



FRANCIS XAVIERTM ENGINEERING COLLEGE AUTONOMOUS INSTITUTION

ACCREDITED BY NBA

ISO 9001:2015 Certified | DST-FIST Supported Institution
Recognized under Section 2(f) & 12(B) of the UGC Act, 1956
Vannarpettai, Tirunelveli - 627003, Tamil Nadu

CURRICULUM

B.E. – Computer Science and Engineering Regulations 2019

VISION

“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

- To produce technocrats in the industry and academia by educating computer concepts and techniques.
- To facilitate the students to trigger more creativity 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.

**B.E.-COMPUTER SCIENCE AND ENGINEERING
(REGULATIONS 2019)
CHOICE BASED CREDIT SYSTEM**

SUMMARY OF CREDIT DISTRIBUTION

S. No	CATEGORY	CREDITS PER SEMESTER									TOTAL CREDIT	CREDITS IN %	Range Of Total Credits	
		I	II	III	IV	V	VI	VII	VIII	IX			Min	Max
1	HSS	3	2					3			8	4.5%	9	11
2	BS	12	4	4	4						24	14.5%	21	21
3	ES	8	11	3							22	13.9%	23	26
4	PC			13	17	10	11	8			59	35.75%	59	59
5	PE					6	6	6	6		24	14.5%	24	27
6	OE					3	3	3	3		12	7.3%	12	15
7	EEC				2		2	1	10		15	9.1%	12	15
TOTAL		23	18	20	23	22	22	21	16		165	100%	-	-

BS - Basic Sciences
 ES - Engineering Sciences
 HSS - Humanities and Social Sciences
 PC - Professional Core
 PE - Professional Elective
 OE - Open Elective
 EEC - Employability Enhancement Course

B.E.- COMPUTER SCIENCE AND ENGINEERING
(REGULATIONS 2019)
CHOICE BASED CREDIT SYSTEM
I – VIII SEMESTERS CURRICULUM AND SYLLABI

FIRST SEMESTER							
Code No.	Course	Category	L	T	P	C	H
19GE1101	English for Professional Communication	HSS	3	0	0	3	3
19GE1201	Matrices and Calculus	BS	3	1	0	4	4
19GE1302	Physics for Information Science	BS	3	0	0	3	3
19GE1402	Chemistry for Information Science	BS	3	0	0	3	3
19CS1501	Python Programming	ES	3	0	0	3	3
19ME1502	Engineering Graphics	ES	1	0	4	3	5
19CS1311	Physics and Chemistry Laboratory	BS	0	0	4	2	4
19CS1511	Python Programming Laboratory	ES	0	0	4	2	4
TOTAL			16	1	12	23	29

SECOND SEMESTER							
Code No.	Course	Category	L	T	P	C	H
19GE2101	Technical Communication	HSS	2	0	0	2	2
19MA2201	Vector Calculus and Transforms	BS	3	1	0	4	4
19EE2503	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	3
19CS2501	C Programming	ES	3	0	0	3	3
19CS2511	Electrical and Electronics Laboratory	ES	0	0	4	2	4
19CS2512	C Programming Laboratory	ES	0	0	4	2	4
19CS2513	Computer Hardware and Software Tools Laboratory(Computer Workshop)	ES	0	0	4	2	4
19GE2M02	Fundamentals of Computational Biology	BS	2	0	0	0	2
TOTAL			13	1	12	18	26

THIRD SEMESTER							
Code No.	Course	Category	L	T	P	C	H
19CS3201	Probability and Queuing Theory	BS	3	1	0	4	4
19CS3501	Digital Systems	ES	2	0	2	3	4
19CS3601	Data Structures	PC	3	0	0	3	3
19CS3602	Software Engineering	PC	3	0	0	3	3
19CS3603	Object Oriented Programming Systems	PC	3	0	0	3	3
19CS3611	Data Structures Laboratory	PC	0	0	4	2	4
19CS3612	Object Oriented Programming Systems Laboratory	PC	0	0	4	2	4
19GE3M01	Communication and Soft Skills	EEC	0	0	2	0	2
TOTAL			14	1	12	20	27

FOURTH SEMESTER							
Code No.	Course	Category	L	T	P	C	H
19CS4201	Discrete Mathematics	BS	3	1	0	4	4
19CS4601	Database Management Systems	PC	3	0	0	3	3
19CS4602	Operating System Concepts	PC	2	0	2	3	4
19CS4603	Design and Analysis of Algorithms	PC	3	0	0	3	3
19CS4604	Computer Architecture	PC	3	0	0	3	3
19CS4605	Microprocessors and Microcontrollers	PC	3	0	0	3	3
19CS4611	Database Management Systems Laboratory	PC	0	0	4	2	4
19CS4901	Interpersonal Skills-Listening and Speaking	EEC	0	0	4	2	4
19GE4M01	Environmental Science and Engineering	HSS	2	0	0	0	2
TOTAL			19	1	10	23	30

FIFTH SEMESTER							
Code No.	Course	Category	L	T	P	C	H
19CS5601	Theory of Computation	PC	3	0	0	3	3
19CS5602	Computer Networks	PC	3	0	0	3	3
19ME5501	Professional Ethics for Engineers	HSS	3	0	0	3	3
	Professional Elective I	PE	3	0	0	3	3
	Professional Elective II	PE	3	0	0	3	3
	Open Elective -I	OE	3	0	0	3	3
19CS5611	System Analysis and Design Laboratory	PC	0	0	4	2	4
19CS5612	Computer Networks Laboratory	PC	0	0	4	2	4
19GE5M01	Life Skills: Aptitude	EEC	0	0	2	0	2
19GE5M03	Intellectual Property Rights	HSS	2	0	0	0	2
TOTAL			20	0	10	22	30

SIXTH SEMESTER							
Code No.	Course	Category	L	T	P	C	H
19CS6601	Compiler Design	PC	3	0	0	3	3
19CS6602	Cryptography and Network Security	PC	3	0	0	3	3
19CS6603	Artificial Intelligence and Machine Learning	PC	3	0	0	3	3
	Professional Elective III	PE	3	0	0	3	3
	Professional Elective Elective IV	PE	3	0	0	3	3
	Open Elective -II	OE	3	0	0	3	3
19CS6611	Mobile Application Development Laboratory	PC	0	0	4	2	4
19CS6911	Mini Project and Internship	EEC	0	0	4	2	4
19GE6M01	Human Rights	HSS	2	0	0	0	2
TOTAL			20	0	8	22	28

SEVENTH SEMESTER

Code No.	Course	Category	L	T	P	C	H
19CS7601	Graphics and Multimedia	PC	3	0	0	3	3
19CS7602	Software Project Management	PC	3	0	0	3	3
	Professional Elective V	PE	3	0	0	3	3
	Professional Elective VI	PE	3	0	0	3	3
	Professional Elective VII	PE	3	0	0	3	3
	Open Elective -III	OE	3	0	0	3	3
19CS7611	Graphics and Multimedia Laboratory	PC	0	0	4	2	4
19CS7911	Technical Seminar	EEC	0	0	2	1	2
TOTAL			18	0	6	21	24

EIGHTH SEMESTER

Code No.	Course	Category	L	T	P	C	H
	Professional Elective VIII		3	0	0	3	3
	Open Elective -IV		3	0	0	3	3
19CS8911	Project Work	EEC	0	0	20	10	20
TOTAL			6	0	20	16	26

- L Lecture
T Tutorial
P Practical
C Credit
H Hours

HUMANITIES AND SOCIAL SCIENCES (HSS)						
Sem	Code No.	Course	L	T	P	C
1	19GE1101	English for Professional Communication	3	0	0	3
2	19GE2101	Technical Communication	2	0	0	2
4	19GE4M01	Environmental Science and Engineering	2	0	0	0
5	19GE5M03	Intellectual Property Rights	2	0	0	0
5	19ME5501	Professional Ethics for Engineers	3	0	0	3
6	19GE6M01	Human Rights	2	0	0	0
TOTAL			14	0	0	8
BASIC SCIENCES (BS)						
Sem	Code No.	Course	L	T	P	C
1	19GE1302	Physics for Information Science	3	0	0	3
1	19GE1402	Chemistry for Information Science	3	0	0	3
1	19GE1201	Matrices and Calculus	3	1	0	4
1	19CS1311	Physics and Chemistry Laboratory	0	0	4	2
2	19MA2201	Vector Calculus and Transforms	3	1	0	4
2	19GE2M02	Fundamentals of Computational Biology	2	0	0	0
3	19CS3201	Probability and Queuing Theory	3	1	0	4
4	19CS4201	Discrete Mathematics	3	1	0	4
TOTAL			20	4	4	24

ENGINEERING SCIENCES (ES)						
Sem	Code No.	Course	L	T	P	C
1	19CS1501	Python Programming	3	0	0	3
1	19CS1511	Python Programming Laboratory	0	0	4	2
1	19ME1502	Engineering Graphics	1	0	4	3
2	19EE2503	Basics of Electrical and Electronics Engineering	3	0	0	3
2	19CS2511	Electrical and Electronics Laboratory	0	0	4	2
2	19CS2501	C Programming	3	0	0	3
2	19CS2512	C Programming Laboratory	0	0	4	2
2	19CS2513	Computer Hardware and Software Tools Laboratory (Computer Workshop)	0	0	4	2
3	19CS3501	Digital Systems	2	0	2	3
TOTAL			12	0	20	22

PROFESSIONAL CORE (PC)						
Sem	Code No.	Course	L	T	P	C
3	19CS3601	Data Structures	3	0	0	3
3	19CS3602	Software Engineering	3	0	0	3
3	19CS3603	Object Oriented Programming Systems	3	0	0	3
3	19CS3612	Object Oriented Programming Systems Laboratory	0	0	4	2
3	19CS3611	Data Structures Laboratory	0	0	4	2
4	19CS4601	Database Management Systems	3	0	0	3
4	19CS4602	Operating System Concepts	2	0	2	3
4	19CS4603	Design and Analysis of Algorithms	3	0	0	3
4	19CS4604	Computer Architecture	3	0	0	3
4	19CS4605	Microprocessors and Microcontrollers	3	0	0	3
4	19CS4611	Database Management Systems Laboratory	0	0	4	2
5	19CS5601	Theory of Computation	3	0	0	3
5	19CS5602	Computer Networks	3	0	0	3
5	19CS5611	System Analysis and Design Laboratory	0	0	4	2
5	19CS5612	Computer Networks Laboratory	0	0	4	2
6	19CS6601	Compiler Design	3	0	0	3
6	19CS6602	Cryptography and Network Security	3	0	0	3
6	19CS6603	Artificial Intelligence and Machine Learning	3	0	0	3
6	19CS6611	Mobile Application Development Laboratory	0	0	4	2
7	19CS7601	Graphics and Multimedia	3	0	0	3
7	19CS7602	Software Project Management	3	0	0	3
7	19CS7611	Graphics and Multimedia Laboratory	0	0	4	2
TOTAL			44	0	30	59

PROFESSIONAL ELECTIVES(PE)					
Code No.	Course	L	T	P	C
PROFESSIONAL ELECTIVES I					
19CS5701	Internet Programming	3	0	0	3
19CS5702	Database Tuning	3	0	0	3
19CS5703	Data Science	3	0	0	3
19CS5704	Object Oriented Analysis and Design	3	0	0	3
19CS5705	System Software	3	0	0	3
PROFESSIONAL ELECTIVES II					
19CS5706	Principles of communications	3	0	0	3
19CS5707	Network Directory Services	3	0	0	3
19CS5708	Design Patterns	3	0	0	3
19CS5709	Real Time Operating Systems	3	0	0	3
19CS5710	Mobile Application Development	3	0	0	3
PROFESSIONAL ELECTIVES III					
19CS6701	High Performance Networks	3	0	0	3
19CS6702	Digital Signal Processing	3	0	0	3
19CS6703	Distributed and Parallel Systems	3	0	0	3
19CS6704	Mobile Computing and Communications	3	0	0	3
19CS6705	Software Testing	3	0	0	3
PROFESSIONAL ELECTIVES IV					
19CS6706	Enterprise Application Development	3	0	0	3
19CS6707	Computational Intelligence and Optimization Techniques	3	0	0	3
19CS6708	Cyber Security	3	0	0	3
19CS6709	Introduction to IoT and its applications	3	0	0	3
19CS6710	Agile Software Development	3	0	0	3

Code No.	Course	L	T	P	C
PROFESSIONAL ELECTIVES V					
19CS7701	Data Mining	3	0	0	3
19CS7702	Digital Image Processing	3	0	0	3
19CS7703	Information Retrieval System	3	0	0	3
19CS7704	Cloud Computing	3	0	0	3
19CS7705	5G Communications	3	0	0	3
PROFESSIONAL ELECTIVES VI					
19CS7707	Real Time Embedded Systems	3	0	0	3
19CS7708	Deep Learning Essentials	3	0	0	3
19CS7709	Resource Optimization Techniques	3	0	0	3
19CS7710	Cyber Forensics and its Tools	3	0	0	3
19CS7711	Data Analytics using R	3	0	0	3
PROFESSIONAL ELECTIVES VII					
19CS7712	Block Chain Technologies	3	0	0	3
19CS7713	Virtual Reality	3	0	0	3
19CS7714	Full Stack Application Development	3	0	0	3
19CS7715	Adhoc and Sensor Networks	3	0	0	3
19CS7716	Information Security	3	0	0	3
PROFESSIONAL ELECTIVES VIII					
19CS8707	Multimedia Compression Techniques	3	0	0	3
19CS8708	Multi-core Architectures and Programming	3	0	0	3
19CS8709	Business Intelligence	3	0	0	3
19CS8710	Total Quality Management	3	0	0	3
19CS8711	Bio Informatics Algorithms	3	0	0	3

OPEN ELECTIVE I					
19CS5801	Database Concepts	3	0	0	3
19CS5802	Principles of Software Engineering	3	0	0	3
19CS5803	Introduction to data structures	3	0	0	3
19CS5804	Principles of Operating Systems	3	0	0	3
OPEN ELECTIVE II					
19CS6801	Java Programming	3	0	0	3
19CS6802	Internet Technologies	3	0	0	3
19CS6803	Principles of Multimedia	3	0	0	3
19CS6804	Digital Computer Organization	3	0	0	3
OPEN ELECTIVE III					
19CS7801	Cloud Computing Technologies	3	0	0	3
19CS7802	Problem Solving Technologies	3	0	0	3
19CS7803	Android Application Development	3	0	0	3
19CS7804	Human Computer Interaction	3	0	0	3
OPEN ELECTIVE IV					
19CS8801	Network Engineering and Management	3	0	0	3
19CS8802	Big data Analytics	3	0	0	3
19CS8803	Data Science Essentials	3	0	0	3
19CS8804	Essential of Management	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)						
Sem	Code No.	Course	L	T	P	C
3	19GE3M01	Communication and Soft Skills	0	0	2	0
4	19CS4901	Interpersonal Skills-Listening and Speaking	0	0	4	2
5	19CS5M01	Life Skills: Aptitude	0	0	2	0
6	19CS6911	Mini Project and Internship	0	0	4	2
6	19CS6M01	Life Skills: Competitive Exams	0	0	2	0
7	19CS7911	Technical Seminar	0	0	2	1
8	19CS8911	Project Work	0	0	20	10
TOTAL			0	0	36	15

MANDATORY COURSES						
Sem	Code No.	Course	L	T	P	C
3	19GE3M01	Communication and Soft Skills	0	0	2	0
4	19GE4M01	Environmental Science and Engineering	2	0	0	0
5	19GE5M01	Life Skills: Aptitude	0	0	2	0
5	19GE5M03	Intellectual Property Rights	2	0	0	0
6	19GE6M01	Human Rights	2	0	0	0
TOTAL			8	0	4	0

19GE1101 ENGLISH FOR PROFESSIONAL COMMUNICATION

**L T P C
3 0 0 3**

Course Objectives

1. To widen the basic reading and writing skills of the first year Engineering and Technology students.
2. To develop listening skills and enhance the ability of comprehending.
3. To hone speaking skills and speak confidently in real life situations.
4. To master vocabulary both General and Technical.
5. To draft letters and write abstracts.

PRE-REQUISITE:

- Basic knowledge in English Language.

UNIT I SHARING INFORMATION 9

Reading- short comprehension passages – day-to-day conversation; Writing- reframing sentences from the jumbled words – creating coherence; Listening- listening to TED talks, texts, short formal and informal conversations; Speaking- introducing oneself to the audience giving importance to characteristics, strengths and weaknesses; Language development-Framing Yes/No questions, Question tag, Vocabulary development - formation of words-verb – Noun – Adjectives, standard abbreviations.

UNIT II READING AND WRITING I 9

Reading – extensive reading - short narratives and news items from newspapers; Writing – sentence structure - short passages on the working principle of any gadget, describing an electronic/ mechanical gadget, importance of punctuation, organizing paragraphs; Listening- listening to telephonic conversations and lectures by native speakers; Speaking- introducing a device to the audience – specifications, descriptions, merits and demerits. Language development – framing ‘Wh’ Questions, writing a complete sentence using the fragments given; Vocabulary development- prefix and suffix.

UNIT III READING AND WRITING II 9

Reading- comprehensive reading – technical passages; Writing - rearranging jumbled sentences, writing short essays; Listening – listening to short English episodes and filling in the blanks – cloze test; Speaking- asking for opinions using do/does; Language development– Direct Speech

and Indirect Speech – Framing Indirect Questions ; Vocabulary development– select Single Word Substitute, Prepositions, Articles.

UNIT IV DEVELOPING LETTER WRITING SKILLS 9

Reading- comprehending Articles from Magazines, understanding the writing style ; Writing- letter writing – Job Application – Resume; Listening- listening to dialogues or conversations and completing exercises based on them; Speaking - Language development- Tenses- simple present - simple past- present continuous and past continuous- Vocabulary development-Synonyms, Antonyms, Phrasal Verbs.

UNIT V EXTENDED WRITING 9

Reading- comprehending Articles from Journals ; Writing- writing Abstracts – developing an outline - identifying main and subordinate ideas - dialogue writing – enquiring about a product ; Listening – listening to Technical Talks – Note Making ; Speaking – participating in conversations- short Group Discussions – phrases used during discussions ; Language development - modal verbs – present / past perfect tense ; Vocabulary development – Fixed and Semi-Fixed Expressions.

Total: 45 Periods

Text Books:

1. Butterfield, Jeff. Soft Skills for Every one. Cengage Learning: New Delhi, 2017.
2. Richards C. Jack and David Bohleke. Speak Now 3. Oxford Press 2012 .

References:

1. Bailey, Stephen. Academic Writing: A Practical guide for Students. New York: Rutledge, 2011.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.

WEB RESOURCE(S):

1. Learn Engineering
https://www.youtube.com/user/LearnEngineeringTeam/videos?view=0&sort=p&shelf_id=14
2. English Speaking Practice
<https://play.google.com/store/apps/details?id=com.talkenglish.practice>
BBC Learning English <http://www.bbc.co.uk/learningenglish/>

Course Outcomes

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

- CO101.1 Listen and comprehend lectures and talks in their area of specialization successfully.
- CO101.2 Read technical texts and write area- specific texts effortlessly.
- CO101.3 Speak appropriately and effectively in varied formal and informal contexts.
- CO101.4 Write winning job applications and good abstracts.
- CO101.5 Write abstracts and technical articles.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3			3		3	3	3	3	3		
2	2			2		2	2	2	2	2		
3	2			2		2	2	2	2	2		
4	3			3		3	3	3	3	3		
5	2			2		2	2	2	2	2		

1→Low 2→Medium 3→High

19GE1201

MATRICES AND CALCULUS

**L T P C
3 1 0 4**

Course Objectives

1. To apply advanced matrix knowledge to Engineering problems.
2. To equip themselves familiar with the functions of several variables.
3. To familiarize with the applications of differential equations.
4. To improve their ability in solving geometrical applications of differential calculus problems.
5. To have knowledge in simple integrals.

PRE-REQUISITE:

- Basic knowledge about matrices.
- Differentiation and Integration

UNIT I

MATRICES

9+3

Characteristic equation – Eigen values and Eigen vectors of a symmetric and non symmetric matrices – Properties of Eigen values of a real matrix - Cayley _ Hamilton theorem and applications of Cayley Hamilton theorem .

UNIT II

FUNCTIONS OF SEVERAL VARIABLES

9+3

Function of two variables – Partial derivatives– Taylor’s expansion of two variables –Maxima and Minima without constraints –Jacobians and its properties – Euler’s theorem for homogeneous

function.

UNIT III ORDINARY DIFFERENTIAL EQUATIONS 9+3

Linear equations of second order and higher order with constant and variable coefficients – Homogeneous equation of Euler type – Legendre’s equations – Methods of Variationparameter

UNIT IV GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS 9+3

Curvature – Radius of Curvature for Cartesian and polar coordinates – Centre of Curvature Cartesian coordinates – Circle of curvature – Involutives and Evolutives.

UNIT V INTEGRAL CALCULUS 9+3

Methods of integration – Substitution rule – Integration by parts – bernoulli formula for integration – Definite integrals and its properties-Solving problems using Reduction formula.

Total: 45 +15 Periods

Text Books:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

References:

1. Kreyszig.E, “Advanced Engineering Mathematics”, John Wiley & Sons. Singapore, 10th edition, 2012
2. K.Ganesan, Sundarammal Kesavan, K.S.Ganapathy Subramanian & V.Srinivasan, “Calculus and Solid Geometry”, Revised Edition, 2013
3. Veerajan. T, Engineering Mathematics I, Tata McGraw Hill Publishing Co, New Delhi, 5thedition, 2006.
4. Kandasamy P etal. Engineering Mathematics, Vol.I (4th revised edition), S.Chand &Co.,New Delhi, 2000.
5. Venkataraman M.K., Engineering Mathematics – First Year (2nd edition), NationalPublishing Co., Chennai, 2000

Web Resources :

1. <https://www.youtube.com/watch?v=SJOTfb1FTfs>
2. <https://www.youtube.com/watch?v=7Yut-slWh68>

Course Outcomes

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

- CO102.1 Make them to understand the fundamental knowledge of eigen values and eigen vectors.
- CO102.2 Make them to apply differentiation to solve maxima and minima problems.
- CO102.3 Make them to apply various techniques in solving differential equations.
- CO102.4 Make them to apply geometrical application in evolutives and involutes.
- CO102.5 Make them to evaluate integrals using techniques of integration, such as substitution,

partial fractions and integration by parts.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	1		2						2			
2	2								2			3
3		2										
4	1		2						1			2
5		2	1									

1→Low 2→Medium 3→High

19GE1302

PHYSICS FOR INFORMATION SCIENCE

L T P C

3 0 0 3

Course Objectives

- Understand the conduction mechanism of conducting materials.
- To enhance the fundamental knowledge in semiconducting materials
- Become proficient in magnetic properties.
- To familiarize the basic concept of Laser and its application.
- Understand the basic knowledge of fiber optics.

Pre-Requisite

- Basic knowledge about different kinds of materials, laser and fiber optics.

UNIT I CONDUCTING MATERIALS

9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures – Quantum free electron theory: Postulates, merits and demerits– Fermi- Dirac statistics – Density of energy states- Average energy.

UNIT II SEMICONDUCTING MATERIALS

9

Intrinsic Semiconductors – Energy band diagram – elemental and compound semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors — Hall effect and devices.

UNIT III MAGNETIC PROPERTIES OF MATERIALS

9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: Domain Theory- M versus H behavior –

Hard and soft magnetic materials – examples and uses-- Magnetic principle in computer data storage – GMR sensor.

UNIT IV LASER 9

Energy levels - Principle of laser - Characteristics of laser radiation - Population inversion - Optical pumping - Pumping mechanisms - Types of laser - CO₂ laser – Semiconductor Laser : Homo junction and Hetero junction laser - Applications of laser: optical data storage and retrieval techniques in CD-ROM - Holography: principle -Types - Comparison of holography with photography - Construction and reconstruction of hologram.

UNIT V FIBER OPTICS 9

Principle of fiber optics - conditions to achieve total internal reflection - Structure of an optical fiber -expressions for Acceptance angle and Numerical aperture - Types of optical fiber based on material, propagation modes and refractive index profile: single mode and multi mode optical fiber, step index and graded index optical fiber - fiber optic communication system - merits of fiber optic communication system over conventional communication systems.

Total: 45 Periods

Text Books:

1. Jasprit Singh, —Semiconductor Devices: Basic Principles, Wiley 2012.
2. Kasap, S.O. —Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
3. Dr. P. Mani, Dhanam Publication “Engineering Physics
4. Pandey, B.K. & Chaturvedi, S. “Engineering Physics”. Cengage Learning India, 2012.

References:

1. Garcia, N. Damask, A. —Physics for Computer Science Students. Springer-Verlag, 2012.
2. Halliday, D., Resnick, R. & Walker, J. “Principles of Physics”. Wiley, 2015.
3. Murugavel, S. Senthilkumar, G. – Materials Science, VRB Publishers Pvt. Ltd, Newedition, 2017
4. Palanisamy P K, Physics for electronics and information science. Dipti Press Pvt. Ltd. 2018.

Web Resources:

1. <https://www.britannica.com/science/Fermi-Dirac-statistics> (Unit I)

2. <http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1>(Unit II)
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934330/>(Unit III)
4. www.physics-and-radio-electronics.com/physics/laser/principles_of_working_of_laser.html(Unit IV)
5. <https://computer.howstuffworks.com/fiber-optic.htm>(Unit V)

Course Outcomes

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

CO103.1 Understand the concept in classical and quantum electron theories

CO103.2 Understand the concept based on semiconducting materials and its applications in various devices

CO103.3 Analyze the magnetic properties of materials and their applications in data storage

CO103.4 Applying the concepts of Laser in its application.

CO103.5 Understand the fiber optic communication system.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3		2								2
2	3	3		2								2
3	3	3		2								2
4	3	1		2								2
5	3	1		2								2

1→Low 2→Medium 3→High

19GE1402

CHEMISTRY FOR INFORMATION SCIENCE

**L T P C
3 0 0 3**

Course Objectives

- To make the students conversant with the principles of electrochemistry.
- To understand the properties and applications of storage materials.
- To make the students conversant with the principles and generation of energy in batteries.
- To acquaint the students with the basics of nano materials, their properties and applications.
- To know about the impact and recycling of e-waste.

Pre-Requisite:

- Basic theoretical concepts of Chemistry in higher secondary level.

UNIT I ELECTROCHEMISTRY 9

Electrochemical cell - redox reaction - cell potential - determination of potential. Electrode potential- origin of electrode potential- oxidation potential- reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems).

UNIT II MATERIALS FOR DATA STORAGE AND SMART SCREEN 9

Classification - magnetic storage [Iron oxide, cobalt alloy, chromium oxide and barium ferrite] - optical storage [photochromic materials] - solid storage. Conductive components: Indium tin oxide [properties and applications] - touch screen [resistive and capacitive]. Chemical components in glass - alumino silicate - gorilla glass.

UNIT III STORAGE DEVICES FOR COMPUTERS 9

Batteries - types: Primary battery [Zinc-carbon]. Secondary battery: lead acid. Modern battery: lithium polymer battery and fuel cells (H₂ - O₂ fuel cell). Super Capacitors.

UNIT IV NANO MATERIALS 9

Introduction to Nanotechnology - Characterisation and Properties of Nanomaterials - Nano chips- types of material - properties - applications. Carbon nanotubes –fullerene, graphene : Types and applications.

UNIT V E-WASTE MANAGEMENT 9

Sources - toxicity due to hazardous substances - impact to environment. E-waste management- Hazardous materials recycling (Gallium, Arsenic, etc.,).

Total: 45 periods

Text Books:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015

References:

1. Smart Materials Taxonomy, Victor Goldade, Serge Shilko, Aleksander Neverov, CRC publication, 2015
2. <https://www.dmccoltd.com/english/museum/touchscreens/technologies/projected.asp>

3. Recent Advances of Flexible Data Storage Devices Based on Organic Nanoscaled Materials- Li Zhou, Jingyu Mao, Yi Ren, Su-Ting Han, V A. L. Roy and Ye Zhou, Small 2018, 1703126
4. S. Vairam, Engineering Chemistry, II nd Edition, John Wiley & sons, New Delhi 2014.

Web Resources:

1. <https://nptel.ac.in/courses/104106105/>
2. <https://nptel.ac.in/courses/118102003/>

Course Outcomes

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

CO104.1 Understand the principles of electrochemistry.

CO104.2 Gain knowledge about the properties and applications of storage materials.

CO104.3 Understand the recent trends in electrochemical energy storage devices.

CO104.4 Understand the basics of nano materials, their properties and applications.

CO104.5 Identify the impact and recycling of e-waste.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	2						1			2	2
2	2										1	1
3	2	2									1	1
4	2	2									1	2
5	2	2					1	2			2	1

1→Low 2→Medium 3→High

19CS1501

PYTHON PROGRAMMING

**L T P C
3 0 0 3**

Course Objectives

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python

Pre-Requisite :

- Basic Problem solving ideas, Analytical and Logical thinking

UNIT I ALGORITHMIC PROBLEM SOLVING

9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS

9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS

9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES

9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES

9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

Total: 45 Periods

Text Books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist``, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

1. John V Guttag, —Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3, Second edition, Pragmatic Programmers, LLC, 2013.

Web Resources:

1. <https://www.python.org/about/gettingstarted/>
2. https://www.tutorialspoint.com/python/python_functions.htm
3. <https://nptel.ac.in/courses/106/106/106106182/>

Course Outcomes

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

- CO105.1 Develop algorithmic solutions to simple computational problems
- CO105.2 Read, write, execute by hand simple Python programs.
- CO105.3 Structure simple Python programs for solving problems.
- CO105.4 Decompose a Python program into functions.
- CO105.5 Represent compound data using Python lists, tuples, dictionaries.
- CO105.6 Read and write data from/to files in Python Programs.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3										1
2			3									
3			3									
4	3										1	
5	3		2									
6	3		2									

1→Low 2→Medium 3→High

19ME1502

ENGINEERING GRAPHICS

L T P C

1 0 4 3

Course Objectives

- To develop graphic skills in students.

Pre-Requisite :

Basic Knowledge on Geometry and conics

UNIT I PLANE CURVES 9

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves

UNIT II PROJECTION OF POINTS AND LINES 9

Principles of projection, projection of points in four quadrants – Projection of straight lines located in the first quadrant – inclined to both planes – Determination of true lengths and true inclinations by rotating line method and traces

UNIT III PROJECTION OF SOLIDS

9

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to one reference plane

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position by cutting planes inclined to HP and perpendicular to VP – Obtaining true shape of section
Development of lateral surfaces of simple and sectioned solids – Prisms, Pyramids, Cylinder and Cone

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 9

Principles of isometric projection – isometric scale – isometric projections of truncated Prisms, Pyramids, Cylinder and Cone. Perspective projection of simple prism, pyramid and cylinder by

Visual ray method.

Total: 45 Periods

Text Books:

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

References:

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

Publication of Bureau of Indian Standards:

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

Special points applicable to end semester examination on Engineering Graphics:

1. There will be five questions in the end semester examination
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size
4. The end semester examination will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time

Course Outcomes

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

CO106.1 Construct plane curves

CO106.2 Draw the projections of points and lines

CO106.3 Draw the projections of simple solids

CO106.4 Draw the sectional views of solids and the applications of development of surfaces

CO106.5 Construct isometric and perspective projections

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3								2			3
2	3								2			3
3	3								2			3
4	3								2			3
5	3								2			3

1→Low 2→Medium 3→High

19CS1311

PHYSICS AND CHEMISTRY LABORATORY

L T P C

0 0 4 2

Course Objectives

- To introduce different experiments to test basic understanding of physics concepts applied in Conducting, Semiconducting, Ferromagnetic material, Thermal physics, Ultrasonic, Laser, Optics and Properties of matter.
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.

Pre-Requisite:

- Experiments in Physics and chemistry introduced at the higher secondary levels in schools.

LIST OF EXPERIMENTS FOR PHYSICS LABORATORY (Any FIVE Experiments)

1. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
2. Determination of band gap of a Semiconductor.
3. Determination of hysteresis losses in ferromagnetic material-B-H curve.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
6. Determination of Wavelength, and particle size using Laser
7. Determination of Numerical aperture and acceptance angle in an optical fiber.
8. Non-uniform bending- Determination of Young's modulus of the material.
9. Determination of wavelength of spectral lines using grating – Spectrometer.
10. Determination of rigidity modulus – Torsion pendulum.

References:

1. Physics Laboratory Manual, Department of Physics, Francis Xavier Engineering College, Tirunelveli.
2. Physics Laboratory Manual, Dr. G Senthilkumar VRB Publishers Pvt.Ltd.

LIST OF EXPERIMENTS FOR CHEMISTRY LABORATORY (Any FIVE Experiments)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Estimation of copper content of the given solution by EDTA method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Estimation of iron content of the given solution using potentiometer.
6. Conductometric titration of strong acid vs strong base.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Conductometric precipitation titration (BaCl_2 vs Na_2SO_4).
9. Estimation of sodium and potassium present in water using flame photometer.
10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

Text Books:

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

Total: 60 Periods**Course Outcomes**

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

- CO107.1 The students will gain knowledge on the basics of optics, thermal physics and ultrasonics.
- CO107.2 The students will have adequate knowledge in handling conducting, semiconducting and ferromagnetic materials.
- CO107.3 The students will apply the principles of elasticity for Engineering applications.
- CO107.4 The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
- CO107.5 The students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1							2		2	2
2	3	1							2		2	2
3	3	1							2		2	2
4	3	1							2		2	2
5	3	1							2		2	2

1→Low 2→Medium 3→High

19CS1511**PYTHON PROGRAMMING LABORATORY****L T P C****0 0 4 2****Course Objectives**

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.

Pre-Requisite :

- Python Programming

LIST OF EXPERIMENTS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

Platform Needed

Python 3 interpreter for Windows/Linux

Total: 60 Periods

References:

1. John V Guttag, —Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Course Outcomes

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

- CO108.1 Write, test, and debug simple Python programs.
- CO108.2 Implement Python programs with conditionals and loops.
- CO108.3 Develop Python programs step-wise by defining functions and calling them.
- CO108.4 Use Python lists, tuples, dictionaries for representing compound data.
- CO108.5 Read and write data from/to files in Python.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3									1
2					1						1	1
3						1					1	1
4	3	2	3								1	1
5	3	2	3								1	1

1→Low 2→Medium 3→High

19GE2101

TECHNICAL COMMUNICATION

L T P C

2 0 0 2

Course Objectives

- Widen strategies and skills to augment their ability to read and comprehend engineering and technology texts.
- Foster their capability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skills which will help them comprehend technical lectures and extensive talks in their areas of specialization.
- Cultivate writing skills both technical and general.

PRE-REQUISITE:

- Basic knowledge in English Language.

UNIT I READING AND STUDY SKILLS

6

Listening - listening to longer technical talks ; Speaking – describing in detail the working process of any electronic/electrical machine ; Reading – reading longer technical texts and taking down notes – Note Making strategies ; Writing- interpreting charts, graphs; Vocabulary Development - Select Technical Vocabulary ; Language Development- Active Voice and Passive Voice

UNIT II INTRODUCTION TO TECHNICAL WRITING

6

Listening- listening to talks mostly of a scientific/technical nature and completing information ; Speaking – Technical Presentations ; Reading –Technical related topics ;Writing- purpose statements – extended definitions - writing instructions – checklists -recommendations ; Vocabulary Development - select Technical Vocabulary ; LanguageDevelopment – Subject Verb Agreement, Compound Words.

UNIT III INTERMEDIATE WRITING

6

Listening- Listening to mock Interviews ; Speaking – answering Interview questions ;Reading – longer texts both general and technical, practice in speed reading ; Writing –Minutes of the Meeting – Writing opinion paragraph - Writing paragraphs with reasons ;Language Development - If – Conditionals.

UNIT IV REPORT WRITING I

6

Listening- Listening to documentaries and making notes ; Speaking – making TechnicalPresentations ; Reading – reading for detailed comprehension ; Writing - Fire accidentReport, Industrial Visit Report ; Vocabulary Development- finding suitable synonyms- paraphrasing ; Language Development - Clauses.

UNIT V REPORT WRITING II

6

Listening - listening to Reports ; Speaking – participating in a group discussion ; Reading – reading and understanding technical articles ; Writing – writing Feasibility Reports, SurveyReports ; Vocabulary Development - verbal analogies ; Language Development - advancedUse of Articles, Prepositional Phrases.

Total: 30 Periods

Text Books:

1. Butterfield, Jeff. Soft Skills for Every one. Cengage Learning: New Delhi,2017.
2. Richards C. Jack and David Bohleke. Speak Now 4. Oxford Press 2014.

References:

1. Redston, Chris & Gillies Cunningham Face 2 Face (Pre-intermediate Student's Book & Worknbook) Cambridge University Press, New Delhi:2005.
2. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford:

2007.

4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
5. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.

WEB RESOURCE(S):

1. Learn Engineering
https://www.youtube.com/user/LearnEngineeringTeam/videos?view=0&sort=p&shelf_id=14
2. Engineering Dictionary <https://www.engineering-dictionary.com/>
3. Interpretation of Charts <https://www.youtube.com/watch?v=cTWXaLX2L6Y>
IELTS Listening Practice
https://play.google.com/store/apps/details?id=mimosa.english.ieltpractice.listening&hl=en_IN

Course Outcomes

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

- CO201.1 Read advanced technical texts and write area- specific texts effortlessly.
- CO201.1 Listen and comprehend extensive technical lectures and talks in their area of specialization successfully.
- CO201.1 Successfully answer questions during Interviews.
- CO201.1 Write good reports.
- CO201.1 Communicate effectively - adapting to purpose, structure, audience, and medium.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1				2			3		1	2	2	3
2				2			2		3	3	2	2
3				1			1		3	3	2	2
4				3			2		2	2	3	2
5				2			2		3	3	2	2

1→Low 2→Medium 3→High

19MA2201

VECTOR CALCULUS AND TRANSFORMS

L T P C

3 1 0 4

Course Objectives

- To have knowledge in multiple integrals
- To improve their ability in Vector calculus
- To improve the knowledge of Laplace transforms
- To expose to the concept of Analytical function
- To familiarize with Complex integration.

PRE REQUEST

- Basic knowledge about Vectors,
- Continuous function and complex fields.

UNIT I MULTIPLE INTEGRALS 9+3

Double integration in Cartesian and polar coordinates– Area as a double integral in Cartesian and polar coordinates – Triple integration in Cartesian coordinates– Volume as a Triple Integral

UNIT II VECTOR CALCULUS 9+3

Gradient, divergence, Directional derivatives, curl –Angle between surfaces - Solenoidal and irrotational fields – Scalar potential – Vector identities (without proof)–Green’s theorem – Gauss divergence theorem and Stoke’s theorems (without proof).

UNIT III LAPLACE TRANSFORMS 9+3

Transforms of simple functions – Basic operational properties — Inverse transforms – Using Partial fraction – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

UNIT IV ANALYTIC FUNCTIONS 9+3

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate and its properties – Milne-Thomson’s method conformal mapping $w = c + z$, $w = 1 / z$ and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+3

Cauchy’s integral theorem (without proof) – Cauchy’s integral formulae and its applications
Cauchy’s integral formulae for derivatives and its applications – Singularities – Poles and Residues – Cauchy’s residue theorem.

Total: 45+15 Periods

Text Books:

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 42nd Edition, 2012.

References:

1. Kreyszig.E, “Advanced Engineering Mathematics”, John Wiley & Sons. Singapore, 10th edition, 2012.

2. K.Ganesan, Sundarammal Kesavan, K.S.Ganapathy Subramanian & V.Srinivasan, “Advanced Calculus and Complex Analysis”, Revised Edition, 2013.
3. Veerarajan, T., Engineering Mathematics I, Tata McGraw Hill Publishing Co., New Delhi, 5th edition,.
4. Kandasamy Petal. Engineering Mathematics, Vol.I (4th revised edition), S.Chand&Co., New Delhi,2000
5. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., Advanced Mathematics for Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.

Web Resources:

1. <https://nptel.ac.in/courses/111107108/>
2. <https://nptel.ac.in/courses/111103070/>

Course Outcomes

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

CO202.1 Make them to apply integration to compute multiple integrals,area and volume.

CO202.2 Make them to understand the basic concepts of gradient,divergences, curl of a vector point function.

CO202.3 Make them to analyze Laplace transforms and Inverse Laplace transforms of simple functions.

CO202.4 Make them to understand and apply the concept of analytic functions, bilinear transformations.

CO202.5 Make them to understand the concepts of Cauchy’s theorem, Cauchys integral formula.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2								1			3
2	1	2										
3	2								2			
4		3							2			2
5	2	1										

1→Low 2→Medium 3→High

Electronics and Computer Engineering”, 2nd ed., Tata McGraw Hill, 2012.

2. R.S Sedha, “Applied Electronics”, S. Chand &Co., 2008..

References:

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 Resource(s):

1. <https://nptel.ac.in/courses/108108076/>
2. <https://nptel.ac.in/courses/108105053/>
3. <https://nptel.ac.in/courses/117103063/>

Course Outcomes

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

CO203.1 Apply the fundamental laws to electric circuits and measure the electrical quantities

CO203.2 Understand the electrical machines working principles

CO203.3 Applications of electrical machines

CO203.4 Knowledge on digital electronics

CO203.5 Applications of communication engineering.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	1	2	1								
2	2	1	2									2
3	2	1	2									
4	2	1	2	1								
5	2	1	2									2

1→Low 2→Medium 3→High

19CS2501

C PROGRAMMING

L T P C

3 0 0 3

Course Objectives

- To learn the basic constructs of C Programming.
- To learn arrays and strings concepts of C Programming.
- To learn functions and pointers 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.

Pre-Requisite :

- Basic Problem solving ideas, Analytical and Logical thinking

UNIT I BASICS OF C PROGRAMMING 9

Structure of a 'C' program, compilation and linking processes - C Tokens: Constants, Variables – Data Types: Primitive Data Types, Type Definition, Enumeration, Qualifiers, Storage classes – Operators and Expressions - Managing Input and Output operations – Decision Making: Branching statements, Looping statements-Problem Solving with Basic statements

UNIT II ARRAYS AND STRINGS 9

Arrays: Declaration, Initialization, One dimensional, Two dimensional, and Multidimensional arrays - String: String operations – Manipulating String Arrays –Problem Solving with Arrays and Strings

UNIT III FUNCTIONS AND POINTERS 9

Function : Declaration, Definition, Parameter passing methods, Recursion – Pointers: Declaration, Definition, Pointers and Functions, Pointer arithmetic, Pointer to an Array, Array of Pointers, Pointer to Pointer, Pointer to Void (generic pointer), Pointer to function - Dynamic Memory Allocation - Problem Solving with Functions and Pointers

UNIT IV STRUCTURE AND UNION 9

Structure and union - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Self referential structures – Dynamic memory allocation - Singly linked list - typedef

UNIT V FILE PROCESSING 9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments

Total: 45 Periods

Text books:

1. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
Kernighan,B.Wand Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006

References:

1. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007
3. Deitel.P.J and Deitel.H.M, “C How to Program”, Fifth Edition,Prentice-Hall of India,2008
4. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

Web Resources:

1. <https://www.programiz.com/c-programming>
2. <https://nptel.ac.in/courses/106105171/>
3. <https://www.digimat.in/nptel/courses/video/106105171/L01.html>

Course Outcomes

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

CO204.1 Develop simple applications in C using basic constructs

CO204.2 Develop and implement applications using arrays and strings.

CO204.3 Develop and implement applications in C using functions and pointers and use pointers for storing data in the main memory efficiently.

CO204.4 Develop applications in C using structures and union.

CO204.5 Design applications using sequential and random access file processing

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3						1			1
2	3	3	3						1			1
3	3	3	3						1			1
4	3	3	3						1			1
5	3	3	3						1			1

1→Low 2→Medium 3→High

19CS2511

ELECTRICAL AND ELECTRONICS LABORATORY

L T P C

0 0 4 2

Course Objective

- To train the students in performing various tests on electrical drives, sensors and circuits.

LAB EXPERIMENTS:

1. Verification of Circuit Laws
2. Verification of Circuit Theorems
3. Diode based application circuits
4. Transistor based application circuits
5. Load test on DC shunt motor.
6. Load test on Single phase Transformer
7. Load test on single phase Induction motor
8. Characteristics of LVDT
9. RTD and Thermistor
10. Study of CRO and measurement of AC signals

Total: 60 Periods

Course Outcomes

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

- CO205.1 Ability to understand the concept of electrical circuits law and theorems
- CO205.2 Ability to design simple circuits involving diodes and transistors

CO205.3 Ability to understand the predetermined characteristics of electrical machines
 CO205.4 Ability to understand the basic concepts of instruments and their performance

CO206.5 Ability to understand the basic concepts of CRO

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2				1	3	1		2			2
2	2	2			1	3	1					3
3	2				1	3	1					3
4	2		2		1	3	1		2			2
5	2		2		1	3	1		2		1	2

1→Low 2→Medium 3→High

19CS2512

C PROGRAMMING LABORATORY

**L T P C
0 0 4 2**

Course Objectives

- To develop C programs using conditional and looping statements
- To expertise in arrays and strings
- To build modular programs
- To explicitly manage memory using pointers
- To group different kinds of information related to a single entity

Pre-Requisite :

- C Programming structures and syntax

LIST OF EXPERIMENTS

1. Programs using simple statements
2. Programs using decision making statements
3. Programs using looping statements
4. Programs using one dimensional and two dimensional arrays
5. Programs using user defined functions and recursive functions
6. Programs using functions and pointers
7. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)

8. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
9. Check whether a given number is Armstrong number or not?
10. From a given paragraph perform the following using built-in functions:
 - a. Find the total number of words.
 - b. Capitalize the first word of each sentence.
 - c. Replace a given word with another word.
11. Sort the list of numbers using pass by reference.
12. Generate salary slip of employees using structures and pointers.
13. Compute internal marks of students for five different subjects using structures and unions.

Total: 60 Periods

References:

1. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
2. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
3. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
4. Deitel.P.J and Deitel.H.M, “C How to Program”, Fifth Edition, Prentice-Hall of India,2008
5. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

Course Outcomes

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

- CO206.1 Implement program using control statements
- CO206.2 Handle arrays and strings
- CO206.3 Develop reusable modules
- CO206.4 Store data in main memory effectively using pointers
- CO206.5 Form heterogeneous data using structures

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3		1	2			1			1
2	3	3	3						1			1
3	3	3	3						1			1
4	3	3	3						1			1
5	3		3						1			1

1→Low 2→Medium 3→High

**19CS2513 COMPUTER HARDWARE AND SOFTWARE TOOLS
LABORATORY (COMPUTER WORKSHOP)**

**L T P C
0 0 4 2**

Course Objectives

- Understand the basic hardware components
- Gain knowledge about installation of operating systems
- Understand hardware assembling and troubleshooting
- Learn about MS Office tools.
- Understand computer networking.

Pre-Requisite :

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

LIST OF EXPERIMENTS:

EXPERIMENT 1

- a) Study of desktop computer, motherboard and its interfacing components.
- b) Install and configure computer drivers and system components.

EXPERIMENT 2

- a) Disk formatting, partitioning and Disk operating system commands

EXPERIMENT 3

- a) Install, upgrade and configure Windows/Linux operating systems.
- b) Installation of Dual OS using Virtual Machine

EXPERIMENT 4

- a) Installation Antivirus and configure the antivirus.
- b) Installation of printer and scanner software.

EXPERIMENT 5

- a) Assembly and Disassembly of hardware.

b) Troubleshooting and Managing Systems

EXPERIMENT 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

EXPERIMENT 7

- a) Remote desktop connections and file sharing.

EXPERIMENT 8

- a) Study of basic network commands. Establish network connections, Configure IP address and Domain name system.

EXPERIMENT 9

- a) Install two different kinds of network cards and connect two computers to campus LAN and download a file from a computer on the LAN

EXPERIMENT 10

- 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

EXPERIMENT 11

- a) Create a report in Excel containing the pay details of the Employee

EXPERIMENT 12

- a) Create a simple bar chart to highlight the sales of a company for 5 different periods

EXPERIMENT 13

- a) Create a macro which creates a line chart using the data in the worksheet

EXPERIMENT 14

- a) Make a presentation and apply the following:
 - a. Add audio and video effects
 - b. Apply various Color Schemes

c. Apply various animation schemes.

EXPERIMENT 15

a) Create a simple Database / Tables using MS-Access

b) Mail Merge with MS – Access

Total: 60 Periods

Course Outcomes

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

CO207.1 Identify the basic hardware components

CO207.2 Install and configure Windows and Linux operating systems

CO207.3 Install and configure software packages and drivers

CO207.4 Assemble and troubleshoot hardware devices

CO207.5 Install and work with office automation software

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3										2
2	3	3										2
3	3	3										2
4	3	3										2
5	3	3									2	2

1→Low 2→Medium 3→High

**19GE2M02 FUNDAMENTALS OF COMPUTATIONAL BIOLOGY L T P C
2 0 0 0**

Course Objectives

- To introduce students to modern biology with an emphasis on evolution of biology as a multi- disciplinary field.
- To make them aware of application of engineering principles in biology, and engineering solutions inspired by biological examples.
- Know the principle of biosensor, classifications and the characteristics of different sensors and Study its biomedical applications.
- Understand the applications biology for computational applications in IT

Pre-Requisite :

- Basic Knowledge about biology.

UNIT I PHYSIOLOGY OF CELLS **6**

Introduction to Biology – The Cell: Structure – Expression of genetic information – Cell Metabolism– Cellular differentiation – What is Computational Biology?

UNIT II MOLECULAR BIOLOGY **6**

Introduction to Molecules - chemical bonds – DNA – Structure – RNA – Protein Synthesis – Transcription – Translation – Stem cells – applications – DNA Computing.

UNIT III NERVOUS SYSTEM, IMMUNE SYSTEM & CELL SIGNALLING **8**

Basics of nervous system and neural networks – cellular basis of immunity – functional properties of antibodies – T cell receptors – principles of cell signalling - Neuro morphic computing – BrainComputer Interface.

UNIT IV BIO SENSORS **5**

Biosensors – Fundamentals – Components - Types – Designs – Applications.

UNIT V APPLICATIONS OF COMPUTATIONAL BIOLOGY **5**

Bio Computers - Bio Informatics - Synthetic biology – Molecular programming – Tele Medicine– Computational biology towards Data Science.

Total: 30 Periods

Text Books:

1. ThyagaRajan.S., Selvamurugan. N., Rajesh.M.P., Nazeer.R.A., Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K., “Biology for Engineers”, Tata McGraw-Hill, New Delhi, 2012.

References:

1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, “Biochemistry”, W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, “Molecular Biology”, MCGraw-Hill, 5th Edition, 2012. 4. Jon Cooper, “Biosensors A Practical Approach”, Bellwether Books, 2004.
3. Martin Alexander, “Biodegradation and Bioremediation”, Academic Press, 1994.
4. Kenneth Murphy, “Janeway’s Immunobiology”, Garland Science; 8th edition, 2011.
5. Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, “Principles of Neural Science”, McGraw-Hill, 5th Edition, 2012.

Web Resources:

1. <http://nanohub.org/resources/2261/download>

Course Outcomes

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

CO208.1 Appreciate the basic organization of organisms and machinery of the cell

CO208.2 Explain concepts such as DNA structure and potential of molecular biology associated with the new technologies.

CO208.3 Acquire knowledge about biological system that requires engineering expertise to solve them.

CO208.4 Describe and critically evaluate a selected application of a biosensor

CO208.5 Appreciate the engineering principles in biology, and engineering solutions for biological systems..

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											1
2				1	1	1						1
3				1	1							1
4				1	1							1
5	3	2	1	1	1							1

1→Low 2→Medium 3→High

19CS3201

PROBABILITY AND QUEUEING THEORY

L T P C
3 1 0 4

Course Objectives

- To apply the concept of random variable and various distribution
- To equip themselves familiar with basic concept of two dimensional random variable
- To familiarize the knowledge concept of random process.
- To know the concept of queuing models.
- To improve their ability advanced queuing models

Pre-Requisite :

- Basic knowledge about measures of central containices and Probability

UNIT I

RANDOM VARIABLES

12

Discrete and Continuous random variables – Moments – Moment generating functions – Binomialdistributions, Poisson distributions, Geometric distributions, Uniform distributions, Exponentialdistributions and Normal distributions

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression for two dimensional random variables – Transformation of random variables

UNIT III RANDOM PROCESSES 12

Classification of random processes – Stationary process – Wide Sense Stationary process – Ergodic process – Correlation Ergodic process - Markov process - Poisson process

UNIT IV QUEUEING THEORY 12

Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms.

UNIT V NON-MARKOVIAN QUEUES AND QUEUEING NETWORKS 12

M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queue – Open Jackson networks

Total: 45+15 Periods

Text Books:

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., —Fundamentals of Queueing Theory, Wiley Student 4th Edition, 2014.
2. Ibe, O.C., —Fundamentals of Applied Probability and Random Processes, Elsevier, 1st Indian Reprint, 2007.

References:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

Web Resources:

1. https://en.wikipedia.org/wiki/Queueing_theory
2. <https://lecturenotes.in/subject/661/probability-and-queueing-theory-pqt>
3. https://www.researchgate.net/publication/264048218_Probability_Statistics_and_Queueing_Theory

4. <https://www.sciencedirect.com/book/9780080571058/probability-statistics-and-queueing-theory>

Course Outcomes

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

- CO301.1 Understand the fundamental knowledge and have knowledge of standard distribution which can describe all life phenomenon
- CO301.2 Understand the basic concept of two dimensional random variable and apply in engineering Application
- CO301.3 Apply the concept of random process in engineering.
- CO301.4 Acquire skill in analyzing queuing models
- CO301.5 Understand and apply advanced queuing models in real life

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2							2			
2			3									3
3	2		2									
4	3	2							1			
5	3		1									1

1→Low 2→Medium 3→High

19CS350

1DIGITAL SYSTEMS

L T P C

2 0 2 3

Course Objectives

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices

Pre-Requisite :

- HSC Mathematics and Physics

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES

6

Number Systems – Arithmetic Operations - Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations..

UNIT II COMBINATIONAL LOGIC 6

Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor –Magnitude Comparator – Decoders – Encoders –Multiplexers.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 6

Sequential Circuits – Storage Elements: Flip-Flops – State Reduction and Assignment –Design Procedure–Registers and Counters.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 6

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and FlowTables – Race-free State Assignment .

UNIT V MEMORY AND PROGRAMMABLE LOGIC 6

RAM — ROM – Programmable Logic Array – Programmable Array Logic – SequentialProgrammable Devices.

Total Theory Hours: 30 Periods

LIST OF EXPERIMENTS:

1. Verification of Boolean Theorems using basic gates.
2. Design and implement Half/Full Adder and Subtractor.
3. Design and implement combinational circuits using MSI devices:
 - a.) Magnitude Comparator
 - b.) Application using multiplexers
4. Design and implement shift-registers.
5. Design and implement synchronous counters.
6. Design and implement asynchronous counters.
7. Coding combinational circuits using HDL.
8. Coding sequential circuits using HDL.
9. Design and implementation of a simple digital system (Mini Project).

Total Lab Hours: 30 Periods

Total Hours: 60 Periods**Text book:**

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.

References:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design, Tata Mc Graw Hill, 2003.

Web Resources :

1. <https://www.oreilly.com/library/view/fundamentals-ofdigital/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

Course Outcomes

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

CO302.1 Use Booleansimplification techniques to design a combinational hardware circuit.

CO302.2 Design and Implement combinational and sequential circuits.

CO302.3 Analyze a given digital circuit –combinational and sequential.

CO302.4 Design the different functional units in a digital computer system.

CO302.5 Design and Implement a simple digital system.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1									1	
2	3	2	1	1		1			1	1	1	
3	3	2	1	1		1	1				1	1
4	3	2	1	1		1		1		1	1	1
5	3	2	1			1					1	1

1→Low 2→Medium 3→High

2. Reema Thareja, —Data Structures Using C++, Second Edition , Oxford University Press, 2011.

References:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, —Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, —Data Structures and Algorithms", Pearson Education,1983.
3. Stephen G. Kochan, —Programming in C++, 3rd edition, Pearson Education.
4. 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>

Course Outcomes

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

- CO303.1 Implement abstract data types for linear data structures.
- CO303.2 Apply the different linear data structures to problem solutions.
- CO303.3 Apply the different non-linear data structures to problem solutions.
- CO303.4 Critically analyze the various sorting algorithms.
- CO303.5 Evaluate the suitability of different data structures for solving computing problems.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3				1							
2	3	2	1									2
3	3	2	1									2
4	3			2								
5	3	2	1	2								2

1→Low 2→Medium 3→High

19CS3602

SOFTWARE ENGINEERING

L T P C

3 0 0 3

Course Objectives

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures.

Pre-requisite :

- Object Oriented Programming

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.

UNIT II REQUIREMENTS ENGINEERING

9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: FeasibilityStudies, Requirements elicitation and analysis, requirements validation, requirements management.

UNIT III DESIGN CONCEPTS, TESTING AND MAINTENANCE

9

The Design Concepts - The Design Model - Architectural Design - User Interface Design: InterfaceAnalysis - Interface Design Steps - Requirements Modeling - Software Testing Fundamentals – BlackBox Testing - White Box Testing - Unit Testing - Integration Testing- Debugging –SoftwareImplementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPRmodel-Reengineering process model-Reverse and Forward Engineering.

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; Software quality assurance; Software configuration management;.

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 modeling tools; testing tools; Configuration management tools; DevOps.

Total: 45 Periods

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.
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

References:

1. Rajib Mall, —Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, —Software Engineering, A Precise Approach, Wiley India, 2010.
3. Kelkar S.A., —Software Engineering, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, —Software Engineering, Tata McGraw-Hill Publishing Company Limited, 2007.

Web Resources:

1. https://www.tutorialspoint.com/software_engineering/index.htm
2. <https://www.youtube.com/watch?v=4b1D1QFEeI0>
3. <https://www.javatpoint.com/software-engineering-tutorial>
4. https://en.wikipedia.org/wiki/Software_engineering

Course Outcomes

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

CO304.1 Compare different process models.

CO304.2 Explain the Concepts of requirements engineering.

CO304.3 Apply systematic procedure for software design and deployment.

CO304.4 Compare and contrast the various testing and maintenance.

CO304.5 Manage project schedule, estimate project cost and effort required.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3				1						
2	3				2	1			1	1		1
3	3	2	1		2				1			1
4	3	2		1	1		1		1	1		1
5	3	2		1	1		1		1		1	1

1→Low 2→Medium 3→High

19CS3603

OBJECT ORIENTED PROGRAMMING SYSTEMS

L T P C

3 0 0 3

Course Objectives

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

Pre-Requisite :

- C Programming and Python Programming

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 – constructors, methods -access specifiers -Data Types, Variables, Operators,Control Flow, Looping, Arrays, ArrayList, Strings, Packages.

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.

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.

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING

9

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

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events AWT event hierarchy - Introduction to Swing – layout management - Swing Components – TextFields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars Windows – Menus – Dialog Boxes.

Total: 45 Periods

Text Books:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary Cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

References:

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

Web Resources:

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

Course Outcomes

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

CO305.1 Develop Java programs using OOP principles.

CO305.2 Develop Java programs with the concept's inheritance and interfaces.

CO305.3 Build Java applications using I/O streams and exception handling.

CO305.4 Develop Java applications with multithreading and generic programming.

CO305.5 Develop interactive Java programs using applet and swing.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3			1						
2	3	3	3		1	1						1
3	3	3	3		1	1						1
4	3	3	3		1	1						1
5	3	3	3		1	1						1

1→Low 2→Medium 3→High

19CS3611

DATA STRUCTURES LABORATORY

L T P C
0 0 4 2

Course Objectives

- To implement linear and non-linear data structures.
- To understand the different operations of search trees.
- To implement graph traversal algorithms.
- To implement MST and Shortest Path algorithms.
- To get familiarized to sorting and searching algorithms.

Pre-Requisite:

- C Programming
- Data Structure concepts

LIST OF EXPERIMENTS:

1. Implementation of Singly, Doubly and Circular Linked Lists.
2. Polynomial Arithmetic using Linked Lists.
3. Array implementation of Stack and Queue ADTs.
4. Linked list implementation of Stack and Queue ADTs.
5. Evaluation of a postfix expression using a Stack.
6. Infix to postfix conversion using stack.
7. Implementation of Binary Trees and traversals.
8. Implementation of AVL Trees.
9. Implementation of Heaps using Priority Queues.
10. Graph representation and Traversal algorithms.
11. Implementation of MST algorithms.

- 12. Implementation of Shortest Path Algorithms.
- 13. Implementation of searching and sorting algorithms.
- 14. Hashing – any two collision techniques.

Total: 60 Periods

Course Outcomes:

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

- CO306.1 Write functions to implement linear and non-linear data structure operations.
- CO306.2 Suggest appropriate linear / non-linear data structure operations for solving a given problem.
- CO306.3 Appropriately use the linear / non-linear data structure operations for a given problem.
- CO306.4 Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval.
- CO306.5 Identify, implement and use the appropriate data structures for a given problem.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3				1							2
2	3	3	3	2	1							2
3	3	3	3	2	1							2
4	3				1	2						2
5	3	3	3	2	1							2

1→Low 2→Medium 3→High

19CS3612 OBJECT ORIENTED PROGRAMMING SYSTEMS LABORATORY L T P C

0 0 4 2

Course Objectives

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

Pre-Requisite :

- Java Programming

LIST OF EXPERIMENTS

1. 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.
2. Develop a java application to implement arithmetic calculator to perform addition, subtraction, multiplication and division using packages.
3. 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.
4. Design a Java interface for ADT Stack. Implement this interface using array.
5. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
6. 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.
7. 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.
8. Write a Java program to implement user defined exception handling.
9. 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.
10. Write a java program to find the minimum value from the given type of elements using a generic function.
11. Design a Scientific calculator using event-driven programming paradigm of Java.

12. Develop a mini project for any application using Java concepts.

Total: 60 Periods

Course Outcomes:

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

CO307.1 Develop and implement Java programs for real-world applications.

CO307.2 Develop and implement java packages.

CO307.3 Understand and apply the principles of inheritance, interface and abstract class in java applications.

CO307.4 Implement the concepts of ArrayList, abstract class, file processing, exception handling, multi-threading and generic programming in java applications.

CO307.5 Design java applications using event handling.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3			2					2	
2	3	3	3			2					2	
3	3	3	3		1	2						1
4	3	3	3		1	2						1
5	3	3	3		1	2						1

1→Low 2→Medium 3→High

19GE3M01

COMMUNICATION AND SOFT SKILLS

L T P C

0 0 2 0

Course Objectives

- Provide Guidance and Practice to communicate in English.
- Provide support to read from different genres.
- Practice to write technical articles.
- Understand the Importance of Soft skills
- Improve Personality Traits

PRE-REQUISITE:

- Fundamental knowledge in English Language.

UNIT I LISTENING SKILLS

6

Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries - listening to lectures, discussions from TV/ Radio/ Podcast - Video tutorials

UNIT II READING AND WRITING SKILLS

6

Reading different genres of texts ranging from newspapers to creative writing; Writing abstracts – summaries - interpreting visuals - Attributes to technical Writing – Assembly Guidelines – White paper writing - Informal Usability Report – Release/launch notes.

UNIT III WRITING STRATEGIES

6

Introduction to Writing Strategies – different genres of writing – including instruction manuals, proposals, reports, posters and visual communication, technical descriptions, product recalls - Executive Summaries - Repair manuals - organizing ideas from Journalwritings – Note-Making.

UNIT IV PERSONALITY TRAITS – AN OVERVIEW

6

Definition – Types – Openness to experience – Conscientiousness – extraversion – Agreeableness – Neuroticism – Problem solving skills – examine ideas and develop theories and explanations.

UNIT V SOFT SKILLS

6

Motivation – self image – goal setting – managing changes – time management – stress management – leadership traits – team work – career and life planning.

Total: 30 Periods

Text Books:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press: Oxford, 2011.
2. Mitra, K. Barun. Personality Development and Soft Skills. Oxford University Press: Oxford, 2016.

References:

1. Personality Development (CD-ROM), Times Multimedia, Mumbai.
2. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
3. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.

WEB RESOURCE(S):

1. Learn Engineering
https://www.youtube.com/user/LearnEngineeringTeam/videos?view=0&sort=p&shelf_id=14

2. Group Discussion <https://www.youtube.com/watch?v=hhjvTUv9L0g>
3. Presentation Skills <https://www.youtube.com/watch?v=wp4ho9raVjA&t=74s>
4. IELTS Listening Practice

https://play.google.com/store/apps/details?id=mimosa.english.ieltpractice.listening&hl=en_IN

Course Outcomes

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

- CO308.1 Talk in English in real life situations
- CO308.2 Make effective presentations
- CO308.3 Participate in GD and contribute ideas with ease.
- CO308.4 Master soft skills required for the work place.
- CO308.5 Write letters and technical writing.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1				1			1		3	3	1	2
2				1			1		3	3	1	2
3				1			1		3	3	1	2
4				1			1		3	3	1	2
5				1			1		3	3	1	2

1→Low 2→Medium 3→High

19CS4201

DISCRETE MATHEMATICS

L T P C

3 1 0 4

Course Objectives

- To extend student's logical and mathematical maturity and ability to deal with abstraction
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems
- To understand the basic concepts of combinatorics and graph theory
- To familiarize the applications of algebraic structures
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering

PRE-REQUISITE:

- Set theory, permutation, combination

UNIT I LOGICS

9+3

Propositional logic – Truth table – laws of logic- logical connectives-Tautological implications - logical equivalence - Propositional equivalences-Normal forms-PCNF and PDNF – Predicates and quantifiers — Rules of inference.

UNIT II COMBINATORICS

9+3

Mathematical induction – Counting principle- strong induction and well ordering principle-The basics of counting – The pigeonhole principle – Recurrence relations–Solving linear recurrence relations-Generating functions – Inclusion and exclusion principle and its applications.

UNIT III GRAPHS

9+3

Graphs- Some basic definitions of graph - graph models – Graph terminology and special types of graphs – Hand shaking theorem- Matrix representation of graphs and graph isomorphism – Connectivity .

UNIT IV ALGEBRAIC STRUCTURES

9+3

Algebraic systems – Semi groups and monoids – Sub semigroups and submonoids -Groups – Subgroups –Cyclic groups– Homomorphism’s –Cayley’s theorem- Normal subgroup and cosets – Lagrange’s theorem .

UNIT V LATTICES AND BOOLEAN ALGEBRA

9+3

Relation (Reflexive, antisymmetric and transitive) - Partial ordering – Posets - Hasse diagram – Lattices as posets – Some properties of lattices - Lattices as algebraic systems – Sub lattices - Boolean algebra.

Total: 45+15 Periods

Text Books:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011

References:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum’s

Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006

Web Resources:

1. https://en.wikipedia.org/wiki/Discrete_mathematics
2. <https://www.youtube.com/watch?v=1FfX2xW3104>
3. <https://www.javatpoint.com/discrete-mathematics-tutorial>
4. <https://www.journals.elsevier.com/discrete-mathematics>
5. <http://mathworld.wolfram.com/DiscreteMathematics.html>
6. <http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf>

Course Outcomes:

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

CO401.1 Have knowledge of the concepts needed to test the logic of a program.

CO401.2 Have an understanding in identifying structures on many levels.

CO401.3 Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science

CO401.4 Be aware of the counting principles

CO401.5 Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	1		1						2			3
2		2	1									1
3	2	2							2			
4	2		1						1			
5		1	1									2

1→Low 2→Medium 3→High

19CS4601

DATABASE MANAGEMENT SYSTEMS

L T P C

3 0 0 3

Course Objectives

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.

- To understand the physical DB design.
- To understand the fundamental concepts of transaction processing, concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query Processing Techniques.

Pre-Requisite :

- Data structures

UNIT I INTRODUCTION 9

Purpose of Database System – Views of data – Data Models – Database Languages – Database System Architecture – Database users and Administrator – Entity –Relationship (E-R) model –Constraints - Keys - E-R Diagrams – Weak Entity Sets – Extended E-R features - Design of E-R database schema

UNIT II RELATIONAL MODEL 9

Structure of relational database – Relational Algebra: Fundamental operations – Additional Operations – Extended Relational-Algebra operations. Tuple Relational Calculus – Domain Relational Calculus. SQL: Basic structure – Set operations – Aggregate functions – Null Values – Nested subqueries – Views – Data Definition Language – Embedded SQL – Dynamic SQL.

UNIT III DATABASE DESIGN 9

Functional Dependencies: First, Second, Third Normal Forms - Armstrong's Axioms - Decomposition – Properties of Decomposition -Dependency Preservation. Boyce - Codd Normal Form - Fourth Normal Form – Fifth Normal Form.

UNIT IV TRANSACTION MANAGEMENT 9

Transaction Concepts - ACID Properties, Recovery: System Recovery – Media Recovery – Two Phase Commit – Save Points – SQL Facilities for recovery. Concurrency: Locking Protocols – Two Phase Locking – Intent Locking – Recovery Isolation Levels – SQL Facilities for Concurrency. Deadlocks – issues

UNIT V DATA STORAGE AND QUERYING 9

Storage structures: RAID. File Organization: Organization of Records – Indexing – Ordered Indices – B+ tree Index Files – B tree Index Files. Query Processing: Overview – Measures of Query Cost - Selection Operation – Evaluation of Expressions

Total: 45 Periods

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts, 4th Edition, Tata McGraw Hill, 2002.
2. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems, 8th Edition, Pearson Education, 2006.

References:

1. Ramez Elmasri, Shamkant B. Navathe, —Fundamentals of Database Systems, 4th Edition, Pearson / Addison Wesley, 2007.
2. Raghu Ramakrishnan, —Database Management Systems, 3rd Edition, Tata McGraw-Hill 2003.
3. S.K.Singh, —Database Systems Concepts, Design and Applications, 1 st Edition, Pearson Education, 2006.
4. Jeffrey Stanton, —An Introduction to Data Science, an interactive eBook from iTunes.

Web Resources:

1. <https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/>
2. <https://www.guru99.com/what-is-dbms.html>
3. <https://en.wikipedia.org/wiki/Database>
4. <https://searchsqlserver.techtarget.com/definition/database-management-system>
5. <https://www.bmc.com/blogs/dbms-database-management-systems/>

Course Outcomes

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

CO402.1 Evaluate the basic concepts of DBMS and design E-R models for simple database application scenarios.

CO402.2 Apply the SQL concepts and relational algebra operations in a database design and enforce the integrity constraints for queries.

CO402.3 Understand the database schema and apply the normalization rules and techniques to optimize the database.

CO402.4 Assess the basic issues of transaction processing

CO402.5 Understand the database storage mechanisms and query processing.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		3							1	1	1
2	3	2	3		1	1	1			1	1	1

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

1→Low 2→Medium 3→High

19CS4602

OPERATING SYSTEM CONCEPTS

**L T P C
2 0 2 3**

Course Objectives

- Understand the principles and modules of operating systems
- Be familiar with the factors in process scheduling strategies, concurrent processes and threads
- Learn the algorithmic solutions to handle deadlock problems
- Understand the physical and logical memory management and feel the role of virtual memory
- To manage the issues related to file system interface, implementation and disk management

Pre-Requisite :

- C Programming
- Data Structures

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 – Interprocess communication

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 – Monitors.

UNIT III DEADLOCK

6

Deadlock: System model – Deadlock characterization – Methods for handling deadlocks –

Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT IV STORAGE MANAGEMENT

6

Memory Management: Background – Swapping – Contiguous memory allocation – Paging-Segmentation – Segmentation with paging - Virtual Memory: Background – Demand paging – Process creation – Page replacement.

UNIT V FILE SYSTEMS AND I/O SYSTEMS

6

File System Interface: File concept – Access methods – Directory structure – File system mounting – Protection - File-System Implementation: Directory implementation – Allocation methods – Free space management – efficiency and performance - Mass Storage Structure: Disk scheduling – Disk management – Swap space management.

Total Theory Hours: 30 Periods

LABORATORY EXPERIMENTS:

1. Basics of UNIX commands.
2. Implement the following CPU scheduling algorithms
 - a) Round Robin b) SJF c) FCFS d) Priority
3. Implement Bankers Algorithm for Dead Lock Avoidance
4. Implement e all page replacement algorithms
 - a) FIFO b) LRU c) LFU
5. Implement all File Organization Techniques
 - a) Single level directory b) Two level

Total Lab hours: 15 Periods

Total Hours: 45 Periods

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012

References:

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. 5. <http://nptel.ac.in/>.
5. Gary Nutt, —Operating Systemsll, 3 rd Edition, Pearson Education, 2004.
6. Harvey M. Deitel, —Operating Systemsll, 3 rd Edition, Pearson Education, 2004.
7. Dhananjay M.DhamDhere, —Operating Systems A Concept – Based Approachl,3 rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2003

Web Resources:

1. https://www.tutorialspoint.com/operating_system/index.htm
2. https://en.wikipedia.org/wiki/Operating_system
3. <https://www.geeksforgeeks.org/operating-systems/>
4. <http://www.cs.nchu.edu.tw/~hwtseng/OS/os.pdf>
5. <https://www.wiley.com/en-ca/Operating+System+Concepts,+Enhanced+eText,+10th+Edition-p-9781119320913>

Course Outcomes

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

- CO403.1 Acquire knowledge on principles and modules of operating systems
- CO403.2 Realize the factors in process scheduling strategies, concurrent processes and threads
- CO403.3 Develop algorithmic solutions to handle deadlock problems
- CO403.4 Analyze the physical and logical memory management and feel the role of virtual memory
- CO403.4 Identify and solve the issues related to file system interface, implementation and disk management

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		1									
2	3	3		1								
3		3	2	1								
4		3				1						
5		3	2	1								

1→Low 2→Medium 3→High

19CS4603

DESIGN AND ANALYSIS OF ALGORITHMS

**L T P C
3 0 0 3**

Course Objectives

- To understand and apply the algorithm analysis techniques.
- To understand the algorithm techniques brute force and Divide and conquer
- To understand algorithm design techniques dynamic programming and Greedy Technique.
- To understand algorithm design technique Iterative Improvement
- To understand backtracking and Branch and Bound.

Pre-Requisite:

- C Programming
- Data Structures

UNIT I INTRODUCTION

9

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms - Visualization

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.

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 - Prim's algorithm and Kruskal's Algorithm – 0/1
Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 9

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite
Graphs, Stable marriage Problem.

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

Total: 45 Periods

Text Books:

1. Anany Levitin, —Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

References:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, —Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, Reprint 2006.
4. Harsh Bhasin, —Algorithms Design and Analysis, Oxford university press, 2015.
5. <http://nptel.ac.in/>

Web Resources:

1. <https://www.javatpoint.com/daa-tutorial>
2. <https://nptel.ac.in/courses/106106131/>
3. <https://www.cs.duke.edu/courses/fall08/cps230/Book.pdf>
4. https://swayam.gov.in/nd2_cec20_cs03/preview
5. https://www.researchgate.net/publication/326477402_Design_and_Analysis_of_Algorithms

Course Outcomes

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

CO404.1 Analyze the time and space complexity of algorithms.

CO404.2 Design algorithms for various computing problems using brute force and divide and conquer.

CO404.3 Design algorithms using dynamic programming and Greedy Technique.

CO404.4 Design algorithms using Iterative Improvement.

CO404.5 Design algorithms using Backtracking and Branch and Bound.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3										
2	3	2	3									
3	3	2	3									
4	3	2	3									
5	3	2	3									

1→Low 2→Medium 3→High

19CS4604

COMPUTER ARCHITECTURE

**L T P C
3 0 0 3**

Course Objectives

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

Pre-Requisite :

- Theory of Programming Languages

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.

UNIT II ARITHMETIC FOR COMPUTERS 9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism

UNIT III PROCESSOR AND CONTROL UNIT 9

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards

UNIT IV PARALLELISIM 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

UNIT V MEMORY SYSTEM 9

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Secondary storage devices.

Total: 45 Periods

Text Book:

1. David A. Patterson and John L. Hennessey, “Computer organization and design”, Morgan Kauffman / Elsevier, Fifth edition, 2014.

References:

2. V.Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, “Computer Organisation“, VI th edition, Mc Graw- Hill Inc, 2012.
3. William Stallings “Computer Organization and Architecture” , Seventh Edition ,Pearson Education, 2006.
4. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition,Pearson Education, 2005.
5. Govindarajalu, “Computer Architecture and Organization, Design Principles and plications”, first edition, Tata McGraw Hill, New Delhi, 2005.
6. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata Mc Graw Hill, 1998.

Web Resources:

1. https://en.wikipedia.org/wiki/Computer_architecture
2. <https://www.studytonight.com/computer-architecture/architecture-of-computer-system>
3. <https://www.youtube.com/watch?v=4TzMyXmzL8M>
4. <https://www.coursera.org/learn/comparch>
5. <https://www.computersciencedegreehub.com/faq/what-is-computer-architecture/>

Course Outcomes

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

CO405.1 Describe the internal structure and operation of digital computer.

CO405.2 Design arithmetic and logic unit.

CO405.3 Apply pipelining concept for instruction execution.

CO405.4 Understand parallel processing architectures.

CO405.5 Explain the types of memory systems.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		2									
2	3	1	3									
3	3	2	1									2
4	3		1									2
5	3		1									

1→Low 2→Medium 3→High

19CS4605

MICROPROCESSORS AND MICROCONTROLLERS

L T P C

3 0 0 3

Course Objectives

- To understand the Architecture of 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 microcontroller.

- To design a microcontroller based system

Pre-Requisite :

- Digital Systems

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.

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.

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.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits -Instruction set - Addressing modes - Assembly language programming.

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

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, 2007. (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, 2011. (UNIT IV-V)

References:

1. Douglas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH, 2012
2. K.Ray, K.M.Bhurchandi, "Advanced “Microprocessors and Peripherals” 3 rd edition, Tata McGrawHill, 2012

Web Resources:

1. <https://www.javatpoint.com/microprocessor-vs-microcontroller>
2. https://swayam.gov.in/nd1_noc20_ee42/preview
3. <https://www.microcontrollertips.com/microcontrollers-vs-microprocessors-whats-difference/>
4. <https://www.educba.com/microprocessor-vs-microcontroller/>
5. <https://en.wikipedia.org/wiki/Microcontroller>

Course Outcomes

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

- CO406.1 Understand and execute programs based on 8086 microprocessor.
- CO406.2 Design Memory Interfacing circuits.
- CO406.3 Design and interface I/O circuits.
- CO406.4 Understand and execute programs based on 8051 microprocessor.
- CO406.5 Design and implement 8051 microcontroller based systems.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3		3									
3			3									
4	3	1	2									
5	3	1	2									

1→Low 2→Medium 3→High

19CS4611 DATABASE MANAGEMENT SYSTEMS LABORATORY L T P C

0 0 4 2

Course Objectives

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

Pre-Requisite :

- Data Structures
- DBMS

LIST OF EXPERIMENTS:

1. Data Definition Language Commands
2. Data Manipulation Language Commands
3. Data Control Language Commands
4. Nested Queries
5. Set Operators and Join Queries
6. Views and Indexes
7. Integrity Constraints Enforcement
8. PL/SQL – Triggers
9. PL/SQL – Functions
10. PL/SQL – Procedures
11. Form / Menu Design
12. Report Generation

Total: 60 Periods

Course Outcomes

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

CO407.1 Use typical data definitions and manipulation commands.

CO407.2 Design applications to test Nested and Join Queries

CO407.3 Implement simple applications that use Views

CO407.4 Implement applications that require a Front-end Tool

CO407.5 Critically analyze the use of Tables, Views, Functions and Procedures

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3				1							2
2	3		3	2	1							2
3	3		3		1	2						2
4	3		3		1	2						2
5	3	3			1							2

1→Low 2→Medium 3→High

19CS4901 INTERPERSONAL SKILLS- LISTENING AND SPEAKING

**L T P C
0 0 4 2**

Course Objectives

- Master themselves with English Language Skills required for undertaking academic listening and speaking skills.
- Support them to practice formal and informal speaking activities.
- Improve their listening skills to understand native speakers.
- Make technical Presentationsn
- Listen to on-line sources.

PRE-REQUISITE:

- The fundamental knowledge in English Language.

UNIT I LISTENING AS A KEY SKILL

12

Importance of Listening – preparing to listen to a lecture – basics of Note Taking - listening to personal information – listening to technical topics – listening to process information.

UNIT II LISTENING STRATEGY

12

Appreciative listening - listening to Non-Technical Video Lecture by Native Speakers – focus on sounds and words ; Critical Listening – Listening to Technical Video Lecture by Nativespeakers – identifying the key points ; Relationship Listening – Listening to Conversations by native speakers..

UNIT III INTERMEDIATE SPEAKING

12

Self Introduction – Sharing of Ideas – Briefing Academic topics – one to one conversation about a product – explaining a product/gadget – answering questions – stressing syllables –intonation patterns – compare and contrast information – Pronunciation.

UNIT IV ADVANCED SPEAKING

12

Making Technical Presentation – Strategies - Extempore – Speaking about the Strengths &Weaknesses – Responding appropriately to Interview Questions – Group discussion.

UNIT V ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS

12

International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Civil Service (Language related)- Verbal Ability.

Total: 60 Periods

Text Books:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. &David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010.

References:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014.

WEB RESOURCE(S):

1. Learn Engineering
https://www.youtube.com/user/LearnEngineeringTeam/videos?view=0&sort=p&shelf_id=14
2. Group Discussion <https://www.youtube.com/watch?v=hhjvTUv9L0g>
3. Interview Skills <https://www.youtube.com/watch?v=QgjkjsqAzvo>
4. TED Talk <https://www.youtube.com/user/TEDtalksDirector>
5. IELS Listening Practice
https://play.google.com/store/apps/details?id=mimosa.english.ieltpractice.listening&hl=en_IN

Course Outcomes:

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

CO408.1 Listen and respond appropriately.

CO408.2 Present TED Talks.

CO408.3 Make Effective Technical Presentations.

CO408.4 Take up National and International Examination with ease.

CO408.5 Answer questions during interview process with a professional touch..

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1				1			1		3	3	1	2 2
2				1			1		3	3	1	2
3				1			1		3	3	1	2
4				1			1		3	3	1	2
5				1			1		3	3	1	2

1→Low 2→Medium 3→High

19GE4M01 ENVIRONMENTAL SCIENCE AND ENGINEERING

**L T P C
2 0 0 0**

Course Objectives

- To study the nature and facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

7

Definition, scope and importance of environment – need for public awareness - concept of anecosystem – structure and function of an ecosystem – producers, consumers and decomposers –

ecological succession– Introduction, types, characteristic features, structure and function of the(a) forest ecosystem (b) grassland ecosystem (c) pond ecosystem (d) ocean ecosystem –Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity–India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India –In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems –pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION **6**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution– solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES **6**

Forest resources: Use and over-exploitation, deforestation - timber extraction– Water resources: Use and over- utilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources– Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **6**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

Total: 30 Periods

Text Books:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd

edition, Pearson Education, 2004.

References:

1. Dharmendra S. Sengar, ‘Environmental law’, Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press(I) Pvt, Ltd, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, ‘Environmental Studies-From Crisis to Cure’, Oxford University Press, 2005.

Web Resources:

1. https://en.wikipedia.org/wiki/Environmental_engineering_science
2. <https://www.seas.harvard.edu/environmental-science-engineering>
3. https://www.icevirtuallibrary.com/toc/jenes/current?gclid=EAIaIQobChMI4msjvbB5wIVShOPCh2xigE-EAMYAiAAEgKn9vD_BwE&
4. http://www.anthropocenemagazine.org/?gclid=EAIaIQobChMIiOOqmPbB5wIVUQ4rCh1-rApmEAAYASAAEgIkGvD_BwE

Course Outcomes

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

CO409.1 Public awareness of environmental is at infant stage.

CO409.2 Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection.

CO409.3 Students will have a greater knowledge of how natural resources relate to the economy and environment, both currently and in the future.

CO409.4 Partner with community members to identify a community problem and to develop a plan of action to address this community problem. Ignorance and incomplete knowledge has lead to misconceptions.

CO409.5 This course is intended to sharpen student’s perception of population growth and change and increase their awareness.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1						2			3			
2	3	2			1	2	3		3			
3	3				1							
4	3	2				2	3	3	3			3
5	3	2		1	1	2						3

1→Low 2→Medium 3→High

19CS5601

THEORY OF COMPUTATION

L T P C
3 0 0 3

OBJECTIVES:

- To know the different types of finite automata and regular languages
- To familiarize context free grammars
- To learn about push down automata
- To understand the working of Turing machines
- To study about undecidable problems

PRE-REQUISITE:

- Discrete mathematics and Combinatorics.

UNIT I FINITE AUTOMATA AND REGULAR EXPRESSIONS 9

Basic Definitions - Finite Automaton - DFA and NFA - Finite Automaton with ϵ -moves - Equivalence of NFA and DFA - Equivalence of NFAs with and without ϵ -moves - Regular Languages - Regular Expression - Equivalence of finite Automaton and regular expressions - Minimization of DFA

UNIT II GRAMMARS 9

Introduction - Types of Grammar - Context Free Grammars and Languages - Derivations - Parse Trees - Equivalence of Derivations and Parse Trees - Ambiguity - Normalization of CFG - Elimination of Useless symbols - Unit productions - productions - Chomsky normal form - Greibach Normal form.

UNIT III PUSH DOWN AUTOMATA 9

Definition - Moves - Instantaneous descriptions -- Equivalence of Pushdown automata and CFG - Deterministic pushdown automata - Pumping lemma for Regular Languages and CFL - Application of Pumping Lemma

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.

UNIT V UNDECIDABILITY 9

Unsolvable Problems and Computable Functions - Recursive and recursively enumerable languages - Universal Turing machine - Rice Theorem - Post Correspondence Problem - P and NP completeness - Polynomial time reductions.

Total : 45 Periods

TEXT BOOK(S):

1. J.E.Hopcroft, R.Motwani and J.D Ullman, “Introduction to Automata Theory, Languages and Computations”, Pearson Education, Third Edition, 2008.

REFERENCE BOOKS(S):

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 RESOURCE(S):

1. www.nptel.ac.in
2. <http://ocw.mit.edu/courses/mathematics/18-404j-theory-of-computation-fall-2006/>

COURSE OUTCOME(S):

CO501.1 Design finite state automata and regular expression for a language specification and convert one form to another form

CO501.2 Write Context Free Grammars and normalize

CO501.3 Design push down automata(PDA) for languages and convert CFG to PDA and vice versa

CO501.4 Construct Turing machine by applying different techniques

CO501.5 Find undecidability in languages

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3									
2	3	1	1									
3	3	3	3									
4	3	3	3									
5		1	3									

1→Low 2→Medium 3→High

19CS5602

COMPUTER NETWORKS

L T P C

3 0 0 3

OBJECTIVES:

- To understand layered architecture of computer networks and protocols.
- To learn the various mediums used in the physical layer.
- To understand the functionalities of data link layer.
- To learn the routing algorithms and the use of IP addressing in the network layer.
- To understand the working of transport layer.

PRE-REQUISITE:

- Digital Circuits
- Communication Engineering

UNIT I INTRODUCTION TO PHYSICAL LAYER 9

Overview: Data Communication - Network Types - Internet History - TCP/IP Protocol Suite - The OSI Model - Digital Signals - Data rate limits - Performance - Line Coding - Block Coding - Transmission Media: Guided Media - Unguided Media – Switching.

UNIT II DATA LINK LAYER 9

Link Layer Addressing - ARP - Error Detection and Correction - Data Link Control Services - Data Link Layer Protocols - HDLC - PPP - Media Access Control - Ethernet - Wireless LANs: IEEE 802.11, Bluetooth - Connecting Devices.

UNIT III NETWORK LAYER 9

Network layer Services - Packet switching - Performance - IPV4 addresses - Forwarding of packets - Internet Protocol - ICMPV4 - Mobile IP - Routing algorithms - Routing Protocols - IPV6 addressing - IPV6 protocol - Transition from IPV4 to IPV6.

UNIT IV TRANSPORT LAYER 9

Transport Layer Services - Protocols - UDP - TCP: Transition Diagram, Flow Control, Error Control, Congestion Control - SCTP - QoS: Flow Control to improve QoS - Integrated Services - Differentiated Services - Client Server Programming.

UNIT V APPLICATION LAYER AND SECURITY 9

World Wide Web and HTTP - FTP - Electronic Mail - Telnet - Secure Shell - Domain Name System - Cryptographic Algorithms - Authentication Protocols - Message Integrity Protocols - Public Key Distribution(X.509) - Network Layer Security - Transport Layer Security - Application Layer Security - Firewalls.

TEXT BOOK(S):

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, Fifth Edition, 2013
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kauffmann Publishers Inc., Third Edition, 2003.

REFERENCE BOOK(S):

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

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <http://www.protocols.com/pbook/tcpip1.html>

COURSE OUTCOME(S):

CO502.1: Identify the role of each layer in computer networks and its protocols and Encode the data for transmission in wired and wireless medium

CO502.2: Examine various Data Link layer design issues and Data Link protocols.

CO502.3: Design applications using internet protocols.

CS502.4: Implement routing and congestion control algorithms.

CS502.5: Develop application layer protocols and understand socket programming Develop scheme for error detection and correction.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2			2									
3			3									
4				1								
5		3										

1→Low 2→Medium 3→High

19ME5501

PROFESSIONAL ETHICS FOR ENGINEERS

**LT P C
3 0 0 3**

OBJECTIVES:

- To create an awareness on Engineering
- To learn about Ethics and Human Values
- To instill Moral and Social Values and Loyalty
- To know the responsibilities and rights
- To appreciate the rights of others.

PRE-REQUISITE:

- Basic understanding of business management

UNIT I HUMAN VALUES

10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS

9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES

8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –

Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Mike W. Martin and Roland Schinzinger, —Ethics in Engineering, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, SenthilKumar V. S, —Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCEBOOKS(S):

1. Charles B. Fleddermann, —Engineering Ethics, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases, Cengage Learning, 2009.
3. John R Boatright, —Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, _Value Education, Vethathiri publications, Erode, 2011.

WEB RESOURCE(S):

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

COURSEOUTCOME(S):

- CO503 .1 Be familiar with human values
- CO503 .2 To apply ethics in society
- CO503 .3 To discuss the ethical issues related to engineering
- CO503 .4 To realize the responsibilities and rights in the society.
- CO503 .5 Be familiar with global issues

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1							3	2	3	2		1
2							3	2	2	1		2
3							3	2	3	2		1
4							3	2	2	1		2
5							3	1	2	2		1

1→Low 2→Medium 3→High

19CS5611 SYSTEM ANALYSIS AND DESIGN LABORATORY

**L T P C
0 0 4 2**

OBJECTIVES:

- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques

PRE-REQUISITE:

- Basic Understanding of Computer Programming and related Programming Paradigms

LIST OF EXPERIMENTS:

To develop a mini-project by following the 9 exercises listed below.

1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence diagrams.
5. Draw relevant state charts and activity diagrams.
6. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
7. Develop and test the Technical services layer.
8. Develop and test the Domain objects layer.

9. Develop and test the User interface layer.

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank
3. 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. Foreign trading system
12. Conference Management System
13. BPO Management System
14. Library Management System
15. Student Information System

Total: 30 Periods

URSE OUTCOME(S):

CO506.1 Design and implement projects using OO concepts.

CO506.2 Use the UML analysis and design diagrams.

CO506.3 Apply appropriate design patterns.

CO506.4 Create code from design.

CO506.5 Compare and contrast various testing techniques

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1			3									
2	3											
3			2									
4			3									
5	3											

19CS5612

COMPUTER NETWORKS LABORATORY

L T P C
0 0 4 2

OBJECTIVES:

- Learn to communicate between two desktop computers.
- Learn to implement the different protocols
- Be familiar with socket programming.
- Be familiar with the various routing algorithms
- Be familiar with simulation tools.

PRE-REQUISITE:

- Digital Circuits
- Communication Engineering

LIST OF EXPERIMENTS:

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
 - Echo client and echo server
 - Chat
 - File Transfer
4. Write a code simulating ARP /RARP protocols.
5. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
6. Study of TCP/UDP performance using Simulation tool.
7. Simulation of Distance Vector/ Link State Routing algorithm.
8. Performance evaluation of Routing protocols using Simulation tool.
9. Implementation of Stop and Wait Protocol and sliding window

Total: 60 Periods

SOFTWARE:

- C / C++ / Java / Equivalent Compiler
- Network simulator like NS2/ NS3 / Glomosim/OPNET/ 30 Equivalent

HARDWARE:

- Standalone desktops

COURSE OUTCOME(S):

CO507.1 Implement various protocols using TCP and UDP.

CO507.2 Use simulation tools to analyze the performance of various network protocols.

CO507.3 Analyze various routing algorithms.

CO507.4 Implement error correction codes.

CO507.5 Implement socket programming

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1			3					1				
2	3				3							1
3	3	3						1	3			
4			3					1				1
5			3									1

1→Low 2→Medium 3→High

19GE5M01

LIFE SKILLS: APTITUTDE

**L T P C
0 0 2 0**

OBJECTIVES:

- To learn about arithmetical operations with complex numbers
- To understand the meanings of a relation defined on a set, an equivalent relation and a partition of a set
- To learn about how to Calculate percentages in real life contexts , find any percentage of

a given whole using their knowledge of fraction multiplication and increase / decrease a given whole by a percentage

- To learn and understand the situations like motion in a straight line, Boats and Streams, Trains, Races and clocks
- To learn about the Counting techniques, Permutation and Combination, Recursion and generating functions

PRE-REQUISITE:

- Quantitative Aptitude
- Logical Reasoning

UNIT I NUMBER SYSTEMS 6

Introduction - definition- classification on Numbers -power cycles and remainders - short cut process -concept of highest common factor - concept of least common multiple - divisibility - number of zeros in an expression-Percentages-Introduction - definition and Utility of percentage - importance of base/denominator for percentage calculations - concept of percentage values through additions - fraction to percentage conversion table

UNIT II AVERAGES 6

Introduction - average of different groups - addition or removal of items and change in average placement of some of the items. Ratio, Proportions And Variation-Introduction- Ratio- properties- dividing a given number in the given ratio - comparison of ratios -proportions - useful results on proportion- continued proportion - relation among the quantities more than two- variation

UNIT III PROFIT AND LOSS 6

Gain/Loss and percentage gain or percentage loss-multiplying equivalents to find sale price - relation among cost price, sale price, gain/loss and percentage gain or percentage loss - an article sold at two different selling price - two different articles sold at same selling price - percentage gain or percentage loss on selling price - percentage gain or percentage loss on whole property

UNIT VI TIME AND WORK 6

Introduction - Basic concepts -Concepts on working with different efficiency - Pipes and Cisterns -

WorkEquivalence (Man Days) -Alternative approach. Time, Speed And Distance-Definition - Basics of Time, Speed and Distance - Relative speed - Problems based on Trains? Problemsbased on Boats and Streams -Problems based on Races - time taken with two difference modes oftransport - time and distance between two moving bodies

UNIT V PERMUTATION AND COMBINATION

6

Definition - Fundamental rules - Theorems on Permutation - Theorems on CombinationProbability- Concept and importance of probability - underlying factors for Real- Life estimation of probability - Basic facts about probability - some important consideration while defining event.Mixtures and Alligation- Definition - alligation rule - mean value (cost price) of the mixture - some typical situations whereallegation can be used.

Total: 30 Periods

REFERENCE(S):

1. AbhijitGuha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
3. Dr.R S Aggarwal, Quantitative Aptitude, Seventh Revised Edition, S.Chand Publishing Company Ltd, 2013.
4. Edgar Thorpe , Course In Mental Ability And Quantitative Aptitude For Competitive Examinations, Third Edition, Tata McGraw-Hill Publishing Company Ltd, 2013
5. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2013.

WEB RESOURCE(S):

1. <https://www.sawaal.com/aptitude-reasoning/quantitative-aptitude-arithmetic-ability-questions-and-answers.html>
2. <https://www.fresherslive.com/online-test/logical-reasoning-test/questions-and-answers>

COURSE OUTCOME(S):

CO508.1 Perform arithmetical operations with complex numbers

CO508.2 Explain the meanings of a relation defined on a set, an equivalent relation and a partition of a set

CO508.3 Calculate percentages in real life contexts , find any percentage of a given whole using their knowledge of fraction multiplication and increase / decrease a given whole by a percentage

CO508.4 Demonstrate the situations like motion in as straight line, Boats and Streams, Trains, Races and clocks

CO508.5 Evaluate the Counting techniques, Permutation and Combination, Recursion and generating functions

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1			3			1						
2	3							1				
3						3						
4	3							1				1
5	3		1			3						

1→Low 2→Medium 3→High

19GE5M03

INTELLECTUAL PROPERTY RIGHTS

L T P C

2 0 0 0

OBJECTIVE:

- To give an idea about IPR
- To learn the aspects of registration of IPR.
- To learn the agreements and legislations of IPR.
- To learn the digital products and Laws of IPR.
- To give an idea about the enforcements of IPR.

PRE-REQUISITE:

- NIL

UNIT I INTRODUCTION

6

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights,

Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs **6**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS **6**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW **6**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs **6**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL: 30PERIODS

TEXT BOOK(S):

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, —Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCE BOOK(S):

1. Deborah E. Bouchoux, —Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,||Intellectual Property Rights: Unleashing the Knowledge Economy||, McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

WEB RESOURCE(S):

1. <https://nptel.ac.in/courses>
2. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm

COURSE OUTCOME(S):

- C0502M.1 To understand an idea about IPR
- C0502M.2 To understand the aspects of registration of IPR.
- C0502M.3 To understand the agreements and legislations of IPR.
- C0502M.4 To understand the digital products and Laws of IPR.
- C0502M.5 To manage Intellectual Property portfolio to enhance the value of the firm.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1						3	2	3	2	3	2	2
2						3	2	3	2	3	2	2
3						3	2	3	2	3	2	2
4						3	2	3	2	3	2	2
5						3	2	3	2	3	2	2

1→Low 2→Medium 3→High

**PROFESSIONAL ELECTIVES I
INTERNET PROGRAMMING**

19CS5701

**L T P C
3 0 0 3**

OBJECTIVES:

1. To learn to design web pages using HTML5
2. To gain knowledge on creating interactive web pages using JavaScript, jQuery
3. To know to use Cascading Style Sheets (CSS) and DOM.
4. To study different technologies related to XML
5. To learn to develop server side scripting using PHP

PRE-REQUISITE:

- Java Programming, Object Oriented Programming Systems

UNIT I BASICS INTERNET PROTOCOLS, HTML5

9

Basic Internet Protocols - The World Wide Web - HTTP messages - Web servers and clients - Introduction to HTML5 - Editing HTML5 - W3C HTML validation service - Headings - Linking - Images - Special characters and horizontal rules - Lists - Tables - Forms - Internal linking - Meta elements - New HTML5 Form input types.

UNIT II CSS3, JAVASCRIPT 9

Types of CSS - Conflicting style sheets - Positioning Elements - Element Dimension - Box model and Text Flow - Media types - Media Queries - Drop-Down Menus - Text shadows - Introduction to JavaScript - Syntax - Variables and data types - JavaScript Control Statements - Operators - Literals - Functions - Objects - Arrays - Built in objects - Event handling.

UNIT III DOM 9

Introduction to the Document Object Model - DOM History and Levels - Intrinsic Event Handling - Modifying Element Style - The Document Tree - Properties of window - DOM Collections - JavaScript Event Handling - Reviewing the load, mousemove, mouseover, mouseout events - Form processing with focus, blur, submit, reset - Event Bubbling - More Events.

UNIT IV XML AND PHP 9

XML documents and vocabularies - XML versions and declarations - XML namespace - Representing data types : DTD, XML schema - XSLT - XPath - XQuery - Introduction to PHP - Converting Between Data Types - Arithmetic Operators - Initializing and Manipulating Arrays - String Comparisons - String Processing with Regular Expressions - Form Processing and Business Logic.

UNIT V AJAX AND WEB SERVICES 9

Ajax - Enabled rich internet applications with XML and JSON - Web Services Introduction - WCF Services Basics - SOAP - REST - JSON - Publishing and Consuming SOAP-Based Web Services, REST-Based XML Web Services, REST-Based JSON Web Services.

Total: 45 Periods

TEXT BOOK(S):

1. P.J.Deitel, H.M.Deitel, "Internet and World Wide Web - How to program", Pearson Education Publishers, Fifth Edition, 2009.
2. Jeffrey C. Jackson, "Web Technologies - A Computer Science Perspective", Pearson Education, 2007.

REFERENCE BOOK(S):

1. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, Fourth

Edition, 2007.

2. Kogent Learning Solutions Inc., “Html5 Black Book: Covers CSS3, JavaScript, XKL, XHTML, AJAX, PHP and jQuery”, Dreamtech Press, 2011.
3. Joe Fawcett, Danny Ayers, Liam R. E. Quin, “Beginning XML”, John Wiley & Sons Publisher, Fifth Edition, 2012
4. Bates, “Developing Web Applications”, Wiley, 2006.

WEB RESOURCE(S):

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

COURSE OUTCOME(S):

CO501.1 Develop website using HTML5

CO501.2 Create interactive web pages using JavaScript and CSS

CO501.3 Access and process various elements of web page using DOM

CO501.4 Represent web data using XML and perform translation using XSLT

CO501.5 Use AJAX and web services to develop interactive web applications

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		3			1			1		1	1
2	3	3	3			1			1		1	1
3	3		3			1			1		1	1
4	3	3	3			1			1		1	1
5	3	2	2			1			1		1	1

1→Low 2→Medium 3→High

19CS5702

DATABASE TUNING

**L T P C
3 0 0 3**

OBJECTIVES:

1. To get the feel of basics of database tuning
2. To learn concepts behind database design optimization
3. To write procedures involving query planning.
4. To learn about the tuning tools for different database operations.

2. <https://www.peruzal.com/database-and-web-application-performance-tuning-and-consulting>

COURSE OUTCOME(S):

To design databases involving normalization.

CO502.1 To write optimized code for accessing multiple databases.

CO502.2 To use tuning tools for different database operations.

CO502.3 To troubleshoot databases.

CO502.4 To use benchmark databases for demonstrating concepts behind database tuning.

CO502.5 To be able to write procedures involving query planning.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		3									
2	3		1									
3		2										
4	3		1									
5		3										

1→Low 2→Medium 3→High

19CS5703

DATA SCIENCE

L T P C

3 0 0 3

OBJECTIVES:

1. To learn about the data analytics life cycle
2. To understand the advanced analytical modeling
3. To know about the basic concept of data mining
4. To understand about the concept of correlation analysis
5. To learn the various classification techniques

PRE-REQUISITE:

- Artificial Intelligent, Microprocessor
- Microcontroller
- Database Management System

UNIT-I INTRODUCTION TO DATA SCIENCE

9

Introduction: Data Science -Epicycles of Analysis-Stating and Refining the Question- Exploratory Data Analysis- Using Models to Explore Data-Inference: A Primer- Formal Modeling-Inference vs. Prediction : Implications for Modeling Strategy -Interpreting results.

UNIT-II INTRODUCTION TO PROGRAMMING TOOLS FOR DATA SCIENCE

9

Python Basics – Types - Expressions and Variables - String Operations - Python Data Structures - Lists and Tuples – Sets – Dictionaries - Python Programming Fundamentals - Conditions and

Branching – Loops – Functions - Objects and Classes - Introduction of Essential Python Libraries – Numpy – Pandas – Matplotlib - Scikit-learn.

UNIT-III SUPERVISED LEARNING

9

Regression - Linear Regression - Logistic Regression - Reasons to Choose and Cautions - Additional Regression Models - Classification - Decision Trees – Na'ive Bayes – Diagnostics of Classifiers – Additional Classification Methods – Time Series Analysis – Overview of Time Series Analysis – ARIMA Model – Additional Methods – Case study with Python.

UNIT-IV UNSUPERVISED LEARNING

9

Clustering - Overview of Clustering – K-means - Additional Algorithms –Association Rules- Overview - A priori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Validation and Testing – Diagnostics - Text Analysis – Text Analysis Steps – Collecting Raw Text – Representing Text – Term Frequency-Inverse Document Frequency (TFIDF) - Categorizing Documents by Topics – Determining Sentiments – Gaining Insights - Case study with Python.

UNIT-V BIG DATA ANALYTICS

9

Data science in a Big Data world - Benefits and uses of data science and Big Data - Facets of data - The Big Data ecosystem and data science – Introduction of Hadoop - Handling large data on a single computer - The problems in handling large data - General techniques for handling large volumes of data - General programming tips for dealing with large datasets- Case study : Predicting malicious URLs, Recommender system - Steps in Big Data - Distributing data storage and processing with frameworks - Case study: Assessing loan risk.

Total: 45 Periods

TEXT BOOK(S):

1. Peng, R. D., & Matsui. E, The Art of Data Science- A Guide for Anyone Who Works with Data, Skybrude Consulting, 2015.
2. Martin Czygan, Phuong Vo.T.H, Getting Started with Python Data Analysis, Packt Publishing, 2015.

REFERENCE BOOK(S):

1. David Dietrich, Barry Heller & Beibei Yang, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, John Wiley & Sons, 2015.
2. Davy Cielen, Arno Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Manning Publications, 2016.
3. Joel Grus, Data science from scratch: first principles with python, O'Reilly Media, Inc., 2015.
4. Steven S. Skiena, The Data Science Design Manual, First Edition, Springer, 2017.

WEB RESOURCE(S):

1. <https://www.edureka.co/blog/what-is-data-science/>
2. <https://www.guru99.com/data-science-tutorial.html>

COURSE OUTCOME(S):

CO503.1 Able to do data analytics using R

CO503.2 To use different advanced modeling techniques

CO503.3 To apply preprocessing statistical methods for any given raw data

CO503.4 To differentiate various association and correlation methods

CO503.5` To examine the type of data to be mined and present a general classification of data

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		3		1							1
2	3	2										1
3		3	2									1
4	3	3										1
5	2	3										1

1→Low 2→Medium 3→High

19CS5704

OBJECT ORIENTED ANALYSIS AND DESIGN

L T P C

3 0 0 3

OBJECTIVES:

1. To gain basic knowledge in object oriented system.
2. To study the software design process.
3. To assess the unified process and Unified Modeling Language
4. To gain basic OO analysis and design skills through an elaborate case study
5. To learn the appropriate usage of design patterns

PRE-REQUISITE:

- Object Oriented Programming Systems

UNIT I INTRODUCTION

9

Basics of Object Oriented Concepts - Introduction to OOAD - UML - Unified Process(UP) phases - Agile modeling and UP – Agile Business modeling - Case study – the NextGen POS system

UNIT II INCEPTION AND STATIC MODELING

9

Inception - 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 activity diagrams and modeling

UNIT III DYNAMIC MODELING

9

System sequence diagrams – Communication diagrams - Relationship between sequence diagrams and use cases - Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams – relationship – inheritance – Abstract classes – polymorphism - Operation

contracts

UNIT IV DESIGN PATTERNS

9

Object Oriented Design Methodology – Common base class - GRASP: Designing objects with responsibilities– Patterns – Creator – Information expert – Low Coupling – Controller – High Cohesion – Designing for visibility - Applying GoF design patterns – adapter – singleton – factory -strategy – composite - facade - observer patterns

UNIT V IMPLEMENTATION AND APPLICATION

9

Mapping design to code – Test driven development – Refactoring – UML tools and UML as blueprint - UML state machine diagrams and modeling - UML deployment and component diagrams – Adopting Agile modeling on an UP project

Total: 45 Periods

TEXT BOOK(S):

1. Craig Larman, "Applying UML and Patterns: An Introduction to object- oriented Analysis and Design and iterative development", Third Edition, Pearson Education, 2012
2. Scott Ambler, "Agile Modeling: Effective Practices for eXtreme Programming and the Unified Process", Wiley Computer Publishing, 2002

REFERENCE BOOK(S):

1. Mike O'Docherty, "Object-Oriented Analysis & Design: Understanding SystemDevelopment with UML 2.0", 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.
4. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable object-oriented software", Addison-Wesley, 1995.

WEB RESOURCE(S):

1. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
2. <https://www.startertutorials.com/uml/category/ooad>

COURSE OUTCOME(S):

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

CO504.1 Create use case documents that capture requirements for a software system.

CO504.2 Create class diagrams that model both the domain model and design model of a

software system.

CO504.3 Create interaction diagrams that model the dynamic aspects of a software system.

CO504.4 Apply UML tools to address the real world problems with software solutions

CO504.5 Apply design patterns that facilitate development and evolution of new models

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		2									
2	3		2									
3	3		2									
4		3	1									
5		3	1									

1→Low 2→Medium 3→High

19CS5705

SYSTEM SOFTWARE

L T P C

3 0 0 3

OBJECTIVES:

1. To learn about assemblers and its design options.
2. To have a clear understanding about loaders and linkers
3. To learn the basic macro processor functions and emulators
4. To study about virtual machines.
5. To have a clear understanding of the implementations of system software

PRE-REQUISITE:

- Computer Architecture
- Microprocessor and Microcontroller

UNIT I ASSEMBLERS

12

Review of Computer Architecture – Machine Instructions and Programs – Assemblers –Basic Assembler Functions – Assembler Features – Assembler Design Options.

UNIT II LOADERS AND LINKERS

8

Loaders and Linkers – Basic Loader Functions – Machine-Dependent Loader Features – Machine-Independent Loader Features– Loader Design Options-Dynamic Linking and Loading- Object files- Contents of an object file – designing an object format – Null object formats- Code sections-

Relocation – Symbols and Relocation – Relocatable a.out- ELF.

UNIT III MACROPROCESSORS AND EMULATORS 7

Macroprocessors – Basic Macro Processor Functions – Machine-Independent Macro Processor Features – Macro Processor Design Options - Introduction to Virtual Machines (VM) - Emulation - basic Interpretation – Threaded Interpretation – Interpreting a complex instruction set – binary translation.

UNIT IV VIRTUAL MACHINES 9

Pascal P-Code VM – Object-Oriented VMs – Java VM Architecture – Common Language Infrastructure – Dynamic Class Loading.

UNIT V ADVANCED FEATURES 9

Instruction Set Issues – Profiling – Migration – Grids – Code optimizations- Garbage Collection - Examples of real world implementations of system software.

Total: 45 Periods

TEXT BOOK(S):

1. Leland L. Beck, “System Software”, 3rd ed., Pearson Education, 1997.
2. John R. Levine, “Linkers & Loaders”, Morgan Kauffman, 2003.
3. James E Smith and Ravi Nair, “Virtual Machines”, Elsevier, 2005.

REFERENCE BOOK(S):

1. Srimanta Pal, “ Systems Programming “ , Oxford University Press, 2011.
2. John J.Donovan, “ “Systems Programming”, Tata McGraw-Hill, 1991.

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/system-software/>
2. <http://ecomputernotes.com/fundamental/disk-operating-system/system-software>

COURSE OUTCOME(S):

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

CO505.1 Design program for simple assemblers.

CO505.2 To write a simple program on loaders and linkers

CO505.3 Have a clear idea about macroprocessor functions and emulators.

CO505.4 To have a clear idea about virtual machines.

CO505.5 Various implementations of system software will be known.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
-------	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------

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

1→Low 2→Medium 3→High

PROFESSIONAL ELECTIVES II

19CS5706

PRINCIPLES OF COMMUNICATIONS

L T P C

3 0 0 3

OBJECTIVES:

1. Understand analog communication techniques.
2. Understand digital communication techniques.
3. Learn data and pulse communication techniques.
4. Be familiarized with source and Error control coding.
5. Gain knowledge on multi-user radio communication.

PRE-REQUISITE:

- Digital Systems

UNIT I ANALOG COMMUNICATION

9

Noise: Source of Noise - External Noise- Internal Noise- Noise Calculation. Introduction to **Communication Systems:** Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of various Analog Communication System (AM – FM – PM).

UNIT II DIGITAL COMMUNICATION

9

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) – Phase Shift Keying (PSK)– BPSK – QPSK – 8 PSK – 16 PSK- Quadrature Amplitude modulation (QAM)–8QAM–16 QAM – Bandwidth Efficiency–Comparison of various Digital communication System (ASK – FSK – PSK – QAM).

UNIT III DATA AND PULSE COMMUNICATION 9

Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Error Detection and Correction Techniques - Data communication Hardware - serial and parallel interfaces.**Pulse Communication:** Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

UNIT IV SOURCE AND ERROR CONTROL CODING 9

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

UNIT V MULTI-USER RADIO COMMUNICATION 9

Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Hand - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.

Total: 45 Periods

TEXT BOOK(S):

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2009.

REFERENCE BOOK(S):

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3. H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2007.
5. Blake, “Electronic Communication Systems”, Thomson Delmar Publications, 2002.

6. Martin S.Roden, “Analog and Digital Communication System”, 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, “Digital Communication Fundamentals and Applications” 2 nd Edition Pearson Education 2007.

WEB RESOURCE(S):

1. https://www.tutorialspoint.com/digital_communication/digital_communication_analog_to_digital.htm
2. <https://www.ukessays.com/essays/engineering/analog-vs-digital-communication.php>

COURSE OUTCOME(S):

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

CO506.1 Apply analog communication techniques.

CO506.2 Apply digital communication techniques.

CO506.3 Use data and pulse communication techniques.

CO506.4 Analyze Source and Error control coding.

CO506.5 Utilize multi-user radio communication

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2										
2	3	2										
3	3	2	1									
4	3	2										
5	3	2	1									

1→Low 2→Medium 3→High

19CS5707

NETWORK DIRECTORY SERVICES

L T P C

3 0 0 3

OBJECTIVES:

1. To have a deep understanding of the common networking services like DNS and DHCP.
2. To know how to configure server roles with Active Directory Services in Windows Server 2008.
3. To know the physical components of Active Directory.
4. To know how to manage accounts, subnets, Site-Links, Group Policy, and DNS configuration with Active Directory Domain Services.
5. To learn about the backup and restore features in Active Directory Domain Services.

PRE-REQUISITE:

- Computer Networks

UNIT I INFORMATION AND RESOURCE SHARING

9

DNS, DNS architecture, Domain name spaces, Resource record , DNS database and query, Installation and configuration of DNS server, **DHCP**, DHCP architecture ,DHCP client and server responsibilities, Interaction between client and server,DHCP lease process, DHCP options, Installation and configuration of DHCP server.

UNIT II INTRODUCTION TO DIRECTORY

9

Introduction to Directory - Basic Concepts, Directory, Evolution of Active Directory Services, Microsoft Active Directory, LDAP, Common Terminologies and Active Server Concepts, Active Directory Structure and Storage Technologies, Roles of Active Directory Server, Features in Active Directory Server, Features of other Active Directory Services.

UNIT III ACTIVE DIRECTORY DOMAINS AND FORESTS

9

Active Directory Domains and Forests- Logical Structure of Active Directory, Benefits and components, Physical Structure of Active Directory, Domains, Forests, Network Ports.Installation of Active Directory Domain Services in Windows 2008 R2 – Requirements for Installation, Steps for installation and Uninstallation, Understanding of the Active directory domain services

functional levels, working with Installation

UNIT IV ACTIVE DIRECTORY ADMINISTRATION 9

Active Directory Administration - Active Directory Snap-ins and their functions, Active Directory Users and Computers, Active Directory Domains and Trusts, Active Directory Sites and Services, ADSI Edit, Schema Manager, Group Policy Management Console, Working with Active Directory Administration

UNIT V BACKUP/ RESTORE OF ACTIVE DIRECTORY 9

Active Directory - Backing up of Active Directory Domain Services, Recovering of Active Directory Domain Services, Working with Backup and Restore Facilities.

Total: 45 Periods

TEXT BOOK(S):

1. Timothy A. Howes Ph.D. (Author), Mark C. Smith , Understanding and Deploying LDAPDirectory Services Hardcover – 2nd edition ISBN-13: 978-0672334467.

REFERENCE BOOK(S):

1. Brian Desmond,Joe Richards, Robbie Allen, Alistair G.. Active Directory, Designing, Deploying, and Running Active Directory - Lowe-Norris Publisher: O'Reilly Media 5thEdition.
2. Jeremy Moskowitz, Group Policy: Fundamentals, Security, and the Managed Desktop3rd Edition

WEB RESOURCE(S):

1. <http://what-when-how.com/networking/directory-services-networking/>
2. <https://www.addictivetips.com/net-admin/network-directory/>

COURSE OUTCOME(S):

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

CO507.1 Demonstrate a deep understanding of the common networking serviceslike DNS and DHCP.

CO507.2 Describe and configure server roles with Active Directory Services in Windows Server 2008.

CO507.3 Explore the physical components of Active Directory.

CO507.4 Manage accounts, subnets, Site-Links, Group Policy, and DNS configuration with Active Directory Domain Services.

CO507.5 Examine backup and restore features in Active Directory Domain Services.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1									
2	3											
3	3		1									
4	3	2										
5	3	3										

1→Low 2→Medium 3→High

19CS5708

DESIGN PATTERNS

L T P C
3 0 0 3

OBJECTIVES:

1. To understand the common design patterns.
2. To learn to code using creational patterns.
3. To study the various structural patterns.
4. To learn to identify appropriate behavioral patterns.
5. To learn the architectural patterns for software architecture.

PRE-REQUISITE:

- Software Engineering

UNIT I INTRODUCTION TO DESIGN PATTERNS

9

Introduction - Design Pattern - Design Patterns in Smalltalk MVC - Describing Design patterns - Catalog of Design Patterns - Organizing the Catalog - How Design Patterns Solve Design Problems - How to select a Design Pattern - How to use a Design Pattern.

UNIT II CREATIONAL PATTERNS

9

Abstract Factory - Builder - Factory Method - Prototype - Singleton - Case Studies applying Creational Patterns

CO508.4 Select and apply suitable behavioral patterns in specific contexts.

CO508.5 Follow Architectural Patterns while deciding on the software architecture

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1									
2		2	1									
3			2									
4	3											
5	3	2										

1→Low 2→Medium 3→High

19CS5709

REAL TIME OPERATING SYSTEMS

L T P C

3 0 0 3

OBJECTIVES:

1. Explain the concepts, Characteristics and issues of Real-Time systems.
2. Apply the concepts of different Real-Time Scheduling algorithm, in Real-Time operating system environment.
3. Implement the concepts of buffering, mailbox, semaphore, critical section and dead lock avoidance in Real-Time Operating Systems.
4. Explain the features of Real-Time Operating System as Commercial Real-Time Operating Systems.
5. Identify the role of Real-Time operating system in Contemporary Real-Time Operating Systems.

PRE-REQUISITE:

- Operating System Concepts

UNIT I BASIC REAL-TIME CONCEPTS

9

Basic real-time concepts- Real- Time system design Issues-Example Real-Time Systems-Real-Time Operating systems-Real-Time Kernels- Pre-emptive-Priority systems- HybridSystems- The Task-Control Block Model- Characteristics of Real-Time Systems- Types of Real-Time Tasks.

UNIT II REAL-TIME TASK SCHEDULING 9

Real-Time Task Scheduling -Process scheduling, Round Robin Scheduling-Cyclic Executives-Fixed-Priority Scheduling-Rate-Monotonic approach- Dynamic-Priority Scheduling: Earliest-Deadline –First approach

UNIT III INTER COMMUNICATION AND SYNCHRONIZATION 9

Buffering data-Time-Relative Buffering-Ring buffers- Mail boxes-Mailbox Implementation-Queues-Critical Regions.- Semaphores-Mailboxes and semaphores- Deadlock-Deadlockavoidance-The bankers algorithm-Priority Inversion- Priority inheritance Protocol.

UNIT IV COMMERCIAL REAL-TIME OPERATING SYSTEMS 9

Commercial Real-Time Operating Systems- Features of a Real-Time Operating System- Unix as a Real-Time Operating System- Unix-Based Real-Time systems- Windows as a Real-Time Operating system

UNIT V POSIX 9

Case Study:- POSIX- Open software-Genesis of POSIX- Overview of POSIX-Real-Time POSIX Standard- Survey of Contemporary Real-Time Operating Systems-PSOS-VRTXVxWorks-QNX- μ C/OS-II-RT Linux.

Total: 45 Periods

TEXT BOOK(S):

1. Philip A. Laplante, “Real time systems design and analysis” –,Third Edition.IEEE Press-Wiley India-Copyright 2005 and reprint -2010.
2. Rajib Mall –“Real-Time Systems” Theory and Practice-copy right 2007-Pearson Education

REFERENCE BOOK(S):

1. Allan. V. Shaw, “Real Time systems and software”, John Wiley & Sons(4,5)
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Prentice Hall of India - Indian Edition – 1995.
3. Wayne Wolf, “Computers as Components: Principles of Embedded Computing System

Design”, Elsevier Inc ,2001,(4,5)

4. C.M. Krishna, Kang G. Shin, “Real–Time Systems”, McGraw – Hill International Editions, 1997.
5. Raymond J.A.Bhur, Donald L.Bailey, “An Introduction to Real Time Systems”, PHI 1999
6. R.J.A Buhur, D.L Bailey, “An Introduction to Real – Time Systems”, Prentice – Hall International, 1999.

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/real-time-systems/>
2. <https://www.guru99.com/real-time-operating-system.html>

COURSE OUTCOME(S):

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

CO509.1 Explain the concepts, Characteristics and issues of Real-Time systems.

CO509.2 Apply the concepts of different Real-Time Scheduling algorithm, in Real-Time operating system environment.

CO509.3 Implement the concepts of buffering, mailbox, semaphore, critical section and dead lock avoidance in Real-Time Operating Systems.

CO509.4 Explain the features of Real-Time Operating System as Commercial Real-Time Operating Systems.

CO509.5 Identify the role of Real-Time operating system in Contemporary Real-Time Operating Systems

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2		3	1									
3			3									
4	3											
5		3										

1→Low 2→Medium 3→High

19CS5710

MOBILE APPLICATION DEVELOPMENT

L T P C
3 0 0 3

OBJECTIVES:

1. To understand the difference between mobile based application and conventional application
2. To learn to design user interface for Mobile applications
3. To learn to develop simple Android based mobile applications
4. To learn to integrate database with an Android Application
5. To be familiar with mobile frame works like IOS, windows and blackberry

PRE-REQUISITE:

- Object Oriented Programming System
- Software Engineering

UNIT I INTRODUCTION

9

Brief History of Mobile Software Development - Mobile Web Vs. Mobile App - Hardware and Software for different Mobile frameworks - Difference between Mobile and Desktop applications.

UNIT II USER INTERFACE DESIGN

9

Mobile Application users - Basic Design principles - Mobile Information Design - Mobile Platforms: Android, IOS, BlackberryOS, WindowsPhone.

APPLICATION DEVELOPMENT FOR ANDROID-I

9

UNIT III

Android Platform - Different SDKs and their growth - Android Architecture - Android Development Environment Setup - Anatomy of Android Application - Views & Layouts - List View - Adapters - HTTP Connection initiation.

UNIT IV APPLICATION DEVELOPMENT FOR ANDROID-II

9

Database Integration - Android Preferences - Broadcast Receivers - Content providers - Usage of different sensors – Services - intent filters.

UNIT V OTHER MOBILE FRAMEWORKS

9

IOS - Objective C Basics - a simple App in IOS - Windows Phone basics - Simple Application in Windows Phone - Blackberry basics - Simple Application in Blackberry - Introduction to Cross-platform Mobile Application development.

Total: 45 Periods

TEXT BOOK(S):

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox,2012

REFERENCE BOOK(S):

1. Joseph Annuzzi, Jr.,LaurenDarcey, Shane Conder “Introduction to Android™ Application Development, Addison-Wesley, Fourth Edition, 2014
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012

WEB RESOURCE(S):

1. <https://searcharchitecture.techtarget.com/definition/mobile-application-development>
2. https://www.tutorialspoint.com/mobile_development_tutorials.htm

COURSE OUTCOME(S):

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

CO510.1 Explore the differences between mobile based application and conventional application

CO510.2 Design UI in the context of mobile application

CO510.3 Develop mobile applications for Android

CO510.4 Write Android application involving integration of sensors, connectivity to database, etc.

CO510.5 Write simple App for IOS, blackberry and Windows phone.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2			2									
3		2	2									
4	3	2	1									
5		2	1									

1→Low 2→Medium 3→High

19CS6601

COMPILER DESIGN

L T P C
3 0 0 3

OBJECTIVES:

- Acquire knowledge in different phases of a Compiler and its applications.
- Understand the implementation of lexical analyzer.
- Understand the implementation of parsers
- Understand the intermediate code generation for a compiler
- Familiar with the code generation schemes and optimization methods

PRE-REQUISITE:

- Computer Organization and Micro Processors
- Object Oriented Programming
- Assembly Language Programming Lab
- Theory of Computation

UNIT I INTRODUCTION TO COMPILER 8

Language processors - Structure of a compiler - Grouping of phases into passes- Compiler construction tools - Applications of compiler technology: Implementation of high-level programming languages - Optimizations for computer architectures-Design of new computer architecture - Program Translations-Software productivity tools

UNIT II LEXICAL ANALYSIS 9

Lexical Analysis: Role of Lexical Analyzer - Input Buffering - Specification of tokens - Recognition of Tokens -The Lexical-Analyzer Generator Lex - Finite automata - Regular expression to finite automation-Optimization of DFA based Pattern Matchers.

UNIT III SYNTAX ANALYSIS 11

Introduction-Role of the parser - Context-Free Grammars -Writing a Grammar-Top Down parsing - Recursive Descent Parsing - Nonrecursive Predictive Parsing - Bottom-up parsing - Shift Reduce Parsing-LR Parsers: Simple LR Parser - Canonical LR Parser - LALR Parser - Parser generator Yacc.

UNIT IV INTERMEDIATE CODE GENERATION 8

Variants of Syntax Trees -Three-Address Code - Types and Declarations - Translation of Expressions - Control Flow -Backpatching - Switch-Statements - Intermediate Code for Procedures

UNIT V CODE GENERATION 9

Issues in the Design of a Code Generator - The Target Language - Addresses in the Target Code - Basic Blocks and Flow Graphs - Optimization of Basic Blocks - A Simple Code Generator - Peephole Optimization- Principal Sources of Optimization

Total: 45 Periods

TEXT BOOK(S):

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Second Edition, Pearson Education, 2009.

REFERENCE BOOK(S):

1. Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman Compilers: Principles, Techniques and Tools , 2nd Edition, Pearson, 2012.
2. D. Grune, H.E. Bal, C.J.H. Jacobs, K.G. Langendoen, Modern Compiler Design, Wiley, 2008
3. Kenneth C. Loudon, Compiler Construction Principles and Practice. New Delhi: Vikas publishing House, 2003.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2003.

WEB RESOURCE(S):

1. https://www.tutorialspoint.com/compiler_design/index.htm
2. <https://www.geeksforgeeks.org/introduction-of-compiler-design/>

COURSE OUTCOME(S):

CO601.1 Analyze the output generated in each phase of the compiler

CO601.2 Construct a lexical analyzer for regular expressions

CO601.3 Construct Top down and Bottom up parser for context free grammars

CO601.4 Generate intermediate code for programming constructs

CO601.5 Apply optimization techniques in code generation

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1		3						1				2
2			3						1			
3			3							1		2
4	2		2									
5	2		1					1				2

1→Low 2→Medium 3→High

19CS6602

CRYPTOGRAPHY AND NETWORK SECURITY

L T P C
3 0 0 3

OBJECTIVES:

- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems.
- Understand the concept of hash functions and digital signature.

PRE-REQUISITE:

- Computer Networks

UNIT I INTRODUCTION 10

Introduction: Services, Mechanisms and Attacks, OSI Security Architecture, Model for Network Security. Authentication and Authorization: Biometrics, Password, Challenge Response. Confidentiality: General Cipher model, classical encryption techniques, private-key cipher model - block cipher and stream cipher operations, public-key cipher model, attacks on cryptosystems

UNIT II BLOCK CIPHERS & STREAM CIPHERS MECHANISMS 10

Block Cipher Mechanisms: DES, Block cipher modes of operation. Introduction to Finite Fields: Groups, Rings and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Advanced Encryption Standard, Blowfish. Stream Cipher Mechanisms: RC4 Stream Cipher, Key Distribution - Diffie Hellman Key Exchange, Pseudo Random Number Generation.

UNIT III PUBLIC KEY CRYPTOGRAPHY 8

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.

UNIT IV DATA INTEGRITY AND NON-REPUDIATION 8

Data Integrity: Message Authentication Codes, Hash functions, MD5 Message Digest Algorithm. Non-Repudiation: Digital Signature and Digital Signature Standard.

UNIT V NETWORK SECURITY PRACTICES 9

Authentication Application - Kerberos, Electronic Mail Security - PGP, IP Security - IP Security Architecture. Web Security- Secure Socket Layer and Transport layer, Secure Electronic Transaction. System Security: Intruders, Malicious Software, Firewalls.

Total: 45 Periods

TEXT BOOK(S):

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

REFERENCE BOOK(S):

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007.
2. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
3. Charles Pfleeger, “Security in Computing”, 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, “Internet Security Protocols”, Pearson Education Asia, 2000.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication in Public World”, PHI 2002.
6. Bruce Schneier and Neils Ferguson, “Practical Cryptography”, First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
7. Douglas R Simson “Cryptography – Theory and practice”, First Edition, CRC Press, 1995

WEB RESOURCE(S):

1. <http://williamstallings.com/Cryptography/Crypto7e-Student/>
2. <https://www.geeksforgeeks.org/system-security/>

COURSE OUTCOME(S):

- C0602.1 Explain the need for Security Services and Mechanisms to thwart the threats and vulnerabilities of information systems.
- C0602.2 Explain the theory of fundamental cryptography, encryption, and decryption algorithms.
- C0602.3 Illustrate various Public key cryptographic techniques
- C0602.4 Apply cryptographic algorithms and Hash algorithms to ensure data secrecy and data integrity.
- C0602.5 Analyze the authentication applications.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	1									
2	3	1	1									
3	3		1									

4	3	3	3									
5	3	3	3									

1→Low 2→Medium 3→High

19CS6603 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING L T P C
3 0 0 3

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To introduce students to the basic concepts and techniques of Machine Learning.
- To study the various reinforcement learning techniques

PRE-REQUISITE:

- Discrete Mathematics and Combinatorics
- Probability and Statistics
- Computer Organization and Micro Processors

UNIT I PROBLEM SOLVING AGENTS AND STRATEGIES 9

Introduction - Agents –problem characteristics- Problem formulation - uninformed search strategies - heuristics -Informed search strategies - constraint satisfaction.

UNIT II LOGICAL REASONING 9

Knowledge representation -Production based system, Frame based system. - Propositional logic - inferences - first-order logic - inferences in first orderlogic - forward chaining - backward chaining - unification – resolution.

UNIT III PLANNING 9

Planning with state-space search –nonlinear planning- partial-order planning - planning graphs – Strips -Advanced plan generation systems -planning andacting in the real world.

UNIT IV TREE AND RULE BASED MODELS 9

Decision trees – learning decision trees – probability estimation trees – regression trees –learning ordered rule lists – learning unordered rule lists – descriptive rule learning –association rule mining.

Case Studies

UNIT V REINFORCEMENT LEARNING

9

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming– temporal - difference learning – active reinforcement learning – Generalization in reinforcement learning – policy search. Case Studies

Total: 45 Periods

TEXT BOOK(S):

1. S. Russel, P. Norvig, “Artificial Intelligence - A Modern Approach”, 3rd Edition, Pearson Education Ltd., 2014.
2. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
3. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.

REFERENCE BOOK(S):

1. David Poole, Alan Mackworth and Randy Goebel, “Computational Intelligence: A logical approach”, Oxford University Press, 2004.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problemsolving”, 4th Edition, Pearson Education, 2002.
3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998.
4. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/how-artificial-intelligence-ai-and-machine-learning-ml-transforming-endpoint-security/>
2. <https://towardsdatascience.com/notes-on-artificial-intelligence-ai-machine-learning-ml-and-deep-learning-dl-for-56e51a2071c2>

COURSE OUTCOME(S):

CO603.1 Comprehend different types of problem solving agents and its applications.

CO603.2 Solve problems using informed and uninformed search strategies.

CO603.3 Appreciate the concept of planning.

CO603.4 Understand the learning algorithms for tree and rule-based models.

CO603.5 Validate importance of reinforcement learning techniques

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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1	3											
2			3									
3	3	2										
4	3											
5		3	2									

1→Low 2→Medium 3→High

19CS6611 MOBILE APPLICATION DEVELOPMENT LABORATORY

L T P C

0 0 4 2

OBJECTIVES:

- Understand the concept of components and structure of mobile application development
- Understand how to work with various mobile application development frameworks.
- Know the important design concepts and issues of development of mobile applications.
- Know to develop a app that consists of GUI Components, Layouts, Event Listeners
- Understand the concept behind RSS feed and creating graphical primitives on the screen

PRE-REQUISITE:

- Problem Solving using Computers
- Object Oriented Programming

LIST OF EXPERIMENTS:

1. Study experiment on developing a mobile app
2. Development of an application that uses GUI components, Font and Colors.
3. Study experiment on the concept of Layout Managers and event listeners
4. Development of an application that uses Layout Managers and event listeners.
5. Development of a native calculator application.
6. Study experiment on the concept of developing graphical primitives and RSS feed
7. Write an application that draws basic graphical primitives on the screen.
8. Development of an application that makes use of RSS Feed.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock

COURSE OUTCOME(S):

CO611.1 Deploy applications to hand-held devices

CO611.2 Implement the important design concepts and issues of development of mobile applications.

CO611.3 Develop a app that consists of GUI Components, Layouts, Event Listeners

CO611.4 Develop a app that creates RSS feed, graphical primitives on the screen

CO611.5 Able to develop applications by their own

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3		1	2		1	2	1		1
2	3	3	3		1	2		1	2	1		1
3	3	3	3		1				2	1		1
4	3	3	3		1	1			2	1		1
5	3	3	3		1			1	2	1		1

1→Low 2→Medium 3→High

19GE6M01

HUMAN RIGHTS

L T P C
20 0 0

OBJECTIVES:

- To sensitize the Engineering students to various aspects of Human Rights.
- To learn the evolutions in Human Rights.
- To learn the UN Laws of Human Rights.
- To learn the constitutional Provisions of Human rights in India.
- To learn the Human rights of disadvantaged people.

PRE-REQUISITE:

NIL

UNIT I

6

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **6**
 Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948.Theories of Human Rights.

UNIT III **6**
 Theories and perspectives of UN Laws – UN Agencies to monitor and compliance

UNIT IV **6**
 Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **6**
 Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO’s, Media, Educational Institutions, Social Movements.

TOTAL: 30 PERIODS

REFERENCE BOOKS(S):

1. Kapoor S.K., -Human Rights under International law and Indian Laws, Central Law Agency, Allahabad, 2014.
2. Chandra U., -Human Rights, Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

WEB RESOURCE(S):

1. <https://swayam.gov.in/>
2. https://www.tutorialspoint.com/indian_polity/indian_polity_fundamental_rights.htm

COURSE OUTCOME(S):

- CO602.1 To sensitize the Engineering students to various aspects of Human Rights.
- CO602.2 To learn the evolutions in Human Rights.
- CO602.3 To learn the UN Laws of Human Rights.
- CO602.4 To learn the constitutional Provisions of Human rights in India.
- CO602.5 To learn the Human rights of disadvantaged people.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3				3	3					
2	3	2				3	3					
3	3	2				3	3					
4	3					3	3					
5	3					3	3					

1→Low 2→Medium 3→High

PROFESSIONAL ELECTIVES III

19CS6701

HIGH PERFORMANCE NETWORKS

L T P C

3 0 0 3

OBJECTIVES:

- To develop a comprehensive understanding of multimedia networking.
- To study the types of VPN and tunneling protocols for security.
- To learn about network security in many layers and network management.

PRE-REQUISITE:

- Computer Networks

UNIT I INTRODUCTION

9

Review of OSI, TCP/IP; Multiplexing, Modes of Communication, Switching, Routing. SONET – DWDM – DSL – ISDN – BISDN, ATM.

UNIT II MULTIMEDIA NETWORKING APPLICATIONS

9

Streaming stored Audio and Video – Best effort service – protocols for real time interactive applications – Beyond best effort – scheduling and policing mechanism – integrated services – RSVP- differentiated services.

UNIT III ADVANCED NETWORKS CONCEPTS

9

VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN. MPLS -operation, Routing, Tunneling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections.

UNIT IV TRAFFIC MODELLING

9

Little's theorem, Need for modeling, Poisson modeling and its failure, Non - poisson models, Network performance evaluation.

UNIT V NETWORK SECURITY AND MANAGEMENT

9

Principles of cryptography – Authentication – integrity – key distribution and certification – Access control and: fire walls – attacks and counter measures – security in many layers. Infrastructure for network management – The internet standard management framework – SMI, MIB, SNMP, Security and administration – ASN 1

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. J.F. Kurose & K.W. Ross, "Computer Networking- A top down approach featuring the internet", Pearson, 2nd edition, 2003.
2. Walrand .J. Varatya, High performance communication network, Morgan Kauffman –

Harcourt Asia Pvt. Ltd. 2nd Edition, 2000.

REFERENCE BOOK(S):

1. LEOM-GarCIA, WIDJAJA, “Communication networks”, TMH seventh reprint 2002.
2. Aunurag kumar, D. MANjunath, Joy kuri, “Communication Networking”, Morgan KaufmannPublishers, 1ed 2004.
3. Hersent Gurle & petit, “IP Telephony, packet Pored Multimedia communication Systems”, Pearson education 2003.
4. Fred Halsall and Lingana Gouda Kulkarni, ”Computer Networking and the Internet” fifth edition, Pearson education
5. Nader F.Mir ,Computer and Communication Networks, first edition.
6. Larry I.Peterson & Bruce S.David, “Computer Networks: A System Approach”- 1996

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <http://www.protocols.com/pbook/tepip1.html>

COURSE OUTCOME(S):

- CO601.1 To understand the high performance network Architectures
- CO601.2 To apply the multimedia networking in real time applications.
- CO601.3 To understand the virtual Private Networks.
- CO601.4 To understand the traffic modelling for QoS network models.
- CO601.5 To ensure the security in high performance network applications.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3	2	1									
3	3	2										
4	3	2		1								
5	3	2	1	1								

1→Low 2→Medium 3→High

19CS6702

DIGITAL SIGNAL PROCESSING

L T P C
3 0 0 3

OBJECTIVES:

1. To understand the basics of discrete time signals, systems and their classifications.
2. To analyze the discrete time signals in both time and frequency domain.
3. To design lowpass digital IIR filters according to predefined specifications based on analog filter theory and analog-to-digital filter transformation.
4. To design Linear phase digital FIR filters using fourier method, window technique
5. To realize the concept and usage of DSP in various engineering fields

PRE-REQUISITE:

- Digital systems

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS

9

Introduction to DSP – Basic elements of DSP– Sampling of Continuous time signals– Representation, Operation and Classification of Discrete Time Signal–Classification of Discrete Time Systems–Discrete Convolution: Linear and Circular–Correlation.

UNIT II ANALYSIS OF LTI DISCRETE TIME SIGNALS AND SYSTEMS

9

Analysis of LTI Discrete Time Systems using DFT–Properties of DFT–Inverse DFT– Analysis of LTI Discrete Time Systems using FFT Algorithms– Inverse DFT using FFT Algorithm.

UNIT III INFINITE IMPULSE RESPONSE FILTERS

9

Frequency response of Analog and Digital IIR filters–Realization of IIR filter–Design of analog low pass filter–Analog to Digital filter Transformation using Bilinear Transformation and Impulse Invariant method–Design of digital IIR filters (LPF, HPF, BPF, and BRF) using various transformation techniques.

UNIT IV FINITE IMPULSE RESPONSE FILTERS

9

Linear Phase FIR filter–Phase delay–Group delay–Realization of FIR filter–Design of Causal and Non-causal FIR filters (LPF, HPF, BPF and BRF) using Window method (Rectangular, Hamming window, Hanning window) –Frequency Sampling Technique.

UNIT V APPLICATIONS OF DSP

9

Multirate Signal Processing: Decimation, Interpolation, Spectrum of the sampled signal –Processing of Audio and Radar signal

Total: 45 Periods

TEXT BOOK(S):

1. John G. Proakis & Dimitris G.Manolakis, —Digital Signal Processing – Principles, Algorithms & Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCE BOOK(S):

1. Richard G. Lyons, —*Understanding Digital Signal Processing*. Second Edition, Pearson Education.
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, —*Discrete-Time Signal Processing*, 8th Indian Reprint, Pearson, 2004.
3. Emmanuel C.Ifeachor, & Barrie.W.Jervis, —*Digital Signal Processing*, Second Edition, Pearson Education / Prentice Hall, 2002.
4. William D. Stanley, —*Digital Signal Processing*, Second Edition, Reston Publications.

WEB RESOURCE(S):

1. https://www.tutorialspoint.com/digital_signal_processing/index.htm
2. <https://www.wisdomjobs.com/e-university/digital-signal-processing-tutorial-1984.html>

COURSE OUTCOME(S):

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

CO602.1 Perform mathematical operations on signals.

CO602.2 Understand the sampling theorem and perform sampling on continuous-time signals to get discrete time signal by applying advanced knowledge of the sampling theory.

CO602.3 Transform the time domain signal into frequency domain signal and vice-versa.

CO602.4 Apply the relevant theoretical knowledge to design the digital IIR/FIR filters for the given analog specifications

CO602.5 Apply the concept of DSP in various fields

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1										

2	3											
3	3		1									
4	3	1										
5	3		1									

1→Low 2→Medium 3→High

19CS6703

DISTRIBUTED AND PARALLEL SYSTEMS

L T P C
3 0 0 3

OBJECTIVES:

- To learn about concepts of parallel algorithm.
- To understand about the concepts of examples of distributed systems.
- To learn about the objects and file system of distributed system.
- To understand about the Operating system that supports distributed system.
- To learn about the multimedia distribution system.

PRE-REQUISITE :

- Computer Network
- Operating Systems

UNIT I PRINCIPLES OF PARALLEL ALGORITHM DESIGN 9

Decomposition techniques, Characteristics of Tasks and Interactions, Mapping techniques for load Balancing, Parallel Algorithm models, Principles of Message-Passing Programming, MPI.

UNIT II INTRODUCTION TO DISTRIBUTED SYSTEMS 9

Introduction to Distributed systems-examples of distributed systems- resource sharing and the web challenges-architectural models- fundamental models – Introduction to inter-process communications external data representation and marshalling- client server communication-group communication – Case study: IPC in UNIX

UNIT III DISTRIBUTED OBJECTS AND FILE SYSTEM 9

Introduction – Communication between distributed objects – Remote procedure call – Events and notifications – Java RMI case Study – 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.

UNIT IV DISTRIBUTED OPERATING SYSTEM SUPPORT 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

UNIT V DISTRIBUTED TRANSACTIONS, REPLICATION AND MULTIMEDIA

SYSTEMS

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 – Introduction to Distributed Multimedia systems – Characteristics of multimedia data-Quality of Service management .

TOTAL: 45 PERIODS

TEXT BOOK(S):

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(S):

1. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007..
2. Mukesh Singhal and N. G. Shivaratri, —Advanced Concepts in Operating Systems, McGraw-Hill, 2011

WEB RESOURCE(S):

1. <http://www-unix.mcs.anl.gov/dbpp/text/book.html>
2. <https://computing.llnl.gov/tutorials/mpi/>
3. <http://mpitutorial.com/beginner-mpi-tutorial/>
4. <http://www.mcs.anl.gov/research/projects/mpi/tutorial/mpiintro/ppframe.htm>
5. <http://www.tldp.org/LDP/lpg/node7.html>

COURSE OUTCOME(S):

CO603.1: Apply parallel program design techniques.

CO603.2: Explain how to access remote objects.

CO603.3: Understand how to work in the distributed environment.

CO603.4: Explain synchronization of distributed events using common global clocks.

CO603.5: Outline the issues involved in distributed transactions.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3		1									
3		2										
4			2									
5	3	1										

1→Low 2→Medium 3→High

19CS6704

MOBILE COMPUTING AND COMMUNICATIONS

**L T P C
3 0 0 3**

OBJECTIVES:

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system .
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

PRE-REQUISITE :

- Computer Network

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

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

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.

UNIT IV MOBILE TRANSPORT AND APPLICATION LAYER

9

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

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 – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

TOTAL: 45 PERIODS

TEXT BOOK(S):

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(S):

1. Dharma Prakash Agarwal, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, 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.Toh, —AdHoc Mobile Wireless Networks, First Edition, Pearson Education, 2002.

WEB RESOURCE(S):

1. Android Developers : <http://developer.android.com/index.html>
2. Apple Developer : <https://developer.apple.com/>
3. Windows Phone DevCenter : <http://developer.windowsphone.com>
4. BlackBerry Developer : <http://developer.blackberry.com>

COURSE OUTCOME(S):

- CO604.1: Explain the basics of mobile telecommunication systems
 CO604.2 Illustrate the generations of telecommunication systems in wireless networks
 CO604.3 Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
 CO604. 4 Explain the functionality of Transport and Application layers
 CO604.5 Develop a mobile application using android/blackberry/ios/Windows SDK

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3	1										
3	3	2										
4	3											
5	3		2									

1→Low 2→Medium 3→High

19CS6705

SOFTWARE TESTING

L T P C

3 0 0 3

OBJECTIVES:

1. Expose the criteria for test cases.
2. Learn the design of test cases.
3. Be familiar with test management and test automation techniques.

4. Be exposed to test metrics and measurements.
5. To develop and validate test plan

PRE-REQUISITE:

- Software Engineering

UNIT I INTRODUCTION 9

Testing as an Engineering Activity – Testing as a Process – Testing axioms – Basic definitions – Software Testing Principles – The Tester’s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support of Developing a Defect Repository – Defect Prevention strategies.

UNIT II TEST CASE DESIGN 9

Test case Design Strategies – Using Black Bod Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis – Equivalence Class Partitioning – Statebased testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs.structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Evaluating Test Adequacy Criteria.

UNIT III LEVELS OF TESTING 9

The need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing.

UNIT IV TEST MANAGEMENT 9

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items –

test management – test process – Reporting Test Results – The role of three groups in Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

UNIT V TEST AUTOMATION

9

Software test automation – skill needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

Total: 45 Periods

TEXT BOOK(S):

1. Srinivasan Desikan and Gopaldaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCE BOOK(S):

1. Ilene Burnstein, “Practical Software Testing”, Springer International Edition, 2003.
2. Edward Kit,” Software Testing in the Real World – Improving the Process”, Pearson Education,1995.
3. Boris Beizer,” Software Testing Techniques” – 2nd Edition, Van Nostrand Reinhold, New York,1990.
4. Aditya P. Mathur, “Foundations of Software Testing _ Fundamental Algorithms and Techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/software-testing-basics/>
2. https://www.tutorialspoint.com/software_testing/index.htm

COURSE OUTCOME(S):

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

CO605.1 Design test cases suitable for a software development for different domains.

CO605.2 Identify suitable tests to be carried out.

CO605.3 Prepare test planning based on the document.

CO605.4 Document test plans and test cases designed.

CO605.5 Use of automatic testing tools

UNIT III ARCHITECTING AND DESIGNING ENTERPRISE APPLICATION 9

Architecture, Views and Viewpoints - Enterprise Application - An Enterprise Architecture Perspective -Logical Architecture - Technical Architecture and Design - Data Architecture and Design – InfrastructureArchitecture and Design

UNIT IV CONSTRUCTING ENTERPRISE APPLICATIONS 9

Construction Readiness - Introduction to Software Construction Map - Constructing the Solution Layers -Code Review - Static Code Analysis - Build Process and Unit Testing.

UNIT V TESTING AND ROLLING OUT ENTERPRISE APPLICATIONS 9

Testing Enterprise Applications - Enterprise Application Environments -Integration Testing – SystemTesting - User Acceptance Testing

Total: 45 Periods

REFERENCE BOOK(S):

1. Anubhav Pradhan, B.Satheesha Nanjappa, Senthil Nallasamy and E.Veerakumar, "RaisingEnterprise Applications : A Software Engineering Perspective", Wiley India Pvt Ltd, 2010
2. Paul J Perrone, Venkata S.R. Krishna R and Chayanti, "Building Java Enterprise Systems withJ2EE", Techmedia , New Delhi, 2000.
3. Tom Valesky - "Enterprise Java Beans" - Addison Wesley Longman Inc. New Delhi, 2000.
4. Ed Roman - "Mastering EJB" - John Wiley & Sons, New Delhi, 2001.

WEB RESOURCE(S):

1. <https://docs.oracle.com/javaee/6/firstcup/doc/gcrky.html>
2. <https://www.tutorialspoint.com/ejb/index.htm>

COURSE OUTCOME(S):

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

CO606.1 Identify the functional units in developing an enterprise application.

CO606.2 Apply the integrated information systems used in an enterprise for identifying the activities involved in incepting an enterprise application.

CO606.3 Construct and manage large-scale computing systems for an organization.

CO606.4 Analyze the skills required to understand a business environment.

CO606.5 Analyze the testing on enterprise environment to develop an application.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2		2										
3			1									
4	1	2										
5	1	2										

1→Low 2→Medium 3→High

19CS6707 COMPUTATION INTELLIGENCE AND OPTIMIZATION TECHNIQUES

**L T P C
3 0 0 3**

OBJECTIVES:

1. To provide a strong foundation on fundamental concepts in Computational Intelligence.
2. To enable Problem-solving through various searching techniques.
3. To apply these techniques in applications which involve perception, reasoning and learning.
4. To apply Computational Intelligence techniques for information retrieval
5. To apply Computational Intelligence techniques primarily for machine learning.

PRE-REQUISITE:

- Artificial Intelligence

UNIT I INTRODUCTION 9

Introduction to Artificial Intelligence-Search-Heuristic Search-A* algorithm-Game Playing- Alpha-BetaPruning-Expert systems-Inference-Rules-Forward Chaining and Backward Chaining-GeneticAlgorithms.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING 9

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

UNIT III UNCERTAINTY 9
Non monotonic reasoning-Fuzzy Logic-Fuzzy rules-fuzzy inference-Temporal Logic-TemporalReasoning-Neural Networks-Neuro-fuzzy Inference.

UNIT IV LEARNING 9
Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and ApproximateInference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning -Learning Decision Trees – Regression and Classification with Linear Models - Artificial NeuralNetworks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning withComplete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

UNIT V INTELLIGENCE AND APPLICATIONS 9
Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis-Ailapplications – Language Models - Information Retrieval – Information Extraction – MachineTranslation – Machine Learning - Symbol-Based – Machine Learning: Connectionist – MachineLearning.

Total: 45 Periods

TEXT BOOK(S):

1. Stuart Russell, Peter Norvig, —Artificial Intelligence: A Modern Approach, Third Edition, Pearson Education / Prentice Hall of India, 2010.
2. Elaine Rich and Kevin Knight, —Artificial Intelligence, Third Edition, Tata McGraw-Hill, 2010.

REFERENCE BOOK(S):

1. Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.
2. Dan W.Patterson, —Introduction to Artificial Intelligence and Expert Systems, PHI, 2006.
3. Nils J. Nilsson, —Artificial Intelligence: A new Synthesis, Harcourt Asia Pvt. Ltd., 2000

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/>
2. <https://www.geeksforgeeks.org/machine-learning-versus-artificial-intelligence/>

COURSE OUTCOME(S):

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

- CO607.1 Provide a basic exposition to the goals and methods of Computational Intelligence.
- CO607.2 Study of the design of intelligent computational techniques.
- CO607.3 Apply the Intelligent techniques for problem solving
- CO607.4 Improve problem solving skills using the acquired knowledge in the areas of, reasoning, natural language understanding.
- CO607.5 Improve problem solving skills using the computer vision, automatic programming and machine learning.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3											
3		3										
4		2										
5		2	1									

1→Low 2→Medium 3→High

19CS6708

CYBER SECURITY

L T P C

3 0 0 3

OBJECTIVES:

- To provide students with a practical and theoretical knowledge of cryptography and network security.

PRE-REQUISITE:

- Networking

UNIT I INTRODUCTION

9

Introduction to Cyber Security- Importance and challenges in Cyber Security-Cyberspace-Cyber threats- Cyberwarfare-CIA Triad-Cyber Terrorism- Cyber Security of Critical Infrastructure- Cybersecurity - 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 FORENSICS AND AUDITING 9

Introduction to Cyber Forensics- Computer Equipment and associated storage media- Role of forensics Investigator- Forensics Investigation Process- Collecting Network based Evidence- Writing Computer Forensics Reports- Auditing- Plan an audit against a set of audit criteria- Information Security Management System Management- Introduction to ISO 27001:2013.

UNIT V CYBER ETHICS AND LAWS 9

Introduction to Cyber Laws-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: 45 Periods

REFERENCE BOOK(S):

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyberdefense 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 RESOURCE(S):

1. <https://www.geeksforgeeks.org/tag/cyber-security/>
2. <https://nptel.ac.in/courses/106106129/>

COURSE OUTCOME(S):

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

- CO608.1 Importance of Cyber Security
- CO608.2 Challenges in Cyber Security
- CO608.3 Finding the importance of ethical hacking tools
- CO608.4 Understanding the ethical hacking process
- CO608.5 Implementing ethical hacking tools in an organization

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1										
2	3	3	1									
3		3	1									
4	3											
5	3		3									

1→Low 2→Medium 3→High

19CS6709

INTRODUCTION TO IOT AND ITS APPLICATIONS

**L T P C
3 0 0 3**

OBJECTIVES:

1. To understand the fundamentals of Internet of Things
2. To learn about the basics of IOT protocols
3. To build a small low cost embedded system using Raspberry Pi.
4. To apply the concept of Internet of Things in the real world scenario.

PRE-REQUISITE:

- Information security

UNIT I INTRODUCTION TO IoT 9
 Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IOTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE 9
 M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model- IoT reference architecture

UNIT III IoT PROTOCOLS 9
 Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO 9
 Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS 9

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs – Cloudfor IoT - Amazon Web Services for IoT.

Total: 45 Periods

REFERENCE BOOK(S):

1. ArshdeepBahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
3. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
4. Jan Hoeller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012

WEB RESOURCE(S):

1. <https://nptel.ac.in/courses/108108098/>
2. <https://www.geeksforgeeks.org/the-role-of-artificial-intelligence-in-internet-of-things/>

COURSE OUTCOME(S):

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

- CO609.1 Analyze various protocols for IoT
- CO609.2 Develop web services to access/control IoT devices.
- CO609.3 Design a portable IoT using Raspberry Pi
- CO609.4 Deploy an IoT application and connect to the cloud.
- CO609.5 Analyze applications of IoT in real time scenario

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2										
2		3	2									
3	3		3									
4			3									
5		3										

1→Low 2→Medium 3→High

19CS6710

AGILE SOFTWARE DEVELOPMENT

**L T P C
3 0 0 3**

OBJECTIVES:

1. Understanding of what Agility means, when and why to employ Agile development
2. The pitfalls, issues and common mistakes to watch out for
3. To cover key methodologies including Scrum and Kanban
4. Tools and scenarios to introduce Agile to your organization effectively.

PRE-REQUISITE:

- SoftwareEngineering

UNIT I

INTRODUCTION

9

Classification of methods- Introduction and background- Agile Manifesto and Principles- Overview of Scrum- Extreme Programming- Feature Driven development- Lean Software Development- Agile project management- Design and development practices in Agile projects- Test Driven Development- Continuous Integration- Refactoring- Pair Programming- Simple Design- User Stories-Agile Testing- Agile Tools.

UNIT II

EXISTING AGILE METHODS

9

Introduction to Scrum-Project phases- Agile Estimation- Planning game- Product backlog- Sprint backlog-Iteration planning- Initial Stages of Building a Requirement Document-Techniques for Requirements Elicitation- Burn down chart- Sprint planning and retrospective-Daily scrum-Scrum roles – Product Owner-Scrum Master-Scrum Team- Tools for Agile project management.

UNIT III

COMPARISONS OF AGILE MODELS

9

User story definition-Characteristics and content of user stories-Agile design practices- Role of design Principles including Single Responsibility Principle- Open Closed Principle- Need and significance of Refactoring- Refactoring Techniques- Continuous Integration.

UNIT IV

OPEN SOURCE SOFTWARE DEVELOPMENT

9

The Agile lifecycle and its impact on testing- The agile alliances- Test-Driven Development (TDD)- Testing user stories - acceptance tests and scenarios- Planning and managing testing cycle-Test automation- Tools to support the Agile tester-Agile testing – Nine principles and six concrete practices for testing on agile teams.

UNIT V

AGILE TECHNOLOGIES AND APPLICATION

9

Market scenario and adoption of Agile- Roles in an Agile project-Agile applicability-Agile in Distributed teams- Business benefits- Challenges in Agile- Risks and Mitigation-Agile projects on

Cloud- Balancing Agility with Discipline-Agile rapid development technologies.

Total: 45 Periods

TEXT BOOKS:

1. Agile Software Development with Scrum by Ken Schawber, Mike Beedle Publisher: Pearson
2. Agile Software Development, Principles, Patterns and Practices by Robert C. Martin Publisher: Prentice Hall

REFERENCE BOOK(S):

1. Agile Testing: A Practical Guide for Testers and Agile Teams by Lisa Crispin, Janet Gregory Publisher: Addison Wesley:
2. Agile Software Development: The Cooperative Game By Alistair Cockburn Publisher: Addison Wesley.
3. User Stories Applied: For Agile Software by Mike Cohn

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/agile-software-process-and-its-principles/>
2. <https://www.geeksforgeeks.org/software-engineering-agile-software-development/>

COURSE OUTCOME(S):

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

- CO610.1 Perform Scrum Release Planning, and Scrum Sprint Planning.
- CO610.2 Deconstruct user stories into tasks and ideal day estimates.
- CO610.3 End a Sprint with Sprint Reviews and Sprint Retrospectives.
- CO610.4 Use Scrum with multiple, or distributed, project teams.
- CO610.5 Easily pass any Certified Scrum Master certification class.

PO Vs CO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1		3	1									
2	3											
3	3	1										
4		3	2									
5	3											

1→Low 2→Medium 3→High

19CS7601

GRAPHICS AND MULTIMEDIA

L T P C
3 0 0 3

OBJECTIVES:

- To appreciate the importance of technical ability and creativity within design practice and to appreciate illumination and color models
- To understand the two-dimensional graphics, their transformations and clipping techniques.
- To understand the three-dimensional graphics, their transformations and clipping techniques.
- To become familiar with various software programs used in the creation and implementation of multi- media
- To become familiar with Blender Graphics

PRE-REQUISITE:

- Principles of programming languages

UNIT I ILLUMINATION AND COLOR MODELS

9

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection. Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT II TWO-DIMENSIONAL GRAPHICS

9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III THREE-DIMENSIONAL GRAPHICS

9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING

9

Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval technologies.

UNIT V HYPERMEDIA

9

Multimedia authoring and user interface - Hypermedia messaging -Mobile messaging – Hypermedia message component – Creating hypermedia message – Integrated multimedia message standards – Integrated document management – Distributed multimedia systems.CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modelling – Shading & Textures

TOTAL: 45PERIODS

TEXT BOOK(S):

1. Donald Hearn and Pauline Baker M, —Computer Graphics", Prentice Hall, New Delhi, 2007 [UNIT I – III]
2. Andleigh, P. K and Kiran Thakrar, —Multimedia Systems and Design, PHI, 2003. [UNIT IV, V]

REFERENCE BOOK(S):

1. Judith Jeffcoate, —Multimedia in practice: Technology and Applications, PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, —Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnell, —Computer Graphics: Theory into Practice, Jones and Bartlett Publishers, 2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan , 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, —Fundamentals of Computer Graphics, CRC Press, 2010.
6. William M. Newman and Robert F.Sproull, —Principles of Interactive Computer Graphics, Mc Graw Hill 1978.

WEB RESOURCE(S):

1. <https://www.blender.org/support/tutorials/>
2. https://en.wikipedia.org/wiki/Computer_graphics

COURSE OUTCOME(S):

- CO701.1 Apply Illumination and color models.
- CO701.2 Design two dimensional graphics and apply two dimensional transformations.
- CO701.3 Design three dimensional graphics and apply three dimensional transformations.
- CO701.4 Understood Different types of Multimedia File Format
- CO701.5 Design Basic 3d Scenes using Blender

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3						2			1
2	3	1	1						1			1
3	3	3	2		2				2			1
4	3	3	3		1				1			2
5	2	1	3		2				2			1

1→Low 2→Medium 3→High

19CS7602

SOFTWARE PROJECT MANAGEMENT

LTPC

3 003

OBJECTIVES:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization's strategic goals.

PRE-REQUISITE:

- Fundamentals of computing
- Software Engineering

UNIT I PROJECT EVALUATION AND PROJECT PLANNING

9

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION

9

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT

9

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT IV PROJECT MANAGEMENT AND CONTROL

9

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT V STAFFING IN SOFTWARE PROJECTS

9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCE BOOK(S):

1. Robert K. Wysocki —Effective Software Project Management— Wiley Publication, 2011.
2. Walker Royce: —Software Project Management— Addison-Wesley, 1998.
3. Gopalswamy Ramesh, —Managing Global Software Projects— McGraw Hill Education (India), Fourteenth Reprint 2013

WEB RESOURCE(S):

1. [en.wikipedia.org](http://en.wikipedia.org/wiki/Software_project_management) › wiki › Software_project_management
2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm

COURSE OUTCOMES:

- CO702.1 To understand Project Management principles while developing software.
- CO702.2 To gain extensive knowledge about the basic project management concepts, framework and the process models.
- CO702.3 To obtain adequate knowledge about software process models and software effort estimation techniques.
- CO702.4 To define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- CO702.5 To learn staff selection process and the issues related to people management

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1	1	1						3	
2	3	2	1	1	1						3	
3	3	2	1	1	1						3	
4	3	2	1	1	1						3	
5		1	1	1	1						3	

1→Low 2→Medium 3→High

19CS7611 GRAPHICS AND MULTIMEDIA LABORATORY

**L T P C
0 03 2**

OBJECTIVES:

- To develop graphics programming
- Be exposed to creation of 3D graphical scenes using open graphics library suits
- Be familiar with image manipulation, enhancement
- Learn to create animations
- To create a multimedia presentation/Game/Project

PRE-REQUISITE:

- Basic Understanding of Computer Programming and related Programming Paradigms

LIST OF EXPERIMENTS:

IMPLEMENT THE EXERCISES USING C / OPENGL / JAVA

1. Implementation of Algorithms for drawing 2D Primitives – Line
 - (DDA, Bresenham) – all slopes
 - Circle (Midpoint)
2. 2D Geometric transformations –
 - Translation
 - Rotation Scaling
 - Reflection Shear
 - Window-Viewport
3. Composite 2D Transformations
4. Line Clipping
5. 3D Transformations - Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes.

8. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
9. 2D Animation – To create Interactive animation using any authoring tool.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- CO711.1 Create 2D graphical scenes using open graphics library suits
- CO711.2 Create 3D Transformations and 3D Projections
- CO711.3 Be familiar with Line Clipping
- CO711.4 Implement image manipulation and enhancement
- CO711.5 Create 2D animations using tools

REFERENCE:

1. www.edx.org › learn › computer-graphics
2. www.coursera.org › courses › query=computer graphics

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE

C, C++, Java, OpenGL

HARDWARE:

Standalone desktops - 30 Nos.

(or)

Server supporting 30 terminals or more.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3		2							2
2	3	3	2	2	1				2		1	1
3	2	3	3		3					1		2
4	2	3	2	2	2				2	2	2	2
5	3	3	1	1	2				2	1		2

1→Low 2→Medium 3→High

19CS7911

TECHNICAL SEMINAR

L T P C

0 0 2 1

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 three 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: 30 Periods

OUTCOMES:

- Ability to review, prepare and present technological developments.
- Ability to face the placement interviews.

PROFESSIONAL ELECTIVES V

19CS7701

DATA MINING

L T P C

3 0 0 3

OBJECTIVES:

- To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- To expose the students to the concepts of Data warehousing Architecture and Implementation
- To study the overview of developing areas – Web mining, Text mining and ethical aspects of Data mining
- To identify Business applications and Trends of Data mining

PRE-REQUISITE:

- Data Base Management Systems and Data Structure.

UNIT I INTRODUCTION TO DATA WAREHOUSING

8

Evolution of Decision Support Systems- Data warehousing Components – Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations

UNIT II DATA WAREHOUSE PROCESS AND ARCHITECTURE

9

Types of OLAP servers, 3-Tier data warehouse architecture, distributed and virtual datawarehouses. Data warehouse implementation, tuning and testing of data warehouse. Data Staging

(ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS

UNIT III INTRODUCTION TO DATA MINING

9

Data mining-KDD versus datamining, Stages of the Data Mining Process-task primitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns- association-correlation

UNIT IV CLASSIFICATION AND CLUSTERING

10

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Clustering techniques – , Partitioning methods- k-means- Hierarchical Methods – distance based agglomerative and divisible clustering, Density-Based Methods – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis

UNIT V PREDICTIVE MODELING OF BIG DATA AND TRENDS IN DATA MINING

9

Statistics and Data Analysis – EDA – Small and Big Data –Logistic Regression Model – Ordinary Regression Model-Mining complex data objects – Spatial databases – Temporal databases – Multimedia databases – Time series and sequence data – Text mining – Web mining – Applications in Data mining

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition 2011, ISBN: 1558604898.
2. Alex Berson and Stephen J. Smith, “ Data Warehousing, Data Mining & OLAP”, Tata McGraw Hill Edition, Tenth Reprint 2007.
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Data Mining: Practical Machine Learning Tools and Techniques, Third edition, (Then Morgan Kaufmann series in Data Management systems), Ian.H.Witten, Eibe Frank and Mark.A.Hall, 2011
5. Statistical and Machine learning – Learning Data Mining, techniques for better Predictive Modeling and Analysis to Big Data

REFERENCE BOOK(S):

1. Mehmed Kantardzic, “Data Mining concepts, models, methods, and algorithms”, Wiley Interscience, 2003.
2. Ian Witten, Eibe Frank, Data Mining; Practical Machine Learning Tools and Techniques, third edition, Morgan Kaufmann, 2011.
3. George M Marakas, Modern Data Warehousing, Mining and Visualization, Prentice Hall, 2003.

WEB RESOURCE(S):

1. www.nptel.ac.in

2. www.tutorialspoint.com/data_mining/dm_mining

COURSE OUTCOME(S):

CO701.1 To Understand the components of Data warehouse

CO701.2 To Understand the concepts of data Mining

CO701.3 Evolve Multidimensional Intelligent model from typical system

CO701.4 Discover the knowledge imbibed in the high dimensional system

CO701.5 Evaluate various mining techniques on complex data objects

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3			1								
2	3			1								
3	3	2	2	1								
4	3	2	2	1								
5	3	2	2	1								

1→Low 2→Medium 3→High

19CS7702

DIGITAL IMAGE PROCESSING

L T P C

3 0 0 3

OBJECTIVES:

- Understand fundamentals of digital images
- Learn different image transforms
- Study concept of segmentation
- To study about color image processing
- To study about image compression

PRE-REQUISITE:

- Digital Systems
- Computer Graphics

UNIT I DIGITAL IMAGE FUNDAMENTALS

9

A simple image model, Sampling and Quantization, Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images. Basic concepts of digital distances, distance transform, medial axis transform, component labeling, thinning, morphological processing, extension to gray scale morphology.

UNIT II IMAGE TRANSFORMS

9

1D DFT, 2D transforms - DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet transform.

UNIT III SEGMENTATION OF GRAY LEVEL IMAGES

9

Histogram of gray level images, multilevel thresholding, Optimal thresholding using Bayesian classification, Watershed and Dam Construction algorithms for segmenting gray level image. Detection of edges and lines: First order and second order edge operators, multi-scale edge detection, Canny's edge detection algorithm, Hough transform for detecting lines and curves, edge linking

UNIT VI IMAGE ENHANCEMENT AND COLOR IMAGE PROCESSING

9

Point processing, Spatial Filtering, Frequency domain filtering, multi-spectral image enhancement, image restoration. Color Representation, Laws of color matching, chromaticity diagram, color enhancement, color image segmentation, color edge detection, color demosaicing.

UNIT V IMAGE COMPRESSION

9

Lossy and lossless compression schemes, prediction based compression schemes, vector quantization, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme.

TOTAL: 45 PERIODS

REFERENCE BOOKS(S):

1. A.K. Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall, Addison-Wesley, 1989.
2. B. Jähne, “Practical Handbook on Image Processing for Scientific Applications“, CRC Press,1997.
3. Bernd Jähne, Digital Image Processing, Springer-Verlag Berlin Heidelberg 2005.
4. Bovik (ed.), “Handbook of Image and Video Processing”, Academic Press, 2000.
5. Gonzalez and Woods, Digital Image Processing, Prentice-Hall.
6. J. C. Russ. The Image Processing Handbook. CRC, Boca Raton, FL, 4th edn., 2002.
7. J. S. Lim, “Two-dimensional Signal and Image Processing” Prentice-Hall, 1990.
8. M. Petrou, P. Bosdogianni, “Image Processing, The Fundamentals“, Wiley, 1999.
9. Rudra Pratap, Getting Started With MATLAB 7. Oxford University Press, 2006
10. Stephane Marchand-Maillet, Yazid M. Sharaiha, Binary Digital Image Processing, A Discrete Approach, Academic Press, 2000.
11. W. K. Pratt. Digital image processing, PIKS Inside. Wiley, New York, 3rd, edn., 2001.

WEB RESOURCE(S):

1. www.nptel.ac.in
2. www.tutorialspoint.com/dip/index.html

COURSE OUTCOMES:

CO702.1 To know and understand the basics and fundamentals of digital image processing such as digitization, sampling, quantization and 2D transforms.

CO702.2 To Operate transformations on images.

CO702.3 To Learn the basics of segmentation, feature extraction, compression and recognition methods for color models.

CO702.4 To understand the image processing algorithms.

CO702.5 To understand image compression schemes.

PO vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1			1						
2	3	2	1			1						
3	3	2	1			1						
4	3	2	1			1						
5	3	2	1	1		1						

1→Low 2→Medium 3→High

19CS7703

INFORMATION RETRIEVAL SYSTEM

L T P C

3 0 0 3

OBJECTIVES:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations.
- To learn different techniques of recommender system.

PRE-REQUISITE:

- Data Base Management Systems

UNIT I INTRODUCTION

9

Information Retrieval – Early Developments – The IR Problem – The User_s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT II MODELING AND RETRIEVAL EVALUATION

9

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION AND CLUSTERING

9

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT IV WEB RETRIEVAL AND WEB CRAWLING

9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM

9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, —Recommender Systems Handbook, First Edition, 2011.

REFERENCE BOOKS(S):

1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <http://lisbdnet.com/online-information-retrieval-syste>

COURSE OUTCOME(S):

CO703.1 To understand the evolution of information retrieval.

CO703.2 Use an open source search engine framework and explore its capabilities

CO703.3 Apply appropriate method of classification or clustering.

CO703.4 Design and implement innovative features in a search engine.

CO703.5 Design and implement a recommender system.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3			1								

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

1→Low 2→Medium 3→High

19CS7704

CLOUD COMPUTING

L T P C

3 0 0 3

OBJECTIVES

- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To expose the students to the frontier areas of Cloud Computing
- To motivate students to do programming and experiment with the various cloud computing environments
- To shed light on the Security issues in Cloud Computing
- To introduce about the Cloud Standards

PRE-REQUISITE:

- Operating systems
- Networking

UNIT I

9

History of Centralized and Distributed Computing - Overview of Distributed Computing, Cluster computing, Grid computing. Technologies for Network based systems- System models for Distributed and cloud computing- Software environments for distributed systems and clouds.

UNIT II

9

Introduction to Cloud Computing- Cloud issues and challenges - Properties - Characteristics - Service models, Deployment models. Cloud resources: Network and API - Virtual and Physical computational resources - Data-storage. Virtualization concepts - Types of Virtualization- Introduction to Various Hypervisors - High Availability (HA)/Disaster Recovery (DR) using Virtualization, Moving VMs .

UNIT III

9

Service models - Infrastructure as a Service (IaaS) - Resource Virtualization: Server, Storage, Network - Case studies. Platform as a Service (PaaS) - Cloud platform & Management: Computation, Storage - Case studies. Software as a Service (SaaS) - Web services - Web 2.0 - Web OS - Case studies – Anything as a service (XaaS).

UNIT IV

9

Cloud Programming and Software Environments – Parallel and Distributed Programming paradigms – Programming on Amazon AWS and Microsoft Azure – Programming support of Google App Engine – Emerging Cloud software Environment.

UNIT V

9

Cloud Access: authentication, authorization and accounting - Cloud Provenance and meta-data - Cloud Reliability and fault-tolerance - Cloud Security, privacy, policy and compliance- Cloud federation, interoperability and standards.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1.Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, “Distributed and cloud computing from Parallel Processing to the Internet of Things”, Morgan Kaufmann, Elsevier – 2012

REFERENCE BOOKS(S):

1. Barrie Sosinsky, “ Cloud Computing Bible” John Wiley & Sons, 2010
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance, O'Reilly 2009

WEB RESOURCE(S):

1. www.nptel.ac.in
2. [Http://guru99.com/cloud-computing-service-provider.html](http://guru99.com/cloud-computing-service-provider.html)

COURSE OUTCOME(S):

CO704.1 Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing

CO704.2 Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.

CO704.3 Explain the core issues of cloud computing such as security, privacy, and interoperability.

CO704.4 Provide the appropriate cloud computing solutions and recommendations according to the applications used.

CO704.5 Collaboratively research and write a research paper, and present the research online.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2		1								
2	3	2	1	1								
3	3	2	1	1								
4	3	2	1	2	2		1					
5	3	2	1	3	1		1					

1→Low 2→Medium 3→High

19CS7705

5G COMMUNICATIONS

L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept of 5G
- To understand about the RF front end for 5G.
- To have knowledge on the various 5G waveforms.
- To be familiar Networking of 5G.
- To appreciate the emergence of the applications and evaluation of 5G

PRE-REQUISITE:

- Computer Networks, Wireless

UNIT I INTRODUCTION AND ROADMAP TO 5G 8

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 WAVEFORMS AND CHANNEL MODELS 10

5G Radio Access Technologies: Design principles - Multi-carrier with filtering - Nonorthogonal Multiple Access - Radio access for dense deployments – 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 backhauling - Bufferaided 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: 45Periods

REFERENCES:

1. Wei Xiang, Kan Zheng, Xuemin (Sherman) Shen, - 5G Mobile Communications, Springer, 2017.
2. Afif Osseiran, Jose F. Monserrat and Patrick Marsch, - 5G Mobile and Wireless Communications Technology, CambridgeUniversity Press, 2016.
3. Jonathan rodriguez, - Fundamentals of 5G mobile networks, John Wiley & Sons, Ltd, 2015.

WEB RESOURCE(S):

www.nptel.ac.in

COURSE OUTCOME(S):

CO705.1 Articulate the 5G use cases and System Concepts ,5G Architecture and building blocks.

CO705.2 Learn the key and enabling technologies that help in the development of 5G.

CO705.3 Develop the ability to understand and use the 5G waveforms and channel models.

CO705.4 Explain the core concepts of networking in 5G.

CO705.5 Explain the evaluation and applications of 5G and the new challenges in 5G Modelling.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2									
2	3	3	2									
3	3	3	2									
4	3	3	2									
5	3	3	2									

1→Low 2→Medium 3→High

19CS7707

**PROFESSIONAL ELECTIVES VI
REAL TIME EMBEDDED SYSTEMS**

**L T P C
3 0 0 3**

OBJECTIVES:

- Learn the architecture and programming of ARM processor
- Be familiar with the embedded computing platform design and analysis
- Be exposed to the basic concepts of real time Operating system
- Learn the system design techniques and networks for embedded systems.
- Apply the concepts in the real time scenario

PRE-REQUISITE:

- Digital Electronics
- Basic Computer Engineering
- Computer Architecture
- Communication Systems

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and micro processors– Embedded system design process –Design example: Modeltrain controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and outputsupervisormode, exceptions and traps – Co-processors- Memory system mechanisms – CPUperformance- CPU power consumption.

UNIT I EMBEDDED COMPUTING PLATFORM DESIGN 9

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs-Models of programs- Assembly, linking and loading – compilation techniques- Program levelperformance analysis – Software performance optimization – Program level energy and poweranalysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-timeoperating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluatingoperating system performance- power optimization strategies for processes – Example Real timeoperating systems-POSIX-Windows CE.

UNIT IV SYSTEM DESIGN TECHNIQUES AND NETWORKS 9

Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis andarchitecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs andshared memory multiprocessors.

UNIT V CASE STUDY 9

Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera – Telephoneanswering machine-Engine control unit – Video accelerator.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Third Edition “Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCE BOOKS(S):

1. Jonathan W.Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
2. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
3. Raymond J.A. Buhr, Donald L.Bailey, “An Introduction to Real-Time Systems- From Design to Networking with C/C++”, Prentice Hall, 1999.
4. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, International Editions, Mc Graw Hill 1997
5. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, DreamTech Press, 2005.
6. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc Graw Hill, 2004.

WEB RESOURCE(S):

1. www.nptel.ac.in
2. https://www.tutorialspoint.com/embedded_systems/index.htm

COURSE OUTCOME(S):

- CO707.1 Describe the architecture and programming of ARM processor.
- CO707.2 Outline the concepts of embedded systems.
- CO707.3 Explain the basic concepts of real time Operating system design.
- CO707.4 Use the system design techniques to develop software for embedded systems
- CO707.5 Differentiate between the general purpose operating system and the real time operatingsystem
- CO707.6 Model real-time applications using embedded-system concepts

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	3									
2	3	2	2		2							
3	3	2			2							
4	3	2	3		1							
5	3	2		2			1					

1→Low 2→Medium 3→High

19CS7708

DEEP LEARNING ESSENTIALS

LTPC

3003

OBJECTIVES:

- Gain knowledge in Machine Learning Basics
- Understand and apply Optimization on Deep Models and Networks
- Understand and analyze Recurrent and Recursive Networks
- Understand the representation of neural networks in machine learning
- Understand the recursive Networks and natural language Processing.

PRE-REQUISITE:

- Linear Algebra
- Probability
- Statistics
- Programming and Data Analytics

UNIT I INTRODUCTION

Historical Trends in Deep Learning, Linear Algebra: Scalars - Vectors - Matrices - Tensors - Matrices - Norms – Eigendecomposition -Probability and Information Theory: Random variable and distributed Probability - Bayes Rule - Information Theory and structured probabilistic models.

UNIT II MACHINE LEARNING BASICS

10

Numerical Computation: Overflow and Underflow - Gradient based Optimization - Constrained Optimization - Learning Algorithms: Capacity - Overfitting - Under fitting - Bayesian Classification -Supervised - unsupervised algorithms - Building machine learning algorithm.

UNIT III ADVANCED NEURAL NETWORKS

9

Deep Feed forward Networks : Gradient based learning - Hidden Units - Architectural design - Back Propagation algorithms - Regularization for deep learning: Dataset Augmentation - Noise Robustes -Semi supervised learning - Multitask learning - Adserial training.

UNIT IV OPTIMIZATION ON DEEP MODELS

9

Optimization for training Deep Models: Challenges in Neural Networks optimization - Basic Algorithms - Algorithms Adaptive learning Rates - Approximate Second Order Methods - Optimization Strategies and Meta Algorithms - Convolutional Networks: Motivation - Structured Output - Unsupervised features - Neuroscientific basics for Convolutional Networks.

UNIT V RECURRENT AND RECURSIVE NETWORKS

9

Computational graphs - Recurrent Neural networks - Bidirectional RNN - Deep Recurrent Networks - Echo State Networks - Practical Methodology - Applications: Large Scale Deep Learning - Computer Vision - Speech Recognition - Natural language Processing, Case studies in classification, Regression and deep networks.

TOTAL: 45 HOURS

REFERENCE BOOKS(S):

1. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Interscience. 2nd Edition. 2001
2. Theodoridis, S. and Koutroubas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
3. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.
4. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
5. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer. 2001.

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/machine-learning/>
2. https://www.tutorialspoint.com/artificial_neural_network/index.htm

COURSE OUTCOME(S):

CO708.1 Analyze Deep learning Mathematical Models

CO708.2 Explore the Basic fundamentals of Machine Learning Algorithms

CO708.3 Understand the Deep Feedforward Networks

CO708.4 Apply knowledge for Optimization on Deep Models and Convolutional Networks

CO708.5 Elucidate the Recurrent and Recursive Networks and Natural language Processing

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1		2										
2	3	2										
3	3	2	1									
4	3			2	1							
5		2	1	2	1							

1→Low 2→Medium 3→High

19CS7709

RESOURCE OPTIMIZATION TECHNIQUES

L T P C
3 0 0 3

OBJECTIVES:

- Be familiar with resource management techniques.
- Learn to solve problems in linear programming and Integer programming.
- Be exposed to CPM and PERT.

PRE-REQUISITE:

- Design and Analysis of Algorithms
- Computer Networks

UNIT I LINEAR PROGRAMMING

9

Principal components of decision problem – Modeling phases – LP Formulation and graphic solution –Resource allocation problems – Simplex method

UNIT II DUALITY AND NETWORKS

9

Definition of dual problem – Primal – Dual relation ships – Dual simplex methods – Post optimalityanalysis – Transportation and assignment model - Shortest route problem.

UNIT III INTEGER PROGRAMMING

9

Cutting plan algorithm – Branch and bound methods-Simple problems.

UNIT IV CLASSICAL OPTIMISATION THEORY

9

Unconstrained external problems, Newton – Ralphson method – Equality constraints – Jacobean methods – Lagrangian method – Kuhn – Tucker conditions – Simple problems.

UNIT V OBJECT SCHEDULING

9

Network diagram representation – Critical path method – Time charts and resource leveling – PERT.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. H.A. Taha, “Operation Research”, Prentice Hall of India, 2002.

REFERENCE BOOKS(S):

1. Paneer Selvam, „Operations Research“, Prentice Hall of India, 2002
2. Anderson „Quantitative Methods for Business“, 8th Edition, Thomson Learning, 2002.
3. Winston „Operation Research“, Thomson Learning, 2003.
4. Vohra, „Quantitative Techniques in Management“, Tata Mc Graw Hill, 2002.
5. Anand Sarma, „Operation Research“, Himalaya Publishing House, 2003.

WEB RESOURCE(S):

1. https://www.tutorialspoint.com/linear_programming/index.asp
2. www.nptel.ac.in

COURSE OUTCOME(S):

- CO709.1 Solve optimization problems using simplex method.
 CO709.2 Solve optimization problems using Dual simplex method.
 CO709.3 Apply integer programming and linear programming to solve real-life applications.
 CO709.4 Apply Classical Optimization Theory to solve real-life applications.
 CO709.5 Use PERT and CPM for problems in project management

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2									1	
2	3	2									1	
3	3	2	2								1	
4	3	2	1								1	
5	3	2	1									

1→Low 2→Medium 3→High

19CS7710

CYBER FORENSICS AND ITS TOOLS

**L T P C
3 0 0 3**

OBJECTIVES:

- To learn computer forensics
- To become familiar with forensics tools
- To learn to analyze and validate forensics data
- To learn about the ethical hacking
- To learn to analyze the ethical hacking in web.

PRE-REQUISITE:

- Computer Networks
- Operating Systems

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 45 PERIODS

TEXT BOOK(S):

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Stuart, —Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCE BOOK(S) :

1. John R. Vacca, —Computer Forensics, Cengage Learning, 2005
2. Marjie T. Britz, —Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Prentice Hall, 2013.
3. Ankit Fadia — Ethical Hacking, Second Edition, Macmillan India Ltd, 2006
4. Kenneth C. Brancik —Insider Computer Fraud, Auerbach Publications Taylor & Francis Group–2008

WEB RESOURCE(S):

1. www.nptel.ac.in

COURSE OUTCOMES:

- CO710.1 Understand the basics of computer forensics
CO710.2 Apply a number of different computer forensic tools to a given scenario
CO710.3 Analyze and validate forensics data
CO710.4 Identify the vulnerabilities in a given network infrastructure

CO710.5 Implement real-world hacking techniques to test system security

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2	2								
2	3	3	2	2								
3	3	3	2	2								
4	3	3	2	2								
5	3	3	2	2								

1→Low 2→Medium 3→High

19CS7711 DATA ANALYTICS USING R

**L T P C
3 00 3**

OBJECTIVES:

- Be exposed to big data
- Learn the different ways of Data Analysis
- Be familiar with data streams
- Learn the mining and clustering
- Be familiar with the visualization

PRE-REQUISITE:

- Object Oriented Programming
- Programming in C
- C++ or Java

UNIT I INTRODUCTION TO BIG DATA

8

Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Statistical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT II DATA ANALYSIS

12

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlineardynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT III MINING DATA STREAMS

8

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime Analytics Platform (RTAP) applications - case studies - real time sentiment analysis, stock market predictions.

UNIT IV FREQUENT ITEMSETS AND CLUSTERING

9

Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

UNIT V FRAMEWORKS AND VISUALIZATION

8

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed filesystems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

REFERENCE BOOKS(S):

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

WEB RESOURCE(S):

1. www.nptel.ac.in

2. https://www.tutorialspoint.com/data_mining/dm_cluster_analysis.htm

COURSE OUTCOME(S):

- CO711.1 Apply the statistical analysis methods.
 CO711.2 Compare and contrast various soft computing frameworks.
 CO711.3 Design distributed file systems.
 CO711.4 Apply Stream data model.
 CO711.5 Use Visualization techniques

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3				2							
2	2	2	1		2							
3	3		1		1							
4	3				2							
5	3		1		1							

1→Low 2→Medium 3→High

19CS7712 **PROFESSIONAL ELECTIVES VII** **L T P C**
BLOCK CHAIN TECHNOLOGIES **3 0 0 3**

OBJECTIVES:

- To learn about the concept of block chain
- To learn about the applications and design methodology of block chain
- To learn about the ethereum account.
- To learn about the concept of decentralized applications,mining,whisper.
- To learn about swarm and the advanced trends in block chain.

PRE-REQUISITE:

- Cryptography and Network Security

UNIT I BLOCKCHAIN TECHNOLOGY **9**

Blockchain Evolution- Structure-Characteristics-Block chain stack-Decentralized computation platform-Decentralized Storage Platform- Decentralized Messaging Platform-Smart Contracts-Decentralized Applications-Domain Specific Block Chain Applications-Benefits-Challenges

UNIT II BLOCK CHAIN 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-Mist Ethereum Wallet-MetaMask-Web3 JavaScript API-Truffle.

UNIT III ETHEREUM ACCOUNTS

9

Ethereum Accounts-keypairs-working with EOA Accounts-Working with Contract Accounts-Smart Contract-structure-setting up and interacting with a contract using Geth Client-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 : 45 Periods

TEXT BOOK(S):

- 1.ArshdeepBahga, Vijay Madiseti, "Block Chain Applications- A Hands-On Approach" University Press, 2017

REFERENCE BOOKS(S):

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: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

WEB RESOURCE(S):

1. <https://swayam.gov.in/>
2. https://www.tutorialspoint.com/ethereum/ethereum_quick_guide.htm

COURSE OUTCOME(S):

- CO712.1 Understand the concept of block chain
- CO712.2 Understand the applications and design methodology of block chain
- CO712.3 Understand about the ethereum account.
- CO712.4 Understand the concept of decentralized applications, mining, whisper.
- CO712.5 Understand about swarm and the advanced trends in block chain.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3				1						1	
2	3				1						1	
3	3		1	1	1						1	

4	3				1						1	
5	3			1	1						1	

- 1→Low 2→Medium 3→High

19CS7713

VIRTUAL REALITY

L T P C

3 0 0 3

OBJECTIVES:

- Understand the concept of virtual reality and its classic components
- Impart image virtualization having big data
- Compute high performance system with virtual reality

PRE-REQUISITE:

- Computer Graphics and Multimedia

UNIT I INTRODUCTION

9

The three I's of virtual reality, commercial VR technology and the five classic components of a VR system, Augmented Reality and Telepresence.

UNIT II INPUT AND OUTPUT DEVICES

9

Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Output Devices: Graphics displays, sound displays & haptic feedback.

UNIT III MODELING

9

Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management and Modeling real-life from sensors.

UNIT IV HUMAN FACTORS

9

Methodology and terminology, user performance studies, VR health and safety issues. Applications: Medical applications, military applications, robotics applications, Virtual product design (CAD display, process simulation, virtual prototyping)

UNIT V VR PROGRAMMING

9

VR Programming-I: Introducing Unity 3D, Project panel, Scene hierarchy, Simple game object, Scene editor. VR Programming-II: Middle VR, device management, graphics card limitation, 3D user interactions, deployment, VR software: VRPN, VR Juggler.

Total : 45 Periods

TEXT BOOK(S):

1. John Vince, 2013(7th Impression), Virtual Reality System, Pearsons Education, New Delhi

REFERENCE BOOKS(S):

1. Virtual Reality Technology, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc., Second Edition,2006
2. Killer Game Programming in Java, Andrew Davison, O'reilly-SPD, 2005.
3. Understanding Virtual Reality, interface, Application and Design, William R.Sherman, Alan Craig, Elsevier (Morgan Kaufmann), First edition, 2002.
4. 3D Modeling and surfacing, Bill Fleming, Elsevier (Morgan Kauffman), 1999.
5. 3D Game Engine Design, David H.Eberly, Elsevier, Second Edition, 2006.
6. Tony Parisi - Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile - 2015.
8. Alan B.Craig,William R.sherman,Jeffrey D, 2009, Developing Virtual Reality Applications ,1st edition ,Morgan Kaufmann Publisher.
9. Grigore C. Burdea, Philippe Coiffet, 2006, Virtual Reality Technology, 2nd edition,, Wiley.

WEB RESOURCE(S):

1. <http://www.vrs.org.uk/virtual-reality-applications>
2. <https://www.realitytechnologies.com/virtual-reality/>
3. <https://www.vrs.org.uk/virtual-reality-applications/>

COURSE OUTCOME(S):

- CO713.1 Understand the components of a VR system
- CO713.2 Understand the various Input and Output Devices
- CO713.3 Analyze the Modelling of VR system
- CO713.4 Evaluate the applications of human factor
- CO713.5 Understand the concept of VR Programming

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1									
2	3		1									
3	3		1									
4	3	2	1									
5	3	2	1									

- 1→Low 2→Medium 3→High

19CS7714

FULL STACK APPLICATION DEVELOPMENT

**L T P C
3 0 0 3**

OBJECTIVES:

- To understand different Internet Technologies.
- To learn java-specific web services architecture
- To study Database and its Connectivities both frontend and backend

PRE-REQUISITE:

- Internet Programming, Database Management System

UNIT I INTRODUCTION TO HTML, CSS

9

Introduction to HTML-Browsers and HTML-Editor's Offline and Online-Tags, Attribute and Elements-Doctype element-Comments-Headings, Paragraphs,Formatting text-Lists and Links-Images , Table.Introduction CSS-Applying CSS to HTML-Selectors, properties and values-CSS Colors, Backgrounds-CSS Box Model-CSS Margins,Padding,Borders-CSS Text and Font Properties-CSS General Topics.

UNIT II JAVASCRIPT

9

Introduction to JavaScript-Applying JavaScript (internal, external)-Understanding JS Syntax-Introduction to Document and Window Object-Variables,Operators-Data Types,Num Type Conversion-Math,String –Manipulation-Objects,Arrays-Date and Time-Conditional Statements-Switch Case-Looping in JS-Functions.

UNIT III REACTJS

9

Introduction-Templating using JSX-Components, State and Props-Lifecycle of Components-

Rendering List, Portals-Error Handling-Routers-Redux, Redux Saga-Immutable.js-Service side – rendering-Unit testing-Webpack.

UNIT IV NODEJS 9

Overview- Basics and setup-Console-Command utilities-Modules-Concepts-Events- Express.js-database access.

UNIT V MONGODB 9

SQL and NoSql concepts-Create and manage MongoDB-Migration of data into MongoDB-MongoDB with PHP-MongoDB with NodeJS-Services offered by MongoDB-Axios.

Total : 45 Periods

REFERENCE BOOKS(S):

1. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer ,Chris Northwood
2. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB, **Azat Mardan**
3. Node.js, MongoDB, React, React Native Full-Stack Fundamentals and Beyond,Eric Bush
4. Full-Stack React Projects: Modern Web Development Using React 16, Node, Express, and MongoDB, **Shama Hoque**

WEB RESOURCE(S):

1. www.nptel.ac.in
2. www.geeksforgeeks.org/how-to-become-a-full-stack-web-developer-in-2019-a-complete-guide/

COURSE OUTCOME(S):

- CS714.1 To understand the HTML and CSS Concepts.
 CS714.2 To learn Javascrpting and its applications.
 CS714.3 To understand the React JS concepts and its applications.
 CS714.4 To learn NodeJS and its applications.
 CS714.5 To learn MongoDB concepts.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	2		1							1
2	3	2	2		1							1
3	3	2	2		1							1
4	3	2	2		1							1
5	3	2	2		1							1

1→Low 2→Medium 3→High

19CS7715

AD HOC AND SENSOR NETWORKS

L T P C
3 0 0 3

OBJECTIVES:

- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

PRE-REQUISITE:

- Computer Networks

UNIT I INTRODUCTION

9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs):concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

9

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS

9

Issues in designing a routing and Transport Fundamentals of Wireless Communication Technology Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS

9

Single node architecture: hardware and software components of a sensor node - WSN Networkarchitecture: typical network architectures-data relaying and aggregation strategies -MAC layerprotocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS

9

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

Total : 45 Periods

TEXT BOOK(S):

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

REFERENCE BOOKS(S):

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication -2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
5. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

WEB RESOURCE(S):

1. <https://nptel.ac.in/>
2. https://www.tutorialspoint.com/wireless_communication/index.htm

COURSE OUTCOME(S):

CO715.1 Explain the concepts, network architectures and applications of ad hoc and wireless

sensor networks

CO715.2 Analyze the protocol design issues of ad hoc and sensor networks

CO715.3 Design routing protocols for ad hoc and wireless sensor networks with respect to some

protocol design issues.

CO715.4 Understand the concepts of wireless sensor networks (wsns) and MAC protocols.

CO715.5 Evaluate the QoS related performance measurements of ad hoc and sensor networks

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1									
2	3		1									
3	3		1									
4	3	1										
5	3	2	1	2								

- 1→Low 2→Medium 3→High

19CS7716

INFORMATION SECURITY

**LTPC
3003**

OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

PRE-REQUISITE:

- Computer Networks
- Operating Systems

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, VISA International Security Model, Design of Security Architecture, 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 : 45 Periods

TEXT BOOK(S):

1. Michael E Whitman and Herbert J Mattord, —Principles of Information Security, Vikas Publishing House, New Delhi, 2003

REFERENCE BOOKS(S):

1. Micki Krause, Harold F. Tipton, — Handbook of Information Security Management, Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposed, Tata McGraw- Hill, 2003
3. Matt Bishop, —Computer Security Art and Science, Pearson/PHI, 2002.

WEB RESOURCE(S):

1. <https://www.geeksforgeeks.org/what-is-information-security/>
2. <https://www.rapid7.com/fundamentals/information-security-risk-management/>

COURSE OUTCOME(S):

CO716.1 Discuss the basics of information security

CO716.2 Illustrate the legal, ethical and professional issues in information security

CO716.3 Demonstrate the aspects of risk management.

CO716.4 Become aware of various standards in the Information Security System

CO716.5 Design and implementation of Security Techniques.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2						1				
2	3	2	1					2				
3	3	2	1									
4	3	2	1					1				
5	3	2	1					1				

- 1→Low 2→Medium 3→High

PROFESSIONAL ELECTIVES VIII

19CS8707

MULTIMEDIA COMPRESSION TECHNIQUES

L T P C

3 0 0 3

OBJECTIVES:

- Understand error–control coding.
- Understand encoding and decoding of digital data streams.
- Be familiar with the methods for the generation of these codes and their decoding techniques.
- Be aware of compression and decompression techniques.
- Learn the concepts of multimedia communication.

PRE-REQUISITE:

- Computer Graphics.

UNIT I MULTIMEDIA COMPONENTS

9

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION

9

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, and

UNIT III TEXT AND IMAGE COMPRESSION

9

Compression principles-source encoders and destination encoders-lossless and lossy compression-

entropy encoding –source encoding -text compression – static Huffman coding dynamic coding - arithmetic coding -Lempel Ziv-Welsh Compression-image compression.

UNIT IV VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability.

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort service- protocols for real time interactive Applications-distributing multimedia-beyond best effort service- secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

Total: 45 Periods

TEXT BOOK (S):

- 1.Fred Halshall “Multimedia Communication - Applications, Networks, Protocols and Standards”, Pearson Education, 2007.
- 2.Tay Vaughan, “Multideai: Making it Work”, 7 th Edition, TMH 2008 98.
3. Kurose and W.Ross” Computer Networking “a Top down Approach, Pearson Education 2005.

REFERENCE BOOK (S):

1. Marcus Goncalves “Voice over IP Networks”, Mc Graw Hill 1999.
2. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007.
- 3.R.Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education Ranjan Parekh, “Principles of Multimedia”, TMH 2007.

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <https://www.cosy.sbg.ac.at/~uhl/ctmdf.pdf>

COURSE OUTCOME(S):

CO807.1 Design an application with error control.

CO807.2 Understand encoding and decoding of digital data streams.

CO807.3 Use compression and decompression techniques.

CO807.4 Understand the VoiP Technology

CO807.5 Apply the concepts of multimedia communication.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1			1						
2	3	2	1			1						
3	3	2	1			1						
4	3	2	1			1						
5	3	2	1			1						

1→Low 2→Medium 3→High

19CS8708 MULTI-CORE ARCHITECTURES AND PROGRAMMING

L T P C

3 0 0 3

OBJECTIVES:

- To understand the need for multi-core processors, and their architecture.
- To understand the challenges in parallel and multi-threaded programming.
- To learn about the various parallel programming paradigms
- To learn the shared and distributed Programming
- To develop multicore programs and design parallel solutions.

PRE-REQUISITE:

- Computer Organization and Architecture.

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: 45 Periods

TEXT BOOK(S):

1. Peter S. Pacheco, —An Introduction to Parallel Programming, Morgan-Kaufman/Elsevier, 2011.
2. Darryl Gove, —Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011 (unit 2).

REFERENCE BOOK(S):

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 RESOURCE(S):

1. www.nptel.ac.in
2. <https://www.studocu.com/in/document/anna-university/multi-core-architectures-/>

COURSE OUTCOME(S):

CO808.1 Describe multicore architectures and identify their characteristics and challenges.

CO808.2 Identify the issues in Parallel programming Processors.

CO808.3 Write programs using OpenMP and MPI.

CO808.3 Design parallel programming solutions to common problems.

CO808.5 Compare and contrast programming for serial processors and programming for parallel processors

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2										
2	3	2										
3	3	2	1									
4	3	2	1									
5	3	2	1	1								

1→Low 2→Medium 3→High

19CS8709

BUSINESS INTELLIGENCE

L T P C
3 0 0 3

OBJECTIVES:

- Be exposed with the basic rudiments of business intelligence system
- understand the modeling aspects behind Business Intelligence
- understand of the business intelligence life cycle and the techniques used in it
- Be exposed with different data analysis tools and techniques
- To learn about the future of business intelligence

PRE-REQUISITE :

- Nil

UNIT I BUSINESS INTELLIGENCE 9

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 business intelligence.

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.

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

UNIT IV BUSINESS INTELLIGENCE APPLICATIONS 9

Marketing models – Logistic and Production models – Case studies.

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.

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, 9 th Edition, Pearson 2013.

REFERENCE BOOKS(S):

1. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.
2. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager’s Guide”, Second Edition, 2012.
4. Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw- Hill, 2007.
5. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007

WEB RESOURCE(S):

1. www.nptel.ac.in

COURSE OUTCOME(S):

- CO809.1: Explain the fundamentals of business intelligence
 CO809.2: Link data mining with business intelligence
 CO809.3: Apply various modeling techniques
 CO809.4: Explain the data analysis and knowledge delivery stages
 CO809.5: Apply business intelligence methods to various situations and decide on appropriate technique

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2									
2	3	3	2									
3	3	3	2									
4	3	3	2									
5	3	3	2									

1→Low 2→Medium 3→High

19CS8710

TOTAL QUALITY MANAGEMENT

L T P C
3 0 0 3

OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

PRE-REQUISITE:

- Principles of Management

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 - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

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 **9**

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

UNIT V QUALITY MANAGEMENT SYSTEM **9**

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration- ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

Total: 45 Periods

TEXT BOOK(S):

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.

REFERENCE(S):

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO9001-2015 standards

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <https://www.educba.com/total-quality-management-notes/>

COURSE OUTCOME(S):

- CO810.1 To understand the tools and Techniques.
CO810.2 To understand the TQM Principles for quality management.

CO810.3 To apply the tools and techniques of maintaining quality to manufacturing and services processes.

CO810.4 To apply the tools and techniques for performance measures to manufacturing and services processes.

CO810.5 To understand the various standards for Quality Management System.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3										2	
2	3										2	
3	3	2	1								2	
4	3	2	1								2	
5	3										2	

1→Low 2→Medium 3→High

19CS8711

BIO INFORMATICS ALGORITHMS

**L T P C
3 0 0 3**

OBJECTIVES:

- Exposed to the need for Bioinformatics technologies.
- Be familiar with the modeling techniques.
- Learn microarray analysis.
- Exposed to Pattern Matching and Visualization.

PRE-REQUISITE:

- Information Retrieval
- Data Analytics.

UNIT I INTRODUCTION

9

Need for Bioinformatics technologies – Overview of Bioinformatics technologies
Structuralbioinformatics – Data format and processing – Secondary resources and applications –
Role ofStructural bioinformatics - Biological Data Integration System.

UNIT II DATAWAREHOUSING AND DATAMINING INBIOINFORMATICS

9

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis –
DNAdata analysis – Protein data analysis – Machine learning – Neural network architecture

and applications in bioinformatics.

UNIT III MODELING FOR BIOINFORMATICS 9

Hidden Markov modeling for biological data analysis – Sequence identification – Sequence classification – multiple alignment generation – Comparative modeling – Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

UNIT IV PATTERN MATCHING AND VISUALIZATION 9

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT V MICROARRAY ANALYSIS 9

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs.

Total: 45 Periods

TEXT BOOK(S):

1. Yi-Ping Phoebe Chen (Ed), “Bioinformatics Technologies”, First Indian Reprint, Springer Verlag, 2007.

REFERENCE BOOK(S):

1. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.
2. Arthur M Lesk, “Introduction to Bioinformatics”, Second Edition, Oxford University Press, 2005

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <https://www.biotechnologynotes.com/bioinformatics/notes-on-bioinformatics/693>

COURSE OUTCOME(S):

- CO811.1 To understand the concepts of Bioinformatics Technologies.
- CO811.2 To apply data warehousing and data mining in bioinformatics
- CO811.3 To develop models for biological data
- CO811.4 To apply pattern matching techniques to bioinformatics data – protein data genomic data.

CO811.5 To apply micro array technology for genomic expression study.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3						1					
2		2					1					
3	3	2					1					
4	3	2	1	2			1					
5	3	2	1	2			1					

1→Low 2→Medium 3→High

19CS5801

**OPEN ELECTIVES I
DATABASE CONCEPTS**

**L T P C
3 0 0 3**

OBJECTIVES:

1. To correlate the role of database management systems in information technology applications within organization
2. To sketch basic database concepts, including the structure and operation of the relational data model
3. To articulate the use of contemporary logical design methods and tools for databases
4. To understand the relationship between Transaction Processing and Databases
5. To study query processing and optimization

UNIT I DATABASE FUNDAMENTALS

9

Purpose of Database Systems – View of Data - Database System Architecture – Database Users and Administrators – Data Models – Entity Relationship Model – Constraints - Entity Sets – Attributes – Keys - E-R Diagrams - Design Issues - Extended E-R Features - Introduction of Relational Model – E-R Reduction to Relational Schemas

UNIT II RELATIONAL DATABASE MODEL

9

Structure of Relational Databases – Schema Diagrams – Relational Query Languages - Relational Algebra – Queries in SQL – Set Operations – Aggregate Operations – Joins – Views – Integrity Constraints – Authorization – Advanced SQL – Functions and Procedures – Triggers – Assertion – Embedded SQL – Dynamic SQL- SQL Application Programming using C and Java.

UNIT III LOGICAL DATABASE DESIGN 9

Need for good database design – Functional Dependencies and Keys – Closure of Functional Dependencies Set – Closure of attributes - Dependency Preservation - Decomposition using Functional dependencies – Atomic domains and First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies - Decomposition using Multivalued dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form – Introduction to Domain Key Normal Form – Case Studies

UNIT IV DATABASE TRANSACTIONS AND CONCURRENCY CONTROL 9

Transaction Model – ACID properties – Transaction States – Serializability - Conflict serializability – View Serializability – Testing Serializability - Concurrency Control – Lock Based Protocols – Deadlocks – Multiple Granularity – Time Stamp Based Protocols – Validation Based Protocols – Multi Version Schemes – Recovery System – Failure Classification – Storage – Recovery and Atomicity – Recovery Algorithm.

UNIT V QUERY PROCESSING AND OPTIMIZATION 9

Query Processing - Measures of Query Cost - Selection– Sorting - Join Operation – Other Operations - Evaluation of Expressions –Database Tuning - Query Optimization - Transformation of Relational Expressions - Estimating Statistics of Expression Results - Choice of Evaluation Plans – Materialized Views.

Total: 45 Periods

TEXT BOOK(S):

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

REFERENCE BOOK(S):

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Pearson Education/Addison Wesley, Sixth Edition, 2014.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Pearson Education, Fifth Edition, 2009.
3. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition, 2004.

WEB RESOURCE(S):

1. <http://www.1keydata.com/datawarehousing/data-modeling-levels.html>
2. <http://www.cs.uwaterloo.ca/~gweddell/cs448/Arch.pdf>
3. <http://www.sql-tutorial.net/SQL-tutorial.asp>
4. <http://sqlzoo.net/>
5. http://www.service-architecture.com/database/articles/acid_properties.html
6. http://www.oraFAQ.com/wiki/Oracle_database_Performance_Tuning_FAQ

COURSE OUTCOME(S):

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

CO501.1 Draw the ER diagram for enterprise applications

CO501.2 Analyze the consequence of algebra in designing relational model and create database using query languages with constraints and security

CO501.3 Normalize databases to reduce cost due to redundancy constraints

CO501.4 Assess different types of scheduling and recovery techniques for concurrent transactions

CO501.5 Validate the query evaluation plan and optimize to reduce memory complexity

PO Vs CO Mapping

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

1→Low 2→Medium 3→High

19CS5802

PRINCIPLES OF SOFTWARE ENGINEERING

**L T P C
3 0 0 3**

OBJECTIVES:

1. To explore the fundamental concepts of software engineering
2. To develop skills to elicitate, analyze and document requirements
3. To understand the software design principles
4. To introduce ethical and professional issues in developing project
5. To learn the software project management principles

UNIT I SOFTWARE PROCESS AND DEVELOPMENT METHODOLOGY

9

Introduction to software engineering – Life cycle models – Water fall model – Spiral model – Win Win Spiral model – Prototyping model – Increment model – RAD model – Software processes – Specialized process models – The rational unified process

UNIT II SOFTWARE REQUIREMENTS 9

Functional and non functional – Software document – Requirement engineering process – Feasibility studies – Software prototyping – Prototyping in the software process – Data – Functional and behavioral models – Structured analysis and data dictionary

UNIT III ANALYSIS, DESIGN CONCEPTS AND PRINCIPLES 9

Systems engineering – Analysis concepts – Design process and concepts – Modular design – Design heuristic – Architectural design – Data design – User interface design – Real time software design – System design – Real time executives – Data acquisition system – Monitoring and control system

UNIT IV TESTING 9

Taxonomy of software testing – Types of Software testing – Black box testing – Testing boundary conditions – Structural testing – Test coverage criteria based on data flow mechanisms – Regression testing – Unit testing – Integration testing – Validation testing – System testing and Debugging – Software implementation techniques

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Measures and measurement – ZIPF's law – Software cost estimation – Function point models – COCOMO Model – Delphi method – Scheduling – Earned value analysis – Error tracking – Software configuration management – Program evaluation dynamics – Software maintenance – Project planning – Project scheduling – Risk management – Agile software development – Agile methods – Plan driven and agile development – Scaling agile methods - agile project management – Case tools.

Total: 45 Periods

TEXT BOOK(S):

1. Roger S. Pressman, "Software Engineering: A practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2014.
2. Ian Sommerville, "Software engineering", Pearson Education Asia, Ninth Edition, 2012.

- Richard Fairley, "Software Engineering concepts", McGraw-Hill International Edition, 30th Reprint, 2008.

REFERENCE BOOK(S):

- Watts S.Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.
- James F.Peters and Witold Pedrycz, "Software Engineering, An Engineering Approach", Wiley-India, 2007.
- Stephen R.Schach, "Software Engineering", Tata McGraw-Hill, 2007.
- S.A.Kelkar, "Software Engineering", Prentice Hall of India, 2007.

WEB RESOURCE(S):

- <http://172.16.16.210/index.php/nptel-video-courses/video-cse/> video-cse-software-engineering
- <http://172.16.16.210/index.php/nptel-video-courses/video-cse/engineering/2503-software-metrics-quality> video-cse-software-engineering

COURSE OUTCOME(S):

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

CO502.1 Apply software engineering principles for software development

CO502.2 Formulate software requirement specification

CO502.3 Design software according to the specification

CO502.4 Test the software using software testing techniques

CO502.5 Manage software projects

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2		2										
3			2									
4		2										
5	3	2	1									

1→Low 2→Medium 3→High

19CS5803

INTRODUCTION TO DATA STRUCTURES

**L T P C
3 0 0 3**

OBJECTIVES:

1. Understand the basics of abstract data types.
2. Impart knowledge about the principles of linear and non linear data structures.
3. Build an application using sorting and searching.
4. Learn the concept of tree data structures
5. Understand the concept of graph data structures

UNIT I INTRODUCTION

9

Pseudo code - Abstract data types - Model for ADT - ADT Implementations -Algorithm efficiency - Designing recursive algorithms - Recursive examples.

UNIT II STACKS, QUEUES AND LISTS

9

Arrays - Basic stack operation- Stack ADT - Applications of stack - Queues operations- Queue ADT - Queue applications -List ADT - Circular - Doubly linked list.

UNIT III SORTING AND SEARCHING TECHNIQUES

9

Sorting: Insertion Sort- Selection Sort - Bubble Sort - Merge sort - Quick sort -Heap sort-shell sort - External Sorts Searching: Sequential search- Binary Search - Hashed list searches.

UNIT IV TREE CONCEPTS

9

Basic Tree concepts - Binary Trees - Tree Traversals - Expression Trees - Binary Search Trees - AVL Search Trees - Heap concepts - Implementation - Heap ADT.

UNIT V GRAPHS

9

Definitions - Traverse Graph: Depth first Traversal-Breadth first Traversal-Shortest Path Algorithms: Unweighted Shortest Paths - Dijkstra's Algorithm. Minimum Spanning Tree: Prim's Algorithm Kruskal's Algorithm.

Total: 45 Periods

TEXT BOOK(S):

1. Richard F. Gilberg, and Behrouz A. Forouzan, Data Structures - A Pseudocode Approach with C, Thomson 2011.
2. M.A.Weiss, Data Structures and Algorithm Analysis in C, Pearson Education Asia, 2013

REFERENCE BOOK(S):

1. Y.Langsam, M.J.Augenstein and A.M.Tenenbaum, Data Structures using C, PHI, 2007.
2. Aho, J.E.Hopcroft and J.D.Ullman, Data Structures and Algorithms, Pearson education,

Asia, 2010.

3. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, Silicon Press, 2009

COURSE OUTCOME(S):

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

CO503.1 Identify the basic concept of data structure and identify the need for algorithm analysis.

CO503.2 Exemplify the concept of linear data structures with suitable examples.

CO503.3 Design the algorithms for searching and sorting techniques

CO503.4 Classify the types of tree data structures and explain its functionalities.

CO503.5 Outline the concept of graph data structures with examples.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2		3										
3			2									
4		2										
5	3											

1→Low 2→Medium 3→High

19CS5804

PRINCIPLES OF OPERATING SYSTEMS

L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To analyze various memory management schemes.
- To understand I/O management and File systems.

PRE-REQUISITE :

- Computer Network

UNIT I INTRODUCTION

8

An Introduction to Operating System & its Services, Various Types of Operating Systems, Operating System Structure, Concepts of: Process – Files – System Calls – Interrupt – Shell

UNIT II PROCESS MANAGEMENT	8
An Introduction to process; Process State & Transition, Process Control Block, Process Context, Context Switch	
UNIT III PROCESS SCHEDULING	11
Process Scheduling (Pre-emptive & Non-Pre-emptive Algorithms), FCFS (First Come First Served) Algo; Shortest Job First; Priority Scheduling; Round Robin Scheduling Performance Criteria of Scheduling Algorithm :CPU Utilization; Throughput; Turnaround Time; Waiting Time; Response Time. Overview of: Inter-process Communication – Race Condition – Critical Section – Semaphore	
UNIT IV MEMORY MANAGEMENT	9
Partitioned Memory Management (Static & Dynamic), Concept of Fragmentation & Compaction, Paging & Demand Paging, Page Replacement Algorithms (FIFO, Optimal, LRU Algorithms)	
UNIT V FILE MANAGEMENT	9
File Concepts – Types of Files – File Attributes – File Operations Access Methods: Sequential access – Random access, Hierarchical Directory System	
TOTAL: 45 PERIODS	

TEXT BOOK(S):

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCE BOOKS(S):

1. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, Albert S Woodhull- Operating System Design & Implementation Pearson Education, 2011
3. Operating Systems - Stuart E Mandnick & John J Donovan -McGraw-Hill
4. Ramaz Elmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.
5. Achyut S.Godbole, Atul Kahate, —Operating Systems, McGraw Hill Education, 2016.

WEB RESOURCE(S):

1. https://www.tutorialspoint.com/operating_system/index.htm
2. https://en.wikipedia.org/wiki/Operating_system
3. <https://www.geeksforgeeks.org/operating-systems/>
4. <http://www.cs.nchu.edu.tw/~hwtseng/OS/os.pdf>

COURSE OUTCOME(S):

- CO504.1: Understand the Principle of Operating systems and its types
CO504.2: Illustrate the management of processes

CO504.3: Analyze various scheduling algorithms.

CO504.4: Compare and contrast various memory management schemes.

CO504.5: Understand the functionality of file systems.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3									
2	3	2										
3	3	2										
4	3	2										
5	3	2										

1→Low 2→Medium 3→High

19CS6801

**OPEN ELECTIVES II
JAVA PROGRAMMING**

**L T P C
3 0 0 3**

OBJECTIVES:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc
3. Have the ability to write a computer program to solve specified problems
4. Be able to use the Java SDK environment to create, debug and run simple Java programs

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 – if switch statements – while – do while – for loop – nested loop- Defining a method- Calling a method – Passing parameters by values – Overloading methods.

UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS 9

Class Fundamentals-Using predefined classes--Constructors-Access control-Modifiers -Methods- Dealing with Static Members and Methods-Method Overloading-Interfaces-Importing Packages- Understanding Class PathImplementing Packages-Java Doc Comments-Inheritance-Polymorphism.

UNIT III EXCEPTION / ERROR HANDLING 9

Garbage Collection-Finalize () Method-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-Checked and Un Checked Exceptions

UNIT IV APPLICATION PROGRAMMING WITH GUI 9

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

UNIT V APPLETS AND GRAPHICS 9

Applet class – JApplet class – Enabling applets to run as application – Passing string to applets – Html file and applet tag- Graphics class – paint component method – Drawing graphics on panels – Drawing strings , lines, Rectangles, and Ovals, Polygons , Polylines, FontMetrics class.

Total: 45 Periods

TEXT BOOK(S):

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

REFERENCE BOOK(S):

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

COURSE OUTCOME(S):

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

CO601.1 Write basic programs using fundamental structures.

CO601.2 Create basic programs using object oriented concepts.

CO601.3 Create classes that can handle exception and various errors handling mechanism.

CO601.4 Create Simple applications with GUI

CO601.5 Develop applications using applet and graphics

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1									
2	3	2	1									
3	3	2	2									
4	3	2	2									
5	3	2	2									

1→Low 2→Medium 3→High

19CS6802

INTERNET TECHNOLOGIES

**L T P C
3 0 0 3**

OBJECTIVES:

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 gain knowledge about AJAX and web services

UNIT I WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II CLIENT SIDE PROGRAMMING 9

Java Script: An introduction to JavaScript – JavaScript DOM Model – Date and Objects, -Regular Expressions- Exception Handling-Validation-Built-in Objects-Event Handling-DHTML with JavaScript- 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: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV PHP and XML 9

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in Functions Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database.XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V INTRODUCTION TO AJAX and WEB SERVICES

9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; WebServices: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven webservice from an application –SOAP.

Total: 45 Periods

TEXT BOOK(S):

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

REFERENCE BOOK(S):

1. Stephen Wynnkoop and John Burke —Running a Perfect Website, QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, —Web Technologies A Computer Science Perspective, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., —Web Technology, Prentice Hall of India, 2011.
5. Uttam K. Roy, —Web Technologies, Oxford University Press, 2011.

COURSE OUTCOME(S):

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

CO602.1 Construct a basic website using HTML and Cascading Style Sheets.

CO602.2 Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.

CO602.3 Develop server side programs using Servlets and JSP.

CO602.4 Construct simple web pages in PHP and to represent data in XML format.

CO602.5 Use AJAX and web services to develop interactive web applications

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		3			1						
2	3		3			1						
3	3		3			1						

4	3		2			1						
5		3				1						

1→Low 2→Medium 3→High

19CS6803

PRINCIPLES OF MULTIMEDIA

L T P C

3 0 0 3

OBJECTIVES:

- To introduce the concepts of multimedia
- To understand the functions of the various elements of multimedia
- To understand the storage media and compression techniques
- To be familiar with multimedia operating system and networking concepts
- 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

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.

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

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.

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

Total: 45 Periods

TEXT BOOK(S):

1. Parekh R, "Principles of Multimedia", Tata McGraw-Hill, 2013
2. Ralf Steinmetz, KlaraNahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education, 2009

REFERENCE BOOK(S):

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.

COURSE OUTCOME(S):

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

CO603.1 Design a multimedia architecture for handling the stream

CO603.2 Work with the various elements of multimedia system

CO603.3 Select storage media and compression technique

CO603.4 Develop animation, images, Sound using Multimedia Tools.

CO603.5 Develop a multimedia applications

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3		2			1						
2	3		2			1						
3		2				1						
4			2			1						
5			2			1						

1→Low 2→Medium 3→High

19CS6804

DIGITAL COMPUTER ORGANIZATION

**L T P C
3 0 0 3**

OBJECTIVES:

1. Understand of the basic structure and operation of a digital computer.
2. Impart knowledge about the operation of the arithmetic unit including the algorithms & implementation addition, subtraction, multiplication & division.
3. 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.

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.

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.

UNIT IV INPUT/OUTPUT ORGANIZATION

8

Accessing I/O devices-Interrupts-Direct Memory Access-Buses-Interface circuits-Standard I/O Interfaces (PCI, SCSI, USB).

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.

Total: 45 Periods

TEXT BOOK(S):

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

REFERENCE BOOK(S):

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

COURSE OUTCOME(S):

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

CO604.1 Illustrate the basic structure of a digital computer and instruction sets with addressing modes.

CO604.2 Apply the arithmetic operations of binary number system.

CO604.3 Assess the organization of the basic processing unit and examine the basic concepts of pipelining.

CO604.4 Outline the standard I/O interfaces and peripheral devices.

CO604.5 Determine the performance of different types of memory.

PO Vs CO Mapping

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

1→Low 2→Medium 3→High

OPEN ELECTIVE III

19CS7801

CLOUD COMPUTING TECHNOLOGIES

**L T P C
3 0 0 3**

OBJECTIVES:

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate 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 ENABLING TECHNOLOGIES

10

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE

8

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.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD

10

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.

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS

8

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.

Total: 45 Periods

TEXT BOOK(S):

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

REFERENCE BOOKS(S):

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 RESOURCE(S):

1. www.nptel.ac.in
2. <https://www.ibm.com/in-en/cloud/learn/cloud-computing>

COURSE OUTCOME(S):

- CO701.1 Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- CO701.2 Learn the key and enabling technologies that help in the development of cloud.
- CO701.3 Develop the ability to understand and use the architecture of computer and storage cloud, service and delivery models.
- CO701.4 Explain the core issues of cloud computing such as resource management and security.
Be able to install and use current cloud technologies.
- CO701.5 Choose and apply the appropriate technologies, algorithms and approaches for implementation and use of cloud.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3											

3		2	1									
4		2			1							1
5		2										

1→Low 2→Medium 3→High

19CS7802

PROBLEM SOLVING TECHNOLOGIES

L T P C

3 0 0 3

OBJECTIVES:

- To learn basics of problem solving strategies.
- To develop problem solving skills.
- To understand the concepts of problem solving and algorithmic thinking.

UNIT I PROBLEM SOLVING STRATEGIES

9

Problem analysis – formal definition of problem – Solution – top- down design – breaking a problem into sub problems- overview of the solution to the sub problems by writing step by step procedure (algorithm) - representation of procedure by flowchart - Implementation of algorithms – use of procedures to achieve modularity.

UNIT II PROBLEM SOLVING SKILLS

9

Developing logical thinking. Introduction to Problem Solving in Computer Science domain, Errors in reasoning; verbal reasoning; analogy problems lateral thinking.

UNIT III PROBLEM SOLVING AND ALGORITHMIC THINKING

9

Problem definition, Logical reasoning, Problem decomposition, Abstraction. Flowcharting, Name binding, Selection, Repetition, Modularization. Data organization: List and Arrays. Simple algorithms, comparison of performance of algorithms.

UNIT IV DESIGN THINKING

9

Introduction, Need of Design Thinking, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, Tools for Design Thinking, Relevance of Design and Design Thinking in Engineering.

UNIT V PROBLEM SOLVING TECHNIQUES

9

Deductive and hypothetical reasoning; computational problem solving; generating, implementing,

and evaluating solutions; interpersonal problem solving. Factoring and Recursion Techniques, Search and Sort techniques, Text processing and Pattern matching.

Total: 45 Periods

REFERENCE BOOKS(S):

1. H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
2. A. Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999.
3. M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 1994

WEB RESOURCE(S):

1. www.nptel.ac.in
2. [http://www.cs.odu.edu/~cs381/cs381content/problem_solving/proble m_solving.html](http://www.cs.odu.edu/~cs381/cs381content/problem_solving/proble_m_solving.html)

COURSE OUTCOME(S):

CO702.1 Understand the problem-solving strategies.

CO702.2 Identify skills and personality traits of successful problem solving.

CO702.3 Apply standard problem-solving heuristics to aid in problem solving.

CO702.4 Understand the concept of Design Thinking.

CO702.5 Apply problem-solving techniques to programming activities.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1		2	2									
2		2	2									
3	2	2	2									
4		2			1							1
5		2										

1→Low 2→Medium 3→High

19CS7803

ANDROID APPLICATION DEVELOPMENT

**L T P C
3 0 0 3**

OBJECTIVES:

- To build your own android application for you mobile devices
- To understand about the User Interface Designs.
- To understand how android application works.
- To utilize the power of background services, thread and notifications
- Secure, tune, package and deploy android applications.

UNIT I INTRODUCTION TO ANDROID 9

Introduction to Android Architecture: Introduction, History, Features and Android Architecture. Android Application Environment, SDK, Tools: Application Environment and Tools, Android SDK. Programming paradigms and Application Components Intents, Content providers, Broadcast receivers, Services

UNIT II USER INTERFACE DESIGN 9

User Interface Design Views & View Groups, Views : Button, Text Field, Radio Button, Toggle Button, Checkbox, Spinner, Image View, Image switcher, Event Handling, Listeners, Layouts : Linear, Relative, List View, Grid View, Table View, Web View, Adapters. Menus, Action Bars, Notifications : Status, Toasts and Dialogs, Styles and Themes, Creating Custom Widgets, Focus, Touch Mode, Screen Orientation. Designing for Tablets – Working with tablets: Developing for the Honeycomb and Ice Cream Sandwich platforms, Manipulating objects with drag and drop, Optimizing applications for high screen resolution, combining fragments into a multilane UI. Resources, Assets, Localization: Resources and Assets, Creating Resources, Managing application resources and assets, Resource-Switching in Android. Localization, Localization Strategies, Testing Localized Applications, Publishing Localized Applications

UNIT III DATA STORAGE 9

Content Providers: Contents provider, Uri, CRUD access, Browser, CallLog, Contacts, Media Store, and Setting. Data Access and Storage: Shared Preferences, Storage External, Network Connection. SQLite - SQLite Databases

UNIT IV NATIVE CAPABILITIES 9

Camera, Audio, Sensors and Bluetooth: Android Media API: Playing audio/video, Media recording. Sensors - how sensors work, listening to sensor readings. Bluetooth. Maps & Location: Android Communications: GPS, Working with Location Manager, Working with Google Maps extensions, Maps via intent and Map Activity, Location based Services. Location Updates, location-based

services (LBS), Location Providers, Selecting a Location Provider, Finding Your Location, Map - Based Activities, Load maps, Map API key.

UNIT V TESTING

9

Testing: Testing and Commercializing Applications - Basics of Testing, Testing from an IDE (Eclipse), Activity testing, Service testing, Content provider testing, Test Classes, Debugging using DDMS.

Total : 45 Periods

TEXT BOOK(S):

1. Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012
2. W. Frank Ableson, RobiSen, Chris King and C. Enrique Ortiz, “Android in Action”, Third Edition, 2012 .

REFERENCE BOOK(S):

1. Wei-Meng Lee, “Android Application Development Cookbook”, John Wiley and Sons, 2013.
2. Grant Allen, “Beginning Android 4, Apress, 2011.

WEB RESOURCE(S):

1. <https://developer.android.com>
2. <http://www.androidcentral.com/apps>
3. <https://www.opensesame.com/c/android-app-development-beginners-training-course>

COURSE OUTCOME(S):

- CO703.1 Use Android SDK for simple applications
- CO703.2 Create Graphical user interfaces for Android application.
- CO703.3 Create Android application for data processing and management
- CO703.4 Create location based services using android
- CO703.5 Test the Android application

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1	1	2	1						
2	3	2	2	1	2	1						
3	3	2	2	1	2	1						
4	2	2	2	1	2	1						

5		2	2	1	2	1						
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1→Low 2→Medium 3→High

19CS7804

HUMAN COMPUTER INTERACTION

L T P C

3 0 0 3

OBJECTIVES:

- Co-relate the Human input-output channels and identify the suitable methods and devices for Human computer Interaction.
- Develop the models for interaction design for an application.
- Apply the software engineering principles for Human Computer Interaction.
- Apply the concept of implementation support and design the evaluation techniques for Interactions.
- Analyze the cognitive models and explicate the concept of cognitive architecture.

UNIT I FOUNDATIONS

9

The Human - Input-output channels - Human Memory - Thinking - Emotions - Psychology and design of interactive systems; Computer - Text entry devices- Positioning, Pointing & drawing - Display devices for Virtual reality and 3D interaction.

UNIT II INTERACTION

9

Introduction- Models of interaction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, Interactivity. Interaction Design Basics: The process design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping.

UNIT III SOFTWARE PROCESS AND DESIGN RULES

9

HCI in the software process: Introduction, The software life cycle, Usability engineering, Iterative design and prototyping. Design Rules: Introduction- Principles to support Usability - Standards Guidelines - Golden rules.

UNIT VI IMPLEMENTATION SUPPORT AND EVALUATION TECHNIQUES

9

Implementation support Windowing system elements Using tool kits User interface management Evaluation techniques Goals of Evaluation Evaluation through expert analysis Evaluation through User Participation - Universal design principles- Multi modal interaction.

UNIT V MODELS AND THEORIES

9

Cognitive models Goal & task hierarchies Linguistic models Physical and device models
Cognitive Architectures - Communication and collaboration Models Face-to-Face communication
Conversation Text based communication Group working; case studies in automation Control of
Nuclear Power Plant, Air Traffic Controller

Total: 45 Periods

REFERENCE(S):

1. Alan Dix , Janet Finlay, Gregory D. Abowd, Russell Beale, Human Computer Interaction, Third Edition, Pearson Education, 2004
2. Julie A. Jacko and Andrew Sears, The human-computer interaction handbook: fundamentals, evolving Technologies, and emerging applications, Lawrence Erlbaum Associates, Inc., Publishers, 2003
3. Lloyd P. Rieber, Computers, Graphics, & Learning, Brown & Benchmark publishers, 2005.
4. Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: beyond human-computer interaction, Second Edition, John-Wiley and Sons Inc., 2009.
5. Dov Te'eni, Jane Carey, Ping Zhang, Human-Computer Interaction: Developing Effective Organizational Information Systems, John-Wiley and Sons Inc., 2007

WEB RESOURCE(S):

3. <https://www.interaction-design.org/literature/topics/human-computer-interaction>
4. <https://nptel.ac.in/courses/106/103/106103115/>

COURSE OUTCOME(S):

CO704.1. Co-relate the Human input-output channels and identify the suitable methods and devices for Human computer Interaction.

CO704.2 Develop the models for interaction design for an application.

CO704.3 Apply the software engineering principles for Human Computer Interaction.

CO704.4 Apply the concept of implementation support and design the evaluation techniques for Interactions.

CO704.5 Analyze the cognitive models and explicate the concept of cognitive architecture.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1		2	2									
2		2	2									
3	2	2	2									
4		2										
5		2										

1→Low 2→Medium 3→High

OPEN ELECTIVE IV

19CS8801

NETWORK ENGINEERING AND MANAGEMENT

L T P C

3 0 0 3

OBJECTIVES:

1. Understand the concepts of computer networks and to study the functions of different layers.
2. Familiarized with different protocols and network components.
3. Understand the implementation of network management protocol.

UNIT I FOUNDATIONS OF NETWORKING

9

Data communication networks - Protocols and standards -OSI model - Layers in OSI -TCP/IP protocol suite - Error detection and correction: Introduction,Block coding,Checksum – Flow control - Error control.

UNIT II DATA LINK LAYER AND NETWORK LAYER

9

SONET architecture -Layers - Frames - STS multiplexing -SONET networks - Frame relay-ATM- ATM LAN -Internetworking - IPv4 -IPv6- Transition from IPv4 to IPv6 -Address mapping - ICMPICMPv6 -Congestion control :open-loop and Closed-loop Congestion control.

UNIT III HIGH PERFORMANCE NETWORKS

9

Optical Networks: Optical links-WDM System-Optical cross connects-Optical LANs-Optical paths and networks-Switching: Switching performance measures-Modular switch design-packet Switching.

UNIT IV SNMP AND NETWORK MANAGEMENT

9

Network management standards - Network management models - Organization model-Information model - Communication model-Abstract syntax notation-Encoding structure-Internet organization

and standards

UNIT V RMON AND TELECOMMUNICATION NETWORK MANAGEMENT 9

Remote monitoring - RMON SMI and MIB - RMON1 - RMON2-ATM Remote monitoring - TMN - TMN conceptual model-TMN architecture - TMN management service architecture - TMN integrated view FOR FURTHER READING Configuration management-Fault management-performance management-Event Correlation Techniques security Management-Policy Based Management Service Level Management

Total: 45 Periods

REFERENCE BOOK(S):

1. Behrouz A. Forouzan, "Data Communication and Networking",Fourth Edition,Tata McGraw Hill,2007. 2. Mani Subramaniam , "Network Management Principles and practices",Pearson Education,2010
2. Jean Warland and Pravin Vareya, "High Performance Networks", Morgan Kauffman Publishers, 2002 4. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach",Morgan Kaufman Publishers, 2007
3. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON1 and RMON2", Third Edition,Pearson Education,2002

COURSE OUTCOME(S):

Upon completion of the course, the students will be able to
 CO801.1 Explain the fundamentals of networking.
 CO801.2 Explore the Data link Layer and Network layer.
 CO801.3 Elucidate the High Performance Networks.
 CO801.4 Exemplify the SNMP and Network Management.
 CO801.5 Illustrate the RMON and Telecommunication Network Management.

PO Vs CO Mapping

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3											
2	3		1									
3	3											
4			2									
5		3	1									

1→Low 2→Medium 3→High

19CS8802BIG

DATA ANALYTICS

L T P C

3 0 0 3

OBJECTIVES:

- To understand the competitive advantages of big data analytics
- To understand the big data frameworks
- To learn data analysis methods
- To learn stream computing
- To gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

UNIT I INTRODUCTION TO BIG DATA

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 FileSystem Organization – HDFS concepts - MapReduce Execution, Algorithms using MapReduce, 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 – Pig Latin – developing and testing Pig Latin

scripts.Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQL Queries.

Total : 45 Periods

REFERENCE BOOK(S):

1. Bill Franks, —Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley and SAS Business Series, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
3. Michael Berthold, David J. Hand, —Intelligent Data Analysis, Springer, Second Edition, 2007.
4. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
5. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
6. Richard Cotton, Learning R – A Step-by-step Function Guide to Data Analysis, O'Reilly Media, 2013.

WEB RESOURCE(S):

1. www.nptel.ac.in
2. <https://www.qubole.com/big-data-analytics/>

COURSE OUTCOME(S):

- CO802.1 Understand how to leverage the insights from big data analytics
- CO802.2 Analyze data by utilizing various statistical and data mining approaches
- CO802.3 Perform analytics on real-time streaming data
- CO802.4 Understand the various NoSql alternative database models.
- CO802.5 To understand about Hadoop related tools.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2										
2	3	2		1	2							
3	3	2		1	2							
4	3			1	2							

5	3				3							
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1→Low 2→Medium 3→High

19CS8803

DATA SCIENCE ESSENTIALS

L T P C

3 0 0 3

OBJECTIVES:

- To provide strong foundation for Data science and Bigdata
- To understand and Learn about Data Visualization. To visualize and present the inference using various tools
- To understand and learn about Machine learning and Concepts
- To understand and learn the various recommendation systems
- To understand and learn mining in social-network graphs

PRE-REQUISITE :

- Artificial Intelligence

UNIT-I INTRODUCTION

9

BigDataandDataSciencehype–andgettingpastthehype Why now? –Datafication Current landscape ofperspectives Skill setsneeded StatisticalInference Populations andsamples Statistical modeling, probability distributions, fitting amodel Intro toR

UNIT IIEXPLORATORY DATA ANALYSIS AND DATA VISUALIZATION

9

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA,The Data Science Process Case Study: RealDirect (online real estate firm).Data Visualization : Basic principles, ideas and tools for data visualization

UNIT-III MACHINE LEARNING FOR DATA SCIENCE

9

Basic Machine Learning Algorithms Linear Regression k-Nearest Neighbors (k-NN) k-means

UNIT-IV RECOMMENDATION SYSTEMS

9

Building a User-Facing Data Product Algorithmic ingredients of a Recommendation Engine Dimensionality Reduction Singular Value Decomposition Principal Component Analysis Exercise: build your own recommendation system

UNIT-V MINING SOCIAL-NETWORK GRAPHS

9

Social networks as graphs Clustering of graphs-Direct discovery of communities in graphs Partitioning of graphs Neighborhood properties in graphs

TOTAL: 45 PERIODS

TEXT BOOK(S):

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

REFERENCE BOOKS(S):

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1,Cambridge University Press. 2014. (freeonline)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020.2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Knowabout Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009.(free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of DataScience.
6. (Note: this is a book currently being written by the three authors. The authors have madethe first draft of their notes for the book available online. The material is intended for a modern theoretical course in computerscience.)
7. MohammedJ.ZakiandWagnerMieraJr.DataMiningandAnalysis:FundamentalConcepts and Algorithms. Cambridge University Press.2014.

WEB RESOURCE(S):

1. www.nptel.ac.in

COURSE OUTCOME(S):

- CO803.1: Understand the fundamental concepts of data science and Bigdata
 CO803.2: Evaluate the data analysis techniques for applications handling large data
 CO803.3: Demonstrate the various machine learning algorithms used in data science process
 CO803.4: Understand the ethical practices of data science.
 CO803.5: Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2	1								
2	3	3	2	1								
3	3	3	2	1								
4	3	3	2	1								
5	3	3	2	1								

1→Low 2→Medium 3→High

19CS8804

ESSENTIAL OF MANAGEMENT

**L T P C
3 0 0 3**

OBJECTIVES:

- To enable the students to study the evolution of Management.
- To study the planning process.
- To learn about the different ways of organizing the organization.
- To enable the students about the process of communication.
- To study different control techniques.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Total: 45 Periods

TEXT BOOK(S):

1. Stephen P. Robbins & Mary Coulter, —Management, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert —Management, Pearson Education, 6th Edition, 2004.

REFERENCE BOOK(S):

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, —Fundamentals of Management, Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, — Management, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich —Essentials of management, Tata McGraw Hill, 1998.
4. Tripathy PC & Reddy PN, —Principles of Management, Tata McGraw Hill, 1999

WEB RESOURCE(S):

1. <https://nptel.ac.in/courses/110/105/110105146/>
2. <https://courses.lumenlearning.com/boundless-management/chapter/principles-of-management/>

COURSE OUTCOME(S):

- CO804.1 To understand and analyze about the management and the organization.
- CO804.2 To Understand about the managerial functions like planning.
- CO804.3 To Understand about the managerial functions like organizing.
- CO804.4 To Understand about the managerial functions like staffing and directing.
- CO804.5 To Understand about the managerial functions like leading and controlling.

PO Vs CO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2							2		2	
2	3	2							2		2	
3	3	2							2		2	
4	3	2							2		2	
5	3	2							2		2	

1→Low 2→Medium 3→High