floods - Earthquake - Cyclone.</p> <p>Field study of local polluted sites – Urban / Rural / Industrial / Agricultural.</p>					
UNIT III	NATURAL RESOURCES	6			

Forest resources: Use - Overexploitation - Deforestation - case studies. Water resources: Use - Overutilization of surface and groundwater - Water conservation: Rainwater harvesting- Conflicts over water. Mineral resources: Use - Exploitation -Environmental effects of extracting and using mineral resources - Case studies. Food resources: Effects of Modern Agriculture - Fertilizer-Pesticide problems (Eutrophication, Blue baby syndrome, Biomagnification) - Water logging - Salinity - case studies. Energy resources: Renewable (Solar, Wind) - Non renewable energy sources.

UNIT IV	SUSTAINABILITY	6
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Introduction, Need and concept of sustainability, Social- Environmental and Economic Sustainability Concepts, Sustainable Development, Challenges for Sustainable Development. Environmental legislations in India - Water Act, Air Act.

UNIT V	SUSTAINABLE HABITAT	5
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Basic concepts of sustainable habitat, Environment Impact Assessment (EIA) - Procedures of EIA in India, Green Engineering, Social and technological change, Industrial Processes: Pollution Prevention, Industrial Ecology.

Total Periods	30
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Suggestive Assessment Methods

Continuous Assessment Test (100 Marks)	Formative Assessment Test	End Semester Exams
WRITTEN TEST	NA	NA

Outcomes

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

1	Extract the knowledge on the interdisciplinary and holistic nature of the environment. (Understand)
2	Discover the problems related to environmental degradation. (Apply)
3	Sketch the significance of natural resources on the quality of life. (Apply)
4	Solve the issues in areas of sustainability. (Apply)
5	Articulate knowledge on the concepts of sustainable habitat (Apply)

Text Books

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.(UNIT-1,2,3)
2. Nibin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.(UNIT-4,5)

Reference Books

1. 1.G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
2. 2.Rajagobalan.R.'Environmental studies-From Crisis to cure' Oxford University Press,2005.

Web Resources

1. NPTEL Lecture: https://www.youtube.com/watch?v=hihFHam_wNE
2. NPTEL Lecture: <https://www.youtube.com/watch?v=DNUYxyaYh3g>

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	1				2	3					2		
2	3	2				2	3					2		
3	3		1	1		2	3					2		
4	3	2	1	1		2	3					2		
5	3	2	1	1		2	3					2		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 Students will be able to extract the knowledge on the interdisciplinary and holistic nature of the environment. (Understand)

1. Describe the Multidisciplinary nature of Tirunelveli District.
2. Demonstrate the regulation of Ecosystem

COURSE OUTCOME 2: Students will be able to discover the problems related to environmental degradation. (Apply)

1. Demonstrate the control measures of Air and water Pollution
2. Account the problem and suitable remedial measures for floods in the rainy season.

COURSE OUTCOME 3: Students will be able to Sketch the significance of natural resources on the quality of life. (Apply)

1. Highlight the control and effects of deforestation.
2. Label the role of individual in conservation of natural resources

COURSE OUTCOME 4: Students will be able to Solve the issues in areas of sustainability. (Apply)

1. Outline the term "sustainable development"
2. Compare the major limitations of the Air act, 1972 and Water act, 1980.

COURSE OUTCOME 5: Students will be able to articulate knowledge on the concepts of sustainable habitat (Apply).

1. Narrate the concept and procedure for Environment Impact Assessment.
2. Elucidate the prevention of pollution from various industries.

21CS4901	TECHNICAL SEMINAR AND COMPREHENSIVE TEST - I	L	T	P	C
		0	0	2	1

Prerequisites for the course

- Communication

Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

Total Periods : 30

COURSE OUTCOMES:

- CO1: Ability to review and prepare technological developments
- CO2: Ability to present technological developments
- CO3: Ability to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
- CO4: Ability to face the placement interviews
- CO5: Ability to attend the verbal reasoning test

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2	PSO 3
1	2	2								3		2	1		3
2	2	2								3		2	1		3
3	2	2								3		2	1		3
4	2	2								3		2	1		3
5	2	2								3		2	1		3

21PT3901	SOFT SKILLS APTITUDE - I	L	T	P	C
		1	0	0	1
Prerequisites for the course					
<ul style="list-style-type: none"> Basic Maths 					
Objectives					
<ol style="list-style-type: none"> Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them. Students will be able to reason, model, and draw conclusions or make decisions with mathematical, statistical, and quantitative information. 					
UNIT I	MODULE I	3			
Number system, Number series, HCF and LCM of Numbers, Factors and Decimals.					
UNIT II	MODULE II	3			
Square roots and cube roots, Indices and surds, Simplification and approximation, Problems on ages and numbers.					
UNIT III	MODULE III	3			
Percentage, Profit, loss and discount, Average, Ratio and Proportion.					
UNIT IV	MODULE IV	3			
Partnership and share, Alligation and mixtures, Time, work and wages.					
UNIT V	MODULE V	3			
Pipes and cisterns, simple interest, Compound interest, Growth and depreciation.					
Total Periods				15	
Suggestive Assessment Methods					
Continuous Assessment Test			Formative Assessment Test		
1. DESCRIPTIVE QUESTIONS			1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES		
Outcomes					
Upon completion of the course, the students will be able to:					
CO1: Solve real-life problems requiring interpretation and comparison of complex numeric summaries which extend beyond simple measures of center. CO2: Solve real-life problems requiring interpretation and comparison of various representations of ratios CO3: Distinguish between proportional and nonproportional situations and, when appropriate, apply proportional reasoning. CO4: Develop an answer to an open-ended question requiring analysis and synthesis of multiple calculations, data summaries, and/or models. CO5: justify and communicate their conclusions in ways appropriate to the audience.					
Text Books					
1. Quantitative Aptitude for Competitive Examinations 7th Edition (Paperback, AbhijitGuha)					
Reference Books					

1. https://myupsc.com/wp-content/uploads/2020/11/Quantitative-Aptitude-for-Competitive-Examinations-by-Dinesh-Khattar-z-lib.org_.pdf
2. Quantitative Aptitude for Competitive Examinations - Quantitative Aptitude by rsagrawal with 0 Disc. (English, Paperback, Aggarwal R. S.) Revised, 2021

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 and CO Vs PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

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

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I – MODULE I		
1	Number system, Number series	1
2	HCF and LCM of Numbers	1
3	Factors and Decimals.	1

UNIT II - MODULE II		
4	Square roots and cube roots	1
5	Indices and surds, Simplification and approximation	1
6	Simplification and approximation, Problems on ages and numbers.	1
UNIT-III MODULE III		
7	Percentage	1
8	Profit, loss and discount	1
9	Average, Ratio and Proportion.	1
UNIT-IV MODULE IV		
10	Partnership and share	1
11	Alligation and mixtures	1
12	Time, work and wages.	1
UNIT-V MODULE V		
13	Pipes and cisterns	1
14	Simple interest, Compound interest	1
15	Compound interest, Growth and depreciation.	1

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					
<ul style="list-style-type: none"> • Problem Solving and Logical Thinking using C 					
Objectives					
<ol style="list-style-type: none"> 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					
<ol style="list-style-type: none"> 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
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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
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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 & FAT (20 Marks)	Lab Components Assessments (30 Marks)	End Semester Exams (50 Marks)
1. DESCRIPTIVE QUESTIONS	1.CONDUCT OF EXPERIMENTS 2. MODEL EXAM	1.DESRIPTIVE 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	PS 01	PS 02	PS 03
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.

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

- 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)

1. Exercises
2. Project File (Progress Score)
3. Viva voce

End Semester Exams (40 Marks)

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 and interaction

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PSO 2	PS O3
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)

- Identifying entities, attributes and its types, keys, relationships between entities, cardinalities, generalization, and specialization for library management system.
- 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).
 - Professors can teach the same course in several semesters, and each offering must be recorded.
 - 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.)
 - Every professor must teach some course.
 - Every professor teaches exactly one course (no more, no less).
 - Every professor teaches exactly one course (no more, no less), and every course must be taught by some professor.
 - 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.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED FOR LAB EXERCISES	NO OF HOURS REQUIRED FOR TEST PROJECTS
1	Student should decide on a case study and formulate the problem statement.	2	2
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	2	2

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 database tables created from ER Model.	2	2
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	3	1
5	Practicing DDL commands, Integrity constraints, DML commands	3	1
6	Practicing DCL, TCL commands, Views and operations on views	3	1
7	Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, etc	3	1
8	Practicing Sub queries (Nested, Correlated) and Joins.	3	1
9	Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.	3	1
10	Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger	3	1
11	Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.	3	1
12	Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.	3	1
13	Project- Integrated implementation of the database management system	0	12
Total Hours		33	27
Total Hours Required		60	

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

C01	To learn the techniques adopted in Industries of ancient Tamil culture.
C02	To assess the technical competence of ancient Tamil.
C03	To achieve the ability to think about various production technologies in Tamil Culture.
C04	To explore the recovery and development of agricultural and water management technical skills of Tamil culture.
C05	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.

C05	அறிவியல் மற்றும் கணினி துறையில் தமிழ்ப் பெற்றுள்ள தொழில் நுட்ப வளர்ச்சியை அறிதல்.
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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)

SEMESTER V

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS5601	Theory of Computation	PC	3	3	0	0	3
2	21CS5602	Computer Networks	PC	3	3	0	0	3
3	21CS5603	Internet Programming	PC	3	3	0	0	3
4		Professional Elective I	PE	3	3	0	0	3
5		Open Elective –I	OE	3	3	0	0	3
6		Open Elective –II	OE	3	3	0	0	3
7	21CS5901	Technical Seminar and Comprehensive Test – II	EEC	2	0	0	2	1
8	21PT3904	Reasoning	EEC	1	0	0	2	1
Practical Courses								
1	21CS5611	Computer Networks Laboratory	PC	4	0	0	4	2
2	21CS5612	Internet Programming Laboratory	PC	4	0	0	4	2
Total				29	18	0	12	24

Professional Elective I

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/Domain
Professional Elective I								
1	21CS5701	Linux System Administration	5	3	0	0	3	Programming
2	21CS5702	Object Oriented Analysis and Design	5	3	0	0	3	Software Engineering
3	21CS5703	IoT and its Applications	5	3	0	0	3	Networking
4	21CS5704	Virtual and Augmented Reality	5	3	0	0	3	Graphics and Multimedia
5	21CS5705	Data Warehousing and Data Mining	5	3	0	0	3	Data Science

Open Electives I & II

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered By
Open Elective I								
1	21CS5801	Basics of Networking	5	3	0	0	3	CSE
2	21CS5802	Introduction to Data structures	5	3	0	0	3	CSE
3	21CS5803	Principles of Operating Systems	5	3	0	0	3	CSE
4	21CS5804	Object Oriented Programming	5	3	0	0	3	CSE
5	21CS5805	Software Engineering Practices	5	3	0	0	3	CSE
6	21CS5806	Java Programming	5	3	0	0	3	CSE
7	21CS5807	C # and .Net	5	3	0	0	3	CSE
8	21CS5808	Principles of Multimedia	5	3	0	0	3	CSE
9	21CS5809	Digital Computer Organization	5	3	0	0	3	CSE
10	21CS5810	Database Technology	5	3	0	0	3	CSE

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
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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
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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:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Theorem Proofs • String acceptance using the converted PDA from CFG and CFG from PDA • Problems based on properties of CFL 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Halting problem and other undecidable problems and their proofs • Problems based on PCP, MPCP and conversions 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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
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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		
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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 transitions involved in NFA.(Understand)
3. Summarize the transitions 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)

21CS5602	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3
Preamble					
<p>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.</p>					
Prerequisites					
<ul style="list-style-type: none"> • Computer Architecture 					
Objectives					
<ol style="list-style-type: none"> 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			
<p>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</p>					
<p>Suggested Activities:</p> <ul style="list-style-type: none"> • Practical – Local Area Network set up • Practical – RJ45 Cable Crimping 					
<p>SUGGESTED EVALUATION METHODS:</p> <ul style="list-style-type: none"> • Assignment problems • Quizzes 					
UNIT II	DATA LINK LAYER	9			
<p>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.</p>					
<p>Suggested Activities:</p> <ul style="list-style-type: none"> • Practical – CRC Checking • Practical – Bluetooth Connection between PC and Mobile. 					
<p>SUGGESTED EVALUATION METHODS:</p> <ul style="list-style-type: none"> • Assignment problems • Quizzes 					
UNIT III	NETWORK LAYER	9			
<p>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</p>					

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
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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
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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
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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.DESRIPTIVE 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 Understand the scheme for error detection and correction (Understand)
- CO3 Apply the performance of various routing algorithms. (Apply)
- CO4 Analyze the flow control and congestion control algorithms for QoS at end to end level. (Apply)
- CO5 Analyze the role of Application Layer Protocols and Security features (Apply)

Text Books

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill, Fifth Edition, 2013

- Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers Inc., Third Edition, 2003.

Reference Books

- James F. Kuross, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Addison Wesley, Third Edition, 2004.
- Pete Loshin, "IPv6: Theory, Protocol and Practice", ELSEVIER, Morgan Kauffmann Publishers Inc., Second edition, 2004
- William Stallings, "Data and Computer Communication", Pearson Education, Sixth Edition, 2000.
- Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003
- D.E. Comer, "Internetworking with TCP/IP Vol- III", (BSD Sockets Version), Pearson Education, Second Edition, 2003.
- W. Richard Stevens, "UNIX Network Programming Vol-I", Pearson Education, Second Edition, 1998.

Web Resources

- <https://nptel.ac.in/courses/106/105/106105081/www.nptel.ac.in>
- <http://www.protocols.com/pbook/tcpip1.html>
- <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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	3	3	3	3				1				1		3	
2	3	3	3	3				1				1		3	
3	3	3	3	3				1				1		3	
4	3	3	3	3				1				1		3	
5	3	3	3	3				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	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 sub layers. (Analyze)
2. Compose your view on why fragmentation is recommended in a wireless LAN? (Apply)
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. (Apply)
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. (Apply)
3. Interpret the design of a MIB for a simple SNMP? (Apply)

21CS5603	INTERNET PROGRAMMING	L	T	P	C
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					
<ul style="list-style-type: none">• Basic Java Programming					
<ol style="list-style-type: none">1. To learn to design web pages using HTML52. To gain knowledge on creating interactive web pages using JavaScript3. To know to use Cascading Style Sheets (CSS)4. To study different technologies related to XML5. To learn to develop server side scripting using PHP					

UNIT I	HTML 5, CSS 3	9
<p>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.</p>		
<p>Suggested Activities:</p> <ul style="list-style-type: none"> • Programming exercises on HTML Tables, lists. • Assignment on writing simple CSS Programs. 		
<p>SUGGESTED EVALUATION METHODS:</p> <ul style="list-style-type: none"> • 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
<p>Introduction to Scripting - Data types and Variables - Operators, Expressions and Statements - Functions - Arrays - Objects - Document Object Model - Event Handling – JSON</p>		
<p>Suggested Activities:</p> <ul style="list-style-type: none"> • 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. 		
<p>SUGGESTED EVALUATION METHODS:</p> <ul style="list-style-type: none"> • Tutorials on conditionals and loops. • Evaluation of the programs implemented 		
UNIT III	SERVER SIDE PROGRAMMING	9
<p>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.</p>		
<p>Suggested Activities:</p> <ul style="list-style-type: none"> • Servlet programming with database connectivity and session tracking. • JSP applications with database connectivity. 		
<p>SUGGESTED EVALUATION METHODS:</p> <ul style="list-style-type: none"> • Demonstration of simple web application using Servlet and JSP. • Tutorials on JSTL. 		
UNIT IV	PHP and XML	9
<p>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.</p>		
<p>Suggested Activities:</p> <ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Application development using jQuery • Demonstration of programs using jQ HTML 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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.DESRIPTIVE 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	PO1 0	PO1 1	PO1 2	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)

21CS5611	COMPUTER NETWORKS LABORATORY	L	T	P	C
		0	0	4	2
Prerequisites for the course					
<ul style="list-style-type: none"> • Object Oriented Programming • Operating Systems 					
Objectives					
<ol style="list-style-type: none"> 1. To learn the communication between two desktop computers. 2. To implement the different protocols 3. To be familiar with socket programming. 4. To be familiar with the various routing algorithms 5. To be familiar with Packet Tracer simulation tools. 					
S.No	List of Experiments	CO			
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.	CO1			
2	Write a HTTP web client program to download a web page using TCP sockets.	CO1			
3	Applications using TCP sockets like: Echo client and echo server Chat File Transfer	CO1			
4	Study of Cisco Packet Tracer and Simulation of Congestion Control Algorithms using Packet Tracer.	CO2			

5	Simulation of ARP/RARP using Cisco Packet Trace.	C02
6	Study of TCP/UDP performance using Simulation tool.	C02
7	Simulation of Distance Vector/ Link State Routing algorithm.	C03
8	Performance evaluation of Routing protocols using Simulation tool.	C04
9	Implementation Routing Information protocol RIP on IP Network	C05

Total Periods : 60

S.No.	List of Projects	Related Experiment	CO
1.	Network Traffic Analysis and monitoring	Ex. 1 and 6	CO1, CO2
2.	Client Server based instant messenger	Ex. 2 and 6	CO1, CO2
3.	Simulation of Chat Applications	Ex. 2 and 3	CO1
4.	Computing shortest path between different nodes	Ex.7 and 8	CO3, CO4
5.	Multi file uploading system	Ex.3 and 6	CO1, CO2
6.	Simulation of congestion control algorithm using simulator	Ex.5 and 6	CO6
7.	Identifying minimum hops with the help of routing protocols using Packet Tracer	Ex.4 and 8	CO2, CO4
8.	Simulation of protocol link failure condition checking	Ex.8 and 9	CO4, CO5
9.	Simulation of client server file sharing system	Ex. 3 and 8	CO1, CO4
10.	Implementation Static Routing on a network using packet tracer	Ex. 7 and 4	CO2, CO3
11.	Network load balancing system	Ex. 6 and 9	CO2, CO5
12.	Basic routing between two Routers	Ex.6 and 7	CO2, CO3
13.	Secondary authorization server	Ex. 3 and 4	CO1, CO2
14.	Implementation Routing Information protocol RIP on IP Network	Ex. 2 and 4	CO1, CO2
15.	Implementation dynamic Routing on a network	Ex.9 and 6	CO2, CO5

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
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Lab Experiment <ul style="list-style-type: none"> • Viva • Model Exam 	<ul style="list-style-type: none"> • Practical Exam • Viva
Outcomes: Upon completion of the course, the students will be able to CO1: Learn to communicate between two desktop computers. (Understand) CO2: Learn to implement different protocols (Apply) CO3: Be familiar with socket programming (Apply) CO4: Be familiar with the various routing algorithms (Analyze) CO5: Be familiar with Cisco packet tracer simulation tools. (Apply)	
Laboratory Requirements:	
SOFTWARE: <ul style="list-style-type: none"> • C / C++ / Java / Equivalent Compiler • Network simulator Cisco packet tracer. HARDWARE: <ul style="list-style-type: none"> • Standalone desktops 	
Reference Books	
1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, Fifth Edition, 2013	
Web Resources	
1. www.nptel.ac.in 2. http://www.protocols.com/pbook/tcpip1.html 3. https://www.packettracernetwork.com/tutorials/	

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			1	3	2	
2	3	3	3		2				1			1	3	2	
3	3	3	3		2				1			1	3	2	
4	3	3	3		2				1			1	3	2	
5	3	3	3		2				1			1	3	2	

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 for...(Apply)

Course Outcome 1 (CO1):

1. Learn to use commands like tcpdump, netstat, ipconfig, nslookup and traceroute .(Understand)
2. Capture ping and trace route PDUs using a network protocol analyzer and examine. (Analyze)

Course Outcome 2 (CO2):

1. Write a java program for code simulating ARP protocols(Apply)
2. Write a java program for code simulating RARP protocols. (Apply)

Course Outcome 3 (CO3):

1. Write a HTTP web client program to download a web page using TCP sockets. (Apply)
2. Write a java program for Echo client and echo server using TCP sockets. (Apply)

Course Outcome 4 (CO4):

1. To simulate and observe traffic route of a network using distance vector routing protocol.
2. To simulate and observe traffic route of a network using distance vector routing protocol. (Analyze)

Course Outcome 5 (CO5):

1. implement User Datagram Protocol (UDP) using Cisco Packet Tracer. (Apply)
2. Compare Routing Protocols performance using Cisco Packet Tracer. (Apply)

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF WEEKS REQUIRED
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.	1 st week
2	Write a HTTP web client program to download a web page using TCP sockets.	2 nd week
3	Applications using TCP sockets like: Echo client and echo server Chat File Transfer	2 nd week
4	Study of Cisco Packet Tracer and Simulation of Congestion Control Algorithms using Packet Tracer.	3 rd week
5	Simulation of ARP/RARP using Cisco Packet Trace.	3 rd week
6	Study of TCP/UDP performance using Simulation tool.	4 th week

7	Simulation of Distance Vector/ Link State Routing algorithm.	4 th week
8	Performance evaluation of Routing protocols using Simulation tool.	5 th week
9	Implementation Routing Information protocol RIP on IP Network	5 th week

21CS5612	INTERNET PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Java Programming, Object Oriented Programming Systems

Objectives

1. To be familiar with Web page design using HTML/XML and style sheets
2. To learn to create dynamic web pages using server side scripting.
3. To learn to write Client Server applications.
4. To be familiar with the PHP programming and be exposed to creating applications with PHP.
5. To learn tools and components of jQuery.

S.No	List of Experiments	CO
1	Create a web page with the following using HTML To embed a map in a web page To fix the hot spots in that map Show all the related information when the hot spots are clicked	CO1
2	Create a web page with the following. Cascading style sheets. Embedded style sheets. Inline style sheets. Use our college information for the web pages.	CO1
3	Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.	CO2
4	Create an online job registration page along with java script validations.	CO2
5	Write programs in Java to create three-tier applications using servlets 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.	CO3
6	Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password,	CO3

	credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.	
7	Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document	C04
8	Validate the form using PHP regular expression. ii. PHP stores a form data into database.	C04
9	Design a web page application using jQuery.	C05
10	Develop a Simple game using jQuery.	C05

Total Periods : 60

Sl.No	List of Projects	Related Experiments	CO
1	Inventory Control System	EX 1,2,	C01
2	Railway Reservation System	EX 1,2,3	C01,C02
3	Library Management System	EX 1,2,3	C01,C02
4	Banking System	EX 1,2,3	C01,C02
5	Exam Registration	Ex 1,2,3,4	C01,C02
6	Stock maintenance system.	Ex 1,2,3,4	C01,C02
7	Online course reservation system	Ex 1,2,3,4,5	C01,C02,C03
8	E-ticketing	Ex 1,2,3,5	C01,C02,C03
9	Software personnel management system	Ex 1,2,3,5,6	C01,C02,C03
10	Credit card processing	Ex 1,2,3,5,6	C01,C02,C03
11	e-book management system	Ex 1,2,3,5,6	C01,C02,C03
12	Recruitment system	Ex 1,2,7,8	C01,C04
13	Foreign trading system	Ex 7,8	C01,C04
14	Student Information System	Ex 9,10	C05
15	Build a Shooting Game	Ex 9,10	C05

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
<ul style="list-style-type: none"> • Lab Experiment • Viva • Model Exam 	<ul style="list-style-type: none"> • Practical Exam

Outcomes:

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

- C01 Design Web pages using HTML/XML and style sheets. (Apply)
 C02 Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.(Apply)
 C03 Design dynamic web pages using server side scripting.(Apply)
 C04 Use PHP programming to develop web applications.(Apply)
 C05 Design and implement attractive web pages using jquery.(Apply)

Laboratory Requirements:

- Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP

Reference Books

1. Deitel and Deitel and Nieto, –Internet and World Wide Web - How to Program ,Prentice Hall, 5th Edition, 2011.

Web Resources

1. https://www.tutorialspoint.com/internet_technologies/internet_useful_resources.htm
2. <https://www.txcte.org/course-binder/web-technologies>

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			1	3	2	
2	3	3	3		2				1			1	3	2	
3	3	3	3		2				1			1	3	2	
4	3	3	3		2				1			1	3	2	
5	3	3	3		2				1			1	3	2	

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 for...(Apply)

Course Outcome 1 (CO1):

1. Create an HTML document that marks up your resume (Apply)
2. Create a form in HTML5 to provide the list of grocery for the month from the list in the website. Create using forms, labels, text boxes, lists. Allow the user to enter his details to get the grocery delivered to his house. (Apply)

Course Outcome 2 (CO2):

1. Write a Java script to find the Prime number between 1 and 100. (Apply)
2. Write a Java Script to find factorial of a given number.(Apply)

Course Outcome 3 (CO3):

1. Consider a database that has a table Employee with two columns Employee Id and Name. Assume that the administrator user id and password to access to access the database table are Scott and Tiger. Write a JDBC program that can query and print all entries in the table employee. Make the database using type 2 driver database, driver and connection string jdbc :db.oci. Generate a solution for linear pattern searching. (Apply)
2. Design a HTML forms by embedding JSP code for submission of a resume to a job portal website with appropriate database connectivity (Apply)

Course Outcome 4 (CO4):

1. Create a webserver based chat application using PHP. The application should provide the following functions Login, Send message (to one or more contacts) and Receive messages (from one or more contacts) (Apply)
2. Write a PHP program that tests whether an email address is input correctly. Test your program with both valid and invalid email addresses (Apply)

Course Outcome 5 (CO5):

1. Create an Java script file for jQuery using the absolute URL. (Apply)
2. Give the basic structure of shorthand notation `$()` in jQuery.(Apply)

PROFESSIONAL ELECTIVE I

21CS5701	Linux System Administration	L	T	P	C
		2	0	2	3
Preamble					
<p>This course Red Hat Certified System Administrator (RHCSA) has proven the skills and knowledge required in Red Hat Enterprise Linux environments. Red Hat Certified System Administrator (RHCSA) is able to perform the following tasks: Understand and use essential tools for handling files, directories, command-line environments, and documentation. Create simple shell scripts.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS4604- Operating System Concepts 					
Objectives					
<ul style="list-style-type: none"> • To introduce the key role of an Linux Operating system • To Emphasize the importance of Server Management concepts of an Enterprise Linux Operating system • To Realize the significance of Software repositories and management • To understand the commands for processes, files and its operations. • To insist the File system Management of a Linux Operating system • Comprehend the need of Security vulnerability and explore the Containerized platform offered by the Linux Operating system 					
UNIT I	MANAGING USER, GROUP ACCOUNTS AND FILES	6			
Manage Local Users and Groups - Describe User and Group Concepts- Gain Superuser Access- Manage Local User Accounts- Manage Local Users and Groups- Manage Local User Accounts- Managing user password- Control Access to Files- Manage File System Permissions from the Command Line- Manage Default Permissions and File Access- Cron Job scheduling					
SUGGESTED ACTIVITIES:					
<ul style="list-style-type: none"> • Quiz: Describe Linux File System Hierarchy Concepts 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assessments with MCQ 					
UNIT II	SSH AND SHELL	6			
Introduction - Access Systems and Obtaining Support- Edit Text Files from the Shell Prompt- Configure SSH Key-based Authentication- Detect and Resolve Issues with Red Hat Insights-manage Files from the Command Line -Describe Linux File System Hierarchy Concepts - Make Links Between Files- Match File Names with Shell Expansions					
SUGGESTED ACTIVITIES:					
<ul style="list-style-type: none"> • Quiz: Describe User and Group Concepts 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assignment on Local and Global user, user accounts and File system permission 					
UNIT III	SECURITY IN LINUX	6			
Manage SELinux Security- Change the SELinux Enforcement Mode- Control SELinux File Contexts- Adjust SELinux - Policy with Booleans- Tune System Performance- Kill Processes - Monitor Process Activity- Adjust Tuning Profiles - Influence Process Scheduling - Schedule Future Tasks - Schedule Recurring User Jobs - Manage Temporary Files.					
SUGGESTED ACTIVITIES:					
<ul style="list-style-type: none"> • Activity of securing the file • Working with files, process and scheduling. 					

SUGGESTED EVALUATION METHODS:

Assignment on files and process

UNIT IV	SOFTWARE REPOSITORIES AND FILE SYSTEMS	6
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Install and Update Software Packages - Register Systems for Red Hat Support - Register Systems for Red Hat Support- Install and Update Software Packages with DNF - Enable DNF Software Repositories - Manage Basic Storage - Add Partitions, File Systems, and Persistent Mounts- Manage Storage Stack - Create and Extend Logical Volumes - Manage Layered Storage- Identify Automatically Started System Processes- Control System Services- Reset the Root Password- Repair File System Issues at Boot.

SUGGESTED ACTIVITIES:

- Team projects can be given as demo
- Quiz: Register Systems

SUGGESTED EVALUATION METHODS:

- MCQ assessment
- Assignment on “ Working with repositories and File system concepts”.

UNIT V	CONTAINERS AND FIREWALLS	6
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Analyze and Store Logs - Describe System Log Architecture- Review Syslog Files- Review System Journal Entries- Preserve the System Journal - Maintain Accurate Time-Manage Networking- Validate Network Configuration -Configure Networking from the Command Line -Edit Network Configuration Files-Access Network-Attached Storage -Manage Server Firewalls -Container Concepts -Deploy Containers -Manage Containers as System Services.

SUGGESTED ACTIVITIES:

- Need for organization wide standards adoption of firewalls.
- Learning software tools.

SUGGESTED EVALUATION METHODS:

- Working with containers and firewalls.
- Assignment on selection of appropriate containers for any software development.

Total Periods	30 +30 Lab
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Suggestive Assessment Methods

Continuous Assessment Test & FAT (20 Marks)	Lab Components Assessments (30 Marks)	End Semester Exams (50 Marks)
DESCRIPTIVE QUESTIONS	1.CONDUCT OF EXPERIMENTS 2. MODEL EXAM	DESCRIPTIVE QUESTIONS

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

C01: Understand the need of a Linux Operating system, basic commands and process management funtions.
 C02: Apply the concept creating user and group account.
 C03: Understand the commands for working with process and file system in linux.
 C04: Apply the File system concepts and significance of Software repositories and management.
 C05: Apply the concept of containers for different applications.

Text Books

1. Rhcsa Red Hat Enterprise Linux 8: Training and Exam Preparation Guide sa Red Hat Enterprise Linux 8: Training and Exam Preparation Guide ,ASGHAR GHORI,first Edition.

Reference Books

nil

Web Resources

- www.redhat.com
- <https://www.youtube.com/watch?v=TmrS7FhaaRA&list=PLlr7wO747mNrUoTuXhZ0REJw3hL4oWvLm>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
1	3	2	2	2	2	2	2				2		2	3	
2	2	3	3	2	3	2							2	3	
3	2	2	2	2	2	2	2		2		1	1	2	3	
4	2	2	3	2	2		2		2		2		2	3	
5	2	2	2	2	2	2	2		2		1	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					

S.NO	NAME OF EXPERIMENTS	CO
Do the following exercises given in the list:		
Suggested List of Applications		
<ol style="list-style-type: none"> 1. Edit Text Files from the Shell Prompt 2. Configure SSH Key-based Authentication 3. Gain Superuser Access and Manage Local Group Accounts & Manage User Passwords 4. Manage File System Permissions from the Command Line and Manage Default Permissions and File Access 5. Change the SELinux Enforcement Mode and Control SELinux File Contexts 6. Influence Process Scheduling and Schedule Recurring User Jobs and Manage Temporary Files 7. Install and Update Software Packages with DNF and Mount and Unmount File Systems 8. Add Partitions, File Systems, and Persistent Mounts and Manage Swap Space 9. Create and Extend Logical Volumes and Manage Layered Storage 10. Review Syslog Files and Review System Journal Entries 		

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					
<ul style="list-style-type: none"> • Computer Programming , Object Oriented Programming Systems 					
Objectives					
<ol style="list-style-type: none"> 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 NextGenPOS system					
Suggested Activities:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • 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
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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
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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
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Suggestive Assessment Methods

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

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, Regine Meunier, 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. Micheal Blaha, 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			1			2		3		
2	3	3	3	2	2			1			2		3		
3	3	3	3	2	2			1			2		3		
4	3	2	2	3	3			1			2		3		
5	3	3	3	2	2			1			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

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)

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						
<ul style="list-style-type: none"> • Embedded systems, mobile application development, Computer Networking, Microprocessors and Microcontrollers 						
Objectives						
<ul style="list-style-type: none"> • 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:						
<ul style="list-style-type: none"> • Survey the open hardware platforms available for IoT and compare their characteristics. • IOT Levels and Templates • Explore big data analytics. 						
SUGGESTED EVALUATION METHODS:						
<ul style="list-style-type: none"> • 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:						
<ul style="list-style-type: none"> • Describing IOT Reference Model. • Explaining various IOT Protocols such as Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and MQTT. 						
SUGGESTED EVALUATION METHODS:						
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Assignment on operational principles of sensors and actuators • Identify the sensors required for the system, connect sensors • Assignment on access technologies 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Lecture on Cloud Storage models/ • Explaining Web server for IOT • Explaining data analytics for IoT. 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Review of security in various IoT platform 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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.DESRIPTIVE 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 Madiseti 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/>

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	
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. Point out 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)

21CS5704	VIRTUAL AND AUGMENTED REALITY	L	T	P	C
		3	0	0	3
Preamble					
This course provides 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					
<ul style="list-style-type: none"> • Engineering drawing, Computer graphics 					
Objectives					
<ol style="list-style-type: none"> 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:		
<ul style="list-style-type: none"> • Assignment on trackers and its types • Flipped Class room – How audio video analogies are retrieved using output devices 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Assignment on rendering process and pipeline • Group discussion – Modeling 3d environments with different depth factor. 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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:		
<ul style="list-style-type: none"> • Practicing WTK installation and understand – WorldToolKit's user interface functions. • Flipped Class room- Which is best WTK or Java 3D. 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • 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.DESRIPTIVE 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 use image based x-ray visualization in VR?(Evaluate)

3. How will you create a scene manipulation for real world objects? (Create)

21CS5705	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3
Preamble					
Data warehousing is a method of organizing and compiling data into one database, whereas data mining deals with fetching important data from databases. Data mining attempts to depict meaningful patterns through a dependency on the data that is compiled in the data warehouse.					
Prerequisites for the course					
<ul style="list-style-type: none"> Database management system 					
Objectives					
<ol style="list-style-type: none"> To understand the principles of Data warehousing and Data Mining. To be familiar with the Data warehouse architecture and its Implementation. To know the Architecture of a Data Mining system. To understand the various Data preprocessing Methods. To perform classification and prediction of data. 					
UNIT I	Data Warehousing and Business Analysis	9			
Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Clean-up and Transformation Tools – Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.					
Suggested Activities:					
Explain in detail about the implementation of a data warehousing.					
Suggested Evaluation Methods:					
<ul style="list-style-type: none"> Assignment MCQ 					
UNIT II	Data Mining	9			
Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of a Typical Data Mining Systems- Classification of Data Mining Systems. Association Rule Mining – Mining Various Kinds of Association Rules.					

Suggested Activities:

Explain the data mining functionalities.

Suggested Evaluation Methods:

- Assignment
- MCQ

UNIT III**Classification and Prediction****9**

Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Suggested Activities:

Explain various classification methods.

Suggested Evaluation Methods:

- Assignment
- MCQ

UNIT IV**Cluster Analysis****9**

Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Suggested Activities:

Compare various Clustering methods.

Suggested Evaluation Methods:

- Assignment
- MCQ

UNIT V**Mining Object, Spatial, Multimedia, Text and Web Data****9**

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Suggested Activities:

Discuss about some of the case studies in data mining applications.

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.DESRIPTIVE QUESTIONS

Outcomes

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

CO1 Understand the functionality of the various data mining and data warehousing component.

(Understand)

CO2 Understand the Concepts of data mining. **(Understand)**

CO3 Apply the various classification methods. **(Apply)**

CO4 Apply systematic procedure for the various Clustering Methods. **(Apply)**

CO5 Apply and analyse mining concepts in different database. **(Analyse)**

Text Books

1. Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

Reference Books

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

Web Resources

1. <https://www.coursera.org/specializations/data-mining>
2. <https://itmasters.edu.au/free-short-course-knowledge-discovery-and-data-mining>
3. <https://panoply.io/data-warehouse-guide/data-warehousing-and-data-mining>
4. https://www.tutorialspoint.com/dwh/dwh_overview.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					1					3	3	
2	3	3	3					1					3	2	
3	3	3	3					1					3	3	
4	3	3	3					1					3	3	
5	3	3	3					1					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

Course Outcome 1 (CO1):

1. Explain about operational database management and data warehouse. (Understand)
2. Explain the architecture of Data warehouse. (Understand)
3. Explain the various OLAP operations. (Understand)

Course Outcome 2 (CO2):

1. Define data mining. (Remember)
2. List the various data mining Task. (Remember)
3. Write about Data pre-processing and Data Cleaning. (Remember)

Course Outcome 3 (CO3):

1. Compare various Classification methods. (Understand)
2. Explain about Support Vector Machine. (Understand)
3. Explain the Ensemble Methods. (Understand)

Course Outcome 4 (CO4):

1. Explain the various Clustering Methods with example. (Apply)
2. Explain about clustering high dimensional data with an example. (Apply)
3. Explain Outlier Analysis with an example. (Apply)

Course Outcome 5 (CO5):

1. How do you do multidimensional analysis? (Analyse)
2. Analyse the various challenges in World Wide Web mining. (Analyse)
3. Analyse the challenges in Multimedia Data Mining. (Understand)

OPEN ELECTIVE - I

21CS5801	BASICS OF NETWORKING	L	T	P	C
		3	0	0	3
preamble					
Networking refers to interconnected computing devices that can exchange data and share resources with each other. These networked devices use a system of rules, called communications protocols, to transmit information over physical or wireless technologies. computer networking adds power, functionality and flexibility to every computing environment. Computer networks enable communication for every business, entertainment, and research purpose. The internet, online search, email, audio and video sharing, online commerce, live-streaming, and social networks all exist because of computer networks.					
Prerequisites for the course					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ol style="list-style-type: none"> 1. To Understand the division of network functionalities into layers. 2. To Identify the components required to build different types of networks 3. To Learn the various routing 4. To Learn the flow control and congestion control algorithms 5. To learn the various application layers 					
UNIT I	NETWORK FUNDAMENTALS & LINK LAYER	9			

Network devices - Hub, Repeater, Bridge, Switch, Router and Gateways - Building a network-Requirements-Layering and protocols - Internet Architecture - Network software - Performance; Link layer Services - Framing-Error Detection - Flow control		
SUGGESTED ACTIVITIES :		
<ul style="list-style-type: none"> • Protocol Layering – In class • Performance Metrics – In class 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • MCQ • Quizzes 		
UNIT II	MEDIA ACCESS & INTERNETWORKING	9
Media access control – Ethernet (802.3) – Wireless LANs – 802.11 – Bluetooth – Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)		
SUGGESTED ACTIVITIES :		
<ul style="list-style-type: none"> • Problems on IP – In class 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment Problems • Quizzes 		
UNIT III	ROUTING	9
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses –multicast routing (DVMRP, PIM).		
SUGGESTED ACTIVITIES :		
<ul style="list-style-type: none"> • Analysis in class - Routing 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • MCQ • Quizzes 		
UNIT IV	TRANSPORT LAYER	9
Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements		
SUGGESTED ACTIVITIES :		
<ul style="list-style-type: none"> • Analysis in class – TCP and UDP 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • MCQ • Quizzes 		
UNIT V	APPLICATION LAYER	9
Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS SNMP		
SUGGESTED ACTIVITIES :		
<ul style="list-style-type: none"> • Mailing – In class • Analysis in class - Web Services 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • MCQ • Quizzes 		
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.DESRIPTIVE QUESTIONS

Course Outcomes

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

CO1 Identify the components required to build different types of networks (Understand)

CO2 Understand the internetworking and switching principles (Understand)

CO3 Apply the implementation logics of routing. (Apply)

CO4 Apply the data flow control mechanism. (Apply)

CO5 Analyse different protocol implementations in networking.(Analyse)

Text Books

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011. (Unit I to Unit V)

Reference Books

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.

Web Resources

1. <https://nptel.ac.in/courses/106/105/106105183/>
2. <https://nptel.ac.in/courses/106/105/106105081/>
3. https://onlinecourses.nptel.ac.in/noc21_cs18/preview
4. <http://www.protocols.com/pbook/tcpip1.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								3	3	
2	3	3	3		2								3	3	
3	3	3	3		3								3	3	
4	3	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: Students will be able to Predict the suitable method for.(Apply)

Course Outcome 1 (CO1):

1. List the different network criteria (Remember)
2. Generalize LAN, WAN and MAN. (Apply)
3. Can you discriminate bandwidth and latency? Justify (Apply)

Course Outcome 2 (CO2):

1. Assess about Nodes and Links (Apply)
2. Outline the services provided by the Data link layer (understand)
3. Analyze the role of 802.11 (Analyse)

Course Outcome 3 (CO3):

1. Identify when the forwarding table used. (Apply)
2. How would you design Class A, Class B and Class C of IP? (Remember)
3. Analyze how routers differentiate the incoming unicast, multicast and broadcast IP packets (Analyse)

Course Outcome 4 (CO4):

1. Conclude what would you infer from the term RTT? (Evaluate)
2. What is the purpose of TCP push operation? (Understand)
3. Identify how a well-known port different from an ephemeral port? (Apply)

Course Outcome 5 (CO5):

1. Define Persistent and Non-persistent connections. (Remember)
2. Examine the protocol used for e-mail security.(Analyse)
3. Recommend the groups of HTTP header? (Apply)

21CS5802	INTRODUCTION TO DATA STRUCTURES	L	T	P	C
		3	0	0	3
Preamble					
This course provides the knowledge on data structures to implement the physical forms of abstract data types and designing efficient software. It allows exploring algorithm design and how those algorithms are used within computer programs. And also discovers all forms of data are collected and managed, relationships are maintained between them, and the operations related to data are carried out.					
Prerequisites for the course					
<ul style="list-style-type: none"> • C Programming 					
Objectives					
1. To understand the concepts of ADTs					

2. To Learn linear data structures – lists, stacks, and queues
3. To Learn non-linear data structures –Trees and graphs
4. To apply Graph algorithms
5. To apply Searching, Sorting and Hashing Techniques

UNIT I

LINEAR DATA STRUCTURES – LIST

9

Abstract Data Types (ADTs) – List ADT – array implementation – linked list implementation –singly linked lists- circularly linked lists- doubly-linked lists – applications of lists.

Suggested Activities:

- Write and execute a program to get the middle element of linked list in a single iteration
- Write and execute a program to detect loop in a linked list

SUGGESTED EVALUATION METHODS:

- Programming exercises in the Hacker Rank, Hacker Earth and Skill Rack
- Quizzes
- Assignment Problems - Circularly Linked List and Operations

UNIT II

LINEAR DATA STRUCTURES – STACKS, QUEUES

9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – applications of queues.

Suggested Activities:

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

SUGGESTED EVALUATION METHODS:

- Programming exercises in the Hacker Rank, Hacker Earth and Skill Rack
- Quizzes
- Assignment Problems - Conversion of Infix and Postfix Expression

UNIT III

NON LINEAR DATA STRUCTURES – TREES

9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – AVL Trees - Heap – Binary Heap.

Suggested Activities:

- Converting a tree from in order to post order using tree traversal methods
- Converting a tree from pre order to post order using tree traversal methods

SUGGESTED EVALUATION METHODS:

- Assignment Topic: AVL Trees

<ul style="list-style-type: none"> • Programming exercises in the Hacker Rank, Hacker Earth and Skill Rack • 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: <ul style="list-style-type: none"> • Practical - Count all possible paths between two vertices in Breadth first search • Practical - Sum of the minimum elements in all connected components of an undirected graph 		
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Assignment Topic: Dijkstra’s Algorithm • Programming exercises in the Hacker Rank, Hacker Earth and Skill Rack • Quizzes 		
UNIT V	SEARCHING, SORTING AND HASHING TECHNIQUES	9
Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Hashing- Hash Functions.		
Suggested Activities: <ul style="list-style-type: none"> • Comparison of internal sorting algorithms • Practical – Implementation of Hash table • Practical – Implementation of Merge Sort & Quick Sort. 		
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Programming exercises in the Hacker Rank, Hacker Earth and Skill Rack • Assignment Problems - Bubble Sort Algorithm • 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 Understand abstract data types for linear data structures. (Understand)		

- CO2 Write a method for linear data structure operations. (Apply)
 CO3 Write a method for non linear data structure operations. (Apply)
 CO4 Suggest and use appropriate linear/non-linear data structure operations for solving a graph problem (Apply)
 CO5 Critically analyze the various sorting, searching and hashing techniques (Analyse)

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. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, –Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Stephen G. Kochan, –Programming in C||, 3rd edition, Pearson Education.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, –Fundamentals of Data Structures in C||, Second Edition, University Press, 2008

Web Resources

1. <https://www.geeksforgeeks.org/data-structures/>
2. <https://www.javatpoint.com/data-structure-tutorial>
3. <https://www.coursera.org/learn/data-structures>
4. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm
5. <https://www.studytonight.com/data-structures/introduction-to-data-structures>

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	3									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):

1. Define ADT. Give any two examples. (Remember)
2. Examine a doubly linked list with neat diagram. (Understand)
3. Analyze and write a routine to find position of given element in singly linked list (Analyze)

Course Outcome 2 (CO2):

1. Given the prefix for an expression. Write its postfix: ++A*BCD and +*AB*CD (Apply)
2. Illustrate the purpose of top and pop? (Analyze)
3. Summarize the rules followed during the infix to postfix conversions. (Understand)

Course Outcome 3 (CO3):

1. If the depth of binary tree is k, the maximum number of nodes in the binary tree is $2^k - 1$. Prove. (Analyze)
2. Create an expression tree for the expression. $((a + ((b/c)*d)) - e)$ (Apply)
3. Differentiate AVL tree and Binary search tree. (Understand)

Course Outcome 4 (CO4):

1. Define a Undirected Graph? (Remember)
2. What is the difference between undirected and directed graph? Justify? (Understand)
3. Differentiate BFS and DFS. (Understand)
4. Give the purpose of Dijkstra's algorithm. (Remember)

Course Outcome 5 (CO5):

1. Interpret the fastest searching algorithm and give reason. (Analyze)
2. Classify the different sorting methods. (Analyze)
3. Prepare a simple C Program for a linear search. (Apply)

21CS5803	PRINCIPLES OF OPERATING SYSTEMS	L	T	P	C
		3	0	0	3
Preamble:					
An OS is a program that acts an intermediary between the user of a computer and computer hardware. Operating systems can control the execution of all kinds of programs. Principles of Operating Systems enlighten the concept of OS, Process, Process scheduling, Threads, Deadlock, Memory management and file systems.					
Prerequisites for the course					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ol style="list-style-type: none"> 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.	
UNIT I	PROCESSES	9
Introduction to operating systems – operating system structures – system calls – system programs – system structure - Processes: Process concept – Process scheduling – Operations on processes.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Discussion about OS and structure of OS • Learning System call with its use 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment process scheduling • MCQ 		
UNIT II	THREADS, PROCESS SCHEDULING AND SYNCHRONIZATION	9
Threads: Multi-threading models– Threading issues - CPU Scheduling: Scheduling criteria – Scheduling algorithms. Process Synchronization: The critical – section problem – Semaphores – Classic problems of synchronization – critical regions – Monitors.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Learning thread and scheduling algorithms • Learning about process synchronization 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment on Scheduling problems. • MCQ 		
UNIT III	DEADLOCK	9
Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Discuss about deadlock • Learn methods for handling deadlock 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment on deadlock avoidance. • MCQ 		
UNIT IV	STORAGE MANAGEMENT	9
Memory Management: Background – Swapping – Contiguous memory allocation – Paging-Segmentation. Virtual Memory: Background – Demand paging –Process creation – Page replacement.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Discuss Memory management techniques • Page replacement policies • Solving problem in memory management techniques 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment on paging problems. • MCQ 		
UNIT V	FILE SYSTEMS AND I/O SYSTEMS	9
File System Interface: File concept – Access methods – Directory structure – File system mounting – Protection – FileSystem Implementation: Directory implementation – Allocation methods – Free		

space management – efficiency and performance.

SUGGESTED ACTIVITIES:

- File system concepts

SUGGESTED EVALUATION METHODS:

- Assignment on File allocation methods
- MCQ

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 Acquire knowledge on principles and modules of operating systems (Remember)

CO2 Realize the factors in process scheduling strategies, concurrent processes and threads (Understand)

CO3 Apply algorithmic solutions to handle deadlock problems (Apply)

CO4 Analyze the physical and logical memory management and feel the role of virtual memory (Analyze)

CO5 Identify and solve the issues related to file system interface, implementation. (Analyze)

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012 – (UNIT 1 to UNIT 5)

Reference Books

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
3. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 1996.
4. D M Dhamdhere, "Operating Systems: A Concept-Based Approach", Second Edition, Tata McGraw-Hill Education, 2007.

Web Resources

1. <https://nptel.ac.in/courses/106/105/106105214/>
2. https://www.tutorialspoint.com/operating_system/index.htm
3. <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	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2			1					3	2	
2	3	3	3	3	2			1					3	2	
3	3	3	3	3	2			1					3	2	
4	3	3	3	2	2			1					3	2	
5	3	3	3	3	2			1					3	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	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 OUTCOME 1: Students will be able to Predict the suitable method for...(Apply)

Course Outcome 1 (C01):

1. What is an operating system? (Understand)
2. Why API's need to be used rather than system calls? (Analyze)
3. Differentiate tightly coupled systems and loosely coupled systems? (Analyze)

Course Outcome 2 (C02):

1. Provide two programming examples in which multithreading does not provide better performance than a single threaded solution. (Apply)
2. Give two hardware instructions and their definitions which can be used for implementing mutual exclusion. (Understand)
3. Explain in detail about threads? Give your answers "How threads can be used in multithreaded model" (Analyze)

Course Outcome 3 (C03):

1. List out the methods used to recover from the deadlock. (Remember)
2. "If there is a cycle in the resource allocation graph, it may or may not be in deadlock state ". Comment on this statement. (Analyze)

3. Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Show that the system is deadlock free (Apply)

Course Outcome 4 (CO4):

1. Understand how program memory addresses relate to physical memory addresses, memory management in base-limit machines, and swapping (Understand)
2. Write about swapping. Let us assume the user process is of size 1MB and the backing store is a standard hard disk with a transfer rate of 5 MBPS. Calculate the transfer rate. (Apply)
3. Consider the following page reference string 1,2,3,2,5,6,3,4,6,3,7,3,1,5,3,6,3,4,2,4,3,4,5,1. Indicate page faults and calculate total number of page faults for FIFO, optimal and LRU algorithms. Assume four frames and all frames are initially empty. (Apply)

Course Outcome 5 (CO5):

1. What are the various File Access methods are available explain with examples? (Understand)
2. Explain in detail about free space management? (Understand)
3. How the information in the file can be accessed? (Apply)

21CS5804	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

Preamble

This course provides the main features of Object Oriented Programming System. It focuses on the basic concepts of C++. Object-oriented programming aims to implement real-world entities like inheritance, hiding, polymorphism, etc in programming. The main aim of OOP is to bind together the data and the functions that operate on them so that no other part of the code can access this data except that function.

Prerequisites for the course

- C Programming

Objectives

- To understand the Object Oriented Programming concepts using the C++ language.
- To know the principles of data abstraction, inheritance and polymorphism.
- To understand the principles of virtual functions and polymorphism.
- To understand the handling of formatted I/O and unformatted I/O.
- To understand the exception handling

UNIT I	Object-Oriented Thinking- C++ Basics	9
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Object-Oriented Thinking: Need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts. **C++ Basics:** Structure of a C++ program, Data types, Variables and Expressions, Operators, Pointers, Arrays, Strings, Structures. Flow control statements- Functions - Parameter passing, Default arguments, inline functions, Recursive

functions, Pointers to functions. Preprocessor directives.

Suggested Activities:

- Implementation of simple C++ programs Using basic Constructs of C++.
- Understanding OOP

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT II

C++ Classes and Data Abstraction

9

Classes, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

Suggested Activities:

- Implementation of C++ programs – use constructors and destructors.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT III

Inheritance- Virtual Functions and Polymorphism

9

Inheritance: Defining a class hierarchy, Different forms of inheritance, Virtual base class.
Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Pure virtual functions, Abstract classes.

Suggested Activities:

- Implementation of C++ programs – use inheritance virtual functions and polymorphism concepts.

SUGGESTED EVALUATION METHODS:

- Assignment
- MCQ

UNIT IV

C++ I/O

9

I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Formatted I/O.

Suggested Activities:

- Implement C++ programs using C++ Streams.

SUGGESTED EVALUATION METHODS:

- Assignment

<ul style="list-style-type: none"> • MCQ 		
UNIT V	Exception Handling	9
Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception specifications, Rethrowing an exception, Catching all exceptions.		
Suggested Activities:		
<ul style="list-style-type: none"> • Write a C++ program with appropriate exception handling. 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment • MCQ 		
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.CODING CHALLENGES	DESCRIPTIVE QUESTIONS
Course Outcomes		
Upon completion of the course, the students will be able to:		
CO1 Develop C++ programs using OOP principles. (Understand, Apply)		
CO2 Develop programs with data abstraction and data hiding .(Understand, Apply)		
CO3 Develop programs with reusability .(Understand, Apply)		
CO4 Develop programs for file handling.(Understand, Apply)		
CO5 Develop programs with exception handling.(Understand, Apply)		
Text Books		
<ol style="list-style-type: none"> 1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill. (Units-1,2,3,4,5) 2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education. (Units-1,2,3,4,5) 		
Reference Books		
<ol style="list-style-type: none"> 1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education. 2. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press. 3. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd 		
Web Resources		
<ol style="list-style-type: none"> 1. https://www.w3schools.com/cpp/cpp_oop.asp 2. https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/ 3. https://www.javatpoint.com/cpp-oops-concepts 4. https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.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	3	3	3		2							2	2		
2	3	3	3		2							2	2		
3	3	3	3		2							2	2		
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	20	10			10
UNDERSTAND	40	20			20
APPLY	40	50	10	10	50
ANALYZE		20			20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Develop C++ programs using OOP principles (Understand, Apply)

1. Describe the various features of the Object-Oriented Programming. (Understand)
2. Write a C++ program to generate student class to calculate the student performance based on the following criteria: Above 75 percentage as Distinction, 60 to 74 percentage as First Class and Below 60 percentage as Second class. (Apply)
3. Write a C++ program to sort set of names stored in an array in alphabetical order. (Apply)

Course Outcome 2 (CO2): Develop programs with data abstraction and data hiding. (Understand, Apply)

1. Illustrate with suitable examples the data abstraction and data hiding. (Understand)
2. Write a C++ program that illustrates the use of various access specifiers. (Apply)
3. What is the default access specifier in C++? Illustrate with an example. (Understand)

Course Outcome 3 (CO3): Develop programs with reusability (Understand, Apply)

1. Discuss in detail about Inheritance and its types. (Understand)
2. Develop a C++ application for the salary calculation of the employee where employee class contains the following attributes name, id, Address, Mailid and Mobile no as members. Inherit the salary class from the employee class to calculate the salary of the employees with 20% of BP as DA, 10 % of BP as HRA, 9% of BP as PF. Generate pay slips for the employees with their gross and net salary. (Apply)
3. Write a C++ program for Student Management System using Multiple inheritance. (Apply)

Course Outcome 4 (CO4): Develop programs for file handling. (Understand, Apply)

1. Write a C++ program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes. (Apply)
2. Illustrate with suitable examples the file handling in C++. (Understand)
3. Discuss in detail about the file pointers with appropriate examples. (Understand)

Course Outcome 5 (CO5): Develop programs with exception handling. (Understand, Apply)

1. Write a C++ program to implement user defined exception handling. (Apply)
2. Illustrate with suitable examples the StackTrace Elements. (Understand)
3. Write a C++ Program to handle all types of exceptions. (Apply)

21CS5805	SOFTWARE ENGINEERING PRACTICES	L	T	P	C
		3	0	0	3
Preamble					
The essence of software engineering practice might be described as understand the problem, plan a solution, carry out the plan, and examine the result for accuracy.					
Prerequisites for the course					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ol style="list-style-type: none"> 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 design and testing methodologies 4. To learn the software project management principles 5. To learn the software quality management principles 					
UNIT I	SOFTWARE PROCESS MODELS	9			
The Nature of Software-Software Process Models-Waterfall Model-Incremental Process Models - Evolutionary Process Models- Prototyping-Spiral Model-Concurrent Model -Introduction to Agility-Agile Process-Extreme programming-XP Process.					
Suggested Activities:					
Explain the software process models with a neat diagram.					
Suggested Evaluation Methods:					
<ul style="list-style-type: none"> • Assignment • MCQ 					
UNIT II	REQUIREMENTS ENGINEERING	9			
Software Requirements: Functional and Non-Functional, User requirements, System					

requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management.		
Suggested Activities: State requirement engineering process and explain requirement elicitation problem.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT III	DESIGN CONCEPTS, TESTING AND MAINTENANCE	9
The Design Concepts - The Design Model - Architectural Design Requirements Modelling - Software Testing Fundamentals – Black Box Testing - White Box Testing - Unit Testing - Integration Testing- Debugging –Software Implementation Techniques: Coding Practices-Refactoring-Maintenance and Reengineering		
Suggested Activities: Explain the fundamental software design concepts. Explain the various testing strategies in software testing.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT IV	SOFTWARE PROJECT MANAGEMENT	9
Team management – Team processes, Team organization and decision -making, Roles and responsibilities in a software team, Role identification and assignment, Project tracking, Team problem resolution; Project planning and scheduling; Software measurement and estimation techniques; Risk analysis and management;		
Suggested Activities: Explain the different activities in project planning.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT V	SOFTWARE QUALITY PROCESS IMPROVEMENT	9
Overview of Quality management and Process Improvement; Overview of SEI -CMM, ISO 9000, CMMI, PCMM, TQM and Six Sigma; overview of CASE tools. Software tools and environments: Programming environments; Project management tools; Requirements analysis and design modelling tools; testing tools; Configuration management tools; DevOps.		
Suggested Activities: Explain how the software quality can be measured.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • 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.DESRIPTIVE QUESTIONS
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Course Outcomes

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

- CO1** Understand and Compare different process models. **(Understand)**
CO2 Explain the Concepts of requirements engineering. **(Remember)**
CO3 Apply systematic procedure for software design and deployment. **(Apply)**
CO4 Compare and contrast the various testing methodologies. **(Understand)**
CO5 Manage project schedule, estimate project cost and effort required. **(Analyse)**

Text Books

1. Roger S. Pressman, –Software Engineering – A Practitioner’s Approach||, Seventh Edition, McGraw-Hill International Edition, 2010.
2. Ian Sommerville, –Software Engineering||, 9th Edition, Pearson Education Asia, 2011.

Reference Books

1. Gene Kim, Jez Humble, Patrick Dubois and John Willis, "The Devops Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", IT Revolution Press, 2016
2. Rajib Mall, –Fundamentals of Software Engineering||, Third Edition, PHI Learning Private Limited, 2009.
3. Pankaj Jalote, –Software Engineering, A Precise Approach||, Wiley India, 2010.

Web Resources

1. https://www.tutorialspoint.com/software_engineering/index.htm
2. <https://www.javatpoint.com/software-engineering-tutorial>

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	3										3	1	2	2	
2	3	2	2				2	3		3		1	2	2	
3	3	3					3					1	3	2	
4	3		3				3	2		2	2	1	2	3	
5	2	2	3					3		3	2	1	3	3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	40	30	10	10	20
UNDERSTAND	40	40	10	10	40

APPLY	20	20	5	5	30
ANALYZE		10			10
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Explain software prototyping and its approaches in software process. (Understand)
2. Point out two deficiencies in waterfall model. (Understand)
3. What are the potential advantages of adhering to life cycle models for software? (Understand)

Course Outcome 2 (CO2):

1. What is requirement engineering? (Remember)
2. Write about feasibility analysis (Remember)
3. Summarize the characteristics of good SRS. (Remember)

Course Outcome 3 (CO3):

1. Explain various testing strategies with an example. (Apply)
2. How do you measure cyclomatic complexity? (Apply)
3. Explain how software testing is related to reliability of software with an example. (Apply)

Course Outcome 4 (CO4):

1. Describe the various activities in project planning. (Understand)
2. Explain about direct and indirect measures. (Understand)
3. State the importance of scheduling activity in project Management (Understand)

Course Outcome 5 (CO5):

1. Write down the various challenges in CMM. (Analyse)
2. Why ISO 9000 is important in software quality management. (Analyse)
3. What are the advantages and disadvantages of Six Sigma. (Analyse)

21CS5806	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3
Preamble					
This course is about programming in Java. Java is a multipurpose, easy to learn, powerful platform where virtually a complete application in any domain can be implemented. Java is the most widely used language for developing open-source software systems. With Java, there comes huge library support which reduces the development time and enhances software reuse for faster development.					
Prerequisites for the course					

- Object Oriented Programming Systems

Objectives

- To Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc
- To have an ability to write programs using exception handling techniques.
- To understand streams and efficient user interface design techniques.

UNIT I

JAVA FUNDAMENTALS

9

Overview of JDK framework – Identifiers – variables – Assignment statements and Expressions – Constants - Numeric data types, operations and conversions – String Type – Scanner class – control statements - switch statements –Loop Statements

Suggested Activities:

- Write a Java Program using Strings
- Write a java program with looping concepts

Suggested Evaluation Methods:

- Quiz and Assignment problems
- Tutorials on program writing skills.

UNIT II

OBJECT ORIENTED PROGRAMMING CONCEPTS

9

Class Fundamentals- Access Control-Modifiers - Constructors - Defining a method- Calling a method – Passing parameters by values – Overloading Methods-Polymorphism -Inheritance – Interfaces.

Suggested Activities:

- Write and execute a java program to perform method overloading.
- Write and execute java program to Exploring class hierarchy using inheritance and implementing Interface based run-time polymorphism.

Suggested Evaluation Methods:

- Quiz
- Tutorial on above activities

UNIT III

EXCEPTION / ERROR HANDLING

9

Exceptions & Errors-Types of Exception-Control Flow in Exceptions-Use of try -catch-finally-throw-throws in Exception Handling -In-built and User Defined Exceptions.

Suggested Activities:

- Write and execute a java program for Exceptions
- Write and execute a java program for Error Handling

Suggested Evaluation Methods:

- Solving Assignment programs
- Test Projects

UNIT IV**APPLICATION PROGRAMMING WITH GUI****9**

Event-Driven Programming- Event and Event Sources – Listeners and handling events – Mouse events – Key events -Introduction to Swings-Frame Components-Text Input-Choice Components- Menus-Dialog Box-Layout Management

Suggested Activities:

- Write and execute java program for Event Handling
- Write and execute java program to collect user information using Swing

Suggested Evaluation Methods:

- Quiz and Assignment problems
- Tutorials on program writing skills.

UNIT V**APPLETS AND GRAPHICS****9**

Applet class – JApplet class – Enabling applets to run as application – Passing string to applets – Graphics class – paint component method – Drawing graphics on panels – Drawing strings , lines, Rectangles, and Ovals, Polygons , Polylines, Font Metrics class.

Suggested Activities:

- Write and execute java program for calculator using Applet.
- Write and execute java program to perform Graphics operations

Suggested Evaluation Methods:

- Quiz
- Tutorials on program writing skills

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

1. DESCRIPTIVE
QUESTIONS**Course Outcomes**

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

1. Write basic programs using fundamental structures. (Understand)
2. Write basic programs using object-oriented concepts. (understand)
3. Write Java programs for classes that can handle exception and various errors handling mechanism. (understand)
4. Create Simple applications with GUI. (Apply)
5. Develop applications using applet and graphics (Apply)

Text Books

1. Y.Daniel Liang “ Introduction to Java Programming” 7th Edition, Pearson Education,2013
178.

Reference Books

1. P.J.Deitel&H.M.Deitel, “Java: How to Program Java
Prentice Hall, Seventh Edition, 2011.
2. Herbert Schildt, “Java The Complete Reference”,TataMcgrawHill, Eight Edition, 2011.
3. E.BalaGurusamy, “Programming with java A Primer”, Tata McGraw, Hill Education, Fourth Edition, 2009

Web Resources

1. <https://www.programiz.com/java-programming>

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	3	1	2	2	1								3	2	
2	3	1	2	2	1								3	2	
3	3	1	2	2	1								3	2	
4	3	1	2	2	1								3	2	
5	2	1	3	2	1								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): Write basic programs using fundamental structures

1. What are the fundamental structures in java? (Remember)
2. Explain about the looping statements. (Understand)

Course Outcome 2 (CO2): Create basic programs using object-oriented concepts

1. Illustrate classes and objects with an example program. (Understand)
2. Explain Polymorphism in detail. (Understand)
3. Define inheritance. (Remember)

Course Outcome 3 (CO3): Create classes that can handle exception and various errors handling mechanism

1. Write short notes on Built-in Exception classes in java. (Remember)
2. What are the types of exceptions? (Remember)
3. Illustrate the Exception handling mechanism with suitable example programs. (Understand)

Course Outcome 4 (CO4): Create Simple applications with GUI

1. Write a java program to implement a food billing system using swing. (Apply)
2. Write a java program to implement a Scientific Calculator using swing. (Apply)

Course Outcome 5 (CO5): Develop applications using applet and graphics

1. Write an Applet code to draw a smiley using Applet. (Apply)
2. Illustrate working with 2D shapes with suitable example programs. (Apply)

21CS5807	C# and .Net Programming	L	T	P	C
		3	0	0	3
Preamble					
<p>This course provides the knowledge on C# programming and allows you to develop windows and web based applications using .NET framework technologies. It also allows exploring the object oriented programming concepts through C# Programming to design and develop dynamic window and web based applications for different platform.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • C++, Object oriented Programming 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the foundations of CLR execution. 2. To learn the .NET framework Technologies. 3. To know the object oriented aspects of C# Programming 4. To have knowledge on developing .Net windows Application 5. To learn web based applications using ASP.Net Technologies. 					
UNIT I	INTRODUCTION TO C#	9			
<p>Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.</p>					
Suggested Activities:					
<ul style="list-style-type: none"> • Assignment : Overview of C# • Write and execute a program for branching and looping statements using C# Programming. 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Online Quizzes • Programming Exercises using Hacker Rank, Hacker Earth and Skill Rack 					
UNIT II	OBJECT ORIENTED ASPECTS OF C#	9			
<p>Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading</p>					
Suggested Activities:					

- Assignment: Overloading and Exceptions
- Write and execute a program for multiple inheritance

SUGGESTED EVALUATION METHODS:

- Online Quizzes
- Programming Exercises using Hacker Rank, Hacker Earth and Skill Rack

UNIT III

APPLICATION DEVELOPMENT ON .NET

9

Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box (Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

Suggested Activities:

- Write and execute a simple calculator program using windows forms
- Write and execute a program for storing information in database using Ado.Net

SUGGESTED EVALUATION METHODS:

- Online Quizzes
- Programming Exercises using Hacker Rank, Hacker Earth and Skill Rack

UNIT IV

WEB BASED APPLICATION DEVELOPMENT ON .NET

9

Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

Suggested Activities:

- Project demonstration for Library Management application using ASP.Net
- Write and execute a program for storing information in database using web service.

SUGGESTED EVALUATION METHODS:

- Online Quizzes
- Programming Exercises using Hacker Rank, Hacker Earth and Skill Rack

UNIT V

CLR AND .NET FRAMEWORK

9

Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

Suggested Activities:

- Assignment: Marshalling
- Group Discussion – Security frameworks available in .NET

SUGGESTED EVALUATION METHODS:

- Online Quizzes
- Programming Exercises using Hacker Rank, Hacker Earth and Skill Rack

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	DESCRIPTIVE QUESTIONS

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

1. Explore the fundamental knowledge of C# Programming (Remember)
2. Understand the Object Oriented aspects of C#.(Understand)
3. Design and Develop windows forms applications using C# on .NET framework (Apply)
4. Design and develop Web based applications using ASP .NET framework(Apply)
5. Understand the CLR aspects on .NET framework.(Understand)

Text Books

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.

Reference Books

1. Andrew Troelsen , "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O'Reilly, 2010.

Web Resources

<https://dotnet.microsoft.com/languages>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	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	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 (CO1):

Explore the fundamental knowledge of C# Programming (Remember)

1. List the major elements of the .NET frame work.
2. What are the major elements of .NET framework? (Remember)
3. What do you mean by checked and unchecked operators? (Understand)

Course Outcome 2 (CO2):

Understand the Object Oriented aspects of C#.(Understand)

1. Explain Constructors and its types. (Understand)
2. Differentiate abstract class and interface. (Understand)

Course Outcome 3 (CO3):

Design and Develop windows forms applications using C# on .NET framework (Apply)

- 1.Create our own window forms with events and controls. (Apply)
2. Write about SDI and MDI application. (Remember)

3. Illustrate SQL Server with ADO.NET with suitable example programs. (Apply)

Course Outcome 4 (CO4):

Design and develop Web based applications using ASP .NET framework(Apply)

- 1.Explain the process of working with XML and .NET. (Understand)
2. Explain how to create Virtual Directory and Web Application. (Analyze)

Course Outcome 5 (CO5):

Understand the CLR aspects on .NET framework.(Understand)

1. What is meant by Versioning? (Remember)
2. Define marshalling. (Understand)
3. Discuss about security in .NET. (Analyze)

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					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ol style="list-style-type: none"> 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 :					
<ul style="list-style-type: none"> • Multimedia – in Class • In Class activity – simple exercises on display device 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • 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.DESRIPTIVE QUESTIONS
Course Outcomes		
Upon completion of the course, the students will be able to:		
<ol style="list-style-type: none"> 1. Design a multimedia architecture for handling the stream. (Apply) 2. Work with the various elements of multimedia system.(Apply) 3. Select storage media and compression technique.(Analyze) 4. Develop animation, images, Sound using Multimedia Tools(Apply) 5. Develop a multimedia applications.(Apply) 		
Text Books		
<ol style="list-style-type: none"> 1. Parekh R, "Principles of Multimedia", Tata McGraw-Hill, 2013 (Unit I, II, III) 2. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education, 2009. 		
Reference Books		
<ol style="list-style-type: none"> 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 & Ghosh Ananda 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, Dragorad A. 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		
<ol style="list-style-type: none"> 1. https://ctl.wiley.com/principles-of-multimedia-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	PO1 0	PO1 1	PO1 2	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)

21CS5809	DIGITAL COMPUTER ORGANIZATION	L	T	P	C
		3	0	0	3
Preamble for the course					
This course introduces the basic concepts of computers, their design and how they work. It encompasses the definition of the machine's instruction set architecture, its use in creating a program, and its implementation in hardware. The course addresses the bridge between gate logic and executable software, and includes programming both in assembly language (representing software) and HDL (representing hardware). Then it describes input/output (I/O) systems, which bring the processor and memory together with a wide range of devices.					
Prerequisites for the course					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ul style="list-style-type: none"> • Understand of the basic structure and operation of a digital computer. • Impart knowledge about the operation of the arithmetic unit including the algorithms & implementation addition, subtraction, multiplication & division. • Acquire knowledge about the diverse ways of communicating with I/O devices and standard I/O interfaces. 					
UNIT I	STRUCTURE OF COMPUTERS	9			
Functional units -Basic operational concepts -Bus structures -Software-performance-Memory locations and addresses -Memory operations-Instruction and instruction sequencing -Addressing modes-Assembly language-Basic I/O operations - Stacks and queues-Pipelining					
Suggested Activities: 1.Check the memory configuration of personal computer. 2.Implement stack concept in your computer using C Programming.					
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Assignment problems • Quizzes 					
UNIT II	ARITHMETIC OPERATIONS	9			
Addition and subtraction of signed numbers-Design of fast adders-Multiplication of positive numbers -Signed operand multiplication and fast multiplication-Integer division- Floating point Numbers and Operations- Parallel Processing					
Suggested Activities: 1. Write a Assembly level language program for 16 bit addition(Choose any Language). 2. Write a Assembly level language program for 16 bit Division.(Choose any Language).					
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Assignment problems • Quizzes 					
UNIT III	BASIC PROCESSING UNIT	11			
Fundamental concepts-Execution of a complete instruction-Multiple bus organization-Hardwired control-Micro programmed control- Pipelining: Basic concepts-Data hazards-Instruction hazards Influence on Instruction sets-Data path and control consideration-Superscalar operation-General Processing Unit					

Suggested Activities: 1.Implement a program for pipelining concept (Choose any Language). 2.Write in any 5 Instruction for 16 bit (Any 16 bit processor)		
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Assignment problems • Quizzes 		
UNIT IV	INPUT/OUTPUT ORGANIZATION	8
Accessing I/O devices-Interrupts-Direct Memory Access-Buses-Interface circuits-Standard I/O Interfaces (PCI, SCSI, USB).		
Suggested Activities: 1.Implement Input port concept Using 16 bit processor and Emulator. 2. Implement output port concept Using 16 bit processor and Emulator.		
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Assignment problems • Quizzes 		
UNIT V	MEMORY UNIT	8
Basic concepts-Semiconductor RAMs -ROMs- Speed -size and cost -Cache memories -Performance consideration-Virtual memory-Memory Management requirements-Secondary storage.		
Suggested Activities: 1.Write in assembly language program and store it in a RAM memory location.(Use Emulator) 2. Retrieving the 16 bit input from the RAM and Execute Your own Program and store the result in the RAM (Using emulator)		
SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none"> • Assignment problems • Quizzes 		
Total Periods		45
Suggestive Assessment Methods		
Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Course Outcomes		
Upon completion of the course, the students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the basic structure of a digital computer and instruction sets with addressing modes. (Understand) 2. Apply the arithmetic operations of binary number system.(Apply) 3. Assess the organization of the basic processing unit and examine the basic concepts of pipelining. (Apply) 4. Outline the standard I/O interfaces and peripheral devices. (Apply) 		

5. Determine the performance of different types of memory. (Apply)

Text Books

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill, Third Reprint 2015

Reference Books

1. William Stallings, Computer Organization and Architecture Designing for Performance, Pearson Education, 2003.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The hardware / software interface, Morgan Kaufmann, Fourth edition.
3. John P. Hayes, Computer Architecture and Organization, McGraw Hill, third edition

Web Resources

1. <https://www.yourarticlelibrary.com/computer-science/digital-computer-meaning-organisation-and-types/85130>
2. <https://www.geeksforgeeks.org/last-minute-notes-computer-organization/>

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	3	3	3	3									3	3	
2	3	3	3	3									3	3	
3	2	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 (CO1): Illustrate the basic structure of a digital computer and instruction sets with addressing modes.

1. Recall the Functional units. (Remember)
2. Summarize Bus structures. (Understand)
3. Explain the concept of Stacks and queues (Apply)

Course Outcome 2 (CO2): Apply the arithmetic operations of binary number system.

1. What are the Floating point Numbers and Operations? (Remember)
2. Compare Addition and subtraction of signed numbers. (Understand)
3. Analyze Signed operand multiplication. (Analyze)

Course Outcome 3 (CO3): Assess the organization of the basic processing unit and examine the basic concepts of pipelining.

1. Narrate the Execution of a complete instruction. (Understand)
2. Write about Micro programmed control. (Remember)
3. Explain Data path and control consideration (Apply)

Course Outcome 4 (CO4): Outline the standard I/O interfaces and peripheral devices.

1. What are Interrupts? (Remember)
2. Explain the Interface circuits (Apply)
3. How about Standard I/O Interfaces? (Remember)

Course Outcome 5 (CO5): Determine the performance of different types of memory.

1. What is meant by Semiconductor RAMs? (Remember)
2. Explain Virtual memory (Understand)
3. Explain Secondary storage. (Apply)

21CS5810	DATABASE TECHNOLOGY	L	T	P	C
		3	0	0	3
Preamble					
Database technologies take information and store, organize, and process it in a way that enables users to easily and intuitively go back and find details they are searching for. Database technologies come in all shapes and sizes, from complex to simple, large to small.					
Prerequisites for the course					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ol style="list-style-type: none"> 1. Know about the Parallel Databases 2. Understand the concept of Distributed Database 3. Familiarize with Object Databases 4. Understand the Relational Systems 5. Use the queries used in the XML Databases 					
UNIT I	PARALLEL DATABASES	9			
Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism					
Suggested Activities:					
Explain the advantages and disadvantages of parallel database system.					
Suggested Evaluation Methods:					
<ul style="list-style-type: none"> • Assignment 					

	<ul style="list-style-type: none"> • MCQ 	
UNIT II	DISTRIBUTED DATABASES	9
Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.		
Suggested Activities: Explain the Distributed Database Design Framework.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT III	OBJECT CONCEPTS	9
Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects		
Suggested Activities: Describe the characteristics of object-oriented database.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT IV	OBJECT RELATIONAL DATABASES	9
Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL / Oracle – Case Studies.		
Suggested Activities: Distinguish between Object Oriented databases and Object relational Databases.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT V	XML DATABASES	9
XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining.		
Suggested Activities: Differentiate XML database and Web database.		
Suggested Evaluation Methods: <ul style="list-style-type: none"> • 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:

- CO 1 - Understand the basic concepts of Parallel Databases (Understand)
 CO 2 - Analyse the Distributed Database Concepts (Analyse)
 CO 3 - Apply the basic concepts of Object Databases (Apply)
 CO 4 - Apply the idea behind Object Relational Database (U Apply)
 CO 5 - Use the queries in the XML Databases (Apply)

Text Books

1. Henry F Korth, Abraham Silberschatz and S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2011.
2. C. J. Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

Reference Books

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Mc Graw Hill, Second Edition.

Web Resources:

1. <https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/>
2. https://www.tutorialspoint.com/xml/xml_databases.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	2	2	2	2	2
2	3	2	2	2		2				2	2	2	2		2
3	2	2		2	2	3				2	2	2	2	2	2
4	2	2	2	3	2	2				2	2		2		2
5	2	2	2	2	2	2				2	2	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

Course Outcome 1 (CO1):

1. What is Parallel database System? (Remember)
2. What is client-server architecture? (Understand)
3. What is Inter query and Intra query operation Parallelism? (Apply)

Course Outcome 2 (CO2):

1. How does a distributed database differ from a parallel database? (Analyse)
2. What are the advantages of 3-tier client server architecture over 2 tier client server Architecture ? (Analyse)
3. What is the purpose of concurrency control in DBMS? (Analyse)

Course Outcome 3 (CO3):

1. Explain about object databases. (Understand)
2. What does object structure mean? (Understand)
3. Explain Complex Objects. (Understand)

Course Outcome 4 (CO4):

1. Explain Object Database Standards. (Understand)
2. Explain ODL(Understand)
3. What are the object relational features in SQL? (Understand)

Course Outcome 5 (CO5):

1. Explain XML Database with example. (Apply)
2. Explain Data Warehouse with an example. (Apply)
3. Explain the concept of Data Mining with an example. (Apply)

21CS5901	Technical Seminar and Comprehensive Test - II	L	T	P	C
		0	0	2	1

Prerequisites for the course

- Communication

Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

Total Periods : 30

COURSE OUTCOMES:

- CO1: Ability to review and prepare technological developments
 CO2: Ability to present technological developments
 CO3: Ability to use various teaching aids such as overhead projectors, power point Presentation and demonstrative models.
 CO4: Ability to face the placement interviews
 CO5: Ability to attend the verbal reasoning test

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	2	2								3		2	1		3
2	2	2								3		2	1		3
3	2	2								3		2	1		3
4	2	2								3		2	1		3
5	2	2								3		2	1		3

21PT3904	REASONING	L	T	P	C
		0	0	2	1
Prerequisites for the course					
<ul style="list-style-type: none"> • 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:					
C01: Improve their interpersonal skills through proper communication.					
C02: Acquire wide knowledge on social Media and its interaction					
C03: Understanding the various strategies for building relationships among peers					
C04: Improve negotiation skills in academic and social contexts					
C05: 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.
- Dale Carnegie, How to Win Friends and Influence People, Latest Edition, 2016. Gallery Books, New York

Web Recourses

- <https://www.fresherslive.com/online-test/logical-reasoning-test/questions-and-answers>
- <https://www.indiabix.com/non-verbal-reasoning/questions-and-answers/>
- <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

SEMESTER VI

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS6101	Total Quality Management	HSSM	3	3	0	0	3
2	21CS6601	Compiler Design	PC	3	3	0	0	3
3		Professional Elective II	PE	3	3	0	0	3
4		Professional Elective III	PE	3	3	0	0	3
5		Open Elective -III	OE	3	3	0	0	3
6	21PT3903	Soft skills –Aptitude II	EEC	1	1	0	0	1
Theory cum Practical Courses								
1	21CS6602	Artificial Intelligence Practices	PC	4	2	0	2	3
Practical Courses								
1	21CS6611	Mobile Application Development Laboratory	PC	4	0	0	4	2
2	21CS6911	Project Work (Phase-I)	EEC	4	0	0	4	2
Total				28	18	0	10	23

Professional Elective II

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/Domain
Professional Elective II								
1	21CS6701	Information Storage Management	6	3	0	0	3	Data Science
2	21CS6702	Java Enterprise Technologies	6	3	0	0	3	Programming
3	21IT7713	Software Testing and Tools	6	3	0	0	3	Software Engineering
4	21CS6703	Micro Controlled Based System Design	6	3	0	0	3	Computer Architecture
5	21CS6704	Wireless Network Technologies	6	3	0	0	3	Networking
Professional Elective III								
1	21CS6705	Business Intelligence	6	3	0	0	3	Data Science
2	21CS6706	Distributed and Parallel Systems	6	3	0	0	3	Computer Architecture
3	21CS6707	Mobile Computing	6	3	0	0	3	Networking
4	21IT5701	Advanced Java Programming	6	3	0	0	3	Programming
5	21CS6708	Agile Software Development	6	3	0	0	3	Software Engineering

Open Electives III

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered to Departments
Open Elective III								
1	21CS6801	Cloud Computing Technologies	6	3	0	0	3	Civil , EEE, Mech
2	21CS6802	Web Technology	6	3	0	0	3	Civil , EEE, Mech
3	21CS6803	Android Application Development	6	3	0	0	3	Civil , EEE, Mech
4	21CS6804	Artificial Intelligence	6	3	0	0	3	Civil , EEE, Mech
5	21CS6805	Cyber Security Essentials	6	3	0	0	3	Civil , EEE, Mech

21HS6101	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

Preamble

To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management. The course explains the importance of daily management, the relationship between daily management and policy management, PDCA and SDCA cycle that will help to understand the various aspects of TQM, and inculcate TQM in day-to-day life to improve productivity and efficiency.

Prerequisites for the course

Nil

Objectives

1. To understand the need for quality and its evolution over time.
2. To understand the need for quality and its evolution over time.
3. To equip with a thorough understanding of quality management tools and techniques.
4. To enable them to effectively implement these tools and techniques to optimize quality management practices.
5. To understand the need for quality and its evolution over time.

UNIT I

INTRODUCTION

9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II

TQM PRINCIPLES

9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen.

UNIT III

TQM TOOLS AND TECHNIQUES I

9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV

TQM TOOLS AND TECHNIQUES II

8

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V

QUALITY MANAGEMENT SYSTEM

10

Introduction—How are standards developed? - Benefits of ISO Registration—ISO 9000 Series of Standards - ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration. Environmental Management System:ISO 14000 Series Standards—Concepts of ISO

14001 - Benefits of EMS.ISO 45001 and related standards — Occupational health and safety, ISO/IEC 27000 family — Information security management - ISO 31000 - Risk management - ISO 26000 - Social responsibility - ISO 20121 - Sustainable events

Total Periods	45
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Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
WRITTEN TEST	1.ASSIGNMENT 2. ONLINE QUIZZES 3.PROBLEM-SOLVING ACTIVITIES	WRITTEN TEST

Outcomes

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

1	To familiarize with the basic concept and framework of Total Quality management.
2	To Understand the Leadership and Employee involvement for Continuous process improvement.
3	To Provide a comprehensive understanding of the traditional tools and equipping with the knowledge and skills to drive quality improvement initiatives effectively.
4	To Apply the various types of Techniques and foster their ability to drive organizational improvement and enhance quality management practices.
5	To Apply various Quality Systems and Auditing on implementation of TQM.

Text Books

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.
2. Poornima M., Pearson publication, rd Edition, Total Quality Management 2017

Reference Books

1. Subburaj Ramasamy, Total Quality Management, Mc Graw Hill Publications
2. Sunil Luthra, Dixit Garg, Ashish Agarwal, Sachin K. Mangla, Total Quality Management (TQM): Principles, Methods, and Applications, Publisher: CRC Press, 2020; ISBN 1000194493,
3. D.R. Kiran, Total Quality Management: Key Concepts and Case Studies, Publisher Butterworth-Heinemann, 2016, ISBN 0128110368,
4. W. Edwards Deming, The Essential Deming: Leadership Principles from the Father of Quality, Editors Joyce Orsini, Diana Deming Cahill, Publisher: McGraw Hill Professional, 2012, ISBN: 0071790217, 9780071790215

Web Recourses

1. <http://www.notesengine.com/dept/cse/7sem/anna-university-7-sem-cse-notes.html>
2. <http://www.vidyarthiplus.com/vp/Thread-GE2022-Total-Quality-Management-Lecture-Notes- Lonely-Edition>
3. <http://freshupdates.in/lecture-notes/anna-university-total-quality-management-lecture-notes/>
4. <http://www.iannauniversity.com/2012/06/ge2022-total-quality-management-lecture.html>
5. <https://www.iso.org/popular-standards.html>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PS 01	PS 02	PSO 3
1	2					2	1	2			2			2	
2	2					2	1	2			2			2	
3	2					2	1	2			2			2	
4	1					2	1	2			2			2	
5	2					2	1	2			3			2	

1-Low, 2- Medium, 3- High

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER			5		5
UNDETSTAND	50		10	5	30
APPLY	50	50	10	10	35
ANALYZE		50		10	30
EVALUATE					
CREATE					
	100	100	25	25	100

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					
<ul style="list-style-type: none"> • 21CS5601-Theory of Computation 					
Objectives					
<ol style="list-style-type: none"> 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:					
<ul style="list-style-type: none"> • Constructs for phases of compiler • LEX tool for tokenization • Problems based on conversion from NFA to DFA, Epsilon NFA to DFA 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • CFG for C language constructs • Push down automata for Parsing • programs using YACC for parsing 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • 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
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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
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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
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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	PO 11	PO12	PSO 1	PS O2	PS O3
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)

Professional Elective II

21CS6701	INFORMATION STORAGE MANAGEMENT	L	T	P	C
		3	0	0	3
Preamble					
<p>The Information Storage and Management course enables organizations to ensure their data is properly stored and managed. The course provides comprehensive coverage of the technologies, management strategies and practices used to protect and store digital data in enterprise environments. It includes best practices for areas such as data protection, storage replication, virtualization, cloud and storage platforms, as well as current trends, enabling technologies and industry standards.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS5602 -Computer networks • 21CS5705- Data Warehousing and Data Mining 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the available storage technologies. 2. To understand the Storage Systems Architecture 3. To understand the concept of Networked Storage 4. To learn to establish & manage data center. 5. To learn security aspects of storage & data center 					
UNIT I	STORAGE TECHNOLOGY	9			
<p>Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.</p>					
UNIT II	STORAGE SYSTEMS ARCHITECTURE	9			
<p>Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Disk Drive, Physical Disk, RAID, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system.</p>					
UNIT III	INTRODUCTION TO NETWORKED STORAGE	9			
<p>Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP- SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS full fill the need, understand the appropriateness of the different networked storage options for different application environments.</p>					
UNIT IV	INFORMATION AVAILABILITY, MONITORING & MANAGING DATACENTERS	9			
<p>List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime - Introduction to Business Continuity, Backup and Archive, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies. Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center.</p>					
UNIT V	SECURING STORAGE AND STORAGE VIRTUALIZATION	9			

Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes.

Total Periods	45
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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 various storage technologies to be suited for various applications. (Understand)
- CO2 Apply security measures to safeguard storage & farm. (Apply)
- CO3 Analyse QoS on Storage (Analyse)
- CO4 Analyze Key metrics to monitor for different components in a storage infrastructure (Analyse)
- CO5 Analyze the various Virtualization technologies

Text Books

1. EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley, India, 2010. (UNITS- I-V)

Reference Books

1. Marc Farley, –Building Storage Networks||, Tata McGraw Hill ,Osborne, 2001.
2. Robert Spalding, –Storage Networks: The Complete Reference–, Tata McGraw Hill , Osborne, 2003.

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PS 01	PSO 2	PS 03
1	3	2	2	2										3	
2	3	2	3									1		3	
3	3	2	1	2								1		3	
4	2	1		2							2	2		3	
5	2	3	3									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					

21CS6702	JAVA ENTERPRISE TECHNOLOGIES	L	T	P	C
		3	0	0	3
Preamble					
This course is about programming in J2EE. J2EE is the standard platform for developing applications in the enterprise and is designed for enterprise applications that run on servers. J2EE provides APIs that let developers create workflows and make use of resources such as databases or web services. Developers can use these APIs to build applications for business computing.					
Prerequisites for the course					
<ul style="list-style-type: none"> 21CS3603 - Object Oriented Programming Systems 					
Objectives					
<ol style="list-style-type: none"> To learn the server-side technologies such as Java servlets and JSP To examine the notion of Enterprise Java Beans (EJB) and its types To familiarize the messaging services using JavaMail and Java Message Service To understand the JSF GUI application and usage of Java web services To learn the various frameworks of MVC architecture 					
UNIT I	SERVLET AND JSP	9			
J2EE architecture – Servlet – Life cycle – Parameter data – Sessions – Cookies – URL rewriting – Other servlet capabilities – Servlets and concurrency – Database connectivity. Java Server Pages: Directive, scripting, action elements - expression language –JavaBeans classes and JSP - JSP Standard Tag Library.					
Suggested Activities:					
<ul style="list-style-type: none"> Write and execute Java Servlet programming for Java Server Pages (JSP) Write and execute java program to develop JSP application using Beans. 					

Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Quiz and Assignment problems • MCQ 		
UNIT II	ENTERPRISE JAVA BEANS	9
Understanding EJBs: Types of EJBs - Anatomy of an EJB - EJB container – Embedded container - Dependency injection and JNDI. Session Beans: Stateless, stateful, singletons beans – Session beans life cycle - Session bean model – asynchronous calls. Message. Driven Beans (MDB): MDB model - MDB as a consumer, producer – Example. Entity Java Bean – Types, life cycle.		
Suggested Activities:		
<ul style="list-style-type: none"> • Write a Java program to execute EJB container with session beans. • Write and execute a java program for Entity java beans. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Quiz • Tutorial on above activities 		
UNIT III	JAVA MAIL AND JMS	9
Java Mail: API – Protocols – Send email message – Retrieving email messages – Deleting email messages – Forwarding email message – Sending and receiving attachments. Java Message service: JMS fundamentals – JMS API – Components of JMS –sending message – receiving message creating a publisher – Creating a subscriber.		
Suggested Activities:		
<ul style="list-style-type: none"> • Write and execute java program to send and receive mail using Java Mail API. • Write and execute java program to send and receive message using JMS Service. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Code Debugging • Test Projects 		
UNIT IV	JSF AND WEB SERVICES	9
Java Server Faces (JSF): overview – architecture – Life cycle – various tags – data tables – JSF JDBC integration – Event handling – Application using JSF. SOAP Web Services: Understanding SOAP web services - Invoke a SOAP web service. RESTful Web Services: Understanding RESTful web services - Java API for RESTful web services.		
Suggested Activities:		
<ul style="list-style-type: none"> • Write and execute java program for JDBC access through SOAP Web Services. • Write and execute java program for accessing web server using RESTfull Web services. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Quiz and Assignment problems • Test Project. 		

UNIT V	MVC ARCHITECTURE	9
MVC Architecture – Struts framework: overview – architecture – Struts Action class– Using Struts HTML tags – Struts validation framework – Developing application with Struts. Introduction to Spring – Introduction to Hibernate.		
Suggested Activities:		
<ul style="list-style-type: none"> • Write and execute java program for developing application using Struts framework. • Write and execute java program for developing application using MVC framework. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Code Debugging • Test project with demonstration 		
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 various storage technologies to be suited for various applications. (Understand)		
CO2 Apply security measures to safeguard storage & farm. (Apply)		
CO3 Analyse QoS on Storage (Analyse)		
CO4 Analyze Key metrics to monitor for different components in a storage infrastructure (Analyze)		
CO5 Analyze the various Virtualization technologies		
Text Books		
1. EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley, India, 2010. (UNITS- I-V)		
Reference Books		
1. Marc Farley, –Building Storage Networks , Tata McGraw Hill ,Osborne, 2001.		
2. Robert Spalding, –Storage Networks: The Complete Reference–, Tata McGraw Hill , Osborne, 2003.		

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	PO 12	PS 01	PS 02	PS 03
1	3	2	3		3								3		
2	3	2	3		3								3		
3	3	2	3		3								3		
4	3	2	3		3								3		
5	3	2	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	15
UNDERSTAND	60	30	15	5	25
APPLY	20	60	5	15	60
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Understand the servlet life cycle and Java Server Page (Understand)

1. Discuss about the Servlet architecture with life cycle.(Understand)
2. Describe Java Server Pages with Java Beans. (Understand)

Course Outcome 2 (CO2): Understand the techniques of session and driven java beans (Understand)

1. Describe the Enterprise Java Beans with EJB Types. (Understand)
2. Distinguish the features of Session Beans and Driven Beans. (Understand)

Course Outcome 3 (CO3): Apply the JavaMail API for developing Mail Service based application. (Apply)

1. Write short notes on Java Mail Services. (Remember)
2. Write and execute java program to send and receive mail using Java Mail API. (Apply)
3. Write and execute java program to send and receive message using JMS Service.(Apply)

Course Outcome 4 (CO4): Apply JSF and SOAP Service for developing Web Services based application. (Apply)

1. Write a java program for JDBC access through SOAP Web Services. (Apply)
2. Describe accessing web server using RESTfull Web services with Examples. (Apply)

Course Outcome 5 (CO5): Design Java Web Application using MVC and Struts Architecture. (Apply)

1. Explain Struts framework for developing Java Web application with example. (Apply)
2. Write java program for developing application using MVC framework. (Apply)

21IT7713	SOFTWARE TESTING AND TOOLS	L	T	P	C
		3	0	0	3
Preamble					
This course is designed to enhance the knowledge of software testing for enriching their career as a software developer. It acquires appropriate skills to design good testcases, perform code walk throughs, bug detection, prepare test plan document for successful tests and get exposed to Test automation tools.					
Objectives					
<ol style="list-style-type: none"> 1. To understand the basics of software testing 2. To understand the testing process for various test cases. 3. To understand various types of testing use test procedures 4. To apply various test cases on mobile and web applications. 5. To apply selenium and TestNG tool for test automation. 					
UNIT I	FOUNDATIONS OF SOFTWARE TESTING	9			
Overview - Black-Box Testing and White-Box Testing - Software Testing Life Cycle- V-model of Software Testing - Program Correctness and Verification - Reliability versus Safety-Failures - Errors and Faults (Defects)- Software Testing Principles - Program Inspections- Stages of Testing: Unit Testing, Integration Testing, System Testing					
UNIT II	TEST PLANNING	9			
Goal of Test Planning - High Level Expectations - Intergroup Responsibilities - Test Phases - Test Strategy-Resource Requirements-Tester Assignments-Test Schedule-Test Cases-Bug Reporting, Metrics and Statistics.					
UNIT III	TEST DESIGN AND EXECUTION	9			

Test Design Factors-Requirement identification-Testable Requirements-Modelling a Test Design Process - Modelling Test Results - Boundary Value Testing - Equivalence Class Testing - Path Testing-Data Flow Testing-Test Design Preparedness Metrics-Test Case Design Effectiveness-Model-Driven Test Design-Test Procedures-Test Case Organization and Tracking, Bug Reporting-Bug Life Cycle -secure coding practice and input validation.

UNIT IV	ADVANCED TESTING CONCEPTS	9
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Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing-Recovery Testing - Configuration Testing - Compatibility Testing - Usability Testing, Testing the Documentation, Security testing - security testing techniques - Testing in the Agile Environment -Testing Web and Mobile Applications.

UNIT V	TEST AUTOMATION AND TOOLS	9
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Automated Software Testing - Automate Testing of Web Applications - **Selenium:** Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports. TestNG

Total Periods	45
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Suggestive Assessment Methods

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

Outcomes

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

- C01**–Understandthebasicconceptsofsoftwaretestingandtheneedforsoftwaretesting
- C02**–Understandhowtestingcanbedoneforvarioustestcases.
- C03**–Understandeffectivetestcaseshatcanuncovercriticaldefectsintheapplication
- C04**–Applyvarioustestcasesonmobileandwebapplications.
- C05**–ApplytheSeleniumandTestNGtoolsforsoftwaretesting

TextBooks

1. Yogesh Singh, "Software Testing", Cambridge University Press, 2nd Edition, 2012. **(UNIT I-III)**
2. Unmesh Gundecha, Satya Avasarala, "Selenium Web Driver 3 Practical Guide" - Second Edition 2018. **(UNIT IV & V)**

Reference Books

1. Glenford J. Myers, Corey Sandler, Tom Badgett, "The Art of Software Testing", 3rd Edition, John Wiley & Sons, Inc., 2012
2. Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", Fourth Edition, Taylor & Francis Group, 2014.
3. Carl Cocchiaro, "Selenium Framework Designing Data-Driven Testing", Packt Publishing, 2018.
4. Elfriede Dustin, Thom Garrett, Bernie Gaurf, "Implementing Automated Software Testing", 2009, Pearson Education, Inc.
5. Satya Avasarala, "Selenium Web Driver Practical Guide", Packt Publishing, 2014
6. Varun Menon, "TestNG Beginner's Guide", Packt Publishing, 2013

Web Resources

1. <http://seleniumhq.org/>
2. <http://sourceforge.net/projects/sahi/>
3. <http://testing.org/doc/index.html>

CO Vs. PO Mapping and CO vs. PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PS O2	PS O3
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	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND	60	60	15	15	60
APPLY	40	40	10	10	30
ANALYZE					
EVALUATE					
CREATE					

21CS6703	MICRO CONTROLLED BASED SYSTEM DESIGN	L	T	P	C
		3	0	0	3

Preamble

This course provides the knowledge on single board computers like raspberry pi and discovers the Linux kernel based Operating systems like Ubuntu mate, Raspbian. It also helps to explore the electronics which interface with Raspberry Pi using GPIO Programming. It provides the ability to create embedded products and Internet of things based products with the help of sensors.

Prerequisites for the course

- 21CS2501 - Introduction to Computing using Python
- 21CS4603- Microprocessors and Microcontrollers
- 21CS4604- Operating Systems

Objectives

1. To Understand the basic functionality and features of Raspberry Pi Models.
2. To Acquire knowledge on Linux Kernel based Operating Systems in Raspberry Pi.
3. To Understand how to configure the Raspberry Pi.
4. To Understand the concept of exploring electronics with GPIO Programming in Raspberry Pi.
5. To Understand the concept of Communication using Raspberry Pi.

UNIT I

INTRODUCTION TO RASPBERRY PI

9

Basic functionality of the Raspberry Pi board and its Processor-setting and configuring the board-differentiating Raspberry Pi from other platform like arduino, begal, asus thinker etc., - Overclocking- Component overview.

Suggested Activities:

- Demonstrating the Practical setup of OS installation and configuration on Raspberry pi.

Suggested Evaluation Methods:

- Assignment on Raspberry pi Model comparison
- Quiz on Raspberry pi Models.

UNIT II

LINUX KERNEL

9

Implications of an operating system on the behaviour of the Raspberry Pi- Overview of Linux and its terminal command – aptget-update – aptget-upgrade – navigating the file system and managing processes- text-based user interface through the shell- overview of graphic user interface.

Suggested Activities:

- Write and execute the Linux Commands in terminal to update, upgrade OS and file handling.
- Executing Linux Commands to install applications from internet in raspberry pi.

Suggested Evaluation Methods:

- Quizzes
- Assignment Problems on file system and managing processes

UNIT III

PROGRAMMING THE RASPBERRY PI

9

Python: Introduction to Python Programming Language- Python Programming Environment – Python Expressions – Strings – Functions- Function Arguments- Lists- List Methods- Control Flow- Numpy- PIP(Python Installation Package) and Customized Libraries.

C++ Programming: Basic C++ Programming Approach- Header File structure and Library organization- Cross compiler and its organization.

Suggested Activities:		
<ul style="list-style-type: none"> • Writing and Executing Python programs like String comparison, String Manipulation and Functions. • Writing and Executing C++ programs for handling libraries 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Test Project and Demonstration • Code Debugging 		
UNIT IV	GPIO PROGRAMMING	9
Communication facilities on Raspberry Pi (I2C, SPI, UART)- Working with RPi- GPIO Library- Interfacing of Sensors and Actuators.		
Suggested Activities:		
<ul style="list-style-type: none"> • Interfacing sensors like IR, Ultrasonic, PIR and Temperature using GPIO Programming. • Interfacing motors with Raspberry pi using GPIO Programming. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Prototype Model Demonstration 		
UNIT V	COMMUNICATION USING RASPBERRY PI	9
Wired and Wireless Communication –Remote Desktop Communication- WiFi-Bluetooth Technologies- Tx/Rx Communication - TCP IP Configurations – SSH – Putty Terminal Usage.		
Suggested Activities:		
<ul style="list-style-type: none"> • Demonstrating Remote Desktop Communication with Raspberry Pi using Putty Terminal. • In Class activity – Exercises on device configuration for communication using Tx and Rx GPIO Pins. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Assignments on TCP IP Configurations. • 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:		
<ul style="list-style-type: none"> • CO1 Configure Raspberry Pi as a fully functional computer. (Understand) • CO2 Understand the Linux Kernel for managing file systems and process. (Understand) • CO3 Apply the GPIO Programming concepts in python and C++ languages. (Apply) • CO4 Apply interfaces to the Sensors and Actuators using GPIO Libraries for developing Robotic Applications. (Apply) • CO5 Apply protocols for implementing applications in wired and wireless communication. (Apply) 		
Text Books		
1. Raspberry Pi User Guide, Eben Upton and Gareth Halfacree, John Wiley & Sons, 2016		
Reference Books		
1. Programming the Raspberry Pi: Getting started with Python, Third Edition, Simon Monk, McGraw Hill Publishers.		

2. Raspberry Pi for Python Programmers Cookbook, Tim Cox, Packt Publishing Limited, 2nd Revised Edition, 2016.

Web Resources

1. <https://www.raspberrypi.org/documentation/usage/python/>
2. <https://www.raspberrypi.org/>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS 01	PSO 2	PS 03
1	3	2	3	2	3								3		
2	3	2	3	2	3								3		
3	3	2	3	3	3								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	35	20	5	5	20
UNDERSTAND	35	20	10	10	30
APPLY	30	60	10	10	50
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Configure Raspberry Pi as a fully functional computer.

(Understand)

1. Define Raspberry Pi. (Remember)
2. Explain how to wire Raspberry Pi as a fully functional computer. (Understand)
3. What is arduino? (Remember)

Course Outcome 2 (CO2): Understand the Linux Kernel for managing file systems and process. (Understand)

1. What are the features of Python? (Remember)
2. Define PIP. (Remember)
3. Discuss on Customized libraries in Python. (Understand)

Course Outcome 3 (C03): Apply the GPIO Programming concepts in python and C++ languages (Apply)

1. Write notes on GPIO Library. (Understand)
2. Discuss on the Communication facilities on Raspberry Pi. (Understand)
3. Apply the Raspberry Pi Libraries for programming the raspberry pi? (Apply)

Course Outcome 4 (C04): Apply Interfaces to the Sensors and Actuators using GPIO Libraries for developing Robotic Applications. (Apply)

1. Apply the interfacing techniques to configure motors with Raspberry Pi? (Apply)
2. Illustrate how robots can be created using GPIO Programming. (Apply)

Course Outcome 5 (C05): Apply protocols for implementing applications in wired and wireless communication. (Apply)

1. Apply the SSH protocols in wired and wireless communication? (Apply)
2. Discuss on Putty terminal usage.(Understand)
3. Explain the steps involved in implementing the Communication protocols for wired and wireless communication. (Remember)

21CS6704	WIRELESS NETWORK TECHNOLOGIES	L	T	P	C
		3	0	0	3
Preamble					
A wireless network connects computers without using network cables. Computers use radio communications to send data between each other. You can communicate directly with other wireless computers, or connect to an existing network through a wireless AP. Wireless networking enables devices with wireless capabilities to use information resources without being physically connected to a network. A wireless local area network (WLAN) is a group of wireless networking nodes within a limited geographic area that is capable of radio communications.					
Prerequisites for the course					
21CS5602 - Computer Networks					
Objectives					
<ol style="list-style-type: none"> 1. To understand the concept about Wireless networks, protocol stack and standards 2. To understand and analyse the network layer solutions for Wireless networks 3. To study about evolution of 4G Networks, its architecture, RF and microwave subsystems. 4. To learn about evolution of 5G Networks and Small Cells for 5G Mobile Networks 5. To study about 5G Communications with Security 					
UNIT I	WIRELESS LAN	9			
Introduction-WLAN technologies: – IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, LoWPAN, Wireless HART					
UNIT II	MOBILE NETWORK LAYER	9			
Introduction – Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol – mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP					

UNIT III	4G OVERVIEW	9
Introduction: Architecture of radio transceivers, Roadmap for wireless networking. Cellular and multiple-user systems: Multiple access techniques and Random multiple access. RF and microwave subsystems: Architecture of RF subsystems, RF system analysis, Microwave network analysis and RF/microwave filters.		
UNIT IV	5G OVERVIEW	9
The 5G Internet: Internet of Things and Context-Awareness, Networking Reconfiguration and Virtualisation Support and Mobility. Small Cells for 5G Mobile Networks: Small Cells, Capacity Limits and Achievable Gains with Densification, Mobile Data Demand and Small-Cell Challenges.		
UNIT V	5G COMMUNICATIONS	9
Mobile Clouds: Technology and Services for Future Communication Platforms, Cognitive Radio for 5G Wireless Networks, TV White Space Technology, White Space Spectrum Opportunities and Challenges, TV White Space Applications. Security for 5G Communications: Security Issues and Challenges in 5G Communications Systems		
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:		
<ul style="list-style-type: none"> • Understand the concept about Wireless networks, protocol stack and standards (Understand) • Summarize the various Network layer of Mobile IP (Understand) • Implement the multiple-user systems and RF and microwave subsystems in 4G Enabling Technologies (Apply) • Implement the concepts of 5G Internet and Small Cells for 5G Mobile Networks (Apply) • Analyze the various Mobile Clouds in 5G Communications with security (Analyze) 		
Text Books		
<ol style="list-style-type: none"> 1. Jochen Schiller, Mobile Communications, Second Edition, Pearson Education 2012. (Unit I,II) 2. Ke-Lin Du, M. N. S. Swamy - Wireless Communication Systems_ From RF Subsystems to 4G Enabling Technologies -Cambridge University Press 2010.(Unit III) 3. Jonathan Rodriguez - Fundamentals of 5G Mobile Networks, 2015 John Wiley & Sons, Ltd.(Unit IV, V) 		
Reference Books		
<ol style="list-style-type: none"> 1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008. 2. Anurag Kumar, D.Manjunath, Joy kuri, –Wireless Networking , First Edition, Elsevier 2011. 3. Simon Haykin , Michael Moher, David Koilpillai, –Modern Wireless Communications , First Edition, Pearson Education 2013 		
Web Resources		
<ul style="list-style-type: none"> • https://www.javatpoint.com/wireless-lan-introduction 		

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	P O2	PO3	PO 4	P O5	PO 6	P O7	PO8	PO9	PO 10	PO 11	PO1 2	PSO 1	PS O2	PSO3
1	3	3	3	2	2									3	
2	3	3		2										3	
3	3	2	3	2	3									2	
4	3	3	3		3									2	
5	3		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
UNDERSTAN D	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 latest 3G/4G networks and its architecture

1. Recall the WLAN technologies. (Remember)
2. Summarize IEEE802.11: System architecture. (Understand)
3. Explain the concept of WPAN (Understand)

Course Outcome 2 (CO2): Summarize the various Network layer of Mobile IP

1. What is Mobile IP? (Remember)
2. Compare mobile ad-hoc network: Routing Protocols. (Understand)
3. Summarize IoT: CoAP. (Understand)

Course Outcome 3 (CO3): Implement wireless network environment for any application using latest wireless protocols and standards

1. Narrate UTM's Terrestrial Radio access network. (Understand)
2. Write in detail about the UMTS Core network Architecture. (Remember)
3. Demonstrate the SCDMA. (Apply)

Course Outcome 4 (CO4): Analyze and select the suitable network depending on the availability and requirement (Analyze)

1. What are the Internetworking objectives and requirements? (Remember)
2. Analyze how Internetworking Architecture can be designed between WLAN and GPRS (Analyze)
3. How Multichannel Multipoint Distribution System works? (Remember)

Course Outcome 5 (CO5): Implement different type of applications for smart phones and mobile devices with latest network strategies

1. What do you mean by 4G vision? (Remember)
2. Explain the techniques of Smart antenna (Understand)
3. Implement the MVNO in 4G vision. (Apply)

Professional Elective III

21CS6705	BUSINESS INTELLIGENCE	L	T	P	C
		3	0	0	3
Preamble					
<p>This course provides the knowledge on leverages software and services to transform data into actionable insights that inform an organization’s strategic and tactical business decisions. BI tools access and analyze data sets and present analytical findings in reports, summaries, dashboards, graphs, charts and maps to provide users with detailed intelligence about the state of the business. This course often also refers to a range of tools that provide quick, easy-to-digest access to insights about an organization’s current state, based on available data.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS5705 - Data Warehousing and Data Mining 					
Objectives					
<p>The students should be able to:</p> <ol style="list-style-type: none"> 1. Explore the basic rudiments of business intelligence system Models. 2. Learn the modelling aspects by reports and visualization techniques. 3. Understand the business intelligence life cycle and efficiency measurement techniques. 4. Learn with marketing models to design the business intelligence system. 5. Understand business intelligence methods for advanced Machine Learning and Visualization techniques. 					
UNIT I	BUSINESS INTELLIGENCE	9			
<p>Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and</p>					

business intelligence.

Suggested Activities:

- Flipped Class room – How Factors make impact in business intelligence projects.

Suggested Evaluation Methods:

- Quizzes
- Assignment of Business Intelligence architectures

UNIT II

KNOWLEDGE DELIVERY

9

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

Suggested Activities:

- Making visualization charts, graphs, widgets from the given dataset using Excel.
- Discussion Topic- Dimensional analysis for business intelligence.

Suggested Evaluation Methods:

- Online Quizzes
- Assignment Problems on Interactive Analysis and Ad Hoc Querying

UNIT III

EFFICIENCY

9

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis.

Suggested Activities:

- Discussion Topic: CCR Model
- Making program for pattern matching algorithm to create cluster analysis and outlier analysis.

Suggested Evaluation Methods:

- Quizzes
- Assignment Problems on Pattern matching using cluster analysis

UNIT IV

BUSINESS INTELLIGENCE APPLICATIONS

9

Marketing models – Logistic and Production models – Case studies: Lotte.com: BI Increases Company Revenue, Cementos Argos: BI Improves Financial Efficiency, Baylis & Harding: BI Provides Decision Making Process Support.

Suggested Activities:

- Assignment – logistic and production models of business intelligence application
- Flipped Class room – Marketing Models in Business intelligence applications.

Suggested Evaluation Methods:

<ul style="list-style-type: none"> • Quizzes • Assignment Problems on Logistic and Production models 		
UNIT V	FUTURE OF BUSINESS INTELLIGENCE	9
Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.		
Suggested Activities:		
<ul style="list-style-type: none"> • Making prediction program for the BI Search and Text Analytics in Business Intelligence. 		
Suggested Evaluation Methods:		
<ul style="list-style-type: none"> • Quizzes • Assignment in Emerging Technologies of Business intelligence 		
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:		
<ul style="list-style-type: none"> • CO1 - Understand the fundamentals of business intelligence models. (Understand) • CO2 - Apply the knowledge delivery using interactive reports and visualization techniques. (Apply) • CO3 - Analyze the efficiency of business modelling techniques. (Analyze) • CO4 - Analyze the marketing models for developing business intelligence applications. (Analyze) • CO5 - Analyze business intelligence methods for advanced Machine Learning and Visualization techniques. (Analyze) 		
Text Books		
1. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.		
Reference Books		
1. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager’s Guide”, Second Edition, 2012.		
2. CindiHowson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw- Hill, 2007.		
Web Resources		
1. https://www.investopedia.com/terms/b/business-intelligence-bi.asp		

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO 2	PSO 3
1	3	2	3	2	3								3		
2	3	2	3	2	3								3		
3	3	2	2	2	3								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	15	10	5	5	15
UNDERSTAND	25	15	5	5	15
APPLY	30	25	10	5	30
ANALYZE	30	50	5	10	40
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Understand the fundamentals of business intelligence models. (Understand).

1. What do you mean by Business Intelligence? (Remember)
2. Discuss on ethics and Business Intelligent System. (Understand)
3. Describe the Enabling factors in business intelligence projects.(Understand)

Course Outcome 2 (CO2): Apply the knowledge delivery using interactive reports and visualization techniques. (Apply)

1. Apply data mining techniques to link with business intelligence models? (Analyze)
2. Discuss on the Visualization techniques. (Understand)
3. What do you mean by Interactive Analysis and Ad Hoc Querying? (Remember)

Course Outcome 3 (CO3): Analyze the efficiency of business modelling techniques. (Analyze)

1. Analyze Business modelling techniques for marketing models. (Analyze)
2. Write about Pattern Matching. (Remember)
3. Explain CCR model. (Understand)

Course Outcome 4 (CO4): Analyze the marketing models for developing business intelligence applications. (Analyze)

1. Analyze the stages of data analysis and knowledge delivery for developing models. (Analyze)
2. Explain Optimizing the Presentation for the Right Message.(Understand)

Course Outcome 5 (CO5): Analyze business intelligence methods for advanced Machine Learning and Visualization techniques. (Analyze)

1. Analyze Logistic and Production models in Business Intelligence. (Analyze)
2. Apply Marketing models for developing Business Intelligence applications. (Apply)
3. Discuss on the emerging technologies in Business Intelligence. (Understand)

21CS6706	DISTRIBUTED AND PARALLEL SYSTEMS	L	T	P	C
		3	0	0	3
Preamble					
<p>This course emphasizes on the Distributed and Parallel Systems. This course explains the Principles of Parallel Algorithm, Mapping Techniques, Characterization and Design. This Course helps the learners to know the Distributed Systems with examples, distributed objects , Remote procedure call, Distributed Operating System and Distributed Transactions, Replication and Multimedia Systems.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS3601-Computer Architecture • 21CS4604-Operating Systems Concepts 					
Objectives					
<ol style="list-style-type: none"> 1. To learn the concepts of parallel algorithm. 2. To understand the concepts of distributed systems. 3. To learn the objects and file system of distributed systems. 4. To understand the Operating system that supports distributed system. 5. To learn the Transactions & Replication in distribution system. 					
UNIT I	PRINCIPLES OF PARALLEL ALGORITHM DESIGN	9			
<p>Decomposition techniques, Characteristics of Tasks and Interactions, Mapping techniques for load Balancing, Parallel Algorithm models, Principles of Message - Passing Programming, MPI.</p>					
Suggested Activities:					
<ul style="list-style-type: none"> • Understanding the techniques of recursive decomposition, data-decomposition, exploratory decomposition and speculative decomposition • Survey on Schemes for Static Mapping • Discuss on the commonly used parallel algorithm models 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assignment on MPI • Quizzes 					
UNIT II	INTRODUCTION TO DISTRIBUTED SYSTEMS	9			
<p>Introduction to Distributed systems - examples of distributed systems- resource sharing and the web challenges-architectural models- fundamental models - Introduction to inter-process</p>					

communications external data representation and marshalling- client server communication- group communication

Suggested Activities:

- Discuss on the examples of distributed systems
- Compare marshalling and unmarshalling activities
- Understand the Closed and open groups on group communication=

SUGGESTED EVALUATION METHODS:

- Assignment on Inter-process communications
- Quizzes

UNIT III

DISTRIBUTED OBJECTS AND FILE SYSTEM

9

Introduction – Communication between distributed objects – Remote procedure call – Events and notifications - Introduction to Distributed File System – File service architecture – Sun network file system – The Andrew File system – Introduction to Name Services- Name services and DNS – Directory services.

Suggested Activities:

- Case study: Sun RPC
- Case study: The Andrew File System
- Case study: The X.500 Directory Service

SUGGESTED EVALUATION METHODS:

- Assignment on Name Services
- Quizzes

UNIT IV

DISTRIBUTED OPERATING SYSTEM

9

The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Distributed debugging – Distributed mutual exclusion

Suggested Activities:

- Discuss on UNIX *exec* system call
- Debate on the Client and server with threads
- Learn the Cristian’s method for synchronizing clocks
- Discuss the Algorithms for mutual exclusion

SUGGESTED EVALUATION METHODS:

- Assignment on Distributed debugging
- Quizzes

UNIT V

DISTRIBUTED TRANSACTIONS & REPLICATION

9

Introduction to distributed transactions - Flat and nested distributed transactions - Concurrency control in distributed transactions - Distributed deadlocks - Replication - System model and group communications – Fault tolerant services.

Suggested Activities:

- Discuss on the two-phase commit protocol
- Compare Phantom deadlocks with Edge chasing
- Passive (primary-backup) replication and Active replication

SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment on Replication • 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	Descriptive Questions
Course Outcomes		
Upon completion of the course, the students will be able to:		
CO1 Understand the parallel program design techniques.(Understand) CO2 Describe the various models in distributed systems and inter-process communications.(Understand) CO3 Apply the Objects and File System of Distributed Systems. (Apply) CO4 Apply synchronization of distributed events using common global clocks.(Apply) CO5 Analyze the issues involved in distributed transactions.(Analyze)		
Text Books		
1. Ananth Grama, Anushul Gupta, George Karypis and Vipin Kumar, – Introduction to Parallel Computing, Second Edition, Pearson Education, 2008. 2. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.		
Reference Books		
1. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007. 2. MukeshSinghal and N. G. Shivaratri, –Advanced Concepts in Operating Systems , McGraw-Hill, 2011		
Web Resources		
1. http://www-unix.mcs.anl.gov/dbpp/text/book.html		

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
1	3	3	3											2	
2	3	3	2											1	
3	3	3	3											2	
4	3	3	3											1	
5	3	2	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	60	5	5	50
ANALYZE		10	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1): Understand the parallel program design techniques.(Understand)

1. Recall the Decomposition techniques. (Remember)
2. Summarize the Characteristics of Tasks and Interactions. (Understand)
3. Discuss the concept of MPI. (Understand)

Course Outcome 2 (CO2): Describe the various models in distributed systems and inter-process communications.

1. Describe resource sharing and web challenges. (Remember)
2. Compare client server communication-group communication. (Understand)
3. Describe the fundamental models of Distributed Systems.(Understand)

Course Outcome 3 (CO3): Apply the Objects and File System of Distributed Systems. (Apply)

1. Narrate the Communication between distributed objects. (Understand)
2. Write about the Events and notifications. (Remember)
3. Outline the Name services and DNS in Distributed File Systems. (Analyze)

Course Outcome 4 (CO4): Apply synchronization of distributed events using common global clocks

1. What do you mean by Process and threads? (Remember)
2. Illustrate Clocks, Events and Process states (Apply)
3. Classify Distributed mutual exclusion. (Analyze)

Course Outcome 5 (CO5): Analyze the issues involved in distributed transactions.

1. Determine the two-phase commit protocol. (Apply)
2. Discuss System model and group communications (Understand)
3. Categorize the deadlocks in Distributed Systems. (Analyze)

21CS6707	MOBILE COMPUTING	L	T	P	C
		3	0	0	3
Preamble					
The purpose of this course is to understand the concept of mobile computing paradigm, novel applications, limitations and also to impart knowledge on the telecommunication systems, protocols in all layers of OSI reference model. This course also provides the knowledge on different mobile OS.					
Prerequisites for the course					
21CS5602- Computer Networks					
Objectives					
<ol style="list-style-type: none"> 1. To understand the basic concepts of mobile computing. 2. To learn the basics of mobile telecommunication system. 3. To be familiar with the network layer protocols and Ad-Hoc networks. 4. To know the basis of transport and application layer protocols. 5. To gain knowledge about different mobile platforms and application development. 					
UNIT I	INTRODUCTION	9			
Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA					
SUGGESTED ACTIVITIES:					
<ul style="list-style-type: none"> • Analyze the problem definition and select a suitable multiplexing strategy • Debate on mobile applications – Need, Quality of living. • Depict the evolvment in the techniques using timelines • Given a scenario, identify and debate on the suitability in multiple access schemes. • Survey on any two MAC algorithms used in wireless networks 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Effect of combined TDMA, FDMA in terms of measuring parameters like cost, transmitter power etc. • Assignments • Quiz 					
UNIT II	MOBILE TELECOMMUNICATION SYSTEM	9			
Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security					
SUGGESTED ACTIVITIES:					
<ul style="list-style-type: none"> • Understanding the elements, its function and signals of GSM required to establish a call • Need of different techniques for sending voice and data. • Understanding the handover techniques 					
SUGGESTED EVALUATION METHODS:					

<ul style="list-style-type: none"> • Written Assignment – Components in respective systems • MCQ 		
UNIT III	MOBILE NETWORK LAYER	9
Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV, Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Discuss Routing protocols and the efficiency • Flipped Classroom • Application wide QoS requirements 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignments • Quiz 		
UNIT IV	MOBILE TRANSPORT AND APPLICATION LAYER	9
Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Discuss WAP and WTA architecture • Discuss about layers 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment • MCQ 		
UNIT V	MOBILE PLATFORMS AND APPLICATIONS	9
Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues		
SUGGESTED ACTIVITIES:		
<ul style="list-style-type: none"> • Discuss all mobile OS • Compare all mobile OS • Learn how to pay amount through mobile (MPS) 		
SUGGESTED EVALUATION METHODS:		
<ul style="list-style-type: none"> • Assignment • MCQ 		
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
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Course Outcomes

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

- Understand the basic concepts of mobile computing. (Understand)
- Understand the basics of mobile telecommunication systems. (Understand)
- Analyze the routing protocols which are suitable for Ad hoc network. (Analyze)
- Analyze the functionality of Transport and Application layers. (Analyze)
- Design a mobile application using android/blackberry/ios/Windows SDK. (Apply)

Text Books

1. Jochen Schiller, –Mobile Communications||, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, –Fundamentals of Mobile Computing||, PHI Learning Pvt.Ltd, New Delhi – 2012

Reference Books

1. Dharma PrakashAgarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”,Thomson Asia Pvt Ltd, 2005.
2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, –Principles of Mobile Computing||, Springer, 2003.
3. William.C.Y.Lee,–Mobile Cellular Telecommunications-Analog and Digital Systems||, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toth, –AdHoc Mobile Wireless Networks||, First Edition, Pearson Education, 2002.

Web Resources:

1. Wireless/Mobile Computing Technologies - GeeksforGeeks
2. Android Developers: <http://developer.android.com/index.html>
3. Apple Developer: <https://developer.apple.com/>
4. Windows Phone DevCenter: <http://developer.windowsphone.com>
5. BlackBerry Developer : <http://developer.blackberry.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	PO1 0	PO1 1	PO 12	PS 01	PS 02	PS 03
1	3	3	3	3									3		
2	3	3	3	2	2								3		
3	3	3	3	3	2								3		
4	3	3	3	2	2								3		
5	3	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. Illustrate the generations of telecommunication systems in wireless networks. (Remember)
2. Apply mobile computing to design taxi dispatcher and monitoring service. Explain the components in detail. (Apply)
3. Discuss the various Reservation based schemes in MAC protocol (Understand)

Course Outcome 2 (CO2):

1. Explain the basics of mobile telecommunication systems. (Remember)
2. What kind of security will be provided for GSM? Explain? (Understand)
3. Compare GPRS and UMTS. (Understand)

Course Outcome 3 (CO3):

1. Explain the key mechanism of mobile IP with the help of a suitable schematic diagram and by using suitable examples. What are the disadvantages of mobile IP? (Understand)
2. Identify a routing protocol for a given Ad hoc network (Understand)
3. Explain in detail about reactive routing protocols? (Understand)

Course Outcome 4 (CO4):

1. Explain the functionality of Transport and Application layers. (Understand)
2. Explain the various improvements in TCP performance with diagram? How does it maintain end to end semantics? (Analyze)
3. Describe about Wireless Transaction Protocol? (Remember)

Course Outcome 5 (CO5):

1. Develop a mobile application using android/blackberry/ios/Windows SDK.(Apply)
- 2 Compare & Contrast various popular mobile OS. (Understand)
3. List the Features required of a mobile device to enable mobile commerce (Understand)

21IT5701	ADVANCED JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

Preamble

This course provides an overview of GUI with Java FX, Networking, Java Database connectivity, Java web frameworks.

Prerequisites for the course

- 21CS3603 - Object Oriented Programming Systems

Objectives

1. To understand the underlying concept in GUI with JavaFX.
2. To understand the concepts of Network programming
3. To apply the concepts of Java Data base connectivity.
4. To apply the techniques of Java Web Frameworks.
5. To explore the adaption of Java in real-time scenarios

UNIT I

GUI WITH JAVAFX

9

Introduction - JavaFXvs Swing - JavaFX Layouts: FlowPane, BorderPane, Hbox, VBox, GridPane- JavaFX UI Controls: Label, TextField, Button, RadioButton, CheckBox, Hyperlink, Menu, Tooltip, FileChooser.

UNIT II

NETWORK PROGRAMMING

9

Socket programming using TCP - Socket programming using UDP - Working with URL's - Working with URL Connection Class - Java Mail API - Sending and Receiving Email

UNIT III

DATABASE CONNECTIVITY

9

JDBC Architecture - JDBC Driver Types - JDBC Configuration - Managing Connections – Statements - Result Set - SQL Exceptions - DDL and DML Operations using Java - Prepared Statements - Multiple Results - Scrollable Result Sets - Updateable Result Sets - Row Sets and Cached Row Sets- Transactions - SQL Escapes.

UNIT IV

JAVA WEB FRAMEWORKS

9

Java Web Frameworks: Spring MVC - Overview of Spring - Spring Architecture - Bean life cycle - XML Configuration on Spring - Aspect – oriented Spring - Managing Database - Managing Transaction

UNIT V

LAMBDA EXPRESSION

9

Introduction – interfaces – Inner classes- Lambda Expression - Variable scope – Method References.

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	1. ASSIGNMENT 2. QUIZZES	1. DESCRIPTIVE QUESTIONS 2. PROBLEM SOLVING
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Outcomes

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

- CO1**– Understand the GUI programming using Java FX.
CO2– Understand the networking concepts and apply it in real world problems.
CO3– Apply the concepts of Java data base connectivity.
CO4– Apply the concept of Java Web frameworks
CO5– Apply Java in Lambda Expressions.

Text Books

1. Cay S. Horstmann, Core Java Volume I--Fundamentals, Pearson, Eleventh Edition, 2018.
(Unit 1)
2. Cay S. Horstmann, Core Java Volume II-Advance Features, Pearson, Eleventh Edition, 2019.**(Unit 2-5)**
3. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Education, Eleventh Edition, 2018 **(Unit 1-2 & 5)**

Reference Books

1. D.T. Editorial Services, Java 8 Programming Black Book, Dreamtech Press, 2015
2. Alan Mycroft, Modern Java in Action: Lambdas, Streams, Functional and Reactive Programming, 2019.
3. Herbert Schildt, Java: The Complete Reference, 12th Edition, McGraw Hill Professional 2021
4. E. Balagurusamy, “Programming with Java – A Primer”, 3rd edition, McGraw Hill Professional 2014.

Web Resources

1. NPTEL, “Programming in Java”, <https://nptel.ac.in/courses/106105191>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO 12	PS 01	PS 02	PS 03
1	2	2	3	2	3	2				2			3		
2	2	3	3	2		2		2		2			3		
3	2	3	3	2		2				2			3		
4	3	3	3	2	2								3		
5	3	3	2					2			2		3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	20	5	5	20
UNDERSTAND	50	50	10	10	30
APPLY	30	30	10	10	50
ANALYZE					
EVALUATE					
CREATE					

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					
<ul style="list-style-type: none"> 21CS3604 - Software Engineering 					
Objectives					
<ol style="list-style-type: none"> 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
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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
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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
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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
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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	PO1 0	PO1 1	PO1 2	PS 01	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					

Open Elective III

21CS6801	CLOUD COMPUTING TECHNOLOGIES	L	T	P	C
		3	0	0	3
Preamble					
Cloud Computing provides to access the applications as utilities over the internet. It allows creating, configuring, and customizing the business applications online. The term Cloud refers to a Network or Internet. Cloud can provide services over public and private networks. Cloud Computing refers to manipulating, configuring, and accessing the hardware and software resources remotely. It offers online data storage, infrastructure, and application.					
Objectives					
The student should be made:					
<ol style="list-style-type: none"> 1. To understand the fundamentals of cloud computing. 2. To understand the cloud enabling Virtualization technologies. 3. To have knowledge on the various issues in cloud computing. 4. To learn Resource Management and Security in cloud computing. 5. To understand the emergence of cloud as the next generation computing paradigm. 					
UNIT I	INTRODUCTION	9			
Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.					
UNIT II	CLOUD ARCHITECTURE, SERVICES AND STORAGE	9			
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage.					
UNIT III	CLOUD ENABLING TECHNOLOGIES	9			
Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Hypervisor – Kubernetes – Container – Docker.					
UNIT IV	RESOURCE MANAGEMENT AND SECURITY IN CLOUD	9			
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance.					
UNIT V	CLOUD TECHNOLOGIES AND ADVANCEMENTS	9			
Hadoop – MapReduce - Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation – Azure – AWS – PowerBI.					
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 fundamentals of cloud computing. CO2 Understand the cloud enabling Virtualization technologies.					

CO3 Analyze the various issues in cloud computing for providing cloud based services.
 CO4 Analyze Resource Management Techniques and Security in cloud computing.
 CO5 Apply the emerging cloud Technologies to design cloud applications.

Text Books

1. J Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012. **(Unit 1, Unit 2)**
2. Rittinghouse, John W., and James F. Ransome, –Cloud Computing: Implementation, Management and Security, CRC Press, 2017. **(Unit 3, Unit 4, Unit 5)**

Reference Books

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, –Mastering Cloud Computing||, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach||, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)||, O'Reilly, 2009.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc23_cs89/preview (Unit 1-5)
2. <https://www.geeksforgeeks.org/cloud-based-services/>

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	PO 12	PS 01	PS 02	PSO 3
1	3													3	
2	3													3	
3		2	1											3	
4		2			1									3	
5		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:

Course Outcome 1 (CO1):

1. Identify which computing paradigm is adaptable in client / server mode? (Remember)
2. Summarize the purpose of Distributed object frameworks? (Understand)

Course Outcome 2 (CO2):

1. List the four major characteristics to identify a service in Cloud (Understand)
2. Explain the purpose of WSDL and UDDI? (Understand)

Course Outcome 3 (CO3):

1. List the entities involved in the cloud platform. (Remember)
2. Differentiate between Public cloud and Private Cloud. (Understand)
3. How the architecture of a cloud is developed using three layers? (Analyze)

Course Outcome 4 (CO4):

1. Why inter cloud resource management requires runtime support system? (Understand)
2. Examine the requirement of security standards in Cloud Computing. (Analyze)
3. Demonstrate the steps to perform virtual machine security in Cloud computing Platform. (Apply)

Course Outcome 5 (CO5):

1. Illustrate the architecture of Virtual Box. (Apply)
2. List the fundamental layers of Hadoop core. (Remember)

21CS6802	WEB TECHNOLOGY	L	T	P	C
		3	0	0	3
Preamble					
This course emphasizes on the Internet Technologies. This course explains html, CSS, PHP,XML and AJAX for web services, JavaScript for Client side programming, Servlets for Server Side Programming .This Course helps the learners to develop programs for web applications.					
Prerequisites for the course					
NIL					
Objectives					
<ol style="list-style-type: none"> 1. To understand different Internet Technologies. 2. To design a website using html and CSS 3. To learn java-specific web services architecture 4. To understand the concept of PHP and XML 5. To learn about the basics of Node.js 					
UNIT I	WEBSITE BASICS, HTML 5, CSS 3, WEB 3.0	9			
Web Essentials: World wide web- HTTP Request Message – HTTP Response Message - Web Clients - Web Servers - HTML5 - Tables - Lists - Image - Video controls - CSS3 - Inline, embedded and external style sheets - Rule cascading - Backgrounds - Border Images - Colors - Shadows -Text - Transformations -Transitions.					
UNIT II	CLIENT SIDE PROGRAMMING	9			

Java Script: An introduction to JavaScript-JavaScript DOM Model-Date and Object -Regular Expressions- Exception Handling-Validation-Built-in Objects- JSON introduction - Syntax - Function Files - Http Request -SQL.

UNIT III	SERVER SIDE PROGRAMMING	9
Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat WebServer- Database Connectivity.		
UNIT IV	PHP and XML	9
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in Functions Form Validation- Regular Expressions. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation.		
UNIT V	Node.js	9
Basics of Node JS - Installation - 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		
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 website using HTML and Cascading Style Sheets. (Understand)
- CO2 Develop dynamic web page with validation using Java Script objects and by applying different event handling mechanisms (Apply)
- CO3 Develop server side programs using Servlets (Apply)
- CO4 Design simple web pages in PHP and to represent data in XML format. (Apply)
- CO5 Apply AJAX and web services to develop interactive web applications (Apply)

Text Books

1. Deitel and Deitel and Nieto, –Internet and World Wide Web - How to Program,Prentice Hall, 5th Edition, 2011.(Unit I to IV)
2. Brad Dayley, Brendan Dayley, Caleb Dayley, ‘Node.js, MongoDB and Angular Web Development’, Addison-Wesley, Second Edition, 2018 (Unit -V)

Reference Books

1. Jeffrey C and Jackson, –Web Technologies A Computer Science Perspective, Pearson Education, 2011.
2. Gopalan N.P. and Akilandeswari J., –Web Technology, Prentice Hall of India, 2011.
3. UttamK.Roy, –Web Technologies, Oxford University Press, 2011.
4. David Herron - Node.js Web Development , Third Edition, 2016

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS 01	PSO 2	PSO 3
1	3	2	3		2									3	
2	3	2	3		2									3	
3	3	2	3		2									3	
4	3	2	3		2									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	20	5	5	10
UNDERSTAND	40	30	10	10	30
APPLY	40	50	10	10	60
ANALYZE					
EVALUATE					
CREATE					

21CS6803	ANDROID APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3
Preamble					
Android Application is a mobile software application developed for use on devices powered by Google's Android platform. The course has been designed to impart practical knowledge on Android application programming thus to reduce the gap between the demand and supply of Competent Android Application Developers.					
Objectives					
<ol style="list-style-type: none"> 1. To demonstrate their understanding of the fundamentals of Android operating systems 2. To demonstrate their skills of using Android software development tools 3. To demonstrate their ability to develop software with reasonable complexity on mobile platform 4. To demonstrate their ability to deploy software to mobile devices 5. To demonstrate their ability to debug programs running on mobile devices 					
UNIT I	INTRODUCTION TO ANDROID OS	9			
Introduction to Android Operating System: Android OS design and Features – Android development framework, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Android tools. Android application components: Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc.					
UNIT II	USER INTERFACE DESIGN	9			
Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts: Linear, Relative, Grid and Table Layouts. User Interface (UI) Components: Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers.					
UNIT III	INTENT AND BROADCAST RECEIVERS	9			
Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, using Intent to dial a number or to send SMS. Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity.					
UNIT IV	DATABASES AND CONTENT PROVIDERS	9			
Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences . Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)					
UNIT V	RESOURCES AND LOCATION BASED SERVICES	9			
Using Internet Resources – Connecting to internet resource, using download manager. Location Based Services –GPS, Creating Map Activity, Location Manager, Finding Current Location and showing location on the Map, updating location.					
Total Periods					45
Suggestive Assessment Methods					
Continuous Assessment Test		Formative Assessment Test		End Semester Exams	

(20 Marks)	(20 Marks)	(60 Marks)
DESCRIPTIVE QUESTIONS	1.ASSIGNMENT 2. ONLINE MCQ	DESCRIPTIVE QUESTIONS

Course Outcomes

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

CO1 Understand basic Android applications. (Understand)

CO2 Design Graphical user interfaces for Android application. (Apply)

CO3 Apply Android application for data processing and management (Apply)

CO4 Apply the SQLite for creating database (Apply)

CO5 Apply GPS to find location based services using android (Apply)

Text Books

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012. (Unit I – Unit V)

Reference Books

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

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	P 09	PO 10	P 01 1	PO 12	PS 01	PSO 2	PS 03
1	2	2											3		
2	2	2	3	2	3								3		
3	3	2	3	2	3								3		
4	3	2	3	2	3								3		
5	2	2	3	2		3							3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	50	70	10	10	60
ANALYZE					
EVALUATE					
CREATE					

21CS6804	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.

Objectives

1. To understand the various agents and search strategies.
2. To learn the Knowledge representation logics in AI
3. To investigate various planning systems in solving AI problems
4. To learn how to handle the uncertainty with reasoning.
5. To explore the various learning techniques

UNIT I	PROBLEM SOLVING AGENT AND STRATEGIES	9
Introduction - foundations of artificial intelligence –history of artificial intelligence-intelligent agents- agents and environments-nature of environments-structure of agents- uninformed search strategies-Informed search strategies.		
UNIT II	KNOWLEDGE REPRESENTATION	9
Knowledge representation -Production based system, Frame based system. - first-order logic - inferences in first order logic - forward chaining - backward chaining - unification – resolution.		
UNIT III	PLANNING AND NLP	9
Planning with state-space search –nonlinear planning- partial-order planning - planning graphs – Strips -Advanced plan generation systems Natural Language Processing - Natural Language for Communication- ChatGPT applications.		
UNIT IV	UNCERTAIN KNOWLEDGE AND REASONING	9
Acting under uncertainty- independence- bayes rules- probabilistic reasoning - representing knowledge in an uncertain domain - the semantics of bayesian networks - time and uncertainty - hidden markov models.		
UNIT V	LEARNING	9
supervised learning- learning decision trees- regression and classification with linear models- support vector machines- ensemble learning- knowledge in learning- explanation-based learning- Reinforcement learning - passive reinforcement learning - active reinforcement learning		
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:

- Understand different types of problem solving agents and its applications. (Understand)
- Understand the concept of Logical Reasoning (Understand)
- Analyse the concepts of planning methodologies. (Analyse)
- Apply reasoning methodologies to handle Uncertainty. (Apply)
- Apply learning algorithms for tree and rule-based models. (Apply)

Text Books:

1. S. Russel, P. Norvig, "Artificial Intelligence - A Modern Approach", 3rd Edition, Pearson Education Ltd., 2010. **(UNIT I – UNIT V)**

Reference Books :

1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill- 2008.
2. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013

Web Resources

1. <https://nptel.ac.in/courses/106105077> **(UNIT I – UNIT V)**
2. <https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/>

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 11	PO1 11	PO 12	PS 0 1	PS 02	PS 03
1	3	3	3										3		
2	3	3	3										3		
3	3	3	3	2									2		
4	3	3	3	2									2		
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):

1. Comprehend different types of problem solving agents and its applications. (Understand)
2. Recall the concepts of Agents. (Remember)
3. Compare the uninformed and informed search strategies (Understand)

Course Outcome 2 (CO2):

1. Recall Knowledge representation with its various aspects? (Remember)
2. Compare Production based system and Frame based system. (Analyse)
3. Describe resolution and unification algorithm for the sentences (Understand)

Course Outcome 3 (CO3):

1. Narrate Planning with state-space search. (Understand)
2. Write about partial-order planning with real world example. (Apply)
3. Develop planning graphs. (Apply)

Course Outcome 4 (CO4):

1. Demonstrate probabilistic reasoning for a Uncertainty problem (Apply)
2. Demonstrate bayesian networks for a real world scenario. (Apply)
3. Discuss hidden markov models in detail. (Understand)

Course Outcome 5 (CO5):

1. Predict in what basis is an attribute selected in decision tree for choosing it as a node (Understand)
2. Illustrate how support vector machines used in supervised learning (Apply)
3. Organize the concept of Passive reinforcement learning for a real world scenario (Apply)

21CS6805	CYBER SECURITY ESSENTIALS	L	T	P	C
		3	0	0	3
Preamble					
This Course Cyber Security will prepare you for an exciting cyber security career by teaching you networking and information security fundamentals, ethical hacking, cloud security, application security and incident handling.					
Objectives					
Students can able to					
<ol style="list-style-type: none"> 1. Understand the importance of Cyber Security 2. Understand the challenges in Cyber Security 3. Analyze the exploitation in various environment and cyber law for various issues. 4. Detect computer systems and networks from cyber security attacks using malicious code detection techniques. 5. Implement the digital forensic and defense techniques in VM in an organization 					
UNIT I	CYBER SECURITY ARCHITECTURE	9			
Basic Cryptography-Symmetric Encryption- Asymmetric Encryption- Web Application Firewall (WAF) and Intrusion prevention system (IPS). Domain Name System-Firewalls-Virtualization. Design Model. Information components security types. Microsoft Windows Security Principles.					
UNIT II	ATTACKER TECHNIQUES AND MOTIVATIONS	9			
Antiforensics: Attackers use Proxies: Types of Proxies-Use of Proxies –Tunneling Techniques – Fraud Techniques: Phishing, Smishing, Vishing and Mobile Malicious Code-Rogue Antivirus-Click Fraud- Threat Infrastructure: Botnets-Fast Flux-Advanced Fast Flux.					
UNIT III	EXPLOITATION AND CYBER LAW	9			
Techniques to Gain a Foothold: Shellcode-Integer Overflow Vulnerabilities-Stack Based Buffer Web Exploit Tools. Misdirection, Reconnaissance and Disruption Methods: Cross Site Scripting (XSS)- Social Engineering- WarXing -DNS Amplification Attacks. Different social challenges. Information technology act.					
UNIT IV	MALICIOUS CODE DETECTION	9			
Models for detection prevention and malware issues. Detect threat and security .Self-Replicating Malicious Code and virus-Spyware-Attacks against Privilege User Accounts- -Stealing Information and Exploitation: Form Grabbing- Man in the Middle Attacks.					
UNIT V	DIGITAL FORENSIC AND DEFENSE TECHNIQUES	9			
Digital forensic and policies, Network Time Security (NTS), Memory Forensics-Honeypots-Malicious Code Naming-Automated Malicious Code Analysis Systems: Passive Analysis-Active Analysis-Physical or VM -Intrusion Detection Systems.					
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 importance of Cyber Security
 CO2 Understand the challenges in Cyber Security
 CO3 Analyze the exploitation in various environment and cyber law for various issues.
 CO4 Detect computer systems and networks from cyber security attacks using malicious code detection techniques.
 CO5 Implement the digital forensic and defense techniques in VM in an organization

Text Books

1. Charles j.brooks, Christopher cyber security essential sybex publication , 2018. (Unit I & II)
2. Security in computing fifth edition, Charles P.fleeger. shari lawrence pfleeger, jonathan Margulies Prentice Hall publisher 2015. (Unit III)
3. The Basics of Cyber Safety Computer and Mobile Device Safety Made Easy, John Sammons Michael Cross, Elsevier 2017. (Unit IV & V)

Reference Books

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyber defense Program Against Advanced Threats, A-press
2. Nina Godbole, SumitBelapure, Cyber Security, Willey
3. Hacking the Hacker, Roger Grimes, Wiley
4. Cyber Law By Bare Act, Govt Of india, It Act 2000.

Web Resources

1. <https://www.geeksforgeeks.org/tag/cyber-security/>
2. <https://nptel.ac.in/courses/106106129/> (Unit 1 – 5)

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
1	3	3	2	2										3	
2	3	3	2	2										2	
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	10	20	5	5	10
UNDERSTAND	20	40	10	10	20
APPLY	50	40	5	5	50
ANALYZE	10	10	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. Techniques in security key expressions. (Remember)
2. Summarize the key algorithm.(Understand)
3. Summarize DNS process. .(Understand)
4. Choose Equivalence of public and private key policies (Apply)

Course Outcome 2 (CO2):

1. What is the use keys in cyber security? (Remember)
2. Compare forensic and digital techniques. (Understand)
3. Analyze the cyber law in nowadays (Analyze)

Course Outcome 3 (CO3):

1. Narrate how to apply key algorithm in cyber security. (Understand)
2. Write an algorithm for cyber security process. (Apply)
3. Develop an public and private key algorithm for encryption and decryption process. (Apply)

Course Outcome 4 (CO4):

1. What are the techniques used for digital cyber space? (Remember)
2. Point out the meaning of cyber attack. (Apply)
3. List out spyware attacks in cyber security? (Remember)

Course Outcome 5 (CO5):

1. Write real time process and algorithm used in cyber attack (Apply)
2. Write about cyber security need and law of cyber space (Apply)

21PT3903	APTITUDE - II	L	T	P	C
		1	0	0	1
Prerequisites for the course					
<ul style="list-style-type: none"> Basic Maths 					
Objectives					
<ul style="list-style-type: none"> Students will be able to critique and evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information. Students will be able to use appropriate technology in a given context. 					
I	MODULE I				3
Time and distance, Trains, Boats and Streams, Races.					
II	MODULE II				3
Clocks, Calendar, Area of plane figures, Volume and surface area of solid figures.					
III	MODULE III				3
Elementary algebra, Linear equations, Quadratic equations and in-equations, Progression.					
IV	MODULE IV				3
Permutation and combination, Probability, Geometry, Trigonometry.					
V	MODULE V				3
Data interpretation, Data sufficiency.					
Total Periods					15
Suggestive Assessment Methods					
Continuous Assessment Test (30Marks)		Formative Assessment Test (10Marks)		End Semester Exams(60Marks)	
DESCRIPTIVE QUESTIONS		ASSIGNMENT ONLINE QUIZZES PROBLEM-SOLVING ACTIVITIES		DESCRIPTIVE QUESTIONS	

21CS6602	ARTIFICIAL INTELLIGENCE PRACTICES	L	T	P	C
		2	0	2	3
Preamble:					
<p>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.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS1501- Problem solving and logical thinking using C • 21CS2501- Introduction to computing using Python • 21MA3202-Probability and Queuing Theory 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the various agents and search strategies. 2. To practice the problem solving methods in game playing and CSP. 3. To learn the Knowledge representation logics in AI 4. To understand various planning systems in solving AI problems 5. To learn how to handle the uncertainty with reasoning and explore learning techniques 					
UNIT I	AGENTS AND STRATEGIES				6
Introduction - Agents –problem characteristics- Problem formulation - uninformed search strategies - heuristics -Informed search strategies					
Suggested Activities:					
<ul style="list-style-type: none"> • Analyzing Search strategies. 					
PRACTICAL:					
<ul style="list-style-type: none"> • Water Jug problem • Solve problems using Search. 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assignment on agents • Quizzes 					
UNIT II	PROBLEM SOLVING AND CSP				6
Local search algorithms and optimization problems - searching with non deterministic actions – searching with partial observations - adversarial search – games – optimal decisions in games - alpha–beta pruning - constraint satisfaction problems					
SUGGESTED ACTIVITIES :					
Practical:					
<ul style="list-style-type: none"> • 8-Queen problem 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assignment on alpha–beta pruning • MCQ's 					
UNIT III	KNOWLEDGE REPRESENTATION				6
Knowledge representation - Logical Agents - first-order logic - inferences in first order logic - forward chaining - backward chaining - unification – resolution.					

SUGGESTED ACTIVITIES:**Practical:**

- Basics of PROLOG
- simple fact for the statements using PROLOG

SUGGESTED EVALUATION METHODS:

- Finding resolution to a problem statement.
- Quizzes

UNIT IV**PLANNING AND NLP****6**

Planning with state-space search -nonlinear planning- partial-order planning - planning graphs - Strips -Advanced plan generation systems Natural Language Processing - Natural Language for Communication- ChatGPT applications.

SUGGESTED ACTIVITIES :

- Design planning graph.

Practical:

- Monkey Banana problem

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment Problems

UNIT V**REASONING IN UNCERTAINTY AND LEARNING****6**

Acting under uncertainty- independence- bayes rules- probabilistic reasoning - representing knowledge in an uncertain domain - supervised learning- learning decision trees- Reinforcement learning - passive reinforcement learning - active reinforcement learning

SUGGESTED ACTIVITIES:**Practical:**

- problems using union and intersection of a list
- flatten a list

SUGGESTED EVALUATION METHODS:

- Demo of acting under uncertainty.
- Quizzes

S.No	List of Experiments	Hrs
1	Basics of PROLOG	3
2	Write simple fact for the statements using PROLOG.	3
3	Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.	3
4	Write a program to solve the Monkey Banana problem.	3
5	Write a program to solve 8-Queen problem.	3
6	Write a program to Solve problems using Best First Search	3
7	Write a program Solve problems using Depth First Search	3

7	Write a program Solve problems using union and intersection of a list	3
9	Write a program to flatten a list	3
10	Write a program to solve water jug problem using LISP/PROLOG	3
Total Periods		30 Theory +30 Lab

Laboratory Requirements

SWI-Prolog, GNU-Prolog, Python

Suggestive Assessment Methods

Continuous Assessment Test & FAT (20 Marks)	Lab Components Assessments (30 Marks)	End Semester Exams (50 Marks)
1. DESCRIPTIVE QUESTIONS	1.CONDUCT OF EXPERIMENTS 2. MODEL EXAM	1.DESRIPTIVE QUESTIONS

Outcomes

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

- Understand different types of problem solving agents and its applications. (Understand)
- Analyze problem solving methods in game playing and Constrained satisfaction problems (Analyze)
- Understand the concept of Logical Reasoning (Understand)
- Apply the concepts of planning in problem solving. (Apply)
- Apply how to handle Uncertainty with reasoning. (Apply)

Text Books

1. S. Russel, P. Norvig, "Artificial Intelligence - A Modern Approach", 3rd Edition, Pearson Education Ltd., 2014.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill- 2008.

Reference Books

1. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", 4thEdition, Pearson Education, 2002.
2. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013

Web Resources

1. <https://nptel.ac.in/courses/106105077>
2. <https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/>

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS 01	PS 02	PS 03
1	3	3	3										3		
2	3	3	3	3									2		
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	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):

1. Comprehend different types of problem solving agents and its applications. (Understand)
2. Recall the concepts of Agents. (Remember)
3. Compare the uninformed and informed search strategies (Understand)

Course Outcome 2 (CO2):

1. Identify the problems in Hill climbing search. (Understand)
2. Implement Min Max algorithm in game playing. (Apply)
3. Inspect the Constraint Satisfaction Problems (Analyse)

Course Outcome 3 (CO3):

1. Recall Knowledge representation with its various aspects? (Remember)
2. Compare forward chaining and backward chaining. (Understand)
3. Describe resolution and unification algorithm and explain it in detail (Understand)

Course Outcome 4 (CO4):

1. Narrate Planning with state-space search. (Understand)
2. Write about partial-order planning with real world example. (Apply)
3. Develop planning graphs. (Apply)

Course Outcome 5 (CO5):

1. Demonstrate probabilistic reasoning for a Uncertainty problem (Apply)
2. Predict in what basis is an attribute selected in decision tree for choosing it as a node (Understand)
3. Organize the concept of Passive reinforcement learning for a real world scenario (Apply)

21CS6611	MOBILE APPLICATION DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

21CS1511 - Programming Practice Laboratory using C

21CS3612 - Object Oriented Programming Systems Laboratory

Objectives

1. To understand the concept of components and structure of mobile application development
2. To understand how to work with various mobile application development frameworks.
3. To know the important design concepts and issues of development of mobile applications.
4. To know to develop a app that consists of GUI Components, Layouts, Event Listeners
5. To understand the concept behind RSS feed and creating graphical primitives on the screen

S.No	List of Experiments	CO
1	Study experiment on developing a mobile app	C01
2	Development of an application that uses GUI components, Font and Colours.	C01
3	Study experiment on the concept of Layout Managers and event listeners	C03
4	Development of an application that uses Layout Managers and event listeners.	C03
5	Development of a native calculator application.	C02
6	Study experiment on the concept of developing graphical primitives and RSS feed	C04
7	Write an application that draws basic graphical primitives on the screen.	C04
8	Development of an application that makes use of RSS feed.	C04
9	Implement an application that creates an alert upon receiving a message	C04
10	Write a mobile application that creates alarm clock	C05

Total Periods : 60

S.No.	List of Projects	Related Experiment	CO
1.	To-do app	Ex. 1,2,3,4,7,10	C01-C05
2.	Notes app	Ex. 1,2,3,4,7,10	C01-C05

3.	Timetable manager	Ex. 1,2,3,4,7,10	C01-C05
4.	Unit Converter app	Ex.1,2,3,4,5,7,10	C01-C05
5.	Internet speed checker app	Ex.1,2,3,4,7,10	C01-C05
6.	Voice translation app	Ex.1,2,3,4,7,9,10	C01-C05
7.	Music player app	Ex.1,2,3,4,7,10	C01-C05
8.	Video player app	Ex.1,2,3,4,7,10	C01-C05
9.	QR code scanner app	Ex. 1,2,3,4,7,9,10	C01-C05
10.	Survey app	Ex. 1,2,3,4,7,10	C01-C05
11.	Disaster management app	Ex.1,2,3,4,7,10	C01-C05
12.	Social media app	Ex.1,2,3,4,7,10	C01-C05
13.	E-voting app	Ex. 1,2,3,4,7,8,10	C01-C05
14.	Online book store app	Ex. 1,2,3,4,7,10	C01-C05
15.	Hostel management app	Ex.1,2,3,4,7,9,10	C01-C05

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
Lab Experiment <ul style="list-style-type: none"> • Viva • Model Exam 	<ul style="list-style-type: none"> • Practical Exam • Viva

Outcomes:

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

CO1: Deploy applications to hand-held devices (Apply)

CO2: Implement the important design concepts and issues of development of mobile applicationn

CO3: Develop a app that consists of GUI Components, Layouts, Event Listeners (Apply)

CO4: Develop an app that creates RSS feed, graphical primitives on the screen. (Analyze)

CO5: Able to develop applications by their own

Laboratory Requirements:

SOFTWARE:

Microsoft Windows 10
Android Studio

HARDWARE:

Intel Desktop Systems: 36 nos
Printers: 02

Reference Books

- ANDROID IN PRACTICE, CHARLIE COLLINS, MICHAEL GALPIN AND MATTHIAS KAPPLER, DREAMTECH, ,2012

Web Resources

1. <https://www.createeducation.com/community-partner/mad-lab/>
2. <https://github.com/Raghuvorkady/MAD-LAB-Programs>

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	PO 12	PS 01	PS 02	PS 03
1	3	3	3		1	2		1	2	1		1	3	2	
2	3	3	3		1	2		1	2	1		1	3	2	
3	3	3	3		1				2	1		1	3	2	
4	3	3	3		1	1			2	1		1	3	2	
5	3	3	3		1			1	2	1		1	3	2	

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 for.(Apply) Course Outcome 1 (C01): Deploy applications to hand-held devices

1. Study experiment on developing a mobile app (Understand)
2. Development of an application that uses GUI components, Font and Colours.(Analyze)

Course Outcome 2 (C02):

Implement the important design concepts and issues of development of mobile application

1. Development of a native calculator application.(Apply)

Course Outcome 3 (C03):

Develop a app that consists of GUI Components, Layouts, Event Listeners

1. Study experiment on the concept of Layout Managers and event listeners(Apply)
2. Development of an application that uses Layout Managers and event listeners (Apply)

Course Outcome 4 (C04):

Develop an app that creates RSS feed, graphical primitives on the screen.

1. Study experiment on the concept of developing graphical primitives and RSS feed
2. Write an application that draws basic graphical primitives on the screen.(Analyze)
3. Development of an application that makes use of RSS feed.
4. Implement an application that creates an alert upon receiving a message.

Course Outcome 5 (C05):

Able to develop applications by their own

1. Write a mobile application that creates alarm clock(Apply)

SEMESTER VII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CS7601	Cloud Computing	PC	3	3	0	0	3
2	21CS7602	Cryptography and Network Security	PC	3	3	0	0	3
3		Professional Elective IV	PE	3	3	0	0	3
4		Professional Elective V	PE	3	3	0	0	3
5		Professional Elective VI	PE	3	3	0	0	3
6		Open Elective -IV	OE	3	3	0	0	3
Practical Courses								
1	21CS7611	Cloud Computing Laboratory	PC	4	0	0	4	2
Total				22	18	0	4	20

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
Professional Elective IV								
1	21IT5703	Cyber Security	7	3	0	0	3	Network Security
2	21CS7701	Computational Intelligence and Optimization Techniques	7	3	0	0	3	Artificial Intelligence
3	21IT7704	Wireless Adhoc and Sensor Networks	7	3	0	0	3	Networking
4	21CS7702	Big Data Analytics	7	3	0	0	3	Data Science
5	21IT5708	C # and DOT Net Essentials	7	3	0	0	3	Programming
Professional Elective V								
1	21CS7703	Information Retrieval Systems	7	3	0	0	3	Data Science
2	21IT6707	Software Project Management	7	3	0	0	3	Software Engineering
3	21CS7704	5G Communications	7	3	0	0	3	Networking
4	21CS7705	Block Chain Technologies	7	3	0	0	3	Network Security
5	21CS7706	Full Stack Application Development	7	3	0	0	3	Programming
Professional Elective VI								
1	21CS7707	Multi-core Architectures and Programming	7	3	0	0	3	Computer Architecture
2	21CS7708	Information Security	7	3	0	0	3	Network Security
3	21CS7709	Deep Learning Essentials	7	3	0	0	3	Artificial Intelligence
4	21CS7710	Cyber Forensics and Tools	7	3	0	0	3	Network Security
5	21CS7711	Data Analytics using R	7	3	0	0	3	Programming

Open Elective IV

1	21CS7801	Network Engineering and Management	7	3	0	0	3	CSE
2	21CS7802	Web Design and Management	7	3	0	0	3	CSE
3	21CS7803	Machine Learning	7	3	0	0	3	CSE
4	21CS7804	Data Science Essentials	7	3	0	0	3	CSE
5	21CS7805	Cyber Forensics	7	3	0	0	3	CSE

21CS7601	CLOUD COMPUTING	L	T	P	C
		3	0	0	3
Preamble					
Cloud Computing has drawn the attention of industries and researchers worldwide. Many applications that are being built nowadays were developed to suit the needs of cloud environment. Hence it becomes necessary to have course in cloud computing which deals with the basics of cloud, different services offered by cloud, and security issues in cloud. In a nutshell, this course on cloud computing provides information on fundamental aspects of the cloud environment.					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS5602 - Computer Networks 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the fundamentals of cloud computing. 2. To understand the cloud enabling Virtualization technologies. 3. To have knowledge on the various issues in cloud computing. 4. To learn Resource Management and Security in cloud computing. 5. To understand the emergence of cloud as the next generation computing paradigm. 					
UNIT I	INTRODUCTION	9			
Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.					
Suggested Activities:					
<ul style="list-style-type: none"> • Installation of Virtualbox / VMware Workstation with Linux or windows OS • Installation of C compiler in the virtual machine 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assignment on Cloud Characteristics • Quizzes 					
UNIT II	CLOUD ARCHITECTURE, SERVICES AND STORAGE	9			
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.					
Suggested Activities:					
<ul style="list-style-type: none"> • Installation of Google App Engine. • Creation of simple web applications using python/java. 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • Assignment on Cloud Storage Providers • Quizzes 					
UNIT III	CLOUD ENABLING TECHNOLOGIES	9			

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Hypervisor – Kubernetes – Container – Docker.

Suggested Activities:

- Simulating cloud scenario using CloudSim

SUGGESTED EVALUATION METHODS:

- Assignment on Hypervisor
- Quizzes

UNIT IV	RESOURCE MANAGEMENT AND SECURITY IN CLOUD	9
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Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

Suggested Activities:

- Finding a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

SUGGESTED EVALUATION METHODS:

- Assignment on Virtual Machine Security
- Quizzes

UNIT V	CLOUD TECHNOLOGIES AND ADVANCEMENTS	9
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Hadoop – MapReduce – Virtual Box - Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation – Azure – AWS – PowerBI.

Suggested Activities:

- Installation of Hadoop single node cluster and run simple applications.

SUGGESTED EVALUATION METHODS:

- Assignment on Federated Services and Applications
- Quizzes

Total Periods	45
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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 fundamentals of cloud computing.
 CO2 Understand the cloud enabling Virtualization technologies.
 CO3 Analyze the various issues in cloud computing for providing cloud based services.
 CO4 Analyze Resource Management Techniques and Security in cloud computing.
 CO5 Apply the emerging cloud Technologies to design cloud applications.

Text Books

1. J Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012. **(Unit 1, Unit 2)**
2. Rittinghouse, John W., and James F. Ransome, –Cloud Computing: Implementation, Management and Security||, CRC Press, 2017. **(Unit 3, Unit 4, Unit 5)**

Reference Books

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, –Mastering Cloud Computing||, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach||, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)||, O'Reilly, 2009.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc23_cs89/preview (Unit 1-5)
2. <https://www.geeksforgeeks.org/cloud-based-services/>

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									3	
2	3	2	2		2									3	
3	3	2	2		2									3	
4	3	2	2		2									3	
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	20	5	5	20
UNDERSTAND	40	20	10	10	20
APPLY	20	20	5	5	20
ANALYZE	20	40	5	5	40
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME :

Course Outcome 1 (CO1):

1. Identify which computing paradigm is adaptable in client / server mode? (Remember)
2. List the four major characteristics to identify a service in Cloud. (Understand)

Course Outcome 2 (CO2):

1. Analyze the challenges in architectural design of cloud. (Analyze)
2. Explain in detail about cloud delivery model. (Understand)

Course Outcome 3 (CO3):

1. Describe in detail about SOA and Web services. (Remember)
2. Differentiate between Public cloud and Private Cloud. (Understand)
3. How the architecture of Hypervisor to develop cloud service in network? (Analyze)

Course Outcome 4 (CO4):

1. Examine Extended Cloud Computing Services with neat block diagram. (Apply)
2. Explain the Secure Software Development Life Cycle with neat diagram. (Understand)

Course Outcome 5 (CO5):

1. What are the programming supports of Google App Engine? Illustrate in detail about the Google File system (Understand)
2. Evaluate the HDFS concepts with suitable illustrations .Develop a word count application with Hadoop Map Reduce programming model. (Evaluate)

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					
<ul style="list-style-type: none"> • 21CS5602 - Computer Networks 					
Objectives					
<ol style="list-style-type: none"> 1. To understand OSI security architecture and classical encryption techniques. 2. To acquire fundamental knowledge on the concepts of finite fields and number theory 3. To describe the principles of public key cryptosystems. 4. To understand the concept of hash functions and digital signature 5. 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:					
<ul style="list-style-type: none"> • Infer the attacks on cryptosystems. • Applying Various cryptographic techniques for Network Security 					
SUGGESTED EVALUATION METHODS:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • 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:					
<ul style="list-style-type: none"> • Assignment problems on Diffie Hellman Key Exchange • Quizzes 					
UNIT III	PUBLIC KEY CRYPTOGRAPY	9			

Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorem, Testing for Primality. Public key ciphers - RSA cryptosystem, Elliptic Curve Cryptography, Key Management.

Suggested Activities:

- RSA Algorithm for Encryption and Decryption
- Elliptic Curve Cryptography for Encryption and Decryption
- Key Management for Public Key Cryptography

SUGGESTED EVALUATION METHODS:

- Assignment problems on RSA
- Quizzes

UNIT IV	MESSAGE AUTHENTICATION AND INTEGRITY	9
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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 Challenge Response.

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 Challenge Response for Authentication and Authorization

SUGGESTED EVALUATION METHODS:

- Assignment on MD5 Message Digest Algorithm
- Quizzes

UNIT V	NETWORK SECURITY PRACTICES	9
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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:

- Analyzing authentication applications such as Kerberos and Electronic Mail Security for System security

SUGGESTED EVALUATION METHODS:

- Assignment on Secure Electronic Transaction
- Quizzes

Total Periods		45
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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 need for Security Services and Mechanisms to thwart the threats and vulnerabilities of information systems		
CO2 Apply the fundamental cryptography, encryption, and decryption algorithms		
CO3 Apply the different cryptographic operations of public key cryptography		
CO4 Apply cryptographic algorithms and Hash functions to ensure data secrecy and data integrity		
CO5 Analyze the authentication applications and System Security		
Text Books		
1. William Stallings, "Cryptography and Network Security Principles and Practices", Sixth Edition, Pearson Education, 2018. (Unit 1-5)		
Reference Books		
1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 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 (Unit 1-5)		

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 and vulnerabilities of information systems

Course Outcome 1 (C01):

1. Compare Passive and Active attack. (Understand)
2. List the two basic functions used in Encryption algorithms.(Remember)

Course Outcome 2 (C02): Students will be able to Apply the fundamental cryptography, encryption, and decryption algorithms

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 (C03): 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 (C04): Students will be able to Apply 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 (C05): Students will be able to Analyze the authentication applications and System Security

1. Demonstrate the Kerberos authentication service.
2. Determine the Secure Electronic Transaction (SET) protocol.

Professional Elective IV

21IT5703	CYBER SECURITY	L	T	P	C
		3	0	0	3

Preamble

This course introduces the concept of cyber security. The students would gain knowledge of various cyber security terminologies, technologies, protocols, threat analysis, security principles, security mechanisms, methods/practices to secure systems

Prerequisites for the course

21CS5602 - Computer Networks

Objectives

1. To provide students with a knowledge and importance of cyber security
2. To understand the various types of hackers and cyber-attacks and analyse the nature of attacks through cyber/computer forensics software/tools.
3. To learn about ethical hacking concepts and Implement Cyber security best practices
4. To classify the various cybercrimes, and its remedial and mitigation measures.
5. To Know about cyber ethics and laws

UNIT I	INTRODUCTION TO CYBER SECURITY	9
Introduction to Cyber Security - Importance and challenges in Cyber Security – Cyberspace -Cyber threats – Cyber warfare - CIA Triad - Cyber Terrorism - Cyber Security of Critical Infrastructure - Organizational Implications		
UNIT II	HACKERS AND CYBER CRIMES	9
Types of Hackers - Hackers and Crackers - Cyber-Attacks and Vulnerabilities- Malware threats Sniffing – Gaining Access-Escalating Privileges - Executing Applications - Hiding Files - Covering Tracks –Worms - Trojans-Viruses – Backdoors		
UNIT III	ETHICAL HACKING AND SOCIAL ENGINEERING	9
Ethical Hacking Concepts and Scopes - Threats and Attack Vectors - Information Assurance – Threat Modelling - Enterprise Information Security Architecture - Vulnerability Assessment and Penetration Testing - Types of Social Engineering - Insider Attack - Preventing Insider Threats - Social Engineering Targets and Defence Strategies		
UNIT IV	CYBER CRIMES	9
Classification of cyber-crime - cyber-crime targeting computers and mobiles, social engineering attacks, malware and ransom ware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber-crimes, Remedial and mitigation measures.		

UNIT V	CYBER ETHICS		9
Introduction to Cyber Ethics - E-Commerce and E-Governance - Certifying Authority and Controller Offences under IT Act - Computer Offences and its penalty under IT Act 2000 - Intellectual Property Rights in Cyberspace			
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. SLIP TEST	1.DESRIPTIVE QUESTIONS	
Outcomes			
Upon completion of the course, the students will be able to:			
<p>CO1 - Understand about the cyber security and its organizational implications.</p> <p>CO2 - Understand the various cyber-attacks and the defence strategies.</p> <p>CO3 – Apply cyber defence tools, methods and components and apply cyber defence methods to prepare a system to repel attacks.</p> <p>CO4 – Analyse the cyber-attacks and mitigation techniques.</p> <p>CO5 – Analyse the cyber ethics and IPR Rights in cyber space.</p>			
Text Books			
1. Nina Godbole, SunitBelapure, “Cyber Security: Understanding Cybercrimes, Computer Forensics and Legal Perspectives”, First Edition, Wiley India, 2011.			
Reference Books			
<p>1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cyber security -How to Build a Successful Cyberdefence Program Against Advanced Threats, A-press, 2014</p> <p>2. Nina Godbole, SumitBelapure, Cyber Security, Willey 2015.</p> <p>3. Hacking the Hacker, Roger Grimes, Wiley 2018.</p> <p>4. Cyber Law By Bare Act, Govt.of India, It Act 2000.</p>			
Web Resources			
<p>1. https://www.geeksforgeeks.org/tag/cyber-security/</p> <p>2. NPTEL course on cyber security : https://nptel.ac.in/courses/106106129/</p>			

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 01	PS 02	PS0 3
1	2	2	1		1	1		1						3	
2	1	1	1	1	2	1	1				1			3	
3		1	1	1	1	1		1	1	1	1			3	
4		1	1	1	1	1		1	1	1		1		3	
5	1	2	1	1	1	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	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

21CS7701	COMPUTATIONAL INTELLIGENCE AND OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3
Preamble					
This course explains the concept of Computational Intelligence and Optimization Techniques. This Course helps the learners to know the models of Artificial Neural Networks, Supervised, Unsupervised Neural Networks, Fuzzy logic concept, Optimization algorithms and considered as one of the central areas of computer science.					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21MA4201 - Discrete Mathematics • 21MA3202 - Probability and Queuing Theory • 21CS3601 - Computer Architecture 					
Objectives					
<ol style="list-style-type: none"> 1. To learn the key aspects of Artificial Neural Networks. 2. To familiarize Supervised and Unsupervised Neural Networks. 3. To analyze the various modules of Fuzzy logic and Genetic algorithm. 4. To gain insight on Neuro Fuzzy modelling and support vector machines. 5. To study about Evolutionary Computation Algorithms. 					
UNIT I	PRINCIPLES OF ARTIFICIAL NEURAL NETWORKS	9			
Introduction - Artificial Neuron Models - Potential Applications of ANN -Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN - Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.					
UNIT II	SUPERVISED AND UNSUPERVISED NEURAL NETWORKS	9			
Perceptron - Back Propagation neural network - Hopfield neural network - Kohonen neural network - Bidirectional Associative Memories - Radial basis function neural network - Counter propagation neural network - Adaptive Resonance Theory neural networks - Introduction to deep learning neural networks.					
UNIT III	PRINCIPLES OF FUZZY LOGIC THEORY	9			
Introduction to classical sets – properties, operations and relations; Fuzzy sets - Operations, properties and relations - Membership functions - Defuzzification methods - Extension principle - Approximate Reasoning - Rule based systems, - Fuzzy Associative Memories(FAMs) - Fuzzy inference systems.					
UNIT IV	NEURO FUZZY SYSTEMS	9			

ANFIS – Architecture and training algorithm – CANFIS - Rule based structure identification - Classification and Regression tree algorithm - Fuzzy inference systems - Fuzzy C-means algorithm, K-means algorithm - mountain clustering - subtractive clustering.

UNIT V	EVOLUTIONARY COMPUTATION ALGORITHMS	9
Genetic Algorithm - Particle Swarm Optimization algorithm - Ant Colony Optimization algorithm - ABC algorithm - Gray Wolf optimization algorithm.		
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 Explain the principles of neural networks (Remember)
- CO2 Develop hybrid artificial neural networks (Apply)
- CO3 Frame fuzzy logic based expert systems (Apply)
- CO4 Determine the performances of hybrid neuro fuzzy algorithms (Apply)
- CO5 Distinguish the various evolutionary computation algorithms (Apply)

Text Books

1. LaureneFausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Fourth edition, Pearson Education India, 2006.
2. Timothy J Ross, “Fuzzy logic with engineering applications”, John Wiley & Sons, Third Edition, 2010.

Reference Books

1. J.S.R.Jang, C.T. Sun and E.Mizutani, “NeuroFuzzy and Soft Computing”, PHI / Pearson Education, Third edition, 2004.
2. Simon Haykin, “Neural Networks Comprehensive Foundation” Second Edition, Pearson Education, 2005.
3. Mohamad Hasoun, “Fundamentals of artificial neural networks”, MIT Press, 2003.
4. A E Eiben and J E Smith, “Introduction to evolutionary computing” Springer, 2nd edition, 2015.

Web Resources

1. <https://nptel.ac.in/courses/106102220>
2. https://onlinecourses.nptel.ac.in/noc21_me10/preview
3. <https://www.udemy.com/course/optimisation/>

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	
2	2		3											3	
3	3	2												3	
4														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):

1. List out the operations of Artificial Neuron. (Remember)
2. Summarize the types of Neuron Activation Function.(Understand)
3. How can you classify the learning rules?(Understand)

Course Outcome 2 (CO2):

1. Illustrate the process of Back propagation neural network. (Remember)

2. Demonstrate the deep learning neural networks. (Understand)
3. List out the process of Counter propagation neural network. (Remember)

Course Outcome 3 (CO3):

1. How can you classify the operations of fuzzy sets?(Understand)
2. Summarize the process of Rule Based Systems. (Understand)
3. List out the procedure of fuzzy interference system. (Understand)

Course Outcome 4 (CO4):

1. Write about ANFIS. (Remember)
2. Differentiate Fuzzy C-Means Algorithm and K-Means Algorithm. (Apply)
3. Illustrate the concept of mountain clustering and subtractive clustering. (Remember)

Course Outcome 5 (CO5):

1. List out the advantages of Particle Swarm Optimization Algorithm. (Understand)
2. Demonstrate the process of Gray Wolf Optimization Algorithm. (Apply)

21IT7704	WIRELESS AD HOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3
Preamble					
This course provides the knowledge on wireless communication, wireless local area, personal area, and wide area technologies, wireless ad hoc networks: link layer issues and medium access control, ad hoc routing, transport layer problems, wireless sensor networks: architectures, medium access control, routing, and energy efficiency.					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS5602 –Computer Networks. 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the basic concepts of wireless LAN and PAN. 2. To understand the issues and classifications of MAC protocol. 3. To apply the knowledge of table driven, on-demand and hybrid routing protocols. 4. To apply the transport layer security protocols. 5. To analyze the various issues in wireless ad hoc networks. 					
UNIT I	WIRELESS LANS AND PANS	9			

Introduction – Fundamentals of WLANS – IEEE 802.11 Standards – HIPERLAN Standard – Bluetooth – Home RF. Wireless ad hoc networks: Introduction – Issues in Wireless Ad Hoc Networks.		
UNIT II	MAC PROTOCOLS	9
Introduction – Issues in Designing a MAC protocol for Wireless Ad Hoc Networks – Design goals of a MAC Protocol for Wireless Networks – Classifications of MAC Protocols – MAC Protocols that use Directional Antennas.		
UNIT III	ROUTING PROTOCOLS	9
Introduction – Issues in Designing a Routing Protocol for Wireless Ad Hoc Networks – Classification of Routing Protocols – Table Driven Routing Protocols: OLSR & STAR, On Demand Routing Protocols: AODV & TORA – Hybrid Routing Protocols: ZRP & ZHLS – Location aware Protocols: GPSR & GLR.		
UNIT IV	TRANSPORT LAYER PROTOCOLS	9
Introduction – Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks – Classification of Transport Layer Solutions – TCP Over Wireless Ad Hoc Networks – Other Transport Layer Protocol for Ad Hoc Wireless Networks.		
UNIT V	SECURITY IN WIRELESS ADHOC NETWORKS	9
Security issues in adhoc networks - Keying Management- Security Requirements - Attacks on adhoc Networks - Secure Routing: Secure AODV, ARAN, SEAD and MASK-Intrusion detection systems.		
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
Outcomes		
Upon completion of the course, the students will be able to:		

CO1– Understand the basis of wireless Ad-hoc networks.

CO2– Understand the design, operation and the performance of MAC layer protocols of wireless Ad-hoc networks.

CO3–Apply the operation and performance of routing protocol of wireless Ad-hoc network.

CO4– Apply the design, operation and the performance of transport layer protocol of Wireless Ad-hoc networks.

CO5– Analyze the importance of security in wireless Ad-hoc networks.

Text Books

1. C. Siva Ram Murthy, “Ad Hoc Wireless Networks: Architectures and Protocols”, Addis Dorling Kindersley (India), 2nd Edition, 2012. **(Unit I – IV)**
2. Farooq Anjum and Petros Mouchtaris, “Security for wireless ad hoc networks”, Wiley Interscience publication, 1st Edition, 2010. **(Unit V)**

Reference Books

1. Hai Lu, Yiu wing and Xiaawen “Adhoc and sensor Wireless Networks: Architectures, Algorithms and Protocols”, Benthem press, 1 st Edition, 2018.
2. Luigi, Gennaro, Giuseppe, Yaser and Claudis, “Ad-Hoc Networks and Wireless”, ADHOC-NOW 2020 Proceedings, Springer, 4th Edition, 2020.

Web Resources

1. <https://archive.nptel.ac.in/courses/106/105/106105160/>**(Unit II – Week 6, Unit V – Week 8)**

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	PS 01	PSO 2	PSO 3
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	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND	70	70	15	15	70
APPLY	30	30	10	10	30
ANALYZE					
EVALUATE					
CREATE					

21CS7702	BIG DATA ANALYTICS	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, Hive, R 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					
<ul style="list-style-type: none"> • 21CS5705- Data Warehousing and Data Mining 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the competitive advantages of big data analytics 2. To understand the big data frameworks 3. To learn data analysis methods 4. To learn stream computing 5. To gain knowledge on Hadoop related tools 					
UNIT I	INTRODUCTION TO BIGDATA	7			

Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data-Risks of Big Data-Structure of Big Data-Challenges of Conventional Systems-Web Data –Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting-Modern Data Analytic Tools		
UNIT II	HADOOP FRAMEWORK	9
Distributed File Systems - Large-Scale File System Organization – HDFS concepts – Map Reduce Execution, Algorithms using Map Reduce, Matrix- Vector Multiplication– Hadoop YARN.		
UNIT III	DATA ANALYSIS	13
Statistical Methods: Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods-Rule Mining Cluster Analysis Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data – Predictive Analytics – Data analysis using R.		
UNIT IV	MINING DATA STREAMS	7
Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream – Mining Data Streams and Mining Time-series data- Real Time Analytics Platform (RTAP) Applications-Case Studies- Real Time Sentiment Analysis, Stock Market Predictions..		
UNIT V	BIG DATA FRAMEWORKS	9
Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations –Hbase Clients – Examples – .Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig–Grunt–Pig Data Model–PigLatin–developing and testing Pig Latin scripts. Hive–Data Types and File Formats–HiveQL Data Definition–HiveQL Data Manipulation–HiveQL Queries.		
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 how to leverage the insights from big data analytics. (Understand)
- CO2 Analyze data by utilizing various statistical and data mining approaches (Analyze)
- CO3 Apply analytics on real-time streaming data (Apply)
- CO4 Apply the various NoSql alternative database models (Apply)
- CO5 Apply Hadoop related tools for Big Data Frameworks. (Apply)

Text Books

1. Bill Franks, – Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics||, Wiley and SAS Business Series,2012. (UNITS- I)
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph",2013 (UNITS – II, V)
3. Michael Berthold, David J.Hand, –Intelligent Data Analysis||, Springer, Second Edition,2007 (UNIT-III)

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		1	2								3		
3	3	2		1	2								3		
4	3			1	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					

21IT5708	C# AND DOT NET ESSENTIALS	L	T	P	C
		3	0	0	3
Preamble					
This course provides essentials for writing object-oriented software programs in C# and .NET					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS3603 - Object Oriented Programming Systems 					
Objectives					
<ol style="list-style-type: none"> 1. To expose basic programming in C# and the object-oriented programming concepts. 2. To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET. 3. To study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET. 4. To learn mobile applications using .Net compact framework. 5. To understand the working of base class libraries, their operations and manipulation of data using XML 					
UNIT I	C# LANGUAGE BASICS	9			
.Net Architecture – Core C# – Variables – Data Types – Flow control – Objects and Types- Classes and Structs – Inheritance- Generics – Arrays and Tuples – Operators and Casts – Indexers.					
UNIT II	C# ADVANCED FEATURES	9			
Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings and Regular Expressions – Generics – Collections – Memory Management and Pointers – Errors and Exceptions – Reflection.					
UNIT III	BASE CLASS LIBRARIES AND DATA MANIPULATION	9			
Diagnostics -Tasks, Threads and Synchronization – .Net Security – Localization – Manipulating XML- SAX and DOM – Manipulating files and the Registry Transactions – ADO.NET- Peer-to-Peer Networking – PNRP – Building P2P Applications – Windows Presentation Foundation.					
UNIT IV	BASED APPLICATIONS, WCF AND WWF	9			
Window based applications – Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)- Introduction to Web Services – .Net Remoting – Windows Service – Windows Workflow Foundation (WWF) – Activities – Workflows					
UNIT V	.NET FRAMEWORK AND .NET COMPACT FRAMEWORK	9			

Assemblies – Shared assemblies – Custom Hosting with CLR Objects – Appdomains – Core XAML – Bubbling and Tunnelling Events- Reading and Writing XAML - .Net Compact Framework – Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

Total Periods	45
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Suggestive Assessment Methods

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

Outcomes

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

- C01** Understand the knowledge of object-oriented concepts
- C02** Develop string manipulation, events and exception handling within .NET application environment
- C03** Develop and manipulate GUI components in C#.
- C04** Design various applications using C# Language in the .NET Framework.
- C05** Analyse and resolve problems (debug /trouble shoot) in C#.NET window based application

Text Books

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, Professional C# 2012 and .NET 4.5, Wiley, ISBN -13: 978-1118314425, 2012.
2. Harsh Bhasin, –Programming in C#, Oxford University Press, ISBN-13: 978-0198097402, 2014.

Reference Books

1. IanGariffiths, Mathew Adams, Jesse Liberty, Programming C# 4.0, OReilly, Fourth Edition, ISBN: 9780596159832, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, ISBN: 978-1-4302-4234-5, 2012.

Web Resources

- <http://www.javatpoint.com>
- <https://ict.iitk.ac.in/courses/introduction-to-c-sharp/>

CO VS PO MAPPING AND CO VS PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS 02	PS 03
1	3	2	2	1						1			3		
2	2	1	1	2	2					1			3		
3	1	1	1	1	2			1	1	1			3		
4	1	1	1	1	1	1		1	1	1			3		
5	1	1	1	1	1		1	1			1	1	3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND	50	30	50	30	30
APPLY	50	55	50	70	55
ANALYZE		15			15
EVALUATE					
CREATE					

Professional Elective V

21CS7703	INFORMATION RETRIEVAL SYSTEMS	L	T	P	C
		3	0	0	3
Preamble					
<p>This course The course focuses on the representation, storage, association and access to data items utilizing different IR calculations and systems. It emphasizes the working of data recovery frameworks for reports in order to recover important or valuable data from them. It helps the students to develop applications and evaluate recommender systems.</p>					
Prerequisites for the course					
21CS7702 - Big Data Analytics					
Objectives					
<ol style="list-style-type: none"> 1. To understand the basics of Information Retrieval Search Engine. 2. To understand the various models in Information Retrieval Systems 3. To Understand the search engine using Crawling And Indexing 4. To Learn the Rank algorithms in Web search 5. To understand the categorization and clustering algorithms in document text mining 					
UNIT I	INTRODUCTION TO IR SEARCH ENGINE	9			
<p>Introduction –Basic IR system Architecture –Other search Applications-Other IR search Applications-Working with Electronic Text-Open source Search engine Frameworks –Lucene, Indiri and Wumpus.</p>					
UNIT II	INFORMATION RETRIEVAL MODELS	9			
<p>Boolean and vector-space retrieval models- Term weighting - TF-IDF weighting-Language Model based IR - Probabilistic IR – Relevance feedback and query expansion.</p>					
UNIT III	WEB SEARCH ENGINE – CRAWLING AND INDEXING	9			
<p>Web search overview, web structure, search engine – Web Search Engine Architecture - crawling the web-crawling Documents and email- web indexes - Index Compression-Index Construction.</p>					
UNIT IV	WEB SEARCH – LINK ANALYSIS	9			
<p>Link Analysis –hubs and authorities – Page Rank algorithms -Searching and Ranking-Queries and users-Static ranking-Dynamic ranking-Evaluating web search.</p>					
UNIT V	DOCUMENT TEXT MINING	9			
<p>Text Mining -Text classification and clustering - Categorization algorithms: naive Bayes and nearest neighbor – Clustering algorithms: Flat clustering-Clustering in information retrieval; k-means;</p>					

Model based Clustering	
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 Retrieval Search Engine.
- CO2 Understand the various models in Information Retrieval Systems
- CO3 Analyze the web search engine using Crawling And Indexing
- CO4 Analyze the Rank algorithms in Web search using Link Analysis
- CO5 Apply the categorization and clustering algorithms in document text mining

Text Books

1. C.Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008.(Unit I-III)
2. Ricardo Baeza -Yates and BerthierRibeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011. (Unit IV and V))

Reference Books

1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.
2. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
3. OphirFrieder “Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series “,2ndEdition, Springer, 2004.
4. Manu Konchady, “Building Search Applications: Lucene, Ling Pipe”, and First Edition, Gate Mustru Publishing, 2008.
5. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

Web Resources

- <http://lisbdnet.com/online-information-retrieval-system>

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	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		30	5	5	50
ANALYZE	40	40	5	5	20
EVALUATE					
CREATE					

21IT6707	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

Preamble

This course aims to equip participants with essential project management skills, tools, and techniques specific to software projects. It emphasizes the importance of effective planning, communication, risk management, and quality assurance in software project delivery. This course encourages active participation, collaboration, and the application of theoretical concepts through case studies. By the end of this course, the students can expect an enriching learning experience that prepares them for successful software project management.

Prerequisites for the course

21CS3604- Software Engineering

Objectives

1. To understand the maturity models and the process of software project management.
2. To understand the management renaissance of the software project.
3. To apply the workflows and estimations in the project plan.
4. To analyze the process automations and evolution of organizations.
5. To develop software product using conventional and modern principles of software project management.

UNIT I	SOFTWARE PROCESS MATURITY	9
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Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT II	SOFTWARE PROJECT MANAGEMENT RENAISSANCE	9
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Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT III	PROJECT PLANNING	9
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Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, Timelines- GANTT Charts cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT IV	PROJECT ORGANIZATIONS	9
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Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT V	SOFTWARE MANAGEMENT PRACTICES	9
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SCRUM- CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

Total Periods	45
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Suggestive Assessment Methods

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

Outcomes

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

- C01** Understand the maturity models and the process of software project management.
- C02** Understand the management renaissance of the software project.
- C03** Apply the workflows and estimations in project plan.
- C04** Analyze the process automations and evolution of organizations of various project organizations.
- C05** Design software product using conventional and modern principles of software project management

Text Books

Bob Hughes, Mike Cotterel, Rajib Mall, "Software Project Management", 6th Edition, McGraw-Hill, 2018

Reference Books

1. RobertK.Wysocki, "EffectiveSoftwareProjectManagement" WileyPublication,2011.
2. WalkerRoyce,"SoftwareProjectManagement",Addison-Wesley,1998.
3. GopalaswamyRamesh,"ManagingGlobalSoftwareProjects"McGrawHillEducation(India),Fourteenth Reprint2013

Web Resources

<https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/>

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	PS 01	PSO 2	PSO 3
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	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND	60	40	10	5	50
APPLY	20	20	10	10	30
ANALYZE	20	40	5	10	20
EVALUATE					
CREATE					

21CS7704	5G COMMUNICATIONS	L	T	P	C
		3	0	0	3
Preamble					
<p>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.</p>					

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**

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.

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					

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					
<ul style="list-style-type: none"> • 21CS5602 - Computer Networks 					
Objectives					
<ol style="list-style-type: none"> 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 Blockchain Applications- 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-Setting 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 Madiseti, "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	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
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					

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					
<ul style="list-style-type: none"> • 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
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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
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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
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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
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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					

Professional Elective VI

21CS7707	MULTI-CORE ARCHITECTURES AND PROGRAMMING	L	T	P	C
		3	0	0	3
Preamble					
<p>"Multi-Core Architectures and Programming" introduces the concept of a multicore processor with architecture and programming using the OpenMP API. It provides an overview of Multicore Architecture and its functional components such as Intercommunication, Cache, and Memory. It provides an ideology of how the operating system's process scheduling in a multicore processor works. Memory programming in core processors is discussed using the OpenMP API and its libraries for the C programming language.</p>					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS3601 - Computer Architecture 					

- 21CS4604 - Operating System Concepts
- 21CS6706 - Distributed and Parallel Systems

Objectives

1. To understand the need for multi-core processors, and their architecture.
2. To understand the challenges in parallel and multi-threaded programming.
3. To learn about the various shared memory programming paradigms.
4. To learn about the various distributed memory programming paradigms.
5. To develop multicore parallel programs to give solutions to common problems.

UNIT I	MULTI-CORE PROCESSORS	9
Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance Issues – Parallel program design.		
UNIT II	PARALLEL PROGRAM CHALLENGES	9
Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).		
UNIT III	SHARED MEMORY PROGRAMMING WITH OpenMP	9
OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.		
UNIT IV	DISTRIBUTED MEMORY PROGRAMMING WITH MPI	9
MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation		
UNIT V	PARALLEL PROGRAM DEVELOPMENT	9
Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.		
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 multicore architectures and identify their characteristics and challenges. (Understand)		
CO2 Understand the issues in programming Parallel Processors. (understand)		
CO3 Develop programs using OpenMP in shared memory. (Apply)		
CO4 Develop program using MPI in distributed Memory. (Apply)		
CO5 Analyze parallel programming solutions to common problems. (Analyze)		
Text Books		

1. Peter S. Pacheco, –An Introduction to Parallel Programming||, Morgan-Kauffman/Elsevier, 2011.
2. Darryl Gove, Multicore Application Programming for Windows, Linux, and Oracle Solaris||, Pearson, 2011(unit 2)

Reference Books

1. Michael J Quinn, –Parallel programming in C with MPI and OpenMP||, Tata McGraw Hill,2003.
2. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.
3. Yan Solihin, Fundamentals of Parallel Multicore Architecture, CRC Press, 2015.

Web Resources

1. Multi-Core Computer Architecture - Course (nptel.ac.in)
2. <https://www.openmp.org/spec-html/5.0/openmp.html>
3. Introduction to parallel programming with OpenMP and MPI - Course (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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	3	3	3	2	2									3	
2	3	3	3	3	2									3	
3	3	3	3	3	2									3	
4	3	3	3	2	2									3	
5	3	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	20	50	5	5	50
ANALYZE	20	20	5	5	20
EVALUATE					
CREATE					

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					
<ul style="list-style-type: none"> • 21CS7602 - Cryptography and Network Security 					
Objectives					
<ol style="list-style-type: none"> 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,4 th 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					

21CS7709	DEEP LEARNING ESSENTIALS	L	T	P	C
		3	0	0	3
Preamble					
This course is about learning the foundational concept of machine learning algorithms, neural networks and deep learning, Convolutional networks, RNNs, LSTM, optimization. This course will culminate in case studies from Imagenet, object detection, natural language processing, face recognition.					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21CS6602 - Artificial Intelligence Practices 					
Objectives					
<ol style="list-style-type: none"> 1. To Learn the basis of Machine Learning 2. To Explore various Deep Learning Networks 3. To Implement Convolutional and Recurrent Neural Algorithms 4. To learn optimization and generalization in deep learning and its applications 5. To Explore the deep learning algorithms in various real time applications 					
UNIT I	MACHINE LEARNING BASICS	9			
Introduction to machine learning - Linear models (SVMs and Perceptrons, logistic regression). Learning Algorithms – Capacity, Overfitting and underfitting – Hyperparameters and Validation Sets – Estimators, Bias and Variance – Maximum Likelihood Estimation – Bayesian Statistics – Supervised Learning Algorithms – Unsupervised Learning Algorithms – Stochastic Gradient Descent – Building a Machine Learning Algorithm – Challenges Motivating deep learning.					
UNIT II	DEEP NETWORKS	9			

History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and other Differentiation Algorithms – Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning –Long Short Term Memory		
UNIT III	CONVOLUTION & RECURRENT NETWORKS	9
Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms-Transfer Learning- Recurrent Neural Networks: Bidirectional RNNs – Deep Recurrent Networks – Concepts in Natural Language Processing		
UNIT IV	OPTIMIZATION AND GENERALIZATION	9
Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience		
UNIT V	CASE STUDY AND APPLICATIONS	9
Imagenet- Object Detection – Object Tracking - Audio WaveNet - Natural Language Processing Word2Vec - Joint Detection - Face Recognition - Scene Understanding - Gathering Image Captions.		
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 and effectively use the procedures for Machine Learning Algorithms(Understand) CO2 Analyze the data generated using Deep Learning model (Apply) CO3 Develop models using Convolutional and Recurrent Neural Algorithms (Apply) CO4 Analyze optimization and generalization in deep learning (Analyze) CO5 Apply appropriate datasets to the deep learning algorithms and analyze the output (Apply)		
Reference Books		

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation, 2016.
2. Dr. Adrian Rosebrock, —Deep Learning for Computer Vision with Python: Starter Bundle||, PyImage Search, 1st edition, 2017.
3. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013. 4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

Web Resources

1. <https://nptel.ac.in/courses/108103192>
2. <https://nptel.ac.in/courses/106105215>
3. <https://nptel.ac.in/courses/106106184>

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	3	3	3										3	
4		3	3	3										3	
5		2	3	2	2				2	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					

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					
<ul style="list-style-type: none"> • 21IT5703 - Cyber Security 					
Objectives					
<ol style="list-style-type: none"> 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 Applications – 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 Certified 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					

21CS7711	Data Analytics using R	L	T	P	C
		3	0	0	3
Preamble					
Fundamental data analytics algorithms and methods will be covered in this course. The various machine learning and data mining algorithms will be covered after the statistical underpinnings. The use of technology will also be discussed, including data management, scalable computation, and visualisation using R. In conclusion, this course will expose students to both the theory and the real systems and software utilised in data analytics.					
Prerequisites for the course					
<ul style="list-style-type: none"> • 21MA3202 - Probability and Queuing Theory • 21CS4601 - Database Management Systems 					
Objectives					
<ol style="list-style-type: none"> 1. To learn data preparation and transformations, R Language. 2. Implement various statistic techniques for data analysis. 3. Learn different data visualization techniques. 4. To perform predictive analysis and Implement Clustering for various kinds of data. 5. To perform analysis on data for real time applications 					
UNIT I	OVERVIEW OF R LANGUAGE , DATA PREPARATION				9
Introduction of R- Installation and Configuring R on PCs- Basic concepts of Object Orientation and R- Generating R code- Graphics- Data manipulation; Arrays and Matrices, Functions, Grouping, Loop and conditional Execution in R.					
Introduction - Data sources – Data understanding: Data tables- continuous and discrete variables- Data preparation: Overview-Cleaning the data – Removing variables – Data transformations – Segmentation.					
UNIT II	STATISTICS				9

Overview of Statistics – Descriptive statistics: central tendency-variation-shape –Inferential statistics- Confidence intervals – Hypothesis tests- chi-square- One-way analysis of variance – Comparative statistics: Visualizing relationships – Correlation coefficient – Correlation analysis for more than two variables.

UNIT III	DATA VISUALIZATION	9
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Visualization Design Principles : General principles-Graphics design-Anatomy of a graph- Tables : Simple Tables- Summary Tables- Two-way Contingency Tables- Super tables- Univariate Data Visualization – Bivariate Data Visualization – Multivariate Data Visualization – Visualizing Groups : Dendrograms-Decision Trees, Cluster Image Maps - Dynamic Techniques.

UNIT IV	CLUSTERING AND PREDICTIVE ANALYSIS	9
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Overview – Distance Measures – Agglomerative Hierarchical Clustering – Partitioned Based Clustering – Fuzzy Clustering – Overview of Predictive Analysis – Principal Component Analysis – Multiple Linear Regression – Discriminant Analysis – Logistic Regression – Naive Bayes Classifiers - k-nearest neighbours – classification and regression trees- Neural networks.

UNIT V	APPLICATIONS	9
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Application: Sales and Marketing – Industry Specific Data Mining – microRNA Data Analysis Case Study – Credit Scoring Case Study – Data Mining Nontabular Data.

Total Periods	45
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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:

- Understand data preparation and transformations in R Language. (Understand)
- Implement various statistic techniques for data analysis. (Apply)
- Analyze different data visualization techniques. (Analyze)
- Implement Clustering and predictive analysis for various kinds of data. (Apply)
- Analyze data for real time applications. (Analyze)

Text Books

1. Glenn J.Myatt, –Making sense of data : A practical guide to exploratory data analysis and data mining, 2 nd Edition, 2014. A
2. Edward R. Tufte, – The Visual display of Quantitative Information||, 2 nd Edition, 2001.

Reference Books

1. Ben Fry, –Visualizing data : Exploring and Explaining Data with the processing Environment||, 2008.
2. Tamraparni Dasu, –Exploratory Data mining and Data cleaning, 2013.

Web Resources:

1. Business analytics and data mining Modeling using R - Course (nptel.ac.in)
2. Data Analysis with R Programming Course (Google) | Coursera
3. Getting Started analyzing Data in R - Introduction to Data Analysis with R | Coursera

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		
2	3	3	3	3	2								3		
3	3	3	3	3	2								3		
4	3	3	3	2	2								3		
5	3	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	20	50	5	5	50
ANALYZE	20	20	5	5	20
EVALUATE					
CREATE					

Open Elective- IV

21CS7801	NETWORK ENGINEERING AND MANAGEMENT	L	T	P	C
		3	0	0	3
Preamble					
This course explains the concept of Network Engineering and Management. This Course helps the learners to know the Communication Networks, Quality of Service, High Performance Networks, and considered as one of the central areas of computer science.					
Prerequisites for the course					
<ul style="list-style-type: none"> • Nil 					
Objectives					
<ol style="list-style-type: none"> 1. To understand the need for interoperable network management. 2. To learn to the concepts and architecture behind standards-based network management. 3. To learn the concepts of High-Performance Networks. 4. To understand the concepts and terminology associated with SNMP. 5. To learn the current trends in network management technologies. 					
UNIT I	FOUNDATIONS OF NETWORKING	9			
Communication Networks –Network Elements – Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching - Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration – Modern Applications.					
UNIT II	QUALITY OF SERVICE	9			
Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in inelastic traffic.					
UNIT III	HIGH PERFORMANCE NETWORKS	9			
Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behaviour – Admission Control – MPLS Networks – Scheduling Policy mechanisms–FIFO – Priority –Round Robin-Principles and Mechanisms – Label Stacking – RSVP – Protocols for Real time Interactive Application - RTP/RTCP.					
UNIT IV	HIGH SPEED NETWORKS	9			
Optical links – WDM systems – Optical Cross Connects – Optical paths and Networks – Principles of ATM Networks – B-ISDN/ATM Reference Model – ATM Header Structure – ATM Adaptation Layer – Management and Control – Service Categories and Traffic descriptors in ATM networks-Wireless LAN –Architecture of IEEE 802.11.					
UNIT V	NETWORK MANAGEMENT	9			
ICMP– Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB-Network Management Architecture-Security and privacy architecture.					

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 concepts of ATM networks and their uses in different ATM adaptation layer and wireless LAN. (Understand)
- CO2 Develop the various concepts of different quality of service and traffic monitoring of IP networks (Apply)
- CO3 Design and develop different communication networks, switched networks and shared networks (Apply)
- CO4 Apply different communication protocols such as ICMP, CMIP, SNMP, SNMPV2 and SNMPV3 (Apply)
- CO5 Apply the concepts of Differential service networks and MPLS networks (Understand)

Text Books

1. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2007.
2. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.
3. Mani Subramaniam, 'Network Management: Principles and Practices', Pearson Education, 2000.

Reference Books

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
2. Jean Warland and PravinVareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
3. Kasera and Seth, 'ATM Networks: Concepts and Protocols', Tata McGraw Hill, 2002

Web Resources

1. <https://nptel.ac.in/courses/106106091>
2. https://onlinecourses.nptel.ac.in/noc22_cs19/preview
3. <https://www.udemy.com/course/snmp-monitoring/>

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	3							2		2	
2	3		3			3						2		2	
3	3	3	3		2							2		2	
4	3	2	3		2							2		2	
5	3	2	3		3							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					

21CS7802	WEBDESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3
Preamble					
This course provides the fundamental knowledge about web designing .It focuses on responsive web design, and CSS framework. Word press is used for developing websites,					
Objectives					
<ol style="list-style-type: none"> To learn web programming concepts like HTML, CSS, Java script etc. To Understand the responsive design and development To learn the web project management and maintenance process To Design a Website with Open source CMS like Word Press. To Design various applications in web page using word press 					
UNIT I	WEB DESIGN - HTML MARKUP FOR STRUCTURE	9			
Working of Web - HTML Markup for Structure - Creating simple page - Marking up text – Adding Links - Adding Images - Table Markup - Forms - HTML5					
UNIT II	CSS AND JAVASCRIPT	9			

CSS - Formatting text - Colors and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation – Java script - Using Java Script

UNIT III

RESPONSIVE WEB DESIGN

9

Sass for Responsive Web Design – Marking Content with HTML5 – Mobile-First or Desktop-First – CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD – Designing small UIs by Large Finger -Images and Videos in Responsive Web Design .

UNIT IV

WEB PROJECT MANAGEMENT

9

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development, Communication, Documentation - QA and testing -Deployment - Support and operations

UNIT V

PROJECT CASE STUDY

9

Using HTML, CSS, JS or using Open source CMS like Word Press, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project – Host and manage the project live in any public hosting

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 Fundamental concepts of HTML. (Understand)
- CO2 Develop programs using CSS, JS. (Apply)
- CO3 Apply the basic concepts of Responsive web design (Apply)
- CO4 Analyse the basic concepts of web project management. (Analyse)
- CO5 Apply Word Press to design a webpage. (Apply)

Text Books

1. Jennifer Niederst Robbins, “Learning Web Design”, OREILLY 4th Edition,2012.(Unit 1,2)
2. Ricardo Zea, “Mastering Responsive Web Design”, PACKT Publishing, 2015(unit III)
3. Justin Emond, Chris Steins, “Pro Web Project Management”, Apress,2011(Unit IV)
4. Deitel and Deitel and Nieto, –Internet and World Wide Web - How to Program||, Prentice Hall, 5th Edition, 2011.(Unit V)

Reference Books

1. Jon Duckett, “HTML and CSS: Design and Build Websites”, John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, “JavaScript and JQuery: Interactive Front-End Web Development”, John Wiley and Sons, edition 2014
3. Uttam K. Roy “Web Technologies” Oxford University Press, 13th impression, 2017

Web Resources

<http://www.wpbeginner.com/category/wp-tutorials/>

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	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					

21CS7803	MACHINE LEARNING	L	T	P	C
		3	0	0	3
Preamble					
Machine Learning is an AI technique that teaches computers to learn from experience. Machine learning algorithms use computational methods to “learn” information directly from data without relying on a predetermined equation as a model.					
Prerequisites for the course					
<ul style="list-style-type: none"> Nil 					
Objectives					
<ol style="list-style-type: none"> To understand the need for machine learning for various problem solving To study the various supervised, semi-supervised and unsupervised learning algorithms 					

in machine learning

3. To understand the latest trends in machine learning
4. To design appropriate machine learning algorithms for problem solving
5. To Explore the advanced learning rules

UNIT I	INTRODUCTION	9
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.		
UNIT II	NEURAL NETWORKS AND GENETIC ALGORITHMS	9
Neural Network Representation – Problems – Perceptron – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.		
UNIT III	BAYESIAN AND COMPUTATIONAL LEARNING	9
Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.		
UNIT IV	INSTANT BASED LEARNING	9
K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.		
UNIT V	ADVANCED LEARNING	9
Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning		
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:		
CO 1 – Understand the basic concept to differentiate between supervised, unsupervised, semi-supervised machine learning approaches. (Understand)		
CO 2 – Understand the decision tree algorithm and identity and overcome the problem of overfitting. (Understand)		

CO 3 –Apply the back propagation algorithm and genetic algorithms to various problems. (Apply)
 CO 4 – Apply the Bayesian concepts to machine learning. (Apply)
 CO 5 – Analyze and suggest appropriate machine learning approaches for various types of problems (Analyze)

Text Books

1. Tom M. Mitchell, –Machine Learning||, McGraw-Hill Education (India) Private Limited, 2013.

Reference Books

1. Ethem Alpaydin, –Introduction to Machine Learning (Adaptive Computation and Machine Learning) , The MIT Press 2004.
2. Stephen Marsland, –Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Web Resources

1. <https://www.ibm.com/topics/machine-learning>
2. <https://www.javatpoint.com/machine-learning>
3. <https://www.geeksforgeeks.org/machine-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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	3	2		2	1							1	3		
2	3	2		2	1							1	3		
3	3	2		2	1							1	3		
4	3	2	2		1							1	3		
5	3	2	2		1							1	3		

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					

21CS7804	DATA SCIENCE ESSENTIALS	L	T	P	C
		3	0	0	3
Preamble					
Data science is the domain of study that deals with vast volumes of data using modern tools and techniques to find unseen patterns, derive meaningful information, and make business decisions. Data science uses complex machine learning algorithms to build predictive models.					
Prerequisites for the course					
Nil					
Objectives					
<ol style="list-style-type: none"> 1. To Learn fundamentals, data analysis, data management and storage 2. To Learn the key concepts in predictive data analysis 3. To Interpret optimization techniques for data science 4. To apply data science in data visualization techniques 5. To Explore the various tools in Data Science 					
UNIT I	DATA SCIENCE FUNDAMENTALS	9			
Linear algebra for data science: Algebraic view, Geometric view, Statistical Modeling, Data Science process: Prior Knowledge, Data Preparation, Modeling - Data collection and analysis techniques - Data management: Sources of data, multiple data sources, Exploring and fixing data, Data storage and management					
UNIT II	PREDICTIVE DATA ANALYSIS	9			
Predictive Modeling, Linear Regression: Model building and assessment, Multiple linear regression: model building and selection, Logistic regression, performance measures, Classification, Clustering.					
UNIT III	OPTIMIZATION FOR DATA SCIENCE	9			
Multivariate optimization: Introduction, Unconstrained Multivariate optimization, Multivariate optimization with equality constraints, Multivariate optimization with inequality constraints, Gradient descent learning rule,					
UNIT IV	DATA VISUALISATION	9			
Introduction, Types of data visualization, Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings, Visualization techniques					
UNIT V	DATA SCIENCE TOOLS	9			
R Programming, Working with Data in R, data analysis problems using R tool, Data visualization in R, Recent trends in various data collection, application development methods in data science with Jupiter Stack. Open source tools: Tableau, spark. Etc., Case study of Social network using Apache Cassandra.					
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:		
C01 Understand data science fundamentals, data analysis, data management and storage (Understand)		
C02 Apply data analytic tools to data in order to predict outcomes and classify data. (Apply)		
C03 Apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems (Apply)		
C04 Apply the methods and algorithms used to map data to graphical depictions (Apply)		
C05 Analyze the concepts in real-world applications and learn open source tools (Analyze)		
Reference Books		
<ol style="list-style-type: none"> 1. Vijay Kotu, Bala Deshpande, Data Science: Concepts and Practice, Second Edition, Morgan Kaufmann Publishers, 2018 2. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly, 2014 3. Lillian Pierson, Data Science For Dummies, John Wiley & Sons, 2017 4. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O’Reilly Media Inc, 2017. 		
Web Resources		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106106179 2. https://nptel.ac.in/courses/111104146 3. https://nptel.ac.in/courses/106106212 		

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	3	3	3									3		
4	3	3	3	3									3		
5		2	3	2	2				2	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	5	20
APPLY	40	50	5	10	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

21CS7805	CYBER FORENSICS	L	T	P	C
		3	0	0	3
Preamble					
The main aim of cyber forensics is to maintain the thread of evidence and documentation to find out who did the crime digitally. Cyber forensics is a field that follows certain procedures to find the evidence to reach conclusions after proper investigation of matters.					
Prerequisites for the course					
Nil					
Objectives					
<ol style="list-style-type: none"> 1. To Learn Computer Forensics. 2. To become familiar with forensics tools. 3. To analyze and validate forensics data. 4. To understand the concept of Ethical Hacking. 5. To study about Ethical Hacking in web. 					
UNIT I	INTRODUCTION TO COMPUTER FORENSICS	9			
Introduction to Traditional Computer Crime, 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					
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 – Cell Phone and Mobile Devices Forensics

UNIT IV	ETHICAL HACKING	9
Introduction to Ethical Hacking – Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats.		
UNIT V	ETHICAL HACKING IN WEB	9
Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications –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
- CO2 Apply a number of different computer forensic tools to a given scenario
- CO3 Analyze and validate forensics data
- CO4 Analyze the vulnerabilities in a given network infrastructure
- CO5 Implement real-world hacking techniques to test system security

Text Books

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.
2. CEH official Certified 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. <http://www.cyberforensics.in/?AspxAutoDetectCookieSupport=1>
2. <https://www.geeksforgeeks.org/cyber-forensics/>
3. <https://www.javatpoint.com/cyber-security-tutorial>
4. <https://nptel.ac.in/courses/106106248>

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	2								3	3	2
2	3	3	3	3	3								3	3	2
3	3	3	3	3	3								3	3	2
4	3	3	3	3	3								3	3	2
5	3	3	3	3	3	2							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	30	50	5	5	50
ANALYZE	10	20	5	5	20
EVALUATE					
CREATE					

21CS7611	CLOUD COMPUTING LABORATORY	L	T	P	C
		0	0	4	2
Preamble					
This course enables the study and implementation of infrastructure as a service, storage as a service and user management on cloud.					
Prerequisites for the course					
<ul style="list-style-type: none"> 21CS5611 - Computer Networks Laboratory 					
Objectives					
<ul style="list-style-type: none"> To create a virtual environment. 					

List of Experiments:

S.NO	NAME OF THE EXPERIMENTS	CO
1	Create virtual machine with different flavors of linux or windows OS on top of windows10 or11.	C01
2	Develop a procedure to transfer the files from one virtual machine to another virtual machine.	C01
3	Installation of Docker from Dockerhub and creating Containers using Dockers and uploading the containers in cloud.	C01
4	Build a Docker image and publish in cloud.	C02
5	Develop a procedure to create a Secure cloud.	C02
6	Develop a procedure to install storage controller and interact with it.	C03
7	Develop a procedure create a one node cluster.	C03
8	Write a word count program to demonstrate the use of Map andReduce tasks.	C03

List of Projects:

S.No.	List of Projects	Related Experiment	CO
1	Attendance System	1	CO1
2	Bus Ticketing Payment System	2	CO1
3	Book Store on the Cloud	3	CO1
4	Smart Traffic Management System	4	CO2
5	Bug Tracking in Cloud Computing	4	CO2
6	Creating a Personal Cloud	4	CO2
7	Scientific Calculator using Google App Engine	4	CO2

8	Create a database on the cloud for employee details with the attributes of emp_id, emp_name, emp_salary, emp_dob and emp_place	4	CO3
9	Create a google database for student mark sheet details with the attributes of student Register Number, Name, Mark, Total, Percentage, and Pass or Fail Status.	4	CO3

Outcomes:

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

CO1– Install virtualization tools such as Virtualbox, VMware workstation and create virtual machines and work in it.

CO2– Design and deploy a web application in a PaaS environment.

CO3– Manipulate large data sets in a parallel environment.

PO vs CO 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
CO1	1	1	1	1	2	1		1		1	1	1		3	
CO2	1	1	1	1	2	1		1		1	1	1		3	
CO3	1	1	1	1	1	1	1	1	1	1	1	1		3	