Curriculum of B.Tech (IT) Programme
Implemented from the Academic Year 2016

1ST YEAR, 1ST SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	BS	M101	MATHEMATICS-I	3	1	0	4	4
2	BS	PH101	PHYSICS-I	3	1	0	4	4
3	ES	EC101	BASIC ELECTRONICS ENGINEERING	3	1	0	4	4
4	ES	ME101	ENGINEERING MECHANICS	3	1	0	4	4
5	HS	HU101	COMMUNICATIVE ENGLISH	2	0	0	2	2
Total no. of Theory:								**18**
PRACTICAL								
6	BS	PH191	PHYSICS-I LAB	0	0	3	3	2
7	ES	EC191	BASIC ELECTRONICS ENGINEERING LAB	0	0	3	3	2
8	ES	ME192	WORKSHOP PRACTICE	0	0	3	3	2
9	HS	HU191	LANGUAGE LAB & SEMINAR PRESENTATION	0	0	3	3	1
Total no. of Practical:								**7**
SESSIONAL								
10	HS	XC181	EXTRA CURRICULAR ACTIVITY (NSS/NCC)	0	0	2	2	1
TOTAL								**26**

1ST YEAR,2ND YEAR SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	BS	M201	MATHEMATICS-II	3	1	0	4	4
2	BS	CH201	CHEMISTRY	3	1	0	4	4
3	ES	EE201	BASIC ELECTRICAL ENGINEERING	3	1	0	4	4
4	ES	CS201	COMPUTER FUNDAMENTALS AND PRINCIPLE OF COMPUTER PROGRAMMING	3	1	0	4	4
5	ES	ME201	ENGINEERING THERMODYNAMICS AND FLUID MECHANICS	3	1	0	4	4
Total no. of Theory:								**20**
PRACTICAL								
6	BS	CH291	CHEMISTRY LAB	0	0	3	3	2
7	ES	CS291	COMPUTER FUNDAMENTALS AND PRINCIPLE OF COMPUTER PROGRAMMING LAB	0	0	3	3	2
8	ES	EE291	BASIC ELECTRICAL ENGINEERING LAB	0	0	3	3	2
9	ES	ME291	ENGINEERING DRAWING AND GRAPHICS	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	MC	MC281	SOFT SKILL DEVELOPMENT	0	0	3	3	2 units
TOTAL								**28**

2ND YEAR, 3RD SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	BS	M(IT)301	MATHEMATICS- III	3	1	0	4	4
2	BS	PH(IT)301	PHYSICS- II	3	0	0	3	3
3	BS	M(IT)302	NUMERICAL METHODS AND STATISTICS	3	0	0	3	3
4	ES	EC(IT)303	ANALOG AND DIGITAL ELECTRONICS	3	0	0	3	3
5	PC	IT301	DATA STRUCTURE & ALGORITHM	3	1	0	4	4
Total no. of Theory:								**17**
PRACTICAL								
6	BS	PH(IT)391	PHYSICS-II LAB	0	0	3	3	2
7	BS	M(IT)392	NUMERICAL METHODS AND STATISTICS LAB	0	0	3	3	2
8	ES	EC(IT)393	ANALOG & DIGITAL ELECTRONICS LAB	0	0	3	3	2
9	PC	IT391	DATA STRUCTURE LAB	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	HS	HU381	TECHNICAL REPORT WRITING AND LANGUAGE PRACTICE	0	0	2	2	1
TOTAL								**26**

2ND YEAR, 4TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	HS	HU401	ENVIRONMENTAL SCIENCE	2	0	0	2	2
2	PC	IT401	COMPUTER ORGANIZATION & ARCHITECTURE **(SG)**	3	1	0	4	4
3	PC	IT402	COMMUNICATION ENGINEERING & CODING THEORY	3	0	0	3	3
4	PC	IT403	FORMAL LANGUAGE AND AUTOMATA THEORY	3	0	0	3	3
5	PC	IT404	OBJECT ORIENTED PROGRAMMING USING JAVA	3	0	0	3	3
Total no. of Theory:								**15**
PRACTICAL								
6	PC	IT491	COMPUTER ORGANIZATION & ARCHITECTURE LAB	0	0	3	3	2
7	PC	IT492	COMMUNICATION ENGINEERING & CODING THEORY LAB	0	0	3	3	2
8	PC	IT494	OBJECT ORIENTED PROGRAMMING LAB	0	0	3	3	2
Total no. of Practical:								**6**
SESSIONAL								
9	MC	MC481	TECHNICAL SKILL DEVELOPMENT	0	0	3	3	2 units
TOTAL								**21**

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PC	IT501	DESIGN ANALYSIS OF ALGORITHM	3	1	0	4	4
2	PC	IT502	SOFTWARE ENGINEERING	3	1	0	4	4
3	PC	IT503	OPERATING SYSTEM	3	1	0	4	4
4	PE	IT504A IT504B IT504C	PROGRAMMING PRACTICE WITH C++ ARTIFICIAL INTELLIGENCE OPERATIONS RESEARCH	3	1	0	4	4
5	HS	HU505	INDUSTRIAL AND FINANCIAL MANAGEMENT	2	0	0	2	2
Total no. of Theory:								**18**
PRACTICAL								
6	PC	IT591	DESIGN ANALYSIS OF ALGORITHM LAB	0	0	3	3	2
7	PC	IT592	SOFTWARE ENGINEERING LAB	0	0	3	3	2
8	PC	IT 593	OPERATING SYSTEM LAB	0	0	3	3	2
9	PE	IT 594A IT 594B IT 594C	PROGRAMMING PRACTICE WITH C++ LAB ARTIFICIAL INTELLIGENCE LAB OPERATIONS RESEARCH LAB	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	PW	IT581	MINI PROJECT - I	0	0	4	4	2
TOTAL:								**28**

3RD YEAR, 5TH SEMESTER

3RD YEAR:6TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PC	IT 601	DATABASE MANAGEMENT SYSTEM	3	1	0	4	4
2	PC	IT 602	WEB TECHNOLOGY	3	0	0	3	3
3	PC	IT 603	COMPUTER NETWORKING	3	1	0	4	4
4	PE	IT 604 A IT 604 B IT 604 C IT 604 D	ERP INFORMATION & CODING THEORY MICROPROCESSOR & MICROCONTROLLER DIGITAL IMAGE PROCESSING	3	1	0	4	4
5	OE	ECE(IT)605A IT 605 B IT 605 C IT 605 D IT 605 E IT 605 F	DIGITAL SIGNAL PROCESSING COMPILER DESIGN GREEN COMPUTING SOFT COMPUTING PROJECT MANAGEMENT HUMAN RESOURCE MANAGEMENT	3	0	0	3	3
Total no. of Theory:								**18**
PRACTICAL								
6	PC	IT691	DATABASE MANAGEMENT SYSTEM LAB	0	0	3	3	2
7	PC	IT692	WEB TECHNOLOGY LAB	0	0	3	3	2
8	PC	IT693	COMPUTER NETWORKING LAB	0	0	3	3	2
9	PC	IT694	SYSTEM ENGINEERING LAB	0	0	3	3	2
Total no. of Practical:								**8**
SESSIONAL								
10	PW	IT682	MINI PROJECT - II	0	0	4	4	2
11	MC	MC681	SEMINAR/GD/ PRESENTATION SKILL/ FOREIGN LANGUAGE	0	0	3	3	2 units
TOTAL								**28**

4TH YEAR: 7TH **SEMESTER**

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PC	IT701	E – COMMERCE	3	0	0	3	3
2	PE	IT702A IT702B IT702C	COMPUTER GRAPHICS AND MULTIMEDIA PATTERN RECOGNITION INTERNET TECHNOLOGY	3	0	0	3	3
3	PE	IT703 A IT703 B IT703 C	CLOUD COMPUTING DISTRIBUTED SYSTEMS DATA WAREHOUSING AND DATA MINING	3	0	0	3	3
4	OE	IT704A EE(IT)704B ECE(IT)704C IT704D	MODELLING AND SIMULATION CONTROL SYSTEM MICROELECTRONICS AND VLSI DESIGN MOBILE COMMUNICATION	3	0	0	3	3
Total no. of Theory:								**12**
PRACTICAL								
5	PC	IT791	E – COMMERCE LAB	0	0	3	3	2
6	PE	IT792A IT792B IT792C	COMPUTER GRAPHICS & MULTIMEDIA LAB PATTERN RECOGNITION LAB INTERNET TECHNOLOGY LAB	0	0	3	3	2
Total no. of Practical:								**4**
SESSIONAL								
7	PW	IT781	INDUSTRIAL TRAINING	0	0	0	4 weeks	2
8	PW	IT782	PROJECT-I	0	0	6	6	3
9	MC	IT783	SEMINAR/GD/ PRESENTATION SKILL/ FOREIGN LANGUAGE	0	0	3	3	2 units
TOTAL								**21**

4TH YEAR: 8TH SEMESTER

Sl. No	Subject Category	Subject Code	Subject Name	Contact Hours/Week				Total Credits
				L	T	P	Total	
THEORY								
1	PE	IT801A IT801B IT801C IT801D	ADVANCED COMPUTER ARCHITECTURE CRYPTOGRAPHY AND NETWORK SECURITY NATURAL LANGUAGE PROCESSING BIOINFORMATICS	3	0	0	3	3
2	OE	IT802A IT802B IT802C IT802D	BUSINESS ANALYTICS CYBER LAW AND SECURITY POLICY ADVANCED DBMS INTERNET OF THINGS	3	1	0	4	4
3	HS	HU802	VALUES & ETHICS IN PROFESSIONS	2	0	0	2	2
Total no. of Theory:								**9**
PRACTICAL								
SESSIONAL								
4	PW	IT 881	DESIGN LAB/ INDUSTRIAL PROBLEM RELATED PRACTICAL TRAINING	0	0	3	3	2
5	PW	IT 882	PROJECT II	0	0	12	12	6
6	PW	IT 883	GRAND VIVA	0	0	0	0	3
TOTAL								**20**

		Total Credit	Percentage (%)	Range of Total Credits (%) as per AICTE	
				Minimum	Maximum
HS	Humanities and Social Sciences	11	5.55	5	10
BS	Basic Sciences	34	17.17	15	20
ES	Engineering Sciences	35	17.67	15	20
PW	Project Work/ Seminar/ Industrial Training etc.	20	10.10	10	15
PC	Professional -Core	67	33.83	30	40
PE	Professional -Electives	21	10.60	10	15
OE	Open Electives	10	5.05	5	10
MC	Mandatory Course	0	8 units		
	Total:	198			

1ST SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MATHEMATICS–I**
SUBJECT CODE	**:**	**M101**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1stSemester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Any introductory course on matrix algebra, calculus, geometry.

Course Objective:

The purpose of this course is to provide fundamental concepts of matrix algebra, Calculus of Single and Several Variables and Vector Analysis.

Course Outcome
On successful completion of the learning sessions of the course, the learner will be able to:

M101.1:	Recall the distinctive characteristics of matrix algebra, differential calculus, integral calculus and vector analysis..
M101.2:	Understand the theoretical working of matrix algebra, differential calculus, integral calculus and vector analysis.
M101.3:	Apply the principles matrix algebra, differential calculus, integral calculus and vector analysis for the solutions of the problems.
M101.4	Analyze the application of matrix algebra, differential calculus, integral calculus and vector analysis.
M101.5	Evaluate the result for application to the problems on matrix algebra, differential calculus, integral calculus and vector analysis

CO-PO- PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
M101.1	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
M101.2	3	3	2	1	-	-	-	-	-	-	-	2	1	-	-	2
M101.3	3	2	3	2	-	-	-	-	-	-	-	2	3	-	-	2
M101.4	2	3	2	2	-	-	-	-	-	-	-	1	2	-	2	1
M101.5	3	2	2	1	-	-	–	-	-	-	-	1	-	-	3	1

Course Contents:

MODULE I [10L]

Matrix Algebra: Elementary row and column operations on a matrix, Rank of matrix, Normal form, Inverse of a matrix using elementary operations, Consistency and solutions of systems of linear equations using elementary operations, Linear dependence and independence of vectors, Concept & Properties of different matrices (unitary, orthogonal, symmetric, skew-symmetric, hermitian, skew-hermitian), Eigenvalues and Eigenvectors of a square matrix (of order 2 or 3), Characteristic polynomials, Cayley-Hamilton theorem and its applications, Reduction to diagonal form (upto 3^{rd} order).

MODULE II [10L]

Calculus-I (Functions of single variable): Rolle's theorem, Mean value theorem- Lagrange & Cauchy, Taylor's and Maclaurin's theorems, Expansion of simple functions by Taylor's and Maclaurin's Theorems, Fundamental theorem of integral calculus, Evaluation of plane areas, volume and surface area of a solid of revolution and lengths, Convergence of Improper integrals, Beta and Gamma Integrals - Elementary properties and the Inter relations.

MODULE III [12L]

Calculus-II (Functions of several variables): Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives, Total Differentiation, Derivatives of composite and implicit functions, Euler's theorem on homogeneous functions, Chain rule, Maxima and minima of functions of two variables – Lagrange's method of Multipliers, Change of variables-Jacobians (up to three variables), Double and triple integrals.

MODULE IV [8L]

Vector Calculus: Scalar and vector triple products, Scalar and Vector fields, Vector Differentiation, Level surfaces, Directional derivative, Gradient of scalar field, Divergence and Curl of a vector field and their physical significance, Line, surface and volume integrals, Green's theorem in plane, Gauss Divergence theorem, Stokes' theorem, Applications related to Engineering problems.

Text Books:

1. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.
3. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. 2008.
4. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley, 1995.
5. G. Strang, Linear algebra and its applications (4th Edition), Thomson, 2006.

Reference Books:

1. S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India, 2000.
2. M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
3. TG. B. Thomas and R. L. Finney, Calculus and Analytic Geometry (9th Edition), ISE Reprint, Addison-Wesley, 1998.
4. Hughes-Hallett et al., Calculus-Single and Multivariable (3rd Edition), John-Wiley and Sons, 2003.
5. J. Stewart, Calculus (5th Edition), Thomson, 2003.
6. J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier,2006.
7. L.Rade and B.Westergren, Mathematics Handbook: for Science and Engineering (5th edition, 1st Indian Edition), Springer, 2009.
8. Murray R Spiegel and Seymour Lipschutz, Schaum's Outline of Vector Analysis.
9. Richard Bronson , Schaum's Outline of Matrix Operations.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS –I**
SUBJECT CODE	**:**	**PH101**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1stSemester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Knowledge of Physics up to 12th standard. Elementary ideas of theory of reflection, refraction and interference, Differential and integral calculus, Quantization of Energy and Inadequacy of classical mechanics are necessary.

Course Objective:

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcome
After completion of the course students will be able to

PH 101.1 : Define
- De-Broglie hypothesis, and Heisenberg's Uncertainty Principle
- Amplitude and Velocity Resonance
- Malus's Law, Brewster's Law
- Characteristics of LASER light
- Intrinsic and extrinsic semiconductor.

PH 101.2 : Explain
- Polarizer and analyzer
- basic principles and different types of LASER and Optical Fibre
- structure of solids, Miller indices
- theory of Matter Wave, equation of motion of Matter Wave
- wave function and its role in representing wave nature of matter
- p-n junction.

PH 101. 3 : Analyze
- grating as many slit system
- role of Q factor in a resonating circuit, conditions of different types of resonance
- minimum requirements for lasing action

- importance of light as a carrier of information
- the failures of classical physics in microscopic situation and need of quantum physics
- Einstein's A, B coefficient and predict the wavelength domain of Lasing action
- Requirement of Miller indices for describing crystallographic planes

PH 101.4 : Apply the knowledge of

- mechanical vibration in electrical circuits
- superposition principle in Newton's ring phenomenon, diffraction phenomenon
- quantum nature of e.m. waves for production of laser
- total internal reflection in transmitting light through optical fibres
- x-ray diffraction in crystal structure
- probability interpretation in Heisenberg's uncertainty principle

PH 101.5 : Judge

- X-ray production process is inverse of the process of Photoelectric Effect.
- different crystallographic structures according to their Coordination number and packing factors
- the outcome of Photo-electric effect, Compton effect and Davission-Germer experiment to justify wave-particle duality of matter

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
PH101.1	3	-	-	-	-	-	-	-	-	-	-	2	1	3	-	-
PH101.2	3	-	-	-	-	-	-	-	-	-	-	2	2	3	-	-
PH101.3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
PH101.4	2	3	-	-	-	-	-	-	-	-	-	1	1	2	-	-
PH101.5	1	3	-	-	-	-	-	-		-	-	1	2	2	-	-

Course Contents:

MODULE I [8L]

Oscillations: Simple harmonic motion: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions: Lissajous' figures, Engineering Applications and related Numerical problems.

Damped vibration: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems.

Forced vibration: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems.

MODULE II [9L]

Classical Optics: Interference of light: Wave nature of light (Huygen's principle), Conditions of sustained interference double slit as an example; qualitative idea of spatial and temporal coherence, conservation of energy and intensity distribution; Newton's ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems.

Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction for plane transmission grating (elementary treatment of intensity distribution for N-slits), single slit and double slits as examples, missing order, Rayleigh criterion, resolving power of grating and microscope (Definition and formula; no deduction required). Engineering Applications, Numerical Problems.

Polarization: Definition, plane of polarization, plane of vibration, Malus law, fundamental concepts of plane, circular and elliptical polarizations (only qualitative idea) with examples,

Brewster's law, Double refraction: ordinary and extraordinary rays, Nicol's prism, Engineering applications, Numerical problems.

MODULE III[9L]

Quantum Physics: Quantum Theory: Inadequacy of classical physics; Planck's quantum hypothesis-Qualitative (without deductions), particle concept of electromagnetic wave (example: photoelectric and Compton effect; qualitative discussions only), wave particle duality; phase velocity and group velocity; de Broglie wave; Davisson and Germer experiment. Quantum Mechanics 1: Concept of wave function, Physical significance of wave function, Probability interpretation; wave function normalization condition and its simple numerical applications; uncertainty principle-applications, Schrödinger equation (no mathematical derivation).

MODULE IV [6L]

X-ray & Crystallography : X-rays – Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant, Applications, Numerical problems.Elementary ideas of crystal structure: lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, fcc and bcc, hcp lattices, (use of models in the class during teaching is desirable) Miller indices and miller planes, Coordination number and Atomic packing factor, Applications, Numerical problems.

MODULE V [8L]

Modern Optics-I:

Laser: Concepts of various emission and absorption process, working principle of laser, metastable state, Population Inversion, condition necessary for active laser action, optical resonator, ruby laser, He-Ne laser, semiconductor laser, Einstein A and B coefficients and equations, industrial and medical applications of laser.

Fibre optics and Applications: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, V number, Types of optical fibres (material, refractive index, mode), Losses in optical fibre- attenuation, dispersion, bending, Numerical problems.

Text Books :

Oscillations:

1. Classical Mechanics- J. C. Upadhyay (Himalaya Publishers)
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwale & Puranik (TMH)
4. Sound-N. K. Bajaj (TMH)
5. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
6. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
7. A textbook of sound-M. Ghosh (S. Chand publishers)
8. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
9. A text book of Light- K.G. Mazumder & B.Ghoshs, (Book & Allied Publisher)
10. R.P. Singh (Physics of Oscillations and Waves)
11. A.B. Gupta (College Physics Vol. II)
12. Chattopadhya and Rakshit (Vibration, Waves and Acoustics)

Classical Optics & Modern Optics-I:

13. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
14. A textbook of Light-Brijlal & Subhramanium, (S. Chand publishers)
15. Modern Optics-A. B. Gupta (Book & Allied Publisher)
16. Optics-Ajay Ghatak (TMH)
17. Optics-Hecht
18. Optics-R. Kar, Books Applied Publishers
19. Möler (Physical Optics)
20. E. Hecht (Optics)
21. E. Hecht (Schaum Series)

22. F.A. Jenkins and H.E White
23. C.R. Dasgupta (Degree Physics Vol 3)

Quantum Physics

24. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
25. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
26. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
27. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
28. Quantum Mechanics-Bransden (Pearson Education Ltd.)
29. Perspective of Modern Physics-A. Beiser (TMH)
30. Eisberg & Resnick is published by Wiley India
31. A.K. Ghatak and S Lokanathan
32. E.E. Anderson (Modern Physics)
33 .Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
34. Binayak Dutta Roy [Elements of Quantum Mechanics]

X-ray & Crystallography

35. Solid state physics-Puri & Babbar (S. Chand publishers)
36. Materials Science & Engineering-Kakani Kakani
37. Solid state physics- S. O. Pillai
38. Introduction to solid state physics-Kittel (TMH)
39. Solid State Physics and Electronics-A. B. Gupta, Nurul Islam (Book & Allied Publisher)
40. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)

General Reference:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chhaya Prakashani Pvt. Ltd.)
3. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4. Engineering Physics Vol: 1-Sudipto Roy, Tanushri Ghosh, Dibyendu Biswas (S. Chand).
5. Engineering Physics Vol:1-S. P. Kuila (New Central)
6. University Physics-Sears & Zemansky (Addison-Wesley)
7. B. Dutta Roy (Basic Physics)
8. R.K. Kar (Engineering Physics)
9. Mani and Mehta (Modern Physics)
10. Arthur Baiser (Perspective & Concept of Modern Physics)

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BASIC ELECTRONICS ENGINEERING**
SUBJECT CODE	**:**	**EC101**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Electric current and voltage-D.C and A.C., Complex impedance, conductivity, resistivity, transformer, charging and discharging of capacitor, active and passive elements.

Course Objective:
Students will be able to Analyze the behaviour of semiconductor diodes in Forward and Reverse bias . To design a half wave and full wave rectifiers, Explore V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations. To acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amps. Students will be able to explain feedback concepts and different oscillators . They will also be familiar with the analysis of digital logic basics and measuring Electronic devices. Students will have knowledge about characteristics of FET.

Course Outcome
On successful completion of the learning sessions of the course, the learner will be able to:

EC101.1:	Understand the PN junction diode, ideal diode, diode models and its circuit analysis, Remember the application of diodes and special diodes.
EC101.2:	Analyse how operational amplifiers are modelled and analysed, and to design Op-Amp circuits to perform operations such as integration differentiation on electronic signals.
EC101.3:	Assess both positive and negative feedback in electronic circuits
EC101.4:	Develop the capability to analyse and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
EC101.1	3	3	2	1	-	2	2	1	1	2	2	1	1	1	2	2
EC101.2	3	2	2	2	1	1	-	1	-	2	1	1	2	2	1	1
EC101.3	3	3	3	1	1	1	-	-	-	1	-	1	-	1	1	-
EC101.4	3	3	2	1	1	2	2	1	2	-	1	-	1	2	2	-

Course Contents:

MODULE I [6L]

Basics of semiconductor: Conductors, Insulators, and Semiconductors- crystal structure, Fermi Dirac function, Fermi level, E-k and Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation), mass action law , charge neutrality in semiconductor, Einstein relationship in semiconductor, Numerical problems on- Fermi level, conductivity, mass action law, drift and diffusion current.

MODULE II [8L]

P-N Junction Diode and its applications: p-n junction formation and depletion region , energy band diagram of p-n junction at equilibrium and barrier energy , built in potential at p-n junction , energy band diagram and current through p-n junction at forward and reverse bias, V-I characteristics and current expression of diode , temperature dependencies of V-I characteristics of diode , p-n junction breakdown – conditions , avalanche and Zener breakdown , Concept of Junction capacitance, Zener diode and characteristics.Diode half wave and full wave rectifiers circuits and operation (IDC, Irms, VDc ,Vrms), ripple factor without filter, efficiency ,PIV,TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

MODULE III [6L]

Bipolar junction transistor (BJT): Formation of PNP/NPN Transistors ,energy band diagram, current conduction mechanism, CE,CB,CC configurations , transistor static characteristics in CE,CB and CC mode, junction biasing condition for active, saturation and cut-off modes, current gain α ,β and γ, early effect.Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias, D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits.BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.

MODULE IV [4L]

Field effect transistor (FET):Concept of field effect, channel width modulation Classification of FETs-JFET, MOSFET, operating principle of JFET. Drain and transfer characteristics of JFET (n-channel and p-channel), CS, CG, CD configurations, Relation between JFET parameters. FET as an amplifier and as a switch– graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems.

MODULE V [10L]

Feedback and Operational Amplifier: Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion. Operational amplifier – electrical equivalent circuit, ideal characteristics, Non ideal characteristics of op-amp – offset voltages;bias current ;offset current; Slew rate ; CMRR and bandwidth, Configuration of inverting and non-inverting amplifier using Op-amp, closed loop voltage gain of inverting and non-inverting amplifier , Concept of virtual ground, Applications op-amp – summing amplifier; differential amplifier; voltage follower ; basic differentiator and integrator.

Problems on Characteristics of Op-amp, CMRR, slew rate, amplifier and application of Op-amp to be discussed. Any other relevant problems related to the topic may be discussed or assigned.

MODULE VI[2L]

Cathode Ray Oscilloscope (CRO):Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

MODULE VII [4L]

Digital Electronics : Binary numbers and conversion, Basic Boolean algebra, Logic gates (AND, OR, NOR, NOT, NAND, XOR) and realization of functions.

Text Books:

1. D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
2. Millman Halkias, Integrated Electronics, Tata McGraw Hill.
3. Boy elstad Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.
4. Sedra& Smith, Microelectronics Engineering

Reference Books:

1. John D. Ryder, Electronic Fundamentals and Applications, PHI
2. J.B.Gupta, Basic Electronics, S.K. Kataria.
3.Malvino: Electronic Principle.
4. Schilling & Belove: Electronics Circuits.

STREAM	:	**INFORMATION TECHNOLOGY**
SUBJECT NAME	:	**ENGINEERING MECHANICS**
SUBJECT CODE	:	**ME101**
YEAR	:	**FIRST**
SEMESTER	:	**1stSemester**
CONTACT HOURS	:	**3L + 1T**
CREDITS	:	**4**

Prerequisite:

Knowledge of Physics, Chemistry & Mathematics in 10+2 standards

Course Objective:

To develop the concept of force, equilibrium, moment and their interrelationships when applied to bodies at static and dynamic conditions.

Course Outcome
On successful completion of the learning sessions of the course, the learner will be able to:

ME101.1:	Construct a free body diagram and calculate the reactions necessary to ensure static equilibrium.
ME101.2:	Study the effect of friction in static and dynamic conditions.
ME 101.3:	Understand the different surface properties, properties of masses and materials properties.
ME101.4:	Analyze and solve different problems of kinematics and kinetics.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
ME101.1	3	3	2	2	-	-	-	-	1	-	-	-	2	1	2	3
ME101.2	3	3	2	2	-	-	-	-	1	-	-	1	-	1	2	1
ME 101.3	3	2	3	2	1	-	-	-	1	-	-	1	2	2	2	3
ME101.4	3	3	3	3	-	-	-	-	1	-	1	-	2	2	2	3

Course Contents:

MODULE I [10L]:
Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).Introduction to

Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications.Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.

MODULE II [7L] :
Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium. Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.

MODULE III [10L]:
Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadrilateral, composite areas consisting of above figures. Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone. Principle of virtual work with simple application Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.

MODULE IV [7L]
Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t,Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).

MODULE V [7L]
Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency.

Text Books :

1. Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P

Reference Books:

10. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
11. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
12. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11^{th} ed. – Pearson.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMMUNICATIVE ENGLISH**
SUBJECT CODE	**:**	**HU101**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**2L**
CREDITS	**:**	**2**

Prerequisite:

Basic knowledge of high school English.

Course Objective:

Designed to meet the basic survival needs of communication in the globalized workplace, including knowledge of and competency in the use of macro skills in reading and writing proficiency, functional grammar and usage.

Course Outcome
On successful completion of the learning sessions of the course, the learner will be able to:

HU101.1:	Able to define, identify and describe the basics of communication theory and its application.
HU101.2:	Able to recognize, recall and make use of English vocabulary and its varied usage
HU101.3:	Able to develop and apply reading and writing skills in an academic and global business context
HU101.4:	Able to identify, explain and use the grammatical structures and forms in English.
HU101.5:	Able to analyse, classify and elaborate on the forms and formats of business writing.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
HU101.1	-	-	-	-	-	-	1	-	2	3	-	2	-	2	3	3
HU101.2	-	-	-	-	-	-	1	-	2	3	-	3	-	2	2	2
HU101.3	-	-	-	-	-	3	3	3	2	3	2	3	-	2	3	3
HU101.4	-	-	-	-	-	3	3	2	-	3	-	3	-	1	1	1
HU101.5		-	-	-	-	3	3	3	-	3	-	3	-	3	3	3

Course Contents:

MODULE I [5L]

Communication: Interface in a Globalized World **:**Definition of Communication & Scope of Communication, Process of Communication—Models and Types, Verbal—Non-Verbal Communication, Channels of Communication, Barriers to Communication & surmounting them [to be delivered through case studies involving intercultural communication]

MODULE II [5L]

Vocabulary and Reading: Word origin—Roots, Prefixes and Suffixes, Word Families, Homonyms and Homophones, Antonyms and Synonyms, One word substitution, Reading—Purposes and Skills, Reading Sub-Skills—Skimming, Scanning, Intensive Reading Comprehension Practice (Fiction and Non fictional Prose/Poetry)

MODULE III [6L]

Functional Grammar and Usage: Articles, Prepositions, Verbs**,** Verb-Subject Agreement, Comparison of Adjectives**,** Tenses and their Use**,** Transformation of Sentences, Error Correction

MODULE IV [10L]

Business Writing : Business Communication in the Present-day scenario**,** Business Letters (Letters of Inquiry, Sales Letters, Complaint and Adjustment Letters, Job Application Letters)**,** Drafting of a CV and Résumé**,** Memo, Notice, Advertisement, Agenda, Minutes of Meetings**,** E-mails (format, types, jargons, conventions)

Texts:

1. Isaac Asimov, I Robot
2. George Orwell, Shooting an Elephant
3. Ruskin Bond, The Cherry Tree OR The Night Train at Deoli
4. Robert Frost, "Stopping by the Woods on a Snowy Evening."f. Precis Writing

References:

1.Raymond Murphy. English Grammar in Use. 3rd Edn. CUP, 2001.
2. Seidl & McMordie. English Idioms& How to Use Them. Oxford:OUP, 1978.
3. Michael Swan. Practical English Usage. Oxford:OUP, 1980.
4. Simeon Potter. Our Language. Oxford:OUP, 1950.
5. Pickett, Laster and Staples. Technical English: Writing, Reading & Speaking. 8th ed. London: Longman, 2001.
6. IIT Kanpur, English Language & Communication Skills (ENG 112 C) syllabus.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS-I LAB**
SUBJECT CODE	**:**	**PH191**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1stSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite: Knowledge of Physics upto 12th standard.

Course Objective:
To develop conceptual understanding of database management system for solving different industry level problems & to learn its applications

Course Outcome:
After completion of this course student will be able to

PH191.1: Define, understand and explain
- ✓ Error estimation, Proportional error calculation
- ✓ superposition principle in Newton's ring, Fresnel's biprism, laser diffraction
- ✓ Basic circuit analysis in LCR circuits

PH 191.2: Ability to analyze experimental data from graphical representations and to communicate effectively them in Laboratory reports including innovative experiments.

PH191.3: Conduct experiments using
- ✓ LASER, Optical fibre
- ✓ Interference by division of wave front, division of amplitude, diffraction grating, polarization of light
- ✓ Quantization of electronic energy inside an atom

✓ Torsional pendulum

PH 191.4: Able to participate as an individual and as a member or leader in groups in laboratory sessions actively

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
PH191.1	3	2	-	-	-	-	-	-	-	-	-	1	1	1	1	-
PH 191.2	1	2	-	3	-	-	-	-		-	-	1	1	2	1	-
PH 191.3	1	2	-	-	-	-	-	-	3	-	-	1	1	1	1	-
PH 191.4	1	2	-	-	-	-	-	-		3	-	1	2	1	3	-

Course Contents:

MODULE I:
General idea about Measurements and Errors (One Mandatory):
✓ Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
✓ Proportional error calculation using Carey Foster Bridge.

MODULE II:
Experiments on Oscillations & Elasticity:
✓ Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
✓ Experiments on Lissajous figure (using CRO).
✓ Experiments on LCR circuit.
✓ Determination of elastic modulus of different materials (Young's modulus and Rigidity modulus)

MODULE III:
Experiments on Optics:
✓ Determination of wavelength of light by Newton's ring method.
✓ Determination of wavelength of light by Laser diffraction method.
✓ Determination of numerical aperture and the energy losses related to optical fibre experiment
✓ Measurement of specific rotation of an optically active solution by polarimeter.

MODULE IV:
Experiments on Quantum Physics:
✓ Determination of Planck's constant using a photoelectric cell.
✓ Verification of Bohr's atomic orbital theory through the Frank-Hertz experiment.

**In addition it is recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as an Innovative experiment.

Probable experiments beyond the syllabus:
✓ Determination of wavelength of light by Fresnel's bi-prism method (beyond the syllabus).
✓ Study of half-wave, quarter-wave plate (beyond the syllabus)
✓ Study of dispersive power of material of a prism.
✓ Study of viscosity using Poyseullie's capillary flow method/using Stoke's law.
✓ Measurement of nodal and antinodal points along transmission wire and measurement of wavelength.
✓ Any other experiment related to the theory.

Text Books:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chhaya Prakashani Pvt. Ltd.)
3. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4. Engineering Physics Vol: 1-Sudipto Roy, Tanushri Ghosh, Dibyendu Biswas (S. Chand).
5. Engineering Physics Vol:1-S. P. Kuila (New Central)

Reference Books:

6. University Physics-Sears & Zemansky (Addison-Wesley)
7. B. Dutta Roy (Basic Physics)
8. R.K. Kar (Engineering Physics)
9. Mani and Mehta (Modern Physics)
10. Arthur Baiser (Perspective & Concept of Modern Physics)

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BASIC ELECTRONICS ENGINEERING LAB**
SUBJECT CODE	**:**	**EC191**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:

A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law.

Course Objective:

Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias; able to design rectifiers like half wave, full wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved; will acquire the basic engineering technique and ability to design and analyze the circuits of OpAmp. Basic concepts and Circuit design with logic gates will be developed for the students. The students will be able to design circuits using FET.

Course Outcome

After completion of this course student will be able to

EC191.1:	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.

EC191.2:	Analyse the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
EC191.3:	Determination of input-offset voltage, input bias current and Slew rate, Common- mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
EC191.4:	Able to know the application of Diode, BJT & OPAMP.

CO-PO Mapping and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
EC191.1	3	2	1	1	-	2	2	1	1	2	2	1	1	1	2	2
EC191.2	3	2	2	-	1	-	-	1	1	2	1	1	1	2	1	1
EC191.3	3	3	3	1	1	1	1	-	-	1	2	1	1	2	1	1
EC191.4	3	3	2	1	1	2	2	1	2	2	1	1	1	1	-	1

Course Contents:

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimetres etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of I-V characteristics of Field Effect Transistors.
8. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
9. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
10. Study of OP AMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
11. Study of Logic Gates and realization of Boolean functions using Logic Gates.
12. Study of Characteristic curves for CB, CE and CC mode transistors.
13. Innovative Experiment.

Text Books:

5. D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
6. Millman Halkias, Integrated Electronics, Tata McGraw Hill.
7. Boy elstad Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.
8. Sedra& Smith, Microelectronics Engineering

Reference Books:

1. John D. Ryder, Electronic Fundamentals and Applications, PHI
2. J.B.Gupta, Basic Electronics, S.K. Kataria.
3. 3.Malvino: Electronic Principle.
4. Schilling & Belove: Electronics Circuits.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**WORKSHOP PRACTISE**
SUBJECT CODE	**:**	**ME192**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
To understand the basic knowledge of Workshop Practice and Safety; identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes; to get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Course Outcome:
After completion of this course student will be able to

ME192.1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
ME192.2	Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and perform operations such as Marking, Cutting etc used in manufacturing processes.

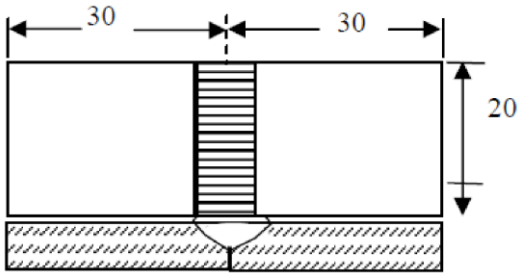
ME192.3	Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturin
ME192.4	Get hands on practice in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
ME192.1	2	-	-	-	-	2	-	1	-	-	1	-	-	-	-	-
ME192.2	2	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
ME192.3	2	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
ME192.4	1	-	-	-	1	3	-	3	-	-	-	1	-	-	-	-

Course Contents:

MODULE I: Pattern Making



MODULE II: Sheet Metal Work

MODULE III: Fitting

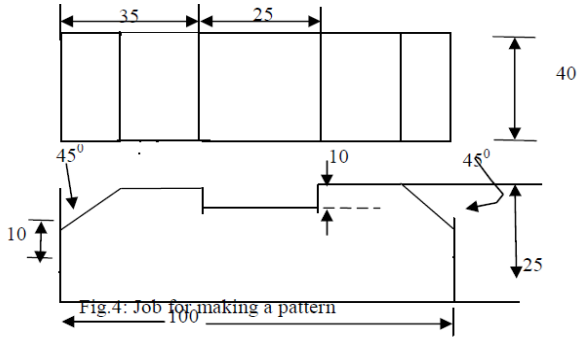


Fig.4: Job for making a pattern

MODULE IV: Machining in Lathe

MODULE V: Welding

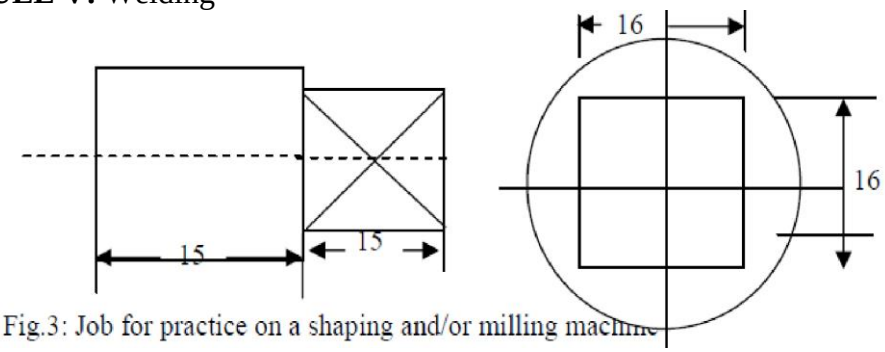


Fig.3: Job for practice on a shaping and/or milling machine

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**LANGUAGE LAB AND SEMINAR PRESENTATION**
SUBJECT CODE	**:**	**HU191**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**1st Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite: Basic knowledge of LSRW skills.

Course Objective:
To train the students in acquiring interpersonal communication skills by focussing on skill acquisition techniques and error feedback.

Course Outcome:
After completion of this course student will be able to

HU191.1	Able to understand advanced skills of Technical Communication in English through Language Laboratory.
HU191.2	Able to analyze communication behaviors.
HU191.3	Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
HU191.4	Able to apply listening, speaking, reading and writing skills in societal and professional life.
HU191.5	Able to adapt to multifarious socio economic and professional arenas with the help of effective communication and interpersonal skills.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
HU191.1	2	-	-	3	-	3	2	2	3	3	-	3	-	2	3	3
HU191.2	2	3	3	3	-	3	3	3	2	3	-	3	-	2-	2	2
HU191.3	1	3	3	3	-	2	2	2	2	3	-	2	-	2	-	3
HU191.4	1	2	3	3	-	2	1	1	2	3	-	2	-	1	1	-
HU191.5	3	3	2	3	-	2	3	2	2	3	-	2	-	-	3	3

Course Contents:

MODULE I:

Introduction to the Language Lab

a. The Need for a Language Laboratory

b. Tasks in the Lab

c. Writing a Laboratory Notebook

MODULE II :

Active Listening

a. What is Active Listening

b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note taking

c. Contextualized Examples based on Lab Recordings

MODULE III:

Speaking

a. Speaking and what it involves

b. Language Functions/Speech Acts

c. Speaking using Picture Prompts and Audio Visual inputs

c. Conversational Role Plays

d. Group Discussion: Principles and Practice

MODULE IV:

Lab Project Work

a. Keeping a Listening Log

b. Writing a Film Review/Advertisements

References:

1. IIT Mumbai, Preparatory Course in English syllabus
2. IIT Mumbai, Introduction to Linguistics syllabus
3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

2ND SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MATHEMATICS-II**
SUBJECT CODE	**:**	**M201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Any introductory course on calculus.

Course Objective:

The purpose of this course is to provide fundamental concepts Ordinary Differential Equations, Graph Theory and Laplace Transform.

Course Outcome

After completion of this course student will be able to

M201.1:	Recall the distinctive characteristics of improper integral, Laplace Transform, ordinary differential equation, graph theory.
M201.2:	Understand the theoretical working of improper integral, Laplace Transform, ordinary differential equation, graph theory.
M201.3:	Apply the principles of improper integral, Laplace Transform, ordinary differential equation, graph theory
M201.4	Analyze the application of improper integral, Laplace Transform, ordinary differential equation, graph theory.

M201.5	Evaluate the result for application to the problems on improper integral, Laplace Transform, ordinary differential equation, graph theory.

CO-PO Mapping and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
M201.1	3	2	1	-	-	-	-	-	-		-	-	1	-	-	-
M201.2	3	3	2	1	-	-		-	-	-	-	2	1	-	-	2
M201.3	3	2	3	2	-	-	-	-	-	-	-	2	3	-	-	2
M201.4	2	3	2	2	-	-	-	-	-	-	-	1	2	-	2	1
M201.5	3	2	2	1	-	-	-	-	–	-	-	1	-	-	3	1

Program Specific Outcomes (PSO):

PS01: Graduates will be able to apply basic engineering knowledge to understand and analyze basic-complex problems in the field of Information Technology.

PSO2: Graduates will be able to provide optimized solutions for organizations and individuals through Information Technology specific skills.

PSO3: Graduates will be able to work in a group to manage projects and human resources in the field of Information Technology.

PSO 4: Graduates will be able to contribute in the research and development field of Information Technology through life long learning to serve the society and nation**.**

Course Contents:

Module I : [10L]

Ordinary differential equations (First order): First order and first degree Exact equations,Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation, General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation), Applications related to Engineering problems.

Module II: [10L]

Ordinary differential equations (Higher order): General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Eulerequations, Solution of simultaneous linear differential equations, Applications related to Engineering problems.

Module III: [10L]

Basic Graph Theory:Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph, Walks, Paths, Circuits, Euler Graph, Cut-sets and cut-vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph.Tree, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using Kruskal's and Prim's algorithm.

MODULE IV: [10L]
Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of t f (t), LT of f (t)/t , LT of derivatives of f (t), L.T. of ∫f(u) du. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. Applications related to Engineering problems.

Beyond Syllabus:
Combinatorics: Fundamental Principles, Permutations, Combinations, Binomial Coefficients.

Text Books:

1. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.
3. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.

Reference Books:

1. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley, 2005.
2. R.K. Ghosh and K.C.Maity, An Introduction to Differential Equations, New Central Book Agency.
3. V. K. Balakrishnan,Graph Theory, Schaum's Outline, TMH.
4. J. Clark and D. A. Holton, A first course at Graph Theory,Allied Publishers LTD.
5. D. B. West, Introduction to Graph Theory,Prentice-Hall of India.
6. N. Deo, Graph Theory, Prentice-Hall of India.
7. J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier, 2006.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CHEMISTRY**
SUBJECT CODE	**:**	**CH201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Knowledge of Chemistry in 10+2 standards

Course Objective:

Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into the electronic structure of crystals and nanomaterials. Learning about the Synthesis, properties and applications of polymers, fuels and alternative energy sources & their significance in petrochemical industries. Analyzing water quality for its various parameters & its significance in industries

Course Outcome

After completion of this course student will be able to

CH201.1:	Able to remember fundamental concepts of Engineering Chemistry and define relevant terminologies.
CH201.2:	Able to understand the principles of thermodynamics, kinetics and physical properties of molecules
CH201.3:	Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries and technical fields.
CH201.4:	Able to analyze and explain the defects in crystalline solids and protective measures of corrosion of metals in the industries.
CH201.5:	Able to assess qualitative and quantitative parameters of applied and industrial chemistry.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CH201.1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CH201.2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CH201.3	-	-	2	-	2	-	-	-		-	-	-	-	-	-	-
CH201.4	2	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-
CH201.5	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-

Course Contents:

Module 1: [8L]

Chemical Thermodynamics–I :Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.Introduction to first law of thermodynamics: Different statements, mathematical form.Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. Heat Capacity: Definition, Classification of Heat Capacity (Cp and CV): Definition and General expression of Cp - CV. Expression of Cp - CV for ideal gas.Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.Application of first law of thermodynamics to chemical processes: exothermic, endothermic. 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature (brief).Evaluation of entropy: characteristics and expression, physical significance. Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for

ideal gas, standard free energy and chemical potential, Condition of spontaneity and equilibrium reaction.

Module 2: [7L]
Reaction Dynamics: Reaction laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudo Unimolecular reaction, Arrhenius equation.Mechanism and theories of reaction rates (Content beyond the syllabus)Solid state Chemistry:Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).Role of silicon and germanium in the field of semiconductor, n-type, p-type semiconductor, photovoltaic cell, fabrication of integrated circuits.

Module 3: [8L]
Electrochemistry: Conductance, Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). Electrochemical cell: Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, calomel half cell (representation, cell reaction, expression of potential, Discussion, Application). Concept of battery: Battery and Commercial electrochemical cell: Dry cell, acid storage cell, alkaline storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). Corrosion and its control: Introduction, cause and effect of corrosion, types of corrosion: dry, wet and other: Electrochemical corrosion, galvanic corrosion, passivation and protective measure.

Module 4 [12L]
Structure and reactivity of Organic molecule: Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyper conjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of some addition, eliminations and substitution reactions. Polymers : Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.: Theory and mathematical expression only), Poly disparity index (PDI). Polymerization processes: addition and condensation polymerization (mechanism not required), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of Tm) and amorphicity (Concept of Tg) of polymer. Preparation, structure and use of some common polymers: plastic (HDPE, LDPE, PVC, PP, PMMA, Polyester, PTFE, Bakelite), rubber (natural rubber, SBR), fibre (nylon 6, nylon 6,6), Vulcanization of rubber, Conducting polymers and biopolymers.Nanomaterial: Basic principles of nano science and technology, classification, preparation, properties and application of nano-material.

Module 5 [5L]
Industrial Chemistry Fuel: Solid Fuel: Coal, Classification of coal, constituents of coal,carbonization of coal (HTC and LTC), Proximate analysis of coal, Calorific value.Liquid fuel: Petroleum, classification of petroleum, Refining, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Biodiesel.Gaseous fuels: Natural gas, water gas, Coal gas, bio gas, CNG, LPG. Water:Introduction, source of water, water quality parameter, specification for drinking water (BIS and WHO standards), Chlorination of Water, Types of hardness- Units, Brief Softening methods.Short overview of water treatment plants (Content beyond the syllabus)

Text Books:

1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit
3. Organic Chemistry: Finar, vol-1

Reference Books:

1. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
2. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
3. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BASIC ELECTRICAL ENGINEERING**
SUBJECT CODE	**:**	**EE201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:
Knowledge of Physics and Mathematics in 10+2 standards

Course Objective:

Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and
frequency to understand the impact of technology in a global and societal context; provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices; to explain the working principle, construction, applications of DC machines, AC machines & measuring instruments; highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome

After completion of this course student will be able to

EE201.1:	Predict the behavior of any electrical and magnetic circuits.
EE201.2:	Formulate and solve complex AC, DC circuits.
EE201.3:	Identify the type of electrical machine used for that particular application.
EE201.4:	Realize the requirement of transformers in transmission and distribution of electric power and other applications.
EE201.5:	Function on multi-disciplinary teams.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
EE201.1	3	3	-	-	-	-	-	-	-	-	-	1	2	1	-	-
EE201.2	2	3	3	-	-	-	-	-	-	-	-	-	1	1	-	-
EE201.3	-	-	-	3	-	-	2	-	-	-	-	-	1	1	-	-
EE201.4	-	2	3	-	-	-	1	-	-	-	-	-	2	2	1	1
EE201.5	-	-	-	-	-	1		2	-	-	-	-	1	1	2	2

Course Contents:

DC CIRCUITS: [7L]

Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff's laws, Source equivalence and conversion, Network Theorems-Superposition Theorem, Thevenin's Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

MAGNETIC CIRCUITS: [3L]

Concept of Magnetic circuit, B-H curve, Analogous quantities in magnetic and electric circuits, Faraday's law, iron losses, self and mutual inductance, Energy stored in magnetic field.

AC SINGLE PHASE CIRCUITS: [8L]

Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R,L,C circuit, Combination R,L,C in AC series , parallel and series parallel circuits with phasor diagrams, impedance and admittance, Power factor, Power in AC circuit, Resonance in RLC series and parallel circuit, Q factor, bandwidth of resonant circuit.

THREE PHASE CIRCUITS: [3L]
Voltages of three balanced phase systems, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two wattmeters method.

DC MACHINES: [6L]
Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Torque Equation ,Speed Torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control).

SINGLE PHASE TRANSFORMER: [5L]
Constructional parts, Types of transformers, Emf equation, No Load no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

THREE PHASE INDUCTION MOTOR: [6L]
Types, Construction, production of rotating field, principle of operation, Slip and Frequency,rotor emf and current, Equivalent circuit and phasor diagram, Torque Slip characteristics torque-speed characteristics Starting of induction motor by star delta starter and(DOL starter). Speed Control of Three phase induction motor by variation of supply frequency, supply voltage and number of poles.

GENERAL STRUCTURE OF ELECTRICAL POWER SYSTEM: [3L]
Power generation to distribution through overhead lines and underground cables with single line diagram, Earthing of Electrical Equipment, Electrical Wiring Practice

Text books

1. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
2. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
3. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
4. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

1. H. Cotton, Wiley Press
2. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .
3. Kothari & Nagrath, Basic Electrical Engineering, TMH

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING**
SUBJECT CODE	**:**	**CS201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Knowledge of Mathematics, Physics.

Course Objective:

The course is designed to provide complete knowledge of C language; students will be able to develop logics which will help them to create programs, applications; learners would be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

Course Outcome

After completion of this course student will be able to

CS201.1:	Understands the concept of anatomy of computer and differentiate among different programming languages for problem solving.
CS201.2:	Apply the concept of conditional and iterative statements to write C programs.
CS201.3:	Analyze real life problems and design algorithms.
CS201.4:	Execute arrays, functions, pointers, structures and apply these concepts to solve real time problems.
CS201.5:	-Create a significant project using the concept of C programming.-

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CS201.1	3	2	1	-	-	-	-	2	2	-	-	-	1	1	-	-
CS201.2	2	3	3	2	2	2		-	3	-	-	-	-	-	-	-
CS201.3	2	3	-	2	2	2	3	2	2	-	2	2		-	2	-
CS201.4	3	2	3	2	2	-	2	-	-	2	2	2	2	-	-	-
CS201.5	3	-	-	-	3	2	-	1	2	1	1	3	-	-	-	-

Course Contents:

Fundamentals of Computer: [10L]

History of Computer, Generation of Computer, Classification of Computers. Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices.Binary and Allied number systems representation of signed & unsigned numbers, BCD, ASCII, Binary number Arithmetic – Addition and Subtraction (using 1's complement and 2's complement). Logic gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR - only truth tables, logic gate symbols and logic equations for gates only. Assembly language, high level language, machine level language, compiler and assembler (basic concepts). Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX. Problem solving-Algorithm & flow chart

C Fundamentals: [33L]

Variable and Data Types:[3L]

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements

C Operators & Expressions:[5L]

Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators - type conversion, C expressions, precedence and associativity.Input and Output: Standard input

and output, formatted output - printf, formatted input scanf, bit fields

Branching and Loop Statements: [3L]
Statement and blocks, if - else, switch, goto and labels, Loops - while, for, do while, break and continue.

Fundamentals and Program Structures: [6L]
auto, external, static and register variables Functions, function types, function prototypes, functions returning values, functions not returning values, scope rules, recursion, C preprocessor and macro.

Arrays, Strings and Pointers: [9L]
One dimensional arrays, Two-dimensional arrays, Multidimensional arrays. Passing an array to a function Character array and string, array of strings, Passing a string to a function, String related functions Pointers, Pointer and Array, Pointer and String, Pointer and functions, Dynamic memory allocation.

Files handling with C:[4L]
formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function

Structures and Unions: [3L]
Basic of structures, arrays of structures, structures and pointers, structures and functions

Text book:

1. Kernighan B.W. & Ritchie D.M. - The C Programming Language
2. Gottfried - Programming with C Schaum
3. Balagurusamy - Programming in C
4. Ram B. Computer Fundamentals, New Age International

Reference Books:

1. Pohl and Kelly - A Book on C
2. Kernighan, B.W. - The Elements of Programming Style
3. Scheid F.S. Theory and Problems of Computers and Programming
4. Rajaraman V. Fundamental of Computers
5. M.M.Oka Computer Fundamentals,EPH
6. Leon Introduction to Computers,Vikas
7. Kanetkar Y. - Let us C
8. Leon- Fundamental of Information Technology,Vikas
9. Ravichandran D. Programming in C, New Age International
10. Xavier C. Introduction to Computers, New Age International

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ENGINEERING THERMODYNAMICS & FLUID MECHANICS**
SUBJECT CODE	**:**	**ME201**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Knowledge of Physics, Chemistry & Mathematics in 10+2 standards

Course Objective:
To understand the basic relationship of heat and work transfer for developing the primary concept of an engine.

Course Outcome
After completion of this course student will be able to

ME201.1:	Know about thermodynamic equilibrium, heat & work transfer, First law and its application.
ME201.2:	Understand the basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
ME201.3:	Know the thermodynamic characteristics of a pure substance and its application in power cycles (Simple Rankine cycles, Air Standard cycles).
ME201.4:	Knowledge of basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
ME201.1	3	3	2	2	-	1	1	1	1	-	1	2	2	1	2	2
ME201.2	3	3	2	2	-	1	2	-	1	-	1	2	1	1	2	2
ME201.3	2	2	1	1	-	2	1	-	-	-	-	1	1	2	2	2
ME201.4	3	3	2	2	-	1	1	-	-	-	1	1	2	2	2	2

Course contents:

Module 1: [10L]
Basic Concepts of Thermodynamics: Introduction: Microscopic and Macroscopic viewpoints. Definition of Thermodynamic systems: closed, open and isolated systems Concept of Thermodynamics state; state postulate.Definition of properties: intensive, extensive & specific properties. Thermodynamic equilibrium. Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles. Zeroth law of thermodynamics. Concept of empirical temperature.Heat and Work: Definition & units of thermodynamic work.Examples of different forms of thermodynamic works; example of electricity flow as work. Work done during expansion of a compressible simple system. Definition of Heat; unit of Heat. Similarities & Dissimilarities between Heat & Work. Ideal Equation of State, processes; Real Gas. Definition of Ideal Gas; Ideal Gas Equations of State.Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.Equations of State of Real Gases: Van der Waal's equation; Virial equation of state.Properties of Pure Substances: p-v, T-s & h-s diagrams of pure substance like H_2O. Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.Definition of dryness fraction of steam, degree of superheat of steam.

Module 2: [6L]

1st Law of Thermodynamics: Definition of Stored Energy & Internal Energy 1st Law of Thermodynamics for cyclic processes Non Flow Energy Equation.Flow Energy & Definition of Enthalpy.Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation.

Module 3: [8L]
2nd Law of Thermodynamics: Definition of Sink, Source Reservoir of Heat.Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators. Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics Absolute or Thermodynamic scale of temperature, Clausius Integral Entropy. Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency. PMM-2; definition & its impossibility

Module 4: [8L]
Air standard Cycles for IC engines: Otto cycle; plot on P-V, T-S planes; Thermal efficiency Diesel cycle; plot on P-V, T-S planes; Thermal efficiency. Rankine cycle of steam: Chart of steam (Mollier's Chart). Simple Rankine cycle plot on P-V, T-S, h-s planes Rankine cycle efficiency with & without pump work (Problems are to solved for each module)

Module 5: [10L]
Properties & Classification of Fluids: Ideal & Real fluids, Newton's law of viscosity; Newtonian and Non-Newtonian fluids, Compressible and Incompressible fluids. Fluid Statics: Pressure at a point. Measurement of Fluid Pressure Manometers: simple & differential U-tube, Inclined tube. Fluid Kinematics: Stream line, Laminar & turbulent flow external & internal flow Continuity equation. Dynamics of ideal fluids: Bernoulli's equation, Total head; Velocity head; Pressure head Application of Bernoulli's equation. Measurement of Flow rate: Basic principles : Venturimeter, Pilot tube, Orificemeter

(Problems are to be solved for each module)

Text Books:
1 Engineering Thermodynamics - P K Nag, 4th edn, TMH.
2 Fluid Mechanics and Hydraulic Machines - R Bansal

Reference Books:

1 Fundamentals of Thermodynamics 6e by Sonntag & Van Wylin published by Wiley
2 Engineering Thermodynamics – Russell & Adeliyi (Indian edition), OUP
3 Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.
4 Basic Engineering Thermodynamics – R Joel, 5th Ed., Pearson
5 Introduction to Fluid Mechanics and Fluid Machines - S.K.Som, G.Biswas. 2nd edn, TMH
6 Fluid Mechanics by A.K.Jain.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CHEMISTRY LAB**
SUBJECT CODE	**:**	**CH291**
YEAR	**:**	**FIRST**

SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Knowledge of Chemistry in 10+2 standards

Course Objective:
Acquiring knowledge on standard solutions and the various reactions in homogeneous and heterogeneous mediums. Understanding the basic principles of pH meter and conductivity meter for different applications and analyzing water for its various parameters. Synthesis of Polymeric materials and Nano-materials.

Course Outcome
After completion of this course student will be able to

CH291.1:	Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
CH291.2:	Able to work as an individual also as an team member
CH291.3:	Able to analyse different parameters of water considering environmental issues
CH291.4:	Able to synthesize nano and polymer materials.
CH291.5:	Capable to design innovative experiments applying the fundamentals of chemistry

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CH291.1	3	2	1	1	1	1	-	-	2	-	-	-	-	-	-	-
CH291.2	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
CH291.3	-	-	-	-	-	2	3	-	-	-	-	1	-	-	-	-
CH291.4	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-
CH291.5	2	-	2	-	1	-	-	-	-	-	-	1	-	-	-	-

Course Contents:

List of Experiments:

1. To Determine the alkalinity in a given water sample.
2. Redox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. Preparation of phenol-formaldehyde resin (Bakelite).
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
6. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
7. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
8. Determination of dissolved oxygen present in a given water sample.
9. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution).

Innovative experiment:
Preparation of silver nano-particles.

Note: From the list of experiments a minimum of 7 (seven) experiments shall have to be performed by one student of which Sl. No. 4 (Preparation of Bakelite) has to be mandatory.

Text Books:

4. Engineering Chemistry: Bandyopadhyay and Hazra
5. Physical Chemistry: P.C. Rakshit
6. Organic Chemistry: Finar, vol-1

Reference Books:

4. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
5. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
6. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING LAB**
SUBJECT CODE	**:**	**CS291**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3P**

CREDITS	**:**	**2**

Prerequisite:
Basic knowledge of computer

Course Objective:
To develop an understanding of the design, implementation, and compilation of a C program, to gain the knowledge about pointers, a fundamental for understanding data structure issues, to understand the usage of user defined data type for application development.

Course Outcome
After completion of this course student will be able to

CS291.1: Understand the concept of data types, loops, functions, array, pointers, string, structures and files.
CS291.2: Apply programming concepts to compile and debug c programs to find solutions.
CS291.3: Analyze problems, errors and exceptions.
CS291.4: Design flow-chart, algorithm and program logic.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CS291.1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CS291.2	2	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-
CS291.3	2	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-
CS291.4	3		3	2	2	-	-		2	-	-	3	-	-	-	-

-

Course Content:

List of Experiments(but not limited to):

1. Some basic commands of DOS, Windows and Linux Operating System, File handling and Directory structures, file permissions, creating and editing simple C program, compilation and execution of C program.
2. Writing C Programs on variable, expression, operator and type-casting.
3. Writing C Programs using different structures of if-else statement and switch-case statement.
4. Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.
5. Writing C Programs demonstrating the concept of Single & Multidimensional arrays.
6. Writing C Programs demonstrating the concept of Function and Recursion.
7. Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.
8. Writing C Programs demonstrating the concept of structures, union and pointer to structure.
9. Writing C Programs demonstrating the concept of String and command line arguments.
10. Writing C Programs demonstrating the concept of dynamic memory allocation.
11. Writing C Programs demonstrating the concept of File Programming.

Text book:

1. Kernighan B.W. & Ritchie D.M. - The C Programming Language
2. Gottfried - Programming with C Schaum
3. Balagurusamy - Programming in C

Reference Books:

1. Pohl and Kelly - A Book on C
2. Kernighan, B.W. - The Elements of Programming Style
3. Scheid F.S. Theory and Problems of Computers and Programming

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BASIC ELECTRICAL ENGINEERING LAB**
SUBJECT CODE	**:**	**EE291**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Knowledge of Mathematics and Physics in 10+2 standards

Course Objective:
Provide knowledge for the analysis of basic electrical circuit, to introduce electrical appliances, machines with their respective characteristics. The ability to conduct testing and experimental procedures on different types of electrical machines and to analyze the operation of electric machines under different loading conditions.

Course Outcome
After completion of this course student will be able to

EE291.1:	Analyze the response of any electrical circuit and network
EE291.2:	Troubleshoot the operation of an electrical apparatus
EE291.3:	Select a suitable measuring instrument for a given application
EE291.4:	Gain the knowledge of various parts and test of DC machine and transformer
EE291.5:	Incorporate the measuring error with actual value and calibrate the instruments

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
EE291.1	1	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
EE291.2	-	3	-	2	-	-	-	-	2	-	-	-	-	-	-	-
EE291.3	-	3	-	3	1	-	-	-	2	-	-	-	-	-	-	-
EE291.4	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-
EE291.5	-	2	-	3	1	-	-	-	2	-	-	-	-	-	-	-

Course Content:

List of Experiments:

1. Characteristics of Fluorescent,Tungsten and Carbon filament lamps
2. Verification of Thevenin's and Norton's Theorem
3. Verification of Superposition Theorem
4. Calibration of Ammeter and Wattmeter
5. Study of R-L-C series circuit
6. Open circuit and short circuit test of a single phase Transformer
7. Starting, Reversing of a and speed control of D.C shunt motor
8. Test on single phase Energy Meter
9. Familiarization of PMMC and MI type Meter
10. Familiarization with house wiring practice

Text books

1. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
2. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
3. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
4. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

1. H. Cotton, Wiley Press
2. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons.
3. Kothari & Nagrath, Basic Electrical Engineering, TMH

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ENGINEERING DRAWING & GRAPHICS**
SUBJECT CODE	**:**	**ME291**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Knowledge of Physics, Mathematics in 10+2 standards

Course Objective:
To learn basics of drafting and use of drafting tools, know about engineering scales, dimensioning and various geometric curves, understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts and to acquire the knowledge of Computer Aided drafting using design software.

Course Outcome
After completion of this course student will be able to

ME291.1:	Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
ME291.2:	Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
ME291.3:	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
ME291.4:	Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
ME291.1	2	-	1	2	-	1	-	-	1		-	1	-	-	-	-
ME291.2	3	-	2	2	-	1	-	-	1	1	-	1	-	-	-	-
ME291.3	2	2	2	1	-	1	-	-	1		-	1	-	-	-	-
ME291.4	1	-	2	2	2	1	-	-	1	1	-	1	-	-	-	-

Course Contents:

List of Experiments:

1. Lines, Lettering, Dimensioning, Scales (Plain scale & diagonal Scale).
2. Geometrical Construction and Curves – Construction of Polygons, Parabola, Hyperbola & ellipse
3. Projection of Points, Lines and Surfaces – orthographic projection- first angle and third angle projection, projection of lines and surfaces- Hexagon
4. Projection of Solids – (Cube, Pyramid, Prism, cylinder and Cone
5. Sectional Views – for simple sold objects

6. Introduction to Computer Aided Drafting – using auto cad & / or similar software- Introduction to Cartesian and polar coordinate systems, absolute and relative coordinates; Basic editing commands: line, point, trace, rectangle, polygon , circle, arc, ellipse, polyline; editing methods; basic object selection methods – window and crossing window,

erase, move, copy, offset, fillet, chamfer, trim, extend, mirror; display command; zoom, pan, redraw, regenerate; simple dimensioning and text, simple exercises.

Text Books:

1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit
3. Organic Chemistry: Finar, vol-1

Reference Books:

1. Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
2. A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
3. Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFT SKILL DEVELOPMENT**
SUBJECT CODE	**:**	**MC281**
YEAR	**:**	**FIRST**
SEMESTER	**:**	**2nd Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Knowledge of English in 10+2 standards

Course Objective:
The objectives of this course are as follows; to expose the students to different aspects of corporate life and workplace behavior; to introduce workplace behavioral norms, etiquettes and standards; to equip students to face interviews, presentations and other professional interactions

Course Outcome
After completion of this course student will be able to

MC281.1:	Understand the communication skill in social and professional fields.
MC281.2:	Apply good communication skills in technical fields.
MC281.3:	Develop good communication skills and all-round personalities with a mature outlook to function effectively

CO-PO Mapping and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MC281.1	2	-	-	3	-	3	2	2	3	3	-	3	-	-	-	-
MC281.2	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-	-
MC281.3	1	3	3	3	-	2	2	2	2	3	-	2	-	-	-	-

Course Contents:

MODULE I – COMMUNICATION TRAINING
- Organizational Communication and Structure.
- Vocabulary related to Corporate Operation.
- Modes of Communication (Telephone, Conference Call, Team Huddle, Public
- Relation etc.
- Communication with Clients, Customers, Suppliers etc.
- Verbal and Non-Verbal Communication, Proxemics and ParaLanguage.
- Vocabulary Building (Synonym / Antonym / One word Substitution etc.)

MODULE II- COMMUNICATION TRAINING (ACCENT NEUTRALISATION)
- Mother Tongue Influence
- Vowel Sounds and Consonantal Sounds
- Pronunciation and Neutral Accent.
- Intonation.
- Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE III – BUSINESS ETIQUETTE
- Presenting oneself in the Business Environment.
- Corporate Dressing and Mannerism.
- Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
- Multi Cultural Etiquette.
- Cultural Difference.
- E-mail Etiquette.

MODULE IV – JOB APPLICATION AND CV / VIDEO RESUME

- Format (Chronological, Skill Oriented, Functional etc.)
- Style and Appearance.
- Writing Tips and Video Content Presentation tips.
- Types of Cover Letter or Job Application Letter.

MODULE V - INTRODUCTION TO CORPORATE LIFE AND PROTOCOLS

Introduction of Companies (Domain Specific)

- Opportunities and Growth Plan.
- Performance and Corporate Behaviour.
- Service Level Agreement and Corporate Jargon.
- Networking and Adapting to Culture, Technology and Environment.

MODULE VI – GROUP DISCUSSION

- Introduction, Definition and Purpose.
- Types of Group Discussion.
- Strategies and Protocols of Group Discussion.
- Skills and Parameters of Evaluation.
- Practice Session and Video Viewing Task.

MODULE VII – LEADERSHIP SKILL

- Leadership Theories.
- Traits and Skills of the Leader.
- Roles, Duties and Responsibilities.
- Case Study of Leaders.
- Interpersonal relationship with Team.

MODULE VIII – TEAM WORK

- Concept of Team Culture.
- Stages of Team Development (Forming, Storming, Norming, Performing, Adjourning)
- Team Working Agreement (Participation, Decision Making, Problem Solving. Conflict Management, Flexibility, Negotiation Skill.
- Team Building (Assess, Plan, Execute and Evaluate)

MODULE IX – PUBLIC SPEAKING AND INTERVIEW BASICS

- Extempore.
- JAM.
- Interview Skill
- Interview over Telephone, Video Conference Interview etc.

MODULE X – BUSINESS TELEPHONE ETIQUETTE (2L)

- Five Phases of a Business Call.
- Pitch, inflection, Courtesy and Tone.
- Understanding, Rate of Speech, Enunciation.
- Hold Procedure.
- Cold and Hot Transfer protocols.
- Dealing with Different Types of Customers (Irate, Talkative, Turnaround etc.)

MODULE XI- READING SKILL

- Vocabulary from context, speed reading, skimming, inferring, comprehension test etc.

References:

1. IIT Mumbai, Preparatory Course in English syllabus
2. IIT Mumbai, Introduction to Linguistics syllabus

3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

3RD SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MATHEMATICS –III**
SUBJECT CODE	**:**	**M(IT)301**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:
An introductory course on Relation and Function, preliminary understanding of Permutation and Combination and knowledge of basic graph theory.

Course Objective:
The purpose of this course is to provide fundamental concepts of Basics of Probability and its Distribution, Discrete Mathematics, Algebraic Structures, Linear Algebra and Advanced Graph Theory.

Course Outcome
After completion of this course student will be able to

M(IT)301.1:	Understand the theoretical workings of Basic Probability and Probability Distribution, Sampling Theory, Estimation of Parameters, Testing of Hypothesis, Algebraic Structures, Linear Algebra, Advanced Graph Theory to evaluate the various measures and forms in related fields.
M(IT)301.2:	Recall the distinctive characteristics of Basic Probability and Probability Distribution, Sampling Theory, Estimation of Parameters, Testing of Hypothesis, Algebraic Structures, Linear Algebra, Advanced Graph Theory.
M(IT)301.3:	Demonstrate various real world scenarios using concepts of Basic Probability and Probability Distribution, Sampling Theory, Estimation of Parameters, Testing of Hypothesis, Algebraic Structures, Linear Algebra, Advanced Graph Theory.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
M(IT)301.1	3	1	1	-	-	-	-	-	-	-	-	1	-	1	-	-
M(IT)301.2	3	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-
M(IT)301.3	3	2	2	-	-	-	-	-	-	-	-	2	3-	2	-	2
M(IT)301.4	3	2	2	-	-	-	-	-	-	-	-	2	3	1	-	2

Course Contents:

MODULE I : [12L]
Basic Probability Theory: Classical and Axiomatic definition of Probability (elementary properties), conditional probability, Bayes theorem and related problems.Probability Distributions: One dimensional random variable. Probability distributions-discrete and continuous.Expectation.Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems.t, χ 2 and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application.

MODULE II : [10L]

Statistics Sampling theory: Random sampling. Statistic and its Sampling distribution. Standard error of statistics. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems. Estimation of parameters: Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal).Confidence intervals and related problems. correlation (t-test).Testing of Hypothesis Simple and Composite hypothesis. Critical region.Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions.χ 2 - test for goodness of fit.

MODULE III: [6L]

Algebraic Structures Group, Subgroup, Cyclic group, Permutation group, Symmetric group (S3), Coset, Normal subgroup, Quotient group, Homomorphism & Isomorphism (Elementary properties only). Definition of Ring, Field, Integral Domain and simple related problems.

MODULE IV: [8L]

Linear Algebra: Vector spaces over any arbitrary field, linear combination, linear dependence and independence, basis and dimension, inner-product spaces, Linear transformations, matrix representation of linear transformations, quadratic forms.

MODULE V: [8L]

Advanced Graph Theory: Planar and Dual Graphs. Kuratowski's graphs.Homeomorphic graphs. Euler formula for connected planar graph and its generalization for graphs with connected components. Detection of planarity, Graph Coloring, Chromatic Numbers and its bounds, Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring. Matching: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related problems.

Text Books:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill Book. Co.
5. Spiegel M R: Theory and Problems of Probability and Statistics (Schaum's Outline Series) - McGraw Hill Book Co.
6. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur& Sons.
7. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.

Reference Books:

1. Grewal B S: Higher Engineering Mathematics (thirty fifth edn) - Khanna Pub.
2. Kreyszig E: Advanced Engineering Mathematics - John Wiley and Sons.
3. J.K. Sharma, Discrete Mathematics, Macmillan
4. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
5. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press. 11. Douglas B. West, Introduction to graph Theory, PHI
6. Lakshminarayan- Engineering Math 1.2.3
7. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.

8. Wilson: Introduction to graph theory, Pearson Education.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS-II**
SUBJECT CODE	**:**	**PH(IT)301**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Pre requisites:
Knowledge of Physics up B.Tech 1st year Physics-I course

Course Objective:
The Physics-II course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome

After completion of this course students will be able to

PH(IT)301.1: Define, understand and explain
- electrostatics, magnetostatics and electromagnetic theory
- operator formalism in Quantum Mechanics
- categories of storage devices
- materials at the low-dimensions
- fundamental particles

PH(IT)301.2: Apply the knowledge of
- Vector space & Heisenberg representation in developing knowledge of quantum bit
- Quantum bit and its representation as a two level system to design quantum logic gates
- Schrödinger equation in problems of junction diode, tunnel diode
- Magnetism and semiconductors in data storage
- Electromagnetic theory in communication and networking
- Poisson's equations in various electronic systems
- Fermi levels in intrinsic and extrinsic semiconductors

PH(IT)301.3: Analyze
- role of superposition principle in generation of a large number of Qubits.
- the principle of display devices
- Which type of magnetic materials to be used for data storage purpose
- Role of quantum confinement in inducing novel feature of a nanomaterial
- change in electric and magnetic fields in various symmetrical bodies
- Quantum gates and quantum circuits

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
PH(IT)301.1	3	1	-	-	-	-	-	-	-	-	-	1				

PH(IT)301.2	3	2	-	-	-	-	-	-	-	-	-	2				
PH(IT)301.3	2	3	-	-	-	-	-	-	-	-	-	1				

Course Contents:

MODULE I : [8L]
Electricity and Magnetism, Electrostatics, Gauss's law in integral form and conversion into differential form, Equation of continuity, Extend to Poisson's & Laplace's equation, Application to parallel plate, spherical and cylindrical capacitors (equivalent 1D problem). Magnetostatics: Lorentz force (concept in Hall effect-), force on a small current element placed in a magnetic field. Biot-Savart law- non existence of magnetic monopole, Ampere's circuital law, Magnetic vector and scalar potential.Electro-magnetism & Electromagnetic theory: Faraday's law, Concept of displacement current, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave.

MODULE II: [12L]
Quantum Mechanics-II: Formulation of quantum mechanics and Basic postulates- superposition principle, orthogonality of wave function, expectation value; operator correspondence, Commutator. Measurements in Quantum Mechanics-Eigenvalue, Eigenfunction, Schrödinger's equation as energy eigenvalue equation. Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only $E<V_0$). Quantum Computation and Communication: The idea of n- dimensional vector space, use of 'bra-ket' notation, matrix representation of bra & kets; basis, Hilbert space; Pauli matrices. Idea of qubit and examples of single qubit logic gates- Classical bits, qubit as a two level system; Bloch vector, Pauli gate, Hadamard gate, Phase shift gate, Quantum circuits related to Quantum gates.

MODULE III: [6L]
Statistical Mechanics, Basics of Statistical Mechanics: Concept of energy levels and energy states. Microstates, Macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level.
Applications of Statistical Mechanics: Fermi level in metals, total energy at absolute zero and total number of particles. Fermi level for intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type).

MODULE IV: [4L]
Storage and display devices, Different storage and display devices: Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Optical storage-CD, DVD, Blu-ray Disc.Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin film transistor display).

MODULE V: [3L]
Physics of Nanomaterials: Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Application of nanomaterials (CNT, grapheme, electronic, environment, medical)

Text Books

1. 1.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub:
3. Cambridge Univ. press
4. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)
5. Introduction to solid state physics-Kittel (TMH)
6. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Book s

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen &
6. Chuang (Cambridge University Press)
7. Solid State Physics- Ali Omar (Pearson Education)
8. Solid state physics- S. O. Pillai
9. Solid State Physics-A. J. Dekker (Prentice-Hall India) 5. Materials Science-Raghavan
10. 11.Introduction to Nanotechnology, B.K. Parthasarathy
11. 12.Nanomaterials Handbook (Advanced Materials and Technologies)- YuryGogotsi (Editor)

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**NUMERICAL METHODS AND STATISTICS**
SUBJECT CODE	**:**	**M(IT)302**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Pre requisites:
Mathematics

Course Objective:
The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic and fundamental concepts of Statistics.

Course Outcome:
After completion of this course students will be able to

M(IT)302.1:	Understand the theoretical workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems and demonstrate error.
M(IT)302.2:	Recall the distinctive characteristics of various numerical techniques and the associated error measures, different descriptive measures of Statistics, correlation and regression.
M(IT)302.3:	Develop mathematical models of various real world scenarios using concepts of mathematical approaches and solve the same by numerical techniques, judge if the results are reasonable, and then interpret and clearly communicate the results**.**

CO-PO-PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
M(IT)302.1	3	2										1				
M(IT)302.2	3	2										1				
M(IT)302.3	3	2	2									1				

Course Contents:

MODULE I: [16L]
Numerical Method I: Approximation in numerical computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic. Interpolation: Calculus of Finite Differences, Newton forward/backward interpolation, Lagrange's interpolation, Divided difference and Newton's divided difference Interpolation. Numerical integration: Newton

Cotes formula, Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. Numerical solution of a system of linear equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method.Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Newton-Raphson method.

MODULE II[7L]:

Numerical Method II: Numerical solution of ordinary differential equation: Taylor series method, Euler's method,Euler's modified method, Milne's Predictor- Corrector Method, Fourth order Runge-Kutta method.Numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method

MODULE III[10L]:

Statistics: Basic Statistics-measure of central tendency, dispersion, Probability, distribution-introduction to mass function, density function, distribution function (Binomial, Poisson, Normal), Correlation & Regression, Curve fitting and method of Least Square.

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, TMH
2. C.Xavier: C Language and Numerical Methods.
3. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).
4. S S Sastry: Introduction & methods of numerical analysis, PHI
5. N. G. Das: Statistical Methods, TMH.
6. Pal and Das: Discrete Mathematics, U N Dhur and Sons.
7. D. S. Sancheti & V.K.Kapoor : Statistics Theory , Method & Application, Sultan chand & sons , New delhi

References Books:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. SoumenGuha& Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.
6. Numerical Analysis, Shastri, PHI
7. Numerical Analysis, S. Ali Mollah
8. Numerical Analysis, James B. Scarbarough
9. Numerical Methods for Mathematics ,Science Engg., Mathews, PHI

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ANALOG AND DIGITAL ELECTRONICS**
SUBJECT CODE	**:**	**EC(IT)303**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics, Physics, Basic Electronics.

Course Objective:
The objective of the course is to prepare students to perform the analysis and design of various digital and analog electronic circuits.

Course Outcome
After completion of this course student will be able to

EC(IT)303.1:	Understand basic analog and digital electronics, including semiconductor properties, operational amplifiers, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques
EC(IT)303.2:	Identify different symbols, working principles of basic Digital electronics circuits for data processing application
EC(IT)303.3:	Analyze the characteristics of basic digital circuits
EC(IT)303.4:	Design analog amplifiers, combinational logic devices and sequential logic devices like counters and registers

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
EC(IT)303.1	2					2						1				
EC(IT)303.2																
EC(IT)303.3		2		3												
EC(IT)303.4		2	3	2	1	1	2									

Course Contents

MODULE I : [10L]

Analog Electronics: Recapitulation of P-N diodes, BJT, FET , Feedback and OPAMP ;Power Amplifiers – Class A, B, AB and C - basic concepts, power, efficiency calculation; Phase Shift, Wein Bridge oscillators; Astable & Monostable Multivibrators, 555 Timer and Multivibrators ; Schmitt Trigger circuit.

MODULE II: [9L]

Introduction to Number Systems: Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBCDIC, Gray codes and their conversions ; Signed binary number representation with 1's and 2's complement methods , Binary arithmetic; Boolean algebra ; Various logic gates; Representation in SOP and POS forms ; Minimization of logic expressions by algebraic method , K-MAP method and Quin Mc-Clusky Method.

MODULE III: [5L]

Combinational Circuits: Adder and Substractor; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

MODULE IV: [6L]

Sequential Circuits: Basic Flip-flop & Latch ; SR, JK, D, T and JK Master-slave Flip Flops Registers (SISO,SIPO,PIPO,PISO); Ring counter, Johnson counter ; Basic concept of Synchronous and Asynchronous counters ; Design of synchronous and asynchronous Mod N Counter.

MODULE V: [2L]

A/D and D/A conversion techniques: Basic concepts of R-2R , A/D and D/A; successive approximation ADC

MODULE VI: [2L]

Logic families:TTL, ECL, MOS and CMOS - basic concept

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DATA STRUCTURE AND ALGORITHM**
SUBJECT CODE	**:**	**IT301**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Basic Mathematics, Programming language

Course Objective:

The objective of the course is to provide knowledge of various data structures and algorithms; to introduce difference techniques for analyzing the efficiency of computer algorithms and provide efficient methods for storage, retrieval and accessing data in a systematic manner and explore the world of searching, sorting, traversal and graph tree algorithm along with demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists and trees.

Course Outcome

After completion of this course student will be able to

IT301.1:	Use different kinds of data structures which are suited to different kinds of applications, and some are highly specialized to specific tasks.
IT301.2:	Comprehend large amounts of data efficiently, such as large databases and internet indexing services.
IT301.3:	Apply efficient data structures which are a key to designing efficient algorithms.
IT301.4:	Analyze some formal design methods and programming languages which emphasize data structures, rather than algorithms, as the key organizing factor in software design.
IT301.5:	Evaluate the stored and retrieved data both in main memory and in secondary memory.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT301.1	3	2		1			1									
IT301.2	3	3	2	3												
IT301.3	3		3													
IT301.4		3		2												
IT301.5		3		2												

Course Contents:

MODULE –I : [8L]

Introduction : Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.Array : Different

representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials.Linked List : Singly linked list, circular linked list, doubly linked list, linked list representation of polynomials and applications.

MODULE –II: [7L]

[Stack and Queue : Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications.Recursion : Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.

MODULE –III : [15L]

Trees : Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree-operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). Huffman tree.

Graphs : Graph definitions and Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm

MODULE – IV: [10L]

Sorting Algorithms : Internal sorting and external sorting Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap), radix sort. Tree Sort technique .Searching : Sequential search, binary search, interpolation search. Hashing : Hashing functions, collision resolution techniques

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E.Mcgraw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PHYSICS-II LAB**
SUBJECT CODE	**:**	**PH(IT)391**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Knowledge of Physics upto B.Tech Physics-I lab

Course Objective:
The Physics-II Lab course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcomes:
At the end of the course students will be able to know to find out:

PH(IT)391.1:	Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers
PH(IT)391.2:	Make use of different basic logic gates and universal gates
PH(IT)391.3:	Implement the combinational circuits in digital electronics using basic logic gates
PH(IT)391.4:	Construct sequential circuits like registers and counters using flip-flops and basic gates

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	PSO 1	PSO 2	PSO 3	PSO 4
PH(IT)391.1	3	2	-	-	-	-	-	-	-	-	-	1	1	1	1	-
PH(IT)391.2	1	2	-	3	-	-	-	-		-	-	1	1	1	2	-
PH(IT)391.3	1	2	-		-	-	-	-	3	-	-	1	3	2	1	-
PH(IT)391.4	1	2	-	-	-	-	-	-		3	-	-	2	3	1	-
													3	2	3	-

Course Contents:

MODULE I :-Electricity Magnetism

1. Study of dipolar magnetic field behaviour.
2. Study of the hysteresis curve of a ferromagnetic material using CRO.

3. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
4. Measurement of Curie temperature of the given sample.
5. Determination of dielectric constant of given sample (frequency dependent).
6. Determination of Hall coefficient of a semiconductor and measurement of Magnetoresistance of a given semiconductor

MODULE II: -Quantum Mechanics-II

7. Determination of Stefan's radiation constant.
8. To study current-voltage characteristics, load response, areal characteristics and spectral response of photovoltaic solar cells & measurement of maximum workable power.
9. Measurement of specific charge of electrons using CRT.
10. Determination of band gap of a semiconductor.
**In addition to regular 7 experiments it is recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as an Innovative experiment.

Probable experiments beyond the syllabus:

1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
2. Determination of thermal conductivity of a good conductor by Searle's method.
3. Study of I-V characteristics of a LED.
4. Study of I-V characteristics of a LDR
5. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

Text Books

1. 1.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub:
3. Cambridge Univ. press
4. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)
5. Introduction to solid state physics-Kittel (TMH)
6. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Book s

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen &

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**NUMERICAL METHODS AND STATISTICS LAB**
SUBJECT CODE	**:**	**M(IT)392**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**3**

Pre requisites:
Concept of basic programming knowledge(C/C++/MATLAB)

Course Objective: The purpose of this course is to provide basic programming skills for solving numerous problems in numerical methods and statistics.

M(IT)392.1:	Write efficient, well-documented code in order to derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
M(IT)392.2:	Present numerical results in an informative way and analyze and evaluate the accuracy of common numerical methods.

CO-PO-PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
M(IT)392.1	2	3	3		1							1				
M(IT)392.2	2	3	3		1							1				

Course Contents:

1. Assignments on Newton forward /backward, Lagrange's interpolation.

2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.

3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Gauss Jacobi and Gauss-Seidel iterations.

4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Newton-Raphson method.

5. Assignments on ordinary differential equations: Euler's method, Euler's modified method, Runge-Kutta methods.

6. Simple problems as assignment on Measures of Central Tendency- mean, median, mode, Measures of Dispersion- variance, standard deviation. Problems related to the engineering field.

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, TMH
2. C.Xavier: C Language and Numerical Methods.
3. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).

References Books:

1. S S Sastry: Introduction & methods of numerical analysis, PHI
2. N. G. Das: Statistical Methods, TMH.
3. Pal and Das: Discrete Mathematics, U N Dhur and Sons.
4. D. S. Sancheti & V.K.Kapoor : Statistics Theory , Method & Application, Sultan chand & sons , New delhi

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ANALOG & DIGITAL ELECTRONICS LAB**
SUBJECT CODE	**:**	**EC(IT)393**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Basic Mathematics, Programming language

Course Objective:
The objective of the course is to illustrate the different electronic circuits and their application in practice.

Course Outcomes:
At the end of the course students will be able to know to find out:

EC(IT)393.1:	Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers
EC(IT)393.2:	Make use of different basic logic gates and universal gates
EC(IT)393.3:	Implement the combinational circuits in digital electronics using basic logic gates
EC(IT)393.4:	Construct sequential circuits like registers and counters using flip-flops and basic gates

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
EC(IT)393.1				2												
EC(IT)393.2	2			2								1				
EC(IT)393.3		2	2													
EC(IT)393.4		3	2			1										

Course Content:

1. Design of an amplifier.
2. Design of a Phase-Shift Oscillator.
3. Design of a Schmitt Trigger using Op Amp.
4. Design of a Multivibrator circuit using 555 timer.
5. Design of Half and Full adder and Half and Full Substractor
6. Construction of simple Decoder & Multiplexer circuits using logic gates

7. Realization of RS / JK / D flip flops using logic gates
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counter.
10. Design of MOD- N Counter (Synchronous and Asynchronous).
11. Study of DAC and ADC.

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications',D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DATA STRUCTURE AND ALGORITHM LAB**
SUBJECT CODE	**:**	**IT391**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Basic Mathematics, Programming language

Course Objective:
To develop the conceptual understanding for solving problems using data structures such as linear lists, stacks, queues, hashing, trees and graphs and writing programs for these solutions.

Course Outcome:
After completion of this course student will be able to

IT391.1: Understand the concept of dynamic memory management, data types, basic data structures, and complexity analysis.

IT391.2: Apply the complexity of the problems.

IT391.3: Analyze the concept of data structures through ADT.

IT391.4: Evaluate the appropriate linear and non-linear data structure and algorithm design method for a specified application design.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT391.1	3	2	1													
IT391.2	2	3	1	3												
IT391.3	3	3	3	3	2				2			3				
IT391.4	3	2	1	3	2							1				

Course Content:

1. Experiments should include but not limited to Implementation of array operations:
2. Stack and Queues: adding, deleting, elements circular Queue: Adding & deleting elements
3. Merging Problem:
4. Evaluation of expressions operations on Multiple stacks & queues:
5. Implementation of linked list: inserting, deleting, inverting a linked list
6. Implementation of stacks and queues

7. Using linked lists: Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication , addition
9. Recursive and Non Recursive traversal Trees
10. Threaded binary tree traversal. AVL tree implementation
11. Application of Trees. Application of sorting and searching algorithms
12. Hash tables implementation: searching, inserting and deleting, searching and sorting techniques.

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E.Mcgraw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**TECHNICAL REPORT WRITING AND LANGUAGE PRACTICE**
SUBJECT CODE	**:**	**HU381**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**3rdSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons.

Course Objective:
Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending & interpreting data in English; speak in English, using appropriate vocabulary and pronunciation in contextualized situations; put into effective practice the pragmatics of Group Discussion; write a detailed technical report as per organizational needs; interact in professional presentations and interviews

Course Outcomes:
At the end of the course students will be able to know to find out:

HU381.1:	Impart skill-based lessons in a manner conducive to developing communicative and socio-linguistic competence in the learners.
HU381.2:	Building general awareness, through guided practice, of the taxonomy of listening and speaking skills and sub-skills.
HU381.3:	Build knowledge of the skills required for professional and public speaking so as to inculcate discourse competence in the learners.
HU381.4:	Reinforce grammar skills and practice writing skills through the production of common industry and workplace documents.
HU381.5	Synthesize and integrate material from primary and secondary sources with their own ideas in research papers.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
HU381.1				3		3	2	2	3	3		3				
HU381.2		3	3	3		3	3	3	2	3		3				
HU381.3		3	3	3		2	2	2	2	3		2				
HU381.4		2	3	3		2	1	1	2	3		2				
HU381.5	3	3	2	3		2	3	2	2	3		2				

Course Contents:

Module 1: The Need for a Language Laboratory
(a)Introduction to the Language Lab
(b)Skill-building exercises in the lab

Module 2: Power Listening
(a)Taxonomy of Listening Skills & Sub-skills [Aural Skimming, Scanning, Listening for Details, Note taking, Evaluative Listening, Empathetic Listening, Paralinguistic and Kinesic Inferencing]
(b)Audio-based Lessons
(c) Repairing Listening 'Gaps' through Learner Feedback

Module 3: Speaking Skills

(a)The Need for Speaking: Content and Situation-based speaking
(b)Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]
(c)The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Module 4: Group Discussion
(a)Teaching GD Strategies
(b)In-house video viewing sessions
(c)Extended Practice and feedback

Module 5: Writing a Technical Report
(a)Organizational Needs for Reports and types
(b)Report Formats
(c)Report Writing Practice Sessions and Workshops

Module 6: SWOT Analysis
(a)SWOT Parameters
(b)Organizational SWOT
(c) Case Study

Module 7: Presentation
(a)Teaching Presentation as a Skill
(b)Speaking Strategies and Skills
(c)Media and Means of Presentation
(d)Extended Practice and Feedback

Module 8: Personal Interview
(a)Preparing for the Interview: Interview Basics, Dressing and Grooming, Q & A
(b)Mock Interview sessions and feedback

1. Reference Books:
2. Nira Konar: English Language Laboratory: A Comprehensive Manual PHI Learning, 2011
3. D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing Pearson Education (W.B. edition), 2011
4. Adrian Duff et. al. (ed.): Cambridge Skills for Fluency
    A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)
    B) Listening (Levels 1-4 Audio Cassettes/Handbooks)
5. Cambridge University Press 1998 Mark Hancock: English Pronunciation in Use
6. 4 Audio Cassettes/CD'S OUP 2004

4TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ENVIRONMENTAL SCIENCE**
SUBJECT CODE	**:**	**HU401**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**2L**
CREDITS	**:**	**2**

Prerequisite:

Knowledge of Basic Chemistry

Course Objective:

The objective of the course is to apply the knowledge of environmental science to design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations; to analyze and discuss the relevance of environmental science to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions; function in multi/interdisciplinary teams with a spirit of tolerance, patience and understanding so necessary for team work; recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome

After completion of this course student will be able to

HU401.1:	Describe the structure and function of the environment and different types of environmental pollution.
HU401.2:	Identify all types of resources and learn the quality parameter to maintain proper balance.
HU401.3:	Apply the method of synthesis of green chemistry and find a green solution.
HU401.4:	Demonstrate the controlling method of environmental pollution and apply their knowledge for environment management.
HU401.5:	Demonstrate environmental problems like global warming, acid rain, natural and manmade disasters.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
HU401.1	3	2					2									
HU401.2	3	2														
HU401.3	2	3	2			2	2									
HU401.4	2	3	2			2	3									
HU401.5	2	3				2										

Course Contents:

MODULE I : [6L]

General: Natural Resources: Forest Resource, water resource, mineral resource, energy resources (renewable, non-renewable, potentially renewable). Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield Disaster Management: Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control). Ecology & Ecosystem: Elements of ecology, definition of ecosystem- components types and function, Food chain & Food web, Structure and function of the following ecosystem:

Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems. Environmental Management: Environmental impact assessment, Environmental laws and protection act of India, Different international environmental agreement.

MODULE II : [6L]

Air Pollution: Sources of Pollutants: point sources, nonpoint sources and manmade sources primary & secondary pollutants. Types of air pollutants: primary & secondary pollutant ; Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN, Smog (Photochemical smog and London smog). Effects on human health & climate: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion. Air pollution and meteorology: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion. control of air pollution (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury)

MODULE III : [6L]

Water Pollution: Classification of water (Ground & surface water). Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatile organic compounds.Surface water quality parameters: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BO Lake: Eutrophication [Definition, source and effect].Ground water: Aquifers, hydraulic gradient, groundwater flow (Definition only),groundwater pollution (Arsenic & Fluoride; sources, effects, control) , Quality of Boiler feed water: DO, hardness, alkalinity, TDS and Chloride, Layout of wastewater treatment plant (scheme only).

MODULE IV[2L]

Land Pollution : Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste , Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

MODULE V[2L]

Noise Pollution : Definition of noise, effect of noise pollution on human health, Average Noise level of some common noise sources, Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18 hr Index) . Noise pollution control.

Text Books

1. A Textbook of Environmental Studies, Shashi Chawla. Tata McGraw Hill Education Private Limited
2. Environmental Studies, Dr. J P Sharma, University Science Press

Reference Books

1. Environmental Engineering, J K Das Mohapatra, Vikas Publication

STREAM	**:**	**INFORMATION TECHNOLOGY**

SUBJECT NAME	**:**	**COMPUTER ORGANIZATION AND ARCHITECTURE**
SUBJECT CODE	**:**	**IT401**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3L +1T**
CREDITS	**:**	**4**

Prerequisite:

Mathematics, Digital Electronics, Basic Programming

Course Objective:

The objective of the course is to study the basic organization and architecture of digital computers, understanding and utilization of digital computers and design and application of computer systems as foundation for more advanced computer-related studies.

Course Outcome

After completion of this course student will be able to

IT401.1:	Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
IT401.2:	Describe the structure and functioning of a digital computer, including its overall system architecture, operating system, and digital components.
IT401.3:	Construct various design techniques of CPU, Memory, pipelining, ALU, interconnecting I/O devices and microprogramming in order to achieve multiprocessing.
IT401.4:	Developed and Design quantitative performance evaluation of computer systems.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT401.1	1	2	3			1	1									
IT401.2	2	2	3													
IT401.3	2	3	3													
IT401.4	2	3	3													

Course Contents:

MODULE I: [4L]

Basic Computer Functions and Interconnection Structures, Discussion between computer architecture and organization, Role of Operating System, Quantitative techniques in computer design. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes

MODULE II: [8L]

Memory classification, Memory Hierarchy and characteristics; Organization of RAM, Magnetic memory recording formats & methods, Disk & tape units with detailed working principles.Memory Inclusion, Coherence and locality properties; Associative memory organization ; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Paging, mapping and management techniques, memory replacement policies.

MODULE III :[10L]

The ALU – ALU organization , Integer representation , Input/output Organization : Introduction to Bus architecture , effect of bus widths , Programmed & Interrupt I/O , DMA.Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address.Multiplication of signed binary numbers-Booth's algorithm ; Divide algorithms Restoring & Non- Restoring ; Floating point - IEEE 754 standard; Floating point number arithmetic; Overflow detection , status flags. Flynn's classification –SISD, SIMD, MISD, MIMD architectures

MODULE IV: [10L]
Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro programmed, CISC & RISC characteristics.Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards, Exception handling, Pipeline optimization techniques; Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, superpipelined and VLIW processor architectures. Array and vector processors.

MODULE V: [10L]
Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared- memory architecture. Cluster computers. Non Von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures.

Text Books:

1. Mano, M.M., "Computer System Architecture", PHI.
2. Kai Hwang"Advanced Computer Architecture" McGraw Hill
3. Behrooz Parhami " Computer Architecture", Oxford University Press
4. Nicholas P Carter"Computer Architecture & Organization" McGraw Hill,

Reference Book:

1. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill
2. Hamacher, "Computer Organisation", McGraw Hill
3. N. Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers" OUP
4. P. Chaudhuri P, "Computer Organisation & Design", PHI,
5. P N Basu- "Computer Organization & Architecture" , Vikas Publication

SUBJECT NAME	**:**	**COMMUNICATION ENGINEERING AND CODING THEORY**
SUBJECT CODE	**:**	**IT402**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Mathematics, Physics, Electronics

Course Objective:

The objective of the course is to comprehend basics of communication system and coding techniques, apply the basic concept of PCM systems and baseband transmission schemes, analyze and evaluate band pass signaling schemes, produce spectral characteristics of band pass signaling schemes and assess noise issues.

Course Outcome

After completion of this course student will be able to

IT402.1:	Understand basics of communication systems and coding schemes.
IT402.2:	Apply the basic concept of PCM systems and baseband transmission schemes.
IT402.3:	Analyze and evaluate band pass signaling schemes.
IT402.4:	Create spectral characteristics of band pass signaling schemes and assess noise performance.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT402.1	1	2	3								2					
IT402.2	1	2	3													
IT402.3	1	2	3													
IT402.4	1	3				1										

Course Contents:

MODULE I : [4L]

Elements of communication system, introduction to signals and modulation. Basic concept of a signal (Amplitude, frequency, wavelength, bandwidth), introduction to baseband transmission - modulation. Elements of Communication systems, origin of noise and its effect on communication systems. Concept and need for modulation - types of modulation, concept of time domain and spectral representation of a signal.

MODULE II: [5L]

Linear Modulation: Basic principles of Amplitude Modulation with Time domain representation of AM signal, modulation index calculation, transmission bandwidth, power & efficiency calculations. Basic concept of square law modulator and balanced modulator. Detection of AM by envelope detector, Synchronous detection for AM-SC.Basic principles of Sideband suppressed techniques and the need for it. Need for carrier suppression .Basic concept of SSB-SC, DSB-SC,VSB-SC.Generation of SSB: Filter method, Phase shift method. Names of SSB-SC, DSB-SC generator and detector

MODULE III: [4L]

Non linear Modulation & Demodulation: Frequency Modulation and Phase Modulation: Time domain representations, total power calculation for a single tone message. Generation of FM & PM: basic concept and difference of wide band frequency modulation and narrow band frequency modulation. basic concept on direct and indirect method of FM generation : introductory discussion on Armstrong method.Basic block diagram representation of generation of FM & PM: basic Concept of VCO & Reactance modulator only. Demodulation of FM and PM: Only Basic Concept of frequency discriminators Phase Locked Loop Comparison of various Analog modulation techniques, inter relation between PM and FM

MODULE I V: [10L]

Sampling and digital transmission: Sampling theorem, Sampling rate, sampling theorem, nyquist rate, Impulse sampling, Reconstruction from samples, Aliasing*;* Analog Pulse Modulation – basic discussion on PAM, PWM, PPM. Concept of Quantisation & Uniform Quantiser, Non-uniform Quantiser, Quantisation error, signal to quantisation noise ratio calculation, A-law & μ-law companding (after discussion on companding mention only the two types and their use) ,Encoding, Coding efficiency.Basic concept of Pulse Code Modulation, Block diagram of PCM, basic concept of DPCM,Delta modulation, basic concept of slope overload and Granular. distortion, Adaptive delta modulation. Multiplexing - TDM, FDM, SDM.Line coding & properties, NRZ & RZ, AMI, Manchester coding. Brief discussion on: ISI, Raised cosine function, Nyquist criterion for distortionless base-band binary transmission, Eye pattern

MODULE V: [5L]

Digital Carrier Modulation & Démodulation Techniques:Introduction to the different digital modulation techniques-ASK, FSK, PSK, BPSK, QPSK, MSK, Introduction to QAM,. Spread Spectrum Modulation – DSSS, FHSS - concept only.

MODULE VI: [6L]

Information Theory & Coding:Introduction to Information Theory, Entropy, Mutual information, Information rate, channel and bandwidth, Bit rate, Baud rate,Information capacity, Shanon's limit, Shanon-Fano algorithm for encoding, Huffman coding for numerical, Shannon's Theorem - Source Coding Theorem, Information Capacity Theorem. Error control Strategies: (Basic Concept of Data communication, concept of FEC, ARQ and CRC).

Text Books:

1. An Introduction to Analog and Digital Communications, Simon Haykin; Published by Wiley India.
2. Principle of Communication Systems by Herbert Taub and D.L.Schilling
3. Modern Digital and Analog Communication Systems –
4. Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

References:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
3. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
4. Understanding Signals and Systems by Jack Golten, Published by McGraw Hill.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**FORMAL LANGUAGE AND AUTOMATA THEORY**
SUBJECT CODE	**:**	**IT403**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Elementary discrete mathematics including the notion of set, function, relation, product, partial order, equivalence relation, graph & tree. They should have a thorough understanding of the principle of mathematical induction and various proof techniques.

Course Objective:

The objective of the course is to present a formal connection between algorithmic problem solving and the theory of languages and automata and develop a mathematical view of students towards algorithmic design and in general computation itself.

Course Outcome

After completion of this course student will be able to

IT403.1:	Understand limitations of some computational models and possible methods of proving them
IT403.2:	Comprehend situations in related areas of theory in computer science
IT403.3:	Apply different computational models using combinatorial methods
IT403.4:	Use formal mathematical methods to prove properties of languages, grammars and automata
IT403.5	Evaluate algorithms for different problems and argue formally about correctness on different restricted machine models of computation

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT403.1	3		3	2				2					-	-	-	-
IT403.2		3	3	3									-	-	-	2
IT403.3	3	3		2			3						-	-	-	1
IT403.4		3		3					2				-	-	2	2
IT403.5	2	3	3	3	2								1	-	-	-

Course Contents:

MODULE I:[14L]

Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept, Finite memory definiteness, testing table & testing graph. Minimization of FSM-completely specified and incompletely specified(Merger graph, Merger table, Compatibility graph) Equivalence between two FSM's, Limitations of FSM Application of finite automata, Finite Automata with output- Moore & Mealy machine.

MODULE II:[10L]
Deterministic finite automaton and non deterministic finite automaton. Transition diagrams and Language recognizers. Finite Automata: NFA with Î transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions. NFA to DFA conversion. DFA minimization. Myhill-Nerode theorem Regular Languages: Regular sets. Regular expressions, identity rules. Arden's theorem states and prove Constructing finite Automata for a given regular expression, Regular string accepted by NFA/DFA. Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). Grammar Formalism: Regular grammars-right linear and left linear grammars. Equivalence between regular linear grammar and FA.

MODULE III:[10L]
Context free grammar. Derivation trees, sentential forms. Right most and leftmost derivation of strings. Context Free Grammars, Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form and Greibach normal form. Pumping Lemma for Context Free Languages. Enumeration of properties of CFL. Closure property of CFL, Ogden's lemma & its applications. Push Down Automata: Push down automata, definition. Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. Introduction to DCFL and DPDA.

MODULE IV: [6L]
Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions, Church's hypothesis, counter machine, Types of Turing machines Universal Turing Machine, Halting problem.

Text Books:

1. "Theory of Computer Science-Automata Languages and Computation", Mishra and Chandrashekaran, 2nd edition, PHI
2. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill

Reference Books:

1. "An Introduction to Computing", Peter Linz, Narosa.
2. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D.

SUBJECT CODE	**:**	**IT404**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Basic Computer programming, Mathematics

Course Objective:

The objective of the course is to introduce the object oriented programming paradigm using JAVA and enable students to write the program and develop projects using JAVA.

Course Outcome

After completion of this course student will be able to

IT404.1:	Understand the key concepts of object oriented programming and have an ability to design object oriented programs and appreciate the techniques of good design
IT404.2:	Understand advanced features of Java
IT404.3:	Analyze complex programming problems and optimize the solutions
IT404.4:	Apply an understanding of ethical principles to problems which commonly arise in the Information Technology Industry

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT404.1	3	3	2	1	-	-	-	-	-	-	-	1	-	-	-	-
IT404.2	-	2	2	2	3	-	-	-	-	-	-	1	-	-	-	2
IT404.3	3	3	3	3	2	-	-	-	-	-	-	3	-	-	-	1
IT404.4	3	3	3	2	3	2	-	-	3	-	3	3	-	-	2	2

Course Content:

Object Oriented Design [3L]

The Objective of the course is to understand basic of Object Oriented Programming, the features of Java and to enable students to write Java program and develop projects.

Object Oriented Concepts [3L]

Class, object, message passing, inheritance, encapsulation, polymorphism, Difference between OOP and other conventional programming – advantages and disadvantages.

Understanding Java Programming Language[2L]

History of Java Programming languages, Purpose of invention of Java. Structure of a basic Java Program, Component of Java Development Kit-API, JRE, Understanding the steps to run a complete Java Program.

Basic Components of Java Program [2L]

Java Tokens-Literals, identifier, keywords, operator, separator, Data types, variables, constant, Type casting-defining type casting, requirement of type casting, implicit and explicit type casting. Control structure. Access specifier.

Class and Object Properties [6L]
Defining class and object, Class Members-Local variable, instance variable, class variable, Primitive and Reference variable, Constructor, this keyword, finalize and garbage collection, Array-Declaring and defining array, accessing array elements, length properties, 2D array, anonymous array, array of Objects. Understanding method- method returning object, passing objects, method passing and returning arrays, use of method overloading. Static-Static block and non static block, static variable, static method. nested & inner classes.

Reusability Properties [6L]
Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages

String Handling [2L]
Basic string handling concepts- String (discuss charAt(), compareTo(),equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() ,trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(),ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods),concept of mutable and immutable string, command line arguments

Exception handling & Multithreading [5L]
Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Basic IO Operation and File Handling [3L]
Understanding unformatted and formatted IO. Reading and writing files.

Swing Programming [4L]
Swing Origins, Components and containers, Difference between AWT and swing, small swing programs, swing apps, concept of delegation event model and listener.

Applet Programming (using swing) [4L]
Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets.

Text Books:
1. Schildt, H., The Complete Reference JAVA McGraw – Hill.

Reference Books:
1. Head First JAVA- Kathie Seira

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER ORGANIZATION & ARCHITECTURE LAB**
SUBJECT CODE	**:**	**IT491**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Mathematics, Digital Electronics, Basic Programming knowledge.

Course Objective:

The objective of the course is to articulate design issues in the development of processor or other components and Learn microprocessor architecture and simulation of assembly language programming using XLINX tools.

Course Outcome
After completion of this course student will be able to

IT492.1:	Apply the knowledge of mathematics, science, and engineering in simulation.
IT492.2:	Use Hardware Description Language (HDL) in order to implement skills in designing Architectural solutions and describing designs using VHDL
IT492.3:	Construct and examines digital circuit design using XILINX tool.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT492.1	3	2	3	2												
IT492.2		2	3	2												
IT492.3		2	3	3												

Course Contents:

All laboratory assignments are based on Hardware Description Language(VHDL or Verilog) Simulation.

- HDL introduction
- Basic digital logic based programming with HDL
- 8-bit Addition, Multiplication, Division
- 8-bit Register design
- Memory unit design and perform memory operations.
- 8-bit simple ALU design
- 8-bit simple CPU design

Text Books:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Kai Hwang”Advanced Computer Architecture” McGraw Hill

Reference Book:

1. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill
2. Hamacher, "Computer Organisation", McGraw Hill

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMMUNICATION ENGINEERING & CODING THEORY LAB**
SUBJECT CODE	**:**	**IT492**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Mathematics, Physics, Electronics

Course Objective:
Understand the channel performance using Information theory and various error-control code properties, apply linear block codes for error detection and correction, apply convolution codes for performance analysis & cyclic codes for error detection and correction, create and evaluate BCH & RS codes for Channel performance improvement against burst errors.

Course Outcome
After completion of this course student will be able to

IT492.1:	Understand amplitude modulation and its demodulation.
IT492.2:	Apply Amplitude Modulated Signal and measurement of modulation index for the various conditions under-modulated, over modulated and critically modulated.
IT492.3:	Design and analyze PAM and its demodulation and PWM, PPM.
IT492.4:	Evaluate and measure the frequency deviation and the modulation index of the wave.
IT492.5:	Create and assess Pulse code modulation, ASK FSK, BPSK demodulation.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT492.1	1	2	3								2					
IT492.2	1	2	3													
IT492.3	1	2	3													
IT492.4	1	3				1										
IT492.5	1	2	3									2				

Course Content:

1. Generation of amplitude modulation (Design using transistor or balanced modulator chip (to view the wave shapes) and its demodulation.
2. Study of Amplitude Modulated Signal and measurement of modulation index for the various conditions under modulated, over modulated and critically modulated.

3. Study of Frequency Modulation (FM) and Demodulation Techniques. Measure the frequency deviation and the modulation index of the wave.
4. Generation of FM using VCO chip
5. Study on time division multiplexing and demultiplexing
6. Generation of PAM and its demodulation
7. Generation of PWM AND PPM (using IC 555 Timer)
8. Study of Pulse code modulation and demodulation
9. Study of Digital Modulation techniques: Generation of ASK and its demodulation
10. Study on Digital Modulation Techniques Generation of ASK and its demodulation
11. Study of Digital Modulation techniques: Generation of FSK and its demodulation
12. Study of Digital Modulation techniques: Generation and demodulation of BPSK

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Principle of Communication Systems by Herbert Taub and D.L.Schilling

Reference Books:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**OBJECT ORIENTED PROGRAMMING LAB**
SUBJECT CODE	**:**	**IT494**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Mathematics, Physics, Electronics

Course Objective:
The objective of the course is to enable students to use basic object oriented features in coding enable students to develop projects

Course Outcome
After completion of this course student will be able to

IT494.1:	Apply object oriented programming concepts in designing programs
IT494.2:	Analyze different dimensions of a problem and provide optimal solutions
IT494.3:	Apply the advance features of JAVA in designing of projects

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT494.1	3	2	2		1	1										
IT494.2	2	3	2		3	1										
IT494.3	3	3	2		3	2										

Course Content:

MODULE I:
Writing simple java programs, compiling and running.
Understanding the main() method.

MODULE II:
Using basic java token, control structures.

MODULE III:
Illustrating class objects, constructor, final, finalize
Understanding Arrays and hands on application using array
Understanding and writing methods
Static and non static concepts

MODULE IV:
Class Relationship

Using inheritance
Creating abstract classes, interfaces

MODULE V:
String Handling

MODULE VI:
Illustrating exception handling
Illustrating multi threading applications

MODULE VII:
Basic IO and File IO operation

MODULE VIII:
AWT and Swing applications

MODULE IX:
Applet programming

Text Books:
1. Schildt, H., The Complete Reference JAVA McGraw – Hill.

Reference Books:
1. Head First JAVA- Kathie Seira

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**TECHNICAL SKILL DEVELOPMENT (PYTHON PROGRAMMING)**
SUBJECT CODE	**:**	**MC481**
YEAR	**:**	**SECOND**
SEMESTER	**:**	**4thSemester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Basic Mathematics, Computer Programming.

Course Objective:
The objective of the course is to provide knowledge of Python and to design and execute the different applications using Python.

Course Outcome
After completion of this course student will be able to

MC481.1:	Understanding basics of Python Programming Language.
MC481.2:	Analyze problems and design effective solutions for them.
MC481.3:	Apply the best features of Python to program real life problems.
MC481.4:	Implement optimal solutions to any problem.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
MC481.1	2											2	2			
MC481.2		3	3	2										1		
MC481.3					3									2		
MC481.4		2	3		3	2			2							1

Course Contents

Module 1: Introduction to Python
Installation of Python
Two modes of using Python Interpreter
Variables and Data Types
Operators and their Precedence

Module 2: Loops and Iterations

Iteration: while and for loops
Python Syntax, Colon & Indentation
Syntax of 'for loops'
Conditional Execution: if, elif and else
Modify loops: break and continue

Module 3: Strings & Lists
Python Strings
Slicing
Python Lists
Mutable and Immutable Types

Module 4: Functions and More on Strings & Lists
Functions
Optional and Named Arguments
More on Strings & Lists experiments
Split and Join
Manipulating and Copying Lists

Module 5: Modules and Packages
Python Modules and Packages
Different ways to import Packages
File Input/Output
The pickle module
Formatted Printing
Exception Handling

Module 6: Graphics, GUI and Object Oriented Programming
Turtle Graphics
Writing GUI Programs
Object Oriented Programming in Python
Inheritance, reusing code

Module 7: Files and Streams
File related modules in Python
File modes and permissions
Reading & Writing data from a file
Redirecting output streams to files
Working with directories, CSV files and Data Files

Module 8: Python and Databases
ODBC and Python
Working with Databases in MySQL
Working with Tables in MySQL
Working with SQLite Database

Text Books:
1. 'Python for Everybody – Exploring Data in Python 3', Charles Severance, Shroff Publishers & Distributors Pvt. Ltd.
2. 'Python Training Guide', Mercury Learning & Information USA, BPB Publications, 2015

Reference Books:
1. 'Python for Education', Ajith Kumar B. P., Inter University Accelerator Center, New Delhi, 2010

2. ‘Python Cookbook: Recipes for Mastering Python 3’, 3rd Edition - David Beazley & Brian K. Jones, O'Reilly Media, Inc., 2013

5TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DESIGN ANALYSIS OF ALGORITHM**
SUBJECT CODE	**:**	**IT501**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Discrete Mathematics Data Structure and Basic Programming Knowledge

Course Objective:

The objective of the course is to study paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice, use different

computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome

After completion of this course student will be able to

IT501.1	Analyze the asymptotic performance of algorithms.
IT501.2	Design the algorithms and execute rigorous correctness proofs for the algorithms.
IT501.3	Apply important algorithmic design paradigms and methods of analysis.
IT501.4	Synthesize efficient algorithms in common engineering design situations.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT501.1	1	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-
IT501.2	1	3	2	2	-	-	-	-	-	-	-	-	1	2	-	2
IT501.3	2	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-
IT501.4	1	2	3	3	-	-	-	-	-	-	-	2	2	2	-	1

Course Content:

MODULE I [2L]

Introduction: Time and Space Complexity, Different Asymptotic notations and their mathematical significance

MODULE II [9L]:

Divide and Conquer: Basic method, use, Merge Sort, Quick Sort and their complexity, Heap Sort and its complexity. Dynamic Programming: Basic method, use, Matrix Chain multiplication, All pair shortest paths, single source shortest path, Strassen's matrix multiplication algorithm. Hashing: introduction, collision resolution, hash functions, analysis of hashing with chaining and with open addressing.

MODULE III[8L]:

Backtracking: Basic method, use, 8 queens' problem, Graph coloring problem. Greedy Method: Basic method, use, Knapsack problem, traveling salesman, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm.

MODULE IV[3**L]:**

Branch and bound technique: integer programming, 0/1 knapsack problem

MODULE V[4**L]:**

Disjoint set manipulation: Set manipulation algorithm like UNION-FIND, union by rank. String matching problem: Different techniques – Naive algorithm, Knuth, Morris, Pratt (KMP) algorithm with their complexities.

MODULE VI[6L]:

Amortized Analysis: Aggregate, Accounting, and Potential Method. Network Flow: Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

MODULE VII [6L]:
Matrix multiplication Algorithm: Application of matrix multiplication to solution of simultaneous linear equations using LUP decomposition, Inversion of matrix and Boolean matrix multiplication.

MODULE VIII [5L]:
Notion of NP-completeness: P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's theorem (Statement only). Approximation Algorithms: Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes.

Textbooks:
1. A. Aho, J. Hopcroft and J. Ullman "The Design and Analysis of Algorithms"
2. E. Horowitz and Sahni "Fundamentals of Computer Algorithms"

Reference books:
1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms"
2. D. E. Knuth "The Art of Computer Programming", Vol. 3

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFTWARE ENGINEERING**
SUBJECT CODE	**:**	**IT502**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Mathematics, Data Structure and Basic Computations.

Course Objective:

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development of and management of software systems.Knowledge of basic software engineering methods and practices and their appropriate application.

Course Outcome

After completion of this course student will be able to

IT502.1	Ability to analysis and design of complex systems and meet ethical standards, legal Responsibilities.
IT502.2	Ability to apply software engineering principles, techniques and develop, maintain, Evaluate large-scalesoftware systems.
IT502.3	To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.
IT502.4	Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT502.1	3	2	1	1	-	-	-	1	-	-	1	1	-	1	2	3
IT502.2	-	3	1	2	2	-	-	1	-	-	1	1	1	-	-	-
IT502.3	2	1	3	-	1	-	-	1	-	-	-	1	-	3	-	1
IT502.4	-	-	2	3	3	-		1	-	-	-	1	-	2	-	2

Course Contents:

Introduction [3L]

Definition of Software Engineering, Software crisis, Evolution of technology- Hype curve, Exploratory style of Software development vs. Software Engineering, Human cognition mechanism, Software Engineering principle- abstraction and decomposition.

Software Development Life Cycle(SDLC) models [4L]

Waterfall model, V-shape Model, Prototyping Model, Spiral Model, RAD Agile Model, Verification and Validation.

Software Project Management [7L]

Responsibility of a project manager, Project planning, Metrics for project size estimation, Project estimation techniques, COCOMO model, Halstead's Software Science, Scheduling-CPM, PERT, Gantt chart, Risk management, Software configuration management, Staffing and team leader project and planning

Requirement analysis and specification [4L]

SRS, Requirement gathering and specification, Functional requirement, Traceability, 4GL.

Software Design [8L]

Characteristics of a good software, Cohesion and coupling, Function oriented design- DFD, Structure chart. Design phase in life cycle, System Design Definitions, Concept and methodologies, data flow oriented Design, Program Design and the requirements. Object oriented design- class and relationship, UML diagram, Use Case Model, State chart diagram.

Coding and Testing [7L]
Coding Standard, software documentation, Testing- unit testing, black box testing- equivalence class partitioning, boundary value analysis, white box testing- McCabe's Cyclometric Complexity, Mutation Testing, Debugging, Program analysis tool, Integration Testing, Grey box testing, System testing- Smoke and performance testing.

Software Reliability and Quality Management [5L]
Reliability, Hazard, MTTF, Repair and Availability, Software quality, Software reliability and fault-tolerance, six-sigma.

Computer-aided software engineering [5L]
Computer-aided software engineering (CASE)-environment and benefit. Function point methods (FSM,ISO,OMG) & Metrics. Standards: Capability Maturity Model Integration, ISO 9001.

Text Books:

1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Books:

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Software Engineering: Iyan Somarville, 7th Edition.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**OPERATING SYSTEM**
SUBJECT CODE	**:**	**IT503**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Pre requisites:
Computer organization and Architecture, Data Structures, Algorithms & Programming Concept

Course Objective:

The objective of the course is to present an introduction to operating systems, with an emphasis on concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization.

Course Outcome:

After completion of this course students will be able to

IT503.1:	Understand the structure and basic architectural components involved in OS.
IT503.2:	Summarize competence in recognizing and using operating system features
IT503.3:	Apply theory and implementation of different operating system aspect.
IT503.4:	Analyze knowledge of different operating system algorithms.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT503.1	2	3	3	3					2				1	-	3	1
IT503.2	2	3	3	3									2	2	-	3
IT503.3	1	3	3	3					2				1	-	3	2
IT503.4	2	3	3	3					2	1		2	1	3	2	3

Course Contents:

Introduction: [3L]

Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.

System Structure: [3L]

Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls**.**

Processes: [3L]

Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication**.**

Threads: [2L]

Overview, benefits of threads, user and kernel threads.

CPU Scheduling: [3L]

Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multiprocessor scheduling.

Synchronization: [4L]

Background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlock: [4L]

System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Memory Management: [4L]
Background, logical vs. physical address space, swapping, contiguous memory allocation, Pre-paging, paging, segmentation, segmentation with paging.

Virtual Memory :[5L]

Background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing, Virtualization(VMware).

File Systems:[6L]
File concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance. Cases studies, access methods and matrices, file security, user authentication; Case studies of UNIX-LINUX Operating System and Mobile OS

I/O Management:[4L]
I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: [3L]
Disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Text Books:
1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
3. Dhamdhere: Operating System TMH

Reference Books:
1. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
2. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PROGRAMMING PRACTICE WITH C++**
SUBJECT CODE	**:**	**IT504A**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L +1T**
CREDITS	**:**	**4**

Prerequisite:

Basic computer programming concepts

Course Objective:

The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome

After completion of this course student will be able to

IT504A.1:	Understand the basic concept of object oriented programming
IT504A.2:	Apply the concept of object oriented programming concept using C++
IT504A.3:	Analyse the different features of object oriented programming in the context of C++
IT504A.4:	Evaluate concept of C++ to design different small to big scale project
IT504A.5:	Implement various concepts related to Computer Language.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT504A.1	3	2	2	2									3	3		
IT504A.2	3	3	2	2									3	2		
IT504A.3	3	3	2	2									2	2		
IT504A.4	3	2	2	2							3				3	3
IT504A.5	3	2	2	2									1			3

Course Contents:

Introduction to Object oriented design, Declaration, Expression and statements [6L]

Concepts of object oriented programming language, Language translator, Basics of OOPs, Structure of C++ program, Class and object, Abstraction and encapsulation, Polymorphism.

Array, Function, Pointer & Data abstraction through classes and user defined data types: [8L]

Array , Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function. Class, Members, Constructor and destructor, Copy constructor. Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables. Friend Function : understanding friend function and its use

Class relationships: Operator Overloading , Polymorphism & Standard Library in C++ [12L]

Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator. Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class, Friend, Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators. Standard library in C++: Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes

Template , Exception Handling & UML Diagram [8L]

Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace. Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception. Object oriented design and modeling :Software development, Qualities of software system, Software

architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.

Introduction to C++11 Features [8L]
Lambda Expressions, Automatic Type Deduction and decltype, Uniform Initialization Syntax,Deleted and Defaulted Functions, nullptr, Delegating Constructors,Rvalue References, Threading Library

Text Books:
5. Schildt, H., The Complete Reference C++, McGraw – Hill.
6. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:
9. C++ object oriented programming paradigm, Debasish Jana, PHI
10. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ARTIFICIAL INTELLIGENCE**
SUBJECT CODE	**:**	**IT504B**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Basic concept of computer science and automation, Knowledge of programming languages, Basic mathematical concepts like calculus, probability, metrics and statistics.

Course Objective:
Apply knowledge of computing and mathematics appropriate to the discipline.Analyze a problem, and identify and define the computing requirements appropriate to its

solution.Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs. Understand current techniques, skills, and tools necessary for computing practice.

Course Outcome

After completion of this course student will be able to

IT504B.1:	Understand different types of AI agents and Tools.
IT504B.2:	Summarize various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction).
IT504B.3:	Apply the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.
IT504B 4:	Analyze working knowledge of reasoning in the presence of incomplete and/or uncertain information.
IT504B.5:	Design knowledge representation, reasoning, and machine learning techniques to real-world problems.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT504 B.1					3								1			
IT504 B.2		2		3		3								3		1
IT504 B.3	2						3	3								2
IT504 B 4	2			3					3	1			1			2
IT504 B.5	2	3	1	3		1	1							2		1

Course Contents:

Introduction to Artificial Intelligence and Agent [4L]

Foundations and History of Artificial Intelligence, Turing Test, Intelligent Agents – Agents and environment. Concept of Rationality, Nature of environments and Structure of agents.

Searching and Problem Solving [12L]

Problem solving agents - Problem formulation with suitable examples, searching for solutions, 8 puzzle problem, tower of Hanoi problem, water jugs problem, 8-queen problem, Data driven and goal driven search, Uninformed search strategies – Breadth-first search, Uniform-cost search, depth-first search, Depth-limited search, Uninformed search strategies Iterative deepening depth-first search, Bidirectional search, avoiding repeated states, Informed search strategies – Greedy best first search, A* search, Informed search strategies Memory-bounded heuristic search, Heuristic Functions, Constraint satisfaction problems, stochastic search methods .

Game Playing [3L]

Adversarial search, Mini-max, alpha-beta pruning.

Knowledge Representation and Reasoning [12L]

Building a Knowledge Base, Propositional logic, first order, script and frame, Logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning, Hierarchical Task network planning, Planning and acting in nondeterministic domains. Uncertain

Knowledge and Reasoning, Probabilities, Bayesian Networks, Inference using full joint distribution, Independence, Bayes' rule and its use, Semantics of Bayesian Networks, Exact Inference in Bayesian networks, Rule-based methods for uncertain reasoning, Dempster-Shafer-theory.

Learning [11L]
Learning from observation – Forms of learning, Inductive learning, Learning Decision trees, Knowledge in learning - Explanation based learning, Learning Decision Trees, Neural Networks (Network structures, Single layer feed-forward neural network, Multilayer feed-forward neural network), clustering concept, Reinforcement Learning – Introduction, Passive reinforcement Learning, Active Reinforcement Learning.

Text Books:
1. Artificial Intelligence: A Modern Approach, Russell & Norvig, Prentice Hall.
2. Artificial Intelligence, Elain Rich and Kevin Knight, TMH.

Reference Books:

1. Prolog Programming for Artificial Intelligence Paperback by Ivan Bratko
2. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**OPERATIONS RESEARCH**
SUBJECT CODE	**:**	**IT504C**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Pre requisites:
Basic Knowledge of Function, plotting of Equation and inequalities, Formulation of Mathematical Problem.

Course Objective:
The objective of the course is to develop models and analyze the model using different techniques, decision making under uncertainty and risk.

Course Outcome:
After completion of this course students will be able to

IT504C.1:	Design knowledge-base representation models.
IT504C.2:	Analyze the performance of rule-based-systems.
IT504C.3:	Implement heuristic search algorithms for real life problem solving
IT504C.4:	Develop rule-based expert systems and planning tools.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
IT504C.1	1		2									
IT504C.2		3		2								
IT504C.3			3		1							
IT504C.4		1				1	2	2				

Course Contents

Linear Programming Problem [11L]:
Basics of Linear Programming Problem(LPP) and its Applications. General Mathematical Formulation of LPP; Definitions: Convex set, Solution, Feasible Solution, Basic and Non-Basic Variables, Basic Feasible Solution, Degenerate and Non-Degenerate solution, Optimum/Optimal Solution; Solution of LPP by Graphical Analysis/Method, Simplex Method, Charnes' Big M-Method; Duality Theory.

Module II [6L]:
Transportation Problem, Assignment Problem.

Network Optimization Models [8L]:
CPM / PERT (Arrow network, Time estimates, earliest expected time, latest allowable occurrence time, latest allowable occurrence time and stack. Critical path, Probability of meeting scheduled date of completion of project. Calculation of CPM network.Various floats for activities.

Game Theory [6L]:
Introduction;Two person Zero Sum game, Saddle Point; Minimax and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.

Sequencing[4L]:
Two men two machines, Three Men Two Machines.

Queuing Theory[9L]:
Introduction and Basic Structure of Queuing Theory; Basic Definitions and Notations. Birth-and-Death Model (Poisson / Exponential distribution); Poisson Queue Models: (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) and Problems. Introduction to STOCHASTIC PROCESSES, Markov Process with Discrete State Space: Poisson Process, Applications in Stochastic Models (Queuing System and Models).

Text Books:

1. Operations Research by Kanti Swaroop and P.K. Man Mohan, Sultan Chand and Sons
2. Linear Programming and Theory of Games by Ghosh and Chakraborty, Central Book Agency
3. Linear Programming and Theory of Games by P.M.Karak, ABS Publishing House
4. Operations Research, D.K.Jana & T.K.Roy, Chhaya Prakashani Pvt. Ltd.
5. Operations Research, Kalavati,VIKAS
6. Operations Research,Humdy A Taha,PHI / Pearson
7. Stochastic Processes by J. Medhi, New Age International Publishers.(For Stochastic Model of Queuing Theory. Page Ch1:49-51,Ch3:138-149,Ch10:388-395).

Reference Books:

1. Operations Research Theory and Applications by J.K.Sharma, Macmillan India Limited.
2. Operations Research, Vijayakumar, Scitech
3. Operations Research by S.D. Sharma, Kedar Nath Ram Nath Publishers.
4. Operations Research by A.P. Verma, S. K. Kataria & Sons.
5. Operations Research by P.K. Gupta & Hira, S.Chand
6. Operations Research by V.K. Kapoor

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**INDUSTRIAL & FINANCIAL MANAGEMENT**
SUBJECT CODE	**:**	**HU505**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**2L**
CREDITS	**:**	**2**

Prerequisite:

Mathematics, English.

Course Objective:

- ✓ Introduce students to financial management and its importance and its applications in business, their relationship with the business environment and the role and functions of chief financial officer.
- ✓ Introduce students to financial planning, and objectives, and its benefits, and the types of areas and stages of financial planning, and the factors that help the success of financial planning and the methods used in financial planning to assess the short-term financial needs.
- ✓ Introduce students to the time value of money and its relationship to the objectives of financial management, rationale for using the time value of money, and simple and compound interest and how to calculate it, and also to understand the present value of the future payments.
- ✓ Introduce students to major financial statements of businesses as well as the definition of the purposes and tools of financial analysis and its importance in the financial control process. Introduce students to the basics of investing in securities through exposure to the following points: knowledge of financial markets, and their components, and functions of the financial market, and the parties worked in the financial markets, the stock traded in the money markets and capital markets, then find out the efficiency standards of the financial market, as well as valuations of Shares and bonds.
- ✓ Giving students how to apply full financial cycle and makes the necessary adjustments on service and commercial installations
- ✓ Giving student's of Application processors to finance small projects.

Course Outcome

After completion of this course student will be able to

HU505.1:	Understand the basic principles of financial accounting and reporting.
HU505.2:	Select, interpret and use different costing techniques as a basis for decisions in various business situations.
HU505.3:	Explain and describe various technology-based business models and the dynamics of value creation, value proposition, and value capture in industrial enterprises.
HU505.4:	Produce and interpret an industrial company's Annual Statement, at a basic level.
HU505.5:	Describe the operations of an industrial enterprise from various perspectives, and analyze its basic strengths and weaknesses based on concepts from the field of Industrial Management.
HU505.6:	Explain how the industrial company markets and price it's products considering GST

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
HU505.1		2	1	2		2							1			
HU505.2					3	1	2		2		1		1			2
HU505.3	3															
HU505.4		2			2		1						3			2
HU505.5		2		2					1							
HU505.6	1	2	2	3							2		2		2	1

Course Content:

Introduction [12L]
Introduction to Accounting, Important Definitions, Basic concepts and conventions, Types of Accounts with Golden Rule of Accounting, Journal, Ledger and Trial Balance, Preparation of Trading Account, Profit & Loss A/C and Balance Sheet for business organizations.

Financial Management [13L]
Introduction to Financial Management, Introduction, Definition and concept, scope, objective, functions of Finance Manager. Ratio Analysis: Definition, Objectives, Advantages & Disadvantages.
Classification of Ratios: Liquidity ratios, Capital Structure ratios, Activity ratios & Profitability Ratios, Capital Budgeting: Nature of Investment Decision, Importance of Capital Budgeting, capital budgeting process, Investment criteria, payback period, Rate of return, cash flow, discounting cash flow NPV method and IRR method, Benefit cost ratio, ARR.

Cost Accounting [8L]
Introduction to cost accounting-Cost Centre Cost unit, Elements of costs, Statement of cost or cost sheet, Marginal cost & C-V-P analysis with BEC. Budget and Budgetary Control: Concepts of Budget, Budgeting and budgetary control, advantages, disadvantages, uses, Master Budget, Zero Based Budget, Cash budget, Flexible budget.

Working capital management[5L]
Introduction-working capital concept-financing working capital-importance of working capital-management of working capital-working capital cycle-management of different components of working capital-working capital forecast.

Introduction to GST [4L]
Introduction to GST-Basic concept and application.

Text Books:

4. Financial Management, Khan & Jain, S. Chand
5. Management Accounting, Khan & Jain, S. Chand
6. Modern Accountancy, Haniff & Mukherjee, TMH

Reference Books:

1. An Introduction to Accountancy, S.N.Maheswari, Vikas publication
2. Cost Accounting: Theory and Practices, B. Banerjee, PHI
3. Financial Management, IM Pandey, Vikas

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DESIGN ANALYSIS OF ALGORITHM LAB**
SUBJECT CODE	**:**	**IT591**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Discrete Mathematics, Data Structure, Basic Programming Knowledge

Course Objective:
The objective of the course is to analyze and design algorithms, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome
After completion of this course student will be able to
IT591.1: Analyze a problem and design the solution for the problem.
IT591.2: Optimize the solution with respect to time complexity & memory usage.
IT591.3: Apply different algorithmic approaches for solving the problems.
IT591.4: Analyze the efficiency of algorithms using time and space complexity theory.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT591.1	2	3	2	-	3	-	-	-	-	-	-	-	1	-	-	-
IT591.2	2	-	2	-	3	-	-	-	-	-	-	-	2	-	-	-
IT591.3	2	3	2	-	3	-	-	-	-	-	-	-	3	2	1	-
IT591.4	2	3	2	-	3	-	-	-	-	-	-	2	2	-	3	2

Course Content:

1. Implement Merge Sort using Divide and Conquer approach
2. Implement Quick Sort using Divide and Conquer approach
3. Find the minimum number of scalar multiplication needed for chain of matrix using dynamic programming
4. Implement all pair of Shortest path for a graph (Floyd- Warshall Algorithm) using dynamic programming
5. Implement Travelling Salesman Problem using dynamic programming
6. Implement Single Source shortest Path for a graph using Bellman Ford Algorithm
7. Implement 15 Puzzle Problem using Branch and Bound technique.
8. Implement 8 Queen Problem using Backtracking.
9. Implement any one of the following problems using Backtracking:
   - Graph Coloring Problem
   - Hamiltonian Problem
10. Implement any one of the following problem using Greedy method:
    - Knapsack Problem
    - Job sequencing with deadlines
11. Implement KMP algorithm for string matching.
12. Implement Ford Fulkerson algorithm.

Textbooks:

1. Aho, J. Hopcroft and J. Ullman “The Design and Analysis of Algorithms”
2. D. E. Knuth “The Art of Computer Programming”, Vol. 3
3. E. Horowitz and Sahni “Fundamentals of Computer Algorithms”

Reference books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFTWARE ENGINEERING LAB**
SUBJECT CODE	**:**	**IT592**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite: Familiar with MS Office Package and Basic Computations.

Course Objective:
Demonstrate the UML diagrams with ATM system descriptions, Demonstrate the working of software testing tools with c language, Understanding Project Planning Tools.

Course Outcome:

After completion of this course student will be able to

IT592.1:	Ability to analysis and design of complex systems and meet ethical standards, legal responsibilities
IT592.2:	Ability to apply software engineering principles, techniques and develop, maintain, evaluate large-scale software systems.
IT592.3:	To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.
IT592.4:	Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT592.1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
IT592.2	-	3		1	-	-	-	1	-	-	-	-	2	-	-	-
IT592.3	1	2	3	-	-	-	-	-	-	-	-	-	3	2	1	-
IT592.4	1	2	1	-	-	-	-	1	-	-	-	2	2	-	3	2

Course Contents:

1. Identifying the Requirements from Problem Statements
2. Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, Identifying Functional Requirements
3. Estimation of Project Metrics
4. Project Estimation Techniques -COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics
5. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
6. Use case diagrams, Actor, Use Case, Subject, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Include Relationship, Extend Relationship, Generalization Relationship, Identifying Actors, Identifying Use cases, Guidelines for drawing Use Case diagrams

7. Identifying Domain Classes from the Problem Statements
8. Introduction to selenium tool for software testing.
9. JUnit, Static analysis, Junit Framework
10. Prepare a SRS document in line with the IEEE recommended standards
11. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
12. Draw the sequence diagram for any two scenarios & Draw the collaboration diagram.
13. Draw the state chart diagram & component diagram.
14. Perform forward engineering in java.(Model to code conversion)
15. Perform reverse engineering in java.(Code to Model conversion)
16. Draw the deployment diagram.

Text Book

1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Book

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Software Engineering: Iyan Somarville, 7th Edition

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**OPERATING SYSTEM LAB**
SUBJECT CODE	**:**	**IT593**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Computer architecture, C,C++, Java

Course Objective:
The objective of the course is to have students understand and appreciate the principles in the design and implementation of operating systems software.

Course Outcome
After completion of this course student will be able to

IT593.1: Describe the important computer system resources and the role of operating system in their management policies and algorithms.

IT593.2: Understand the process management policies and scheduling of processes by CPU

IT593.3: Evaluate the requirement for process synchronization and coordination handled by operating system

IT593.4: Describe and analyze the memory management and its allocation policies

IT593.5 Identify use and evaluate the storage management policies with respect to different storage management technologies.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT593.1	2	3	3	3					2				1	2	-	3
IT593.2	2	3	3	3									2	3	1	-
IT593.3	1	3	3	3					2				1	1	3	2
IT593.4	2	3	3	3					2	1		2	-	2	1	3
IT593.5	1	2	2	2					2	1		2	1	2	2	1

Course Contents:

1. **Managing Unix/Linux Operating System :**
Installation & Configuration of Operating Systems-Multi Booting, VMware installation,Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Super block, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.

2. **Process:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.

3. **Signal**: signal handling, sending signals, signal interface, signal sets.

4.**Semaphore**: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5.**POSIX Threads**: programming with pthread functions (viz. pthread_create, pthread_join,pthread_exit,pthread_attr_init, pthread_cancel)

6.**Inter-process communication**: pipes(use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO),message passing & shared memory(IPC version V).

Text Books:

1. Russ Cox, Frans Kaashoek, Robert Morris , xv6: a simple, Unix-like teaching operating system",Revision8.
2. Sumitabha Das , UNIX Concepts and Applications, Tata McGraw-Hill.

Reference Books:

1. Tanenbaum A.S., “Operating System Design & Implementation”, Practice Hall NJ.2.
2. Stalling, William, “Operating Systems”, Maxwell McMillan International Editions.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PROGRAMMING PRACTICE WITH C++ LAB**
SUBJECT CODE	**:**	**IT 594A**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Basic Computer concepts

Course Objective:
The objective of the course is to introduce the object oriented programming paradigm using C++ and make the students understand different concepts of C++ and apply the features in application development.

Course Outcome
After completion of this course student will be able to

IT594A.1:	Understand the difference between object oriented programming and procedural oriented programming language.
IT594A.2:	Apply the knowledge to write programs using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.
IT594A.3:	Analyze and construct appropriate diagrams and textual descriptions to communicate the static structure and dynamic behavior of an object oriented solution.
IT594A.4:	Develop small to big scale project using C++

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT594A.1	3	2	2		1	1							1	3		
IT594A.2	2	3	2		3	1							3	2		
IT594A.3	3	3	2		3	2							1	2		
IT594A.4	3				3		2					2			3	3

Course Contents:

Introduction [4P]
Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU & GDB script.

Basic Programming Concepts [3P]
Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion

Stream and Structure [3P]
I/O streams, arrays and string manipulation, pointers, structures & unions Template , Exception

Object Oriented Concepts [3P]
Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. Dealing with member functions

Overloading [3P]
Operator overloading and Polymorphism (both static & dynamic).

Inheritance [3P]
Introduction to Inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception handling.

Memory Management [3P]
Dynamic memory allocation, implementation of Linked Lists, using C++.

C++11 Features [3P]
Basic C++11 features

Text Books:
1. Schildt, H., The Complete Reference C++, McGraw – Hill.
2. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:
1. C++ object oriented programming paradigm, Debasish Jana, PHI
2. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ARTIFICIAL INTELLIGENCE LAB**
SUBJECT CODE	**:**	**IT594B**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Knowledge of programming languages.

Course Objective:
Provide understanding of the theoretical underpinnings of artificial intelligence; Introduce the basic problems that are solved in the field of artificial intelligence; Give the basic algorithms for simulating intelligence on computer machines;Offer schemes for knowledge representation and reasoning; Demonstrate the mechanisms of rule-based planning; Show the principles for inductive machine learning; This course includes the philosophical, psychological, and biological issues related to artificial intelligence.

Course Outcome:

After completion of this course student will be able to

IT594B.1:	Understand the fundamentals of knowledge representation, inference and theorem proving using AI tools.
IT594B.2:	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
IT594B.3:	Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.
IT594B.4:	Apply various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction,)

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT594B.1	2											1			1	
IT594B.2		3									1		1			
IT594B.3	1		3						1							2
IT594B.4		3		2								1		1		

Course Contents:

A. Write the following programs using PROLOG

1. Study of PROLOG facts and rules.

2. Write a program to compute the factorial of a number.

3. Write a program to compute GCD of two numbers.

4. Write a program to represent facts and rules.

5. Write a program to represent a family tree.

6. Write a program to diagnose intelligently.

7. Write a program to check whether a given line segment is vertical or horizontal?

8. Write a program for list processing.

B. Write the following programs using PROLOG

1. Write a program to solve 8 queens problem

2. Solve any problem using depth first search.

3. Solve any problem using the best first search.

4. Solve 8-puzzle problem using best first search

5. Solve Robot (traversal) problem using means End Analysis

6. Solve traveling salesman problems.

C. Write some programs on recent trend in AI(It may be beyond the curriculums)

Jupyter Notebook(iPython) :Medical diagnosis.

Text Book

1. Artificial Intelligence: A Modern Approach,. Russell & Norvig, Prentice Hall.

2. Artificial Intelligence, Elain Rich and Kevin Knight, TMH.

Reference Book

1. Prolog Programming for Artificial Intelligence Paperback by Ivan Bratko

2. Jacek M. Zurada, “Introduction to Artificial Neural Systems”, PWS Publishers

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**OPERATIONS RESEARCH LAB**
SUBJECT CODE	**:**	**IT594C**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**5th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite:
Knowledge of programming languages.

Course Objective:
Understand the meaning, purpose, different stages, tools of Operations Research; Explain the Applications of Operations Research; Describe the Limitations of Operation Research

Course Outcome:

After completion of this course student will be able to

IT594C.1:	Understand knowledge of different Optimization Techniques.
IT594C.2:	Analyze for better Optimization Techniques
IT594C.3:	Implement Dijkstra's or Floyd's Algorithm, Maximal Flow Problem, PERT/CPM using TORA

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSo3**	**PSO4**
IT594C.1	1	2										1				
IT594C.2		3	2	3												
IT594C.3		3	3		3	1			1							

Course Content:
Software based lab using C /C++ or GNU C++ (G++ / GCC ++) or CodeBlocks

1. Familiarization with O.R package: TORA
2. Assignment on Linear Programming Problem: Graphical Method Using O.R. Package TORA
3. Assignment on Transportation problem.
4. Assignment on Assignment problem
5. Assignment on Duality
6. Assignment on Simplex method (Including Charnes' Big-M Method)
7. Assignment on Game Theory
8. Assignment on PERT/CPM
9. Assignment on Queuing Problem

Text Books:

1. Operations Research by Kanti Swaroop and P.K. Man Mohan, Sultan Chand and Sons
2. Linear Programming and Theory of Games by Ghosh and Chakraborty, Central Book Agency
3. Linear Programming and Theory of Games by P.M.Karak, ABS Publishing House

Reference Books:

1. Operations Research Theory and Applications by J.K.Sharma, Macmillan India Limited.
2. Operations Research, Vijayakumar, Scitech
3. Operations Research by S.D. Sharma, Kedar Nath Ram Nath Publishers.

6TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DATABASE MANAGEMENT SYSTEM**
SUBJECT CODE	**:**	**IT 601**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:

Mathematics, Data Structure, Operating System.

Course Objective:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcome

After completion of this course student will be able to

IT601.1:	Define Database Management System, explain fundamental elements of a database management system, compare the basic concepts of relational data model, entity-relationship model.
IT601.2:	Understanding and Designing entity-relationship diagrams to represent simple database application scenarios, translate entity-relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data
IT601.3:	Apply a database design and improve the design by normalization
IT601.4:	Analyze efficient query optimization techniques, select suitable transaction management, concurrency control mechanism and Recovery management techniques.
IT601.5:	Evaluate File organization and use appropriate index structure.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PS03**	**PSO4**
IT 601.1	2	3	3	3	-	-	-	-	2	-	-	-	-	-	-	-
IT 601.2	2	3	3	3	-	-	-	-	-	-	-	-	1	-	-	-
IT 601.3	1	3	3	3	-	-	-	-	2	-	-	-	3	-	2	-
IT 601.4	2	3	3	3	-	-	-	-	2	1	-	2	2	2	3	-
IT 601.5	1	3	3	3	-	-	-	-	-	-	-	-	3	-	-	1

Course Contents:

Introduction [2L]

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model [3L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model [4L]

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

SQL and Integrity Constraints [8L]
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design [8L]
Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multivalued dependencies, 4NF, 5NF

Internals of RDBMS [6L]
Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures [4L]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Advanced Transaction Processing [5L]
Transaction-processing Monitors, Transactional workflows, E-Commerce, Main-memory databases, Real-time transaction systems, Long-duration transactions, Transaction management in multi databases.

Text Books:
1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mcgraw Hill.
2. Elmasri Ramez and Novathe Shamkant, “Fundamentals of Database Systems”, Benjamin CummingsPublishing. Company.

Reference Books:
1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill.
2. Peter Rob and Carlos Coronel, Database Systems- Design, Implementation and Management (7/e), Cengage Learning.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**WEB TECHNOLOGY**
SUBJECT CODE	**:**	**IT602**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Networking, Database Management System, JAVA Programming Language.

Course Objective:
Describing the web application architecture and protocols, illustrating different technologies those are used to develop web applications, describing different frameworks those used to develop web applications

Course Outcome: At the end of the course students will be able to

IT602.1:	Understand and evaluate web application architecture, technologies and frameworks.
IT602.2:	Analyze the knowledge of web technology in developing web applications
IT602.3:	Apply different solutions in the field of web application development.
IT602.4:	Evaluate and Design small to large scale project to provide live solution in web application development fields

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSo3	PSo4
IT602.1	3		3								2		1	2	1	3
IT602.2		3		2		2							1	-	1	3
IT602.3					3		2						2	-	1	1
IT602.4					3			3	2			2	2	1	-	3

Course Content:

Introduction to World Wide Web [1L]
Web Architecture, Web Applications, Web servers, Web Browsers and Agents, Internet standards, DNS,SMTP etc.

Classification of Web Protocols [1L]
Pull and Push mechanism: Pros and Cons. HTTP, HTTPS, XMPP

Mark-up [1L]
HTML 4.x: Elements, Attributes, Tags, Forms, Input, Frames, Tables.

Cascading Style Sheets [1L]
Advantages, Rules, CSS, inline and external, using template Layouts,

Javascript and Node JS:[4L]
Basic javaScript concepts, Use of Javascript, Variable, Object, function, Event Handling. Evaluation of Javascript. Create, Publish, Extend & Manage, Node.js HTTPs : Create Server and Get Data, Node.js Express, Node JS MongoDB. Node.js Promise , Node.js Generators & Compare with Callbacks, Node js Streams : File stream, Pipes, Node.js Testing with Jasmine

Non-Browser Web Agents [2L]
Limitation of Applets**:** Security Policy, Signing an Applet,

Server-side Programming [7L]
Servlets: HTTP Tunneling, Programmatically issuing HTTP GET, POST etc. and retrieval of content Concept of Dynamic Web pages, Web server versus Application server, Role of threading in a Server, Servlet-2.x API conforming to Web 2.0: Role of web.xmlas deployment descriptor, request and response, Basic request handling, parameter retrieval, multiple parameter retrieval, inter-Servlet collaboration: Dispatching the request, Concept of state of web: Sessions , tracking session, Using Cookies and session Id, Parameter passing to and from session, Servlet Filters and common uses of Filters and Cookies. Migration to Servlet 3.x plus an omission of web.xml and concept of Web Socket.

Persistence: JDBC 3.x framework [5L]
Need and different approaches of persistence of data,Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Executing basic CRUD using JDBC: Statement, Prepared Statement, Result Set. Execution of batch SQL, Stored Procedures using Callable Statement, Transaction Failure management: Savepoint and rollback concepts, Prevention of SQL injection, Concept of connection URL in details: Connecting to a remote database host (server). Concept of roles of Drivers: Java reflection in Action.

Java Server Pages [6L]
Benefits of JSP over Servlets, JSP scriptlets, page directives, declarations, action tags: <jsp:useBeabn/>, <jsp:include/><jsp:forward/> , introduction to MVC and Spring MVC

XML Technologies [2L]
XML, Namespace, DTD, W3C XML Schema

Ajax [2L]
Introduction to Asynchronous pattern and Using XML to communicate over XMLHttpRequest object. Handling 5 states and finding response states. Migration of Ajax to AJAJ

Web Service [3L]
Introduction to web service architecture. Simple object access protocol, Web service description language, RESTful web service.

Text Book:
1.Professional Java Server Programming Allamaraju, Apress

Reference Book:
1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning,Delhi, 2013.
2**.** Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent
Learning Solutions INC.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER NETWORKING**
SUBJECT CODE	**:**	**IT 603**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Basic Digital Communication, Computer Architecture and Operating System.

Course Objective:
Understanding the basic concept of different network models, explaining the network architecture, Analyzing and evaluating different network protocols.

Course Outcome
After completion of this course student will be able to

IT603.1:	Understand the network model and architecture
IT603.2:	Analyze different networking functions and features for identifying optimal solutions
IT603.3:	Apply different networking concepts for implementing network solution
IT603.4:	Evaluate and implement routing algorithms for implanting solution for the real life problems
IT603.5:	Evaluate model of fault tolerant computer networks.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT603.1	3	2	2	2												
IT603.2	2	3	3	2												
IT603.3	2	3	2	2								2				
IT603.4	2	3	2	2								2				
IT603.5	3	3	3	3								2				

Course Content:

Overview of Data Communication and Networking:[4L]
Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI and TCP/IP.

Physical Level: **[6L]**

Overview of data (analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network.

Data link Layer: **[9L]**
Types of errors, framing, error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, GoBack- N ARQ, Selective repeat ARQ, HDLC; Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet,

Network layer:[8L]
Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, subnetting; Routing : techniques, Routing Protocols, ARP, IP, ICMP, IPV6.

Transport layer: **[7L]**
Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

Application Layer[6L]
DNS, SMTP, SNMP, FTP, HTTPS, Firewalls, IP Filtering

Text Books:
1. B. A. Forouzan – "Data Communications and Networking (5thEd.) " – TMH
2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:
1.A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ERP**
SUBJECT CODE	**:**	**IT 604A**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Basic knowledge on management, managerial tasks, enterprise and networking.

Course Objective:
To acquire an overview of ERP and the knowledge on related technologies.
Skill to ERP Manufacturing Perspective and ERP modules.
To understand the ERP implementation lifecycle.
To examine ERP tools and understand the benefits of ERP

Course Outcome
After completion of this course student will be able to

IT604A.1:	Understand the basic concepts and benefits of ERP
IT604A.2:	Comprehend the concepts of ERP Manufacturing Perspective and ERP Modules.
IT604A.3:	Summarize the ERP life cycle.
IT604A.4:	Analyze different technologies and IT support used in ERP.
IT604A.5	Evaluate different tools used in ERP.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT 604A.1	3	2	2				1				2	3				
IT 604A.2	3	2	1	2							1		2			
IT 604A.3	2		2		2	2								1		
IT 604A.4		2	1		2											1
IT604A.5		2	2		3										2	

Course Contents:

Overview of ERP [10L]:
The evolution of ERP systems: Evolution through Payroll system, Inventory Control system, Materials Requirement Planning, Manufacturing Resource Planning, advantages and disadvantages. Definition and Concept of ERP, Business reasons for rise and popularity of ERP system and Benefits.
Business processes supported by ERP systems:Various business functions in an Organization – Purchasing, Materials Management, Manufacturing, Sales & Distribution, Plant Maintenance, Quality Management, Finance & Accounting including Costing, Human Resources etc.

ERP marketplace: SAP, Oracle, PeopleSoft, JD Edwards, Baan, Microsoft's suit of products etc. Business modules in these ERP packages – a brief comparative description of business function modules and sub-modules.Overview of key end-to-end business processes supported in two major ERP systems – Order to Cash, Procure to Pay, Plan to Produce and Dispatch.

Information Technology and ERP systems [10L]:

The evolution of Information Technology (IT): Evolution of computer generations – Operating systems, File systems to Database Management systems, Communication Networks. Enabling ERP systems by IT evolution.

The evolution of ERP systems architecture: Client-Server based architecture, Multi-Tier architecture – Presentation layer, Application layer, and Database layer. Brief discussion on Extended ERP systems - Web-enabled ERP architecture, Service-Oriented Architecture and Cloud Computing. Open Source ERP.

Related technology concepts: ERP and Supply Chain Management, and Customer Relationship Management, ERP and Business Intelligence, ERP and Data warehousing, ERP and E-business

Implementation of ERP system [10L]:

ERP implementation approach: Single vendor versus Best-of Breed ERP implementation, Big Bang versus Phased implementation, Using ERP of Application Service Provider.

ERP implementation life cycle: Planning different aspects, Understanding requirements and Process preparation – Gap analysis and Business Process Engineering, User Acceptance criteria, Design, Configuration, Customization, Extensions, Data migration, End-user training, User Acceptance, Going live, Roll-out. Differences between ERP implementation life cycle and Custom Software development phases. Drawbacks of ERP system.

Organizing implementation: Interaction with Vendors, Consultants, and Users. Contracts with Vendors, Consultants, and Employees. Project Management and Monitoring. ERP Project Organization– Formation of Steering Committee and different User Groups. Top Management Commitment and Steering Committee meetings. Change Management, Risks and Challenges in ERP implementation.

Post-implementation Support, Review, Maintenance and Security of ERP systems: A typical Support Cycle. Post-implementation Review of ERP systems – measures of review, and approaches for review System maintenance and ERP system maintenance. Software upgrade Security and Access control of ERP systems.

Emerging Trends and Future of ERP systems [10L]:

Emerging Technologies and ERP: Service-oriented Architecture: Enterprise SOA layers – Business processes, Business services, Components and Integration services, Advantages and Drawbacks of SOA, Difference between multi-layered Client-server architecture and SOA, basic awareness of NetWeaver from SAP, Websphere from Oracle and .Net from Microsoft. Enterprise Application Integration: Basic understanding of the concept, Types of EAI – User Interface, Method, Application Interface, Data. Radio Frequency Identification and ERP: awareness of RFID technology, Benefits of RFID integrated with ERPs. M-Commerce: basic concept and applications, difference with E-Commerce, benefits of integration with ERPs.Future of ERP: Technology transformation to SOA, more E-Commerce features, Growing mobile applications, Economical and Easy models of ERP deployment etc.

Text books

1. Electronic commerce(second edition) –Pete Loshin & Paul A. Murphy, Jaico Publishers.E-commerce(second edition) – Bajaj & Nag , Tata McGraw Hill
2. Enterprise Resource Planning –Alexis Leon, Tata McGraw Hill

References:

1. Enterprise Resource Planning, 2nd Edition by Alexis Leon, Tata McGraw Hill Education, 2008

2. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGraw Hill, 1997
3. The SAP R/3 Handbook, Jose Antonio, McGraw Hill

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**INFORMATION AND CODING THEORY**
SUBJECT CODE	**:**	**IT 604B**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Mathematics, Basic Electronics

Course Objective:
This course provides a basic understanding of the fundamental theories and laws of information theory and coding theory and the construction of both source codes and error-detection-correction codes

Course Outcome
After completion of this course student will be able to

IT604B.1:	Understand the concepts of information, mutual information, entropy and various source coding techniques for reliable digital communication.
IT604B.2:	Apply linear algebra, concept of Galois field, conjugate roots, minimal polynomial in channel coding techniques for error control.
IT604B.3:	Analyze the need for source coding and error control techniques in a communication system.
IT604B.4:	Generate different error control codes like linear block codes, cyclic codes, BCH codes, and perform error detection and correction.
IT604B.5:	Design the circuit for different error control coding techniques.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSo3**	**PSO4**
IT604B.1	3	3	3	1												
IT604B.2	3	3	3	2												
IT604B.3	3	3	3	2												
IT604B.4	3	3	3	2												
IT604B.5	3	3	3	2								2				

Course Contents:

Introduction to Information theory[3L]:
Uncertainty and information Basic definition of information, zero memory source, entropy, channel model and channel matrix, mutual information, information measures for continuous random variables, source coding theorem, Shannon - Fano coding, Huffman codes, Kraft Inequality

Channel Capacity and Coding [7L]:
Channel coding, Information rate, channel capacity, information capacity theorem, The Shannon limit.

Linear and Block Codes For Error Correction [7L]:
Introduction to Linear and Block Codes, properties, Matrix description of linear block codes, parity check matrix, decoding of a linear block code, Standard array and syndrome detection, Error correction and detection capability of linear block code, Hamming codes, Block Diagram to generate a linear block code and its decoder

Cyclic Codes [7L]:
Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Decoding cyclic codes, Encoding and Decoding circuit, Golay codes.

BCH Codes [8L]:
Set, group, fields, Galois field Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes. Introduction to Reed Solomon Codes.

Convolutional Codes [8L] :
Encoding, state diagram, Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes: Viterbi decoding, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

Text Books:
1. Information theory, coding and cryptography - Ranjan Bose; TMH.
2. Introduction to Error Control Codes - Salvatore Gravano, Oxford

Reference Books:
1. Information and Coding - N Abramson; McGraw Hill.
2. Introduction to Information Theory - M Mansurpur; McGraw Hill.
3. Information Theory - R B Ash; Prentice Hall.
4. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.
5. Todd K Moon,- Error Correction Coding: Mathematical Methods and Algorithms, John Wiley

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MICROPROCESSOR & MICROCONTROLLER**
SUBJECT CODE	**:**	**IT 604C**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisites:
Digital Electronics, Computer Programming, Computer Organisation and Architecture

Course Objective:
To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

Course Outcome:
After completion of this course student will be able to

IT604C.1:	Able to correlate the architecture, instructions, timing diagrams, addressing modes, memory interfacing, interrupts, data communication of 8085
IT604C.2:	Recognize 8051 microcontroller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts
IT604C.3:	Recognize 8051 microcontroller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts
IT604C.4:	Apply instructions for assembly language programs of 8085, 8086 and 8051
IT604C.5:	Design peripheral interfacing model using IC 8255, 8253, 8251 with IC 8085, 8086 and 8051.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSo3**	**PSO4**
IT604C.1	3		2	2		2										
IT604C.2		3		2		3										
IT604C.3		3														
IT604C.4	3	3	2													
IT64C1.5				2		3						3				

Course Contents:

Module -1: [10L]
Introduction to Microcomputer based systems. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages.
Architecture of 8085 Microprocessor, Pin description of 8085.
Address/data bus Demultiplexing , Status Signals and the control signals.
Instruction set of 8085 microprocessor, Addressing modes
Timing diagram of the instructions (a few examples).

Module -2: [10L]

Assembly language programming with examples, counter and Time Delays, Stack and Subroutine Interrupts of 8085 processor (software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O, Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,

Module 3: [10L]
The 8086 microprocessor- Architecture, Addressing modes, interrupts
Introduction to 8051 Microcontroller –Architecture, Pin Details
Addressing modes, Instruction set, Examples of Simple Assembly Language.

Module -4: [10L]
Memory interfacing with 8085, 8086
Support IC chips- 8255, 8251,8237/8257, 8259
Interfacing of 8255 PPI with 8085 and Microcontroller 8051.
Brief introduction to PIC microcontroller (16F877)

Text Book:

1. Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International
2. Fundamentals of microprocessor and microcontroller- B.Ram
3. An Introduction to Microprocessor and Applications –Krishna Kant, Macmillan

Reference Book:

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, Oxford university press
2. 8086 Microprocessor –K Ayala, Cengage learning
3. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
4. The 8051 microcontrollers – Uma Rao and Andhe Pallavi, Pearson
5. The 8051 Microcontroller and Embedded System- Mazidi
6. The 8051 microcontroller - K. Ayala, Thomson

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DIGITAL IMAGE PROCESSING**
SUBJECT CODE	**:**	**IT604D**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Mathematics, Computer Programming

Course Objective:

The aim of this course is to introduce to the students the basics of digital image processing. The students will gain an overview about the available techniques and possibilities of this field. They will learn basic image transformation, segmentation algorithms and problems of object measurements.

Course Outcome: After completion of this course students will be able to

IT604D.1: Understand the fundamental concepts of a digital image processing system.
IT604D.2: Analyze images in the spatial as well as frequency domain using various transforms.
IT604D.3: Analyze and implement image segmentation and representation techniques
IT604D.4: Categorize and implement various compression techniques.
IT604D.5: Implement and evaluate the techniques for improving the image quality.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT604D.1	2											1				
IT604D.2	2	3	3	2	2											
IT604D.3			2	2					1							
IT604D.4		3	3	3	3		1		1							
IT604D.5	2	3	2	2	3		1		1			1				

Course Contents:

Introduction to Digital Image Processing: [3L]
Elements of digital image processing systems, Elements of visual perception Brightness, contrast, hue, saturation, mach band effect, Image sampling and quantization.

Image Enhancement: [8L]
Spatial Basic grey level transformation, Histogram equalization, Histogram specification techniques, Noise Distributions, Image subtraction and Image averaging, Smoothing, sharpening filters, Frequency Domain methods: Introduction to Fourier Transform and DFT, Discrete Cosine Transform (DCT) and its properties, Smoothing in Frequency- Domain, Sharpening in Frequency- Domain, Homomorphic filtering.

Image Restoration: [7L]

Model of Image Degradation/restoration process, Noise models, Unconstrained restoration, Lagrange multiplier, Least mean square filtering, Constrained least mean square filtering, Wiener filtering.

Color Image Processing: [3L]
Different color Models, Color Transformations, Smoothing & Sharpening Color Image, Color Segmentation, Noise.

Image Compression: [6L]
Need for data compression, Different types of compression, Variable length coding-Huffman Coding, Run Length Encoding, Arithmetic coding, Lossy Compression: Vector Quantization, Transform coding, Basics of Image compression standards: JPEG.

Image Segmentation: [6L]
Thresholding, Region Based segmentation, Region growing, Region splitting and Merging, Edge detection, Canny edge detector.

Image registration: [3L]
Geometric transformations: translation, rotation, scaling, homomorphic coordinate system; ground control points, affine transformation.

Representation & Description: [4L]
Representation of segmented image, Boundary & Regional Descriptors, Use of Principal components for description.

Text Books:

1. Digital Image Processing by Woods, Gonzalves,Pearson
2. Digital Image Processing & Analysis by Chanda & Majumder,PHI

Reference Books:
1. Digital Image Processing by Jahne by Springer India
2. Image Processing, Analysis & Machine Vision by Sonka, VIKAS
3. Fundamentals of Digital Image Processing by Jain, PHI

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DIGITAL SIGNAL PROCESSING**
SUBJECT CODE	**:**	**ECE(IT)605A**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Students should have a thorough understanding of various signals and systems in time and frequency domain. Good understanding on arithmetic of complex numbers and elementary calculus. The candidates are expected to have a basic understanding of discrete mathematical structures.

Course Objective:

To study the z-transform, convolution and applications of z -transform.
To introduce students with transforms for analysis of discrete time signals and systems.
To study Discrete Fourier and Fast Fourier Transforms.
To use and understand implementation of digital filters and filter design techniques.

Course Outcome

After completion of this course student will be able to

ECE(IT)605A.1:	Able to understand the classification and operations of discrete signals.
ECE(IT)605A.2:	A Able to analyze discrete time signals in frequency domain and their region of convergence using ZTransforms.
ECE(IT)605A.3:	Able to interpret discrete time systems.
ECE(IT)605A.4:	Able to define discrete systems in the Frequency domain using Fourier analysis tools like DFT, FFT.
ECE(IT)605A.5:	Able to design FIR and IIR digital filters.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
ECE(IT)605A.1	3	3	2	2												
ECE(IT)605A.2	3	3	2	2												
ECE(IT)605A.3	3	3	3	3	2	2	1	3		2						
ECE(IT)605A.4	3	3	3	3	3	3	1	3		3						
ECE(IT)605A.5	3	3	3	3	3	3	1	3		3	2	3				

Course Contents:

Discrete-time Signals [7L]:

Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, Concept of basic signals as unit impulse, unit step, unit ramp, real & complex exponentials and sinusoid. Arithmetic operations on sequences as Time shifting, Time reverse

and Time scaling. Classification of signals as deterministic & random, periodic & aperiodic, energy & power, even & odd, causal & non causal.

LTI Systems [5L]:
Classification of systems as causal & non causal, time variant & invariant, linear & non linear, stable & unstable. Representation of arbitrary sequence, idea of impulse response and the formulation of convolution sum. properties of convolution, parallel and cascade connection of LTI system.

Z-Transform [7L]:
Physical interpretation of Fourier transform and Laplace transform, mapping from s-plane to z-plane, interpretation of ROC, properties of ROC for finite and infinite duration causal, anti causal & non causal sequence, properties of Z-transform such as linearity, time shifting, time reversal, time scaling, differentiation & convolution, initial and final value theorem, inverse Z-transform by residue & partial-fraction expansion method., analysis of difference equation in z-domain.

Discrete Fourier Transform [5L]:
Idea of DTFT and its relation with DFT, idea of IDFT, Twiddle factors and their properties, computation of DFT/IDFT by matrix method, multiplication of DFTs and the idea of circular convolution, computation of circular convolution by graphical and matrix method, filtering of long data sequences using Overlap-Save and Overlap-Add method.

Fast Fourier Transform [4L]:
Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs using Butterflies diagram, bit reversal, examples for DIT & DIF FFT.

Filter Design [7L]:
Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, condition of linear phase, idea of windowing technique using rectangular, Hamming, & Blackman windows, Realization of digital filter using Direct form-I, Direct Form-II, cascade and parallel.

TEXT BOOKS:
1. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
2. Digital Signal Processing, S.Salivahanan, A.Vallabhraj & C. Gnanapriya, TMH Publishing Co.
3. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).

REFERENCE BOOKS:
1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPILER DESIGN**
SUBJECT CODE	**:**	**IT 605B**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6thSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics, Computer Programming, Automata,

Course Objective:

To provide knowledge of parsing, lexical and syntax analysis.
To analyze various parsing techniques, code optimization.
Students will get an opportunity to learn about the compilers they practically use in labs.
To know how the parse trees are generated, errors are handled.
To know how to code is optimized; all of these concepts will be understood.

Course Outcome
After completion of this course student will be able to

IT605B.1:	To understand the knowledge of parsing, lexical and syntax analysis.
IT605B.2:	To apply the knowledge about the compilers they practically use.
IT605B.3:	To analyze various parsing techniques, code optimization.
IT605B.4:	To learn how the parse trees are generated, errors are handled and code is optimized.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT605B.1	3	2	1	3	3				2		1	2				
IT605B.2	3	1	2	2					1			1				
IT605B.3	3	1	2		2				1			2				
IT605B.4	3	2	1	1	1				2			1				

Course Content:

Introduction to Compilers[3L]:
Compilers and translators need translators, structure of compiler:Phases of compilation and overview, Compiler construction tools.

Lexical Analysis(scanner) [5L]:

Role of lexical analyzer, design of lexical analyzer, regular expressions, Specification and recognition of tokens, input buffering, A language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer, scanner generator (lex,flex).

Syntax Analysis (Parser) [9L]:

Role of parsers, definition of parsing, Shift- reduce parsing, operator precedence parsing, predictive parsing.Context-free language and grammar, push-down automata, LL(1) grammar and top-down parsing, operator grammar, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator, Canonical LR parser.

Semantic Analysis [4L]:

Attribute grammar, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table [6L]:

Its structure, symbol attributes and management.Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Intermediate Code Generation [5L]:

Translation of different language features, different types of intermediate forms. Syntax directed definition, construction of syntax trees, syntax directed translation scheme, implementation of syntax directed translation, three address code, quadruples and triples.

Code optimization and target code generation [3L]:

Code improvement local optimization, global optimization, loop optimization, peep-hole optimization.

Text Books:

1. Compilers Principle, Techniques & Tools - Alfread V. AHO, Ravi Sethi & J.D. Ullman; Addison Wesley.
2. Compiler Design by O.G. Kakde, Laxmi Publ.

Reference Books:

1. Theory and practice of compiler writing, Tremblay & Sorenson, Mc. Graw Hill.
2. System software by Dhamdae, MGH.
3. Keith D. Cooper and Linda Torczon, Engineering a Compiler, Elsevier.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**GREEN COMPUTING**
SUBJECT CODE	**:**	**IT 605C**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Networks, Communication System

Course Objective:
To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment, skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user, and to understand how to minimize equipment disposal requirements.

Course Outcome
After completion of this course student will be able to

IT605C.1:	Understand and analyze Green IT.
IT605C.2:	Understand the Protocols, Standards, and Audits of Green Compliance.
IT605C.3:	Compare and invent new methodology for green assets like Data Centers.
IT605C.4: **IT605C.5:**	Gain knowledge about Grid framework. Apply the concept of the Environmentally Responsible Business Strategies.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT 605C.1		2		3		2						2				
IT 605C.2	3	2			3			1								
IT 605C.3	2		3				2					2				
IT 605C.4	1		2		2			3								
IT 605C.5	3	2		1		2						3				

Course Contents:

FUNDAMENTALS[7L]:
Green IT Fundamentals: Business, IT, and the Environment; Green computing: carbon footprint, scoop on power; Green IT Strategies: Drivers, Dimensions, and Goals; Environmentally Responsible Business: Policies, Practices, and Metrics.

GREEN ASSETS AND MODELING [7L]:
Green Assets: Buildings, Data Centers, Networks, and Devices; Green Business Process Management: Modeling, Optimization, and Collaboration; Green Enterprise Architecture Environmental Intelligence; Green Supply Chains; Green Information Systems: Design and Development Models.

GRID FRAMEWORK [7L]:
Virtualizing of IT systems; Role of electric utilities, Telecommuting, teleconferencing and teleporting; Materials recycling best ways for Green PC; Green Data center; Green Grid framework.

GREEN COMPLIANCE [7L]:
Socio-cultural aspects of Green IT; Green Enterprise Transformation Roadmap; Green Compliance: Protocols, Standards, and Audits; Emergent Carbon Issues: Technologies and Future.

CASE STUDIES[7L]:
The Environmentally Responsible Business Strategies (ERBS); Case Study Scenarios for Trial Runs; Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS:

1. Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

REFERENCES:

1. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.
2. John Lamb, "The Greening of IT", Pearson Education, 2009.
3.Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.
4. Carl Speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press,2012.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SOFT COMPUTING**
SUBJECT CODE	**:**	**IT605D**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6thSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics, Automata, Artificial Intelligence

Course Objective:

To give students knowledge of soft computing theories fundamentals, that is, of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms.

Course Outcome
After completion of this course student will be able to

IT605D.1:	Understand the importance of soft computing.
IT605D.2:	Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
IT605D.3:	Apply soft computing techniques to solve engineering or real life problems.
IT605D.4:	Implement algorithms based on soft computing.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT605D.1	3	3	2	2	2				2		1	1	3	3		
IT605D.2	3	3	2	2					1			1	2	3		
IT605D.3	3	3	2	2	1				1			2	3	3	3	2
IT605D.4	3	3	3	2	2				2			2			2	3

Course Contents:

Introduction [4L]: Soft Computing. Difference between Hard and Soft computing, Requirement of Soft Computing, Major Areas of Soft Computing, Applications of Soft Computing.

Fuzzy Systems [10L]:
Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Min-max Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Genetic Algorithm [8L]:
History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

Neural Networks[8L]:
Neural Network, Learning rules and various activation functions, Single layer Perceptrons , Back Propagation networks, Architecture of Back propagation(BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction

to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Multi-objective Optimization Problem Solving [6L]:
Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA). Non-Pareto approaches to solve MOOPs Pareto-based approaches to solve MOOPs. Some applications with MOEAs.

Hybrid Systems [6L]:
Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems,Neuro Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshmi, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PROJECT MANAGEMENT**
SUBJECT CODE	**:**	**IT605E**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics, Software Engineering

Course Objective:

The aim of this course is to introduce the fundamental principles of Software Project management. The students will also have a good knowledge of the responsibilities of project manager and how to handle these.They will be familiar with the different methods and techniques used for project management.

Course Outcome
After completion of this course student will be able to

IT605E.1	Work in a team to understand and evaluate project management standards, tools, managing contracts and software quality.
IT605E.2	Apply project management techniques to real-world project
IT605E.3	Apply different techniques in monitoring and control of projects and people.
IT605E.4	Describe the basic concepts of software project management and project planning

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT605E.1											3					
IT605E.2	1	2	3	2		1	2				2					
IT605E.3		2			2			1		2	2					
IT605E.4					2				3		2	3				

Course Contents:

INTRODUCTION [5L]:
ProjectDefinition, ContractManagement, Activities Covered by SoftwareProjectManagement, Overview of Project Planning, Step wise Project Planning.

PROJECT EVALUATION [5L]:
Strategic Assessment, TechnicalAssessment, CostBenefitAnalysis, CashFlowForecasting, Cost BenefitEvaluation Techniques, Risk Evaluation.

ACTIVITY PLANNING [6L]:
Objectives, ProjectSchedule, SequencingandSchedulingActivities, NetworkPlanningModels, ForwardPass, BackwardPass, ActivityFloat, ShorteningProject Duration, Activity On Arrow

Networks, Risk Management, NatureofRisk, TypesofRisk, ManagingRisk, HazardIdentification, HazardAnalysis, RiskPlanningand Control.

MONITORING AND CONTROL [8L]:
Creating Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value Prioritizing Monitoring, Getting Project Back To Target, Change Control, ManagingContracts, Introduction, Types ofContract, StagesIn Contract Placement, Typical Terms of A Contract, Contract Management, Acceptance.

MANAGING PEOPLEAND ORGANIZING TEAMS [8L]
Introduction, Understanding Behavior, Organizational Behaviour: A Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation, TheOldham, HackmanJobCharacteristicsModel, WorkingIn Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures – Stress –Health And Safety – Case Studies.

PROJECT QUALITY MANAGEMENT [3L]
Concept of Project Quality, TQM in Projects, Project Audit.

TEXT BOOKS
1. Bob Hughes, Mike Cotterell, “Software Project Management”, Third Edition, TataMcGraw Hill, 2004

REFERENCES:

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Royce, “Software Project Management”, Pearson Education, 1999.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**HUMAN RESOURCE MANAGEMENT**
SUBJECT CODE	**:**	**IT605F**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Project Management

Course Objective:
Learn fundamental HRM frameworks and analyze the overall role of HRM in business. It improves their ability to think about how HRM should be used as a tool to execute strategies and achieve a competitive advantage.

Course Outcome
After completion of this course student will be able to

IT605F.1	Explain the importance of human resources and their effective management in organizations
IT605F.2	Describe the meanings of terminology and tools used in managing employees Effectively and Record governmental regulations affecting employees and Employers
IT605F.3	Demonstrate a basic understanding of different tools used in forecasting, planning and maintenance of human resource needs
IT605F.4	Analyze the key issues related to administering the human elements such as Motivation, compensation, appraisal, career planning, diversity, ethics, and training

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT605F.1		1	1					2	3	2	3					
IT605F.2					2	2	1	1		2	3					
IT605F.3					2			1		2	3	2				
IT605F.4							2			2	3	2				

Course Content:

Introduction [3L]:
Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management inIndustry, Role & position of Personnel function in the organization.

ProcurementandPlacement [3L]:
Need for Human Resource Planning, Process of Human Resource Planning, Methods of Recruitment, Psychological tests and interviewing, Meaning and Importance of Placement and Induction,Employment Exchanges Act 1959, The Contract Labour Act 1970.

Training & Development [3L]:
Difference between training and Development, Principles of Training, Employee Development, Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job analysis & Design [2L]:
Job Analysis, Job Description & Job Description, Job Specification.

Job Satisfaction [8L]:
Job satisfaction and its importance, Motivation, Factors affecting motivation, introduction to Motivation Theory, Workers Participation, Quality Of Worklife.The Compensation Function: Basic concepts in wage administration,company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives,Payment of Wages Act 1936, Minimum Wages Act 1961.

Integration [8L]:
Human Relations and Industrial Relations, Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry, Employee Employer relationship Causes and Effects of Industrial disputes, Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining; Role of trade unions in maintaining cordial Industrial Relations.

Maintenance [8L]:
Fringe & retirement terminal benefits, Administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948, Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI Act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

Text Books:
1.T.N.Chhabra-Human Resource Management, Dhanpat Rai Co.

Reference Books:
1. Low B.Flippo –Principlesof PersonnelManagement, McGraw-Hill
2. R.C.Saxena-LabourProblemsand Social Welfare, K.Math & Co.
3. AMinappaand, M.S.Saiyada-PersonnelManagement, TataMc.Graw-Hill
4. C.B.Mamoria –PersonnelManagement, HimalayaPublishingHouse

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DATABASE MANAGEMENT SYSTEM LAB**
SUBJECT CODE	**:**	**IT691**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Perquisite: Knowledge about the basics of electronics and basic concepts in logic design, basic knowledge of data structure and programming concepts.

Course Objective:
To develop conceptual understanding of database management system for solving different industry level problems & to learn its applications

Course Outcome:

After completion of this course student will be able to
IT691.1: Design and implement a database schema for a given problem-domain
IT691.2: Create and maintain tables using PL/SQL Course Outcome
IT691.3: Populate and query a database
IT691.4: Prepare reports
IT691.5: Application development using PL/SQL & front end tools

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT691.1	2	-	3	3	2	-	-	-	-	-	-	-	-	-	-	-
IT691.2	-	-	3	3	2	-	-	-	2	-	-	-	1	-	-	-
IT691.3	2	-	3	3	2	-	-	-	-	2	-	-	3	-	2	-
IT691.4	-	-	3	3	2	-	-	-	-	-	-	2	2	2	3	-
IT691.5	2	-	3	3	2	-	-	-	-	-	-	2	3	-	-	2

Course Content:

1.Study of Backend Tool – Oracle.
2. Data Definition Language (DDL) commands in RDBMS.
3. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
4. High-level language extension with Cursors.
5. High level language extension with Triggers
6. Procedures and Functions.
7. Embedded SQL.
8. Database design using E-R model and Normalization.
9. Mini project (Application Development using Oracle and Visual Basic)
i.Inventory Control System.
ii.Material Requirement Processing
iii.Hospital Management System
iv.Railway Reservation System
v.Personal Information System
vi.Web Based User Identification System
vii.Time-table Management System

Text Book

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition

Reference Book

1. ORACLE DATABASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill.
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**WEB TECHNOLOGY LAB**
SUBJECT CODE	**:**	**IT692**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite: Basic knowledge on Java and computer networking and database.

Course Objective:

Describing the web application architecture and protocols.
Illustrating different technologies those are used to develop web applications
Describing different frameworks used to develop web applications.

Course Outcome: At the end of the course students will be able to
IT692.1: understand and evaluate web application architecture, technologies and frameworks.
IT692.2: Apply the knowledge of web technology in developing web applications
IT692.3: Evaluate different solutions in the field of web application development.
IT692.4: Implement small to large scale projects to provide live solutions in web application development fields.

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
IT692.1:	2												1	-	1	2
IT692.2:	2	3	3	3	3								2	1	3	-
IT692.3:	2	3	3	3	3								1	-	-	3
IT692.4:	2	3	3	3	3				2	3		3	3	-	1	-

Course Contents:

HTML: Developing application using different HTML elements , Designing forms using HTML, Apply DOM

CSS: Using different CSS Styles for designing interactive forms and interfaces.

Java Script: Using Javascript variables, operators, control structure, functions and event handling, Form validation using javascript, Node js server implementation, express js for implementing web application handling get, put, post, etc.

JDBC: Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Batch execution, Stored Procedure

Servlet: Developing web application using servlet: get/post, Developing filter application, Session handling.

JSP: Developing web application using JSP as view, Session handling using JSP, Using JSP components, Custom tag development.

Web Service: Development web service as reusable components

AJAX: Developing web application using AJAX: accessing XML, text files.

Text Book:

1.Professional Java Server Programming Allamaraju, aprerss

Reference Book:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning,
Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent
Learning Solutions INC.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**Computer NetworkingLab**
SUBJECT CODE	**:**	**IT 693**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Basic Computer Architecture and Operating System.

Course Objective:
Understanding the basic concept of different network models, Explaining the network architecture, Apply different computer routing algorithms in real life problems.

Course Outcome
After completion of this course student will be able to

IT693.1:	Understand and apply different network commands.
IT693.2:	Analyze different networking functions and features for implementing optimal solutions.
IT693.3:	Apply different networking concepts for implementing network solutions.
IT693.4:	Implement different network protocols.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT693.1	3	2	2	3	3											
IT693.2	3	2	2	3	3											
IT693.3	3	2	2	3	3							2				
IT693.4	3	2	2	3	3							2				

Course Content:

- Familiarization with: Different networking cables, Different connectors, Hubs, Switches, Routers
- NIC Installation & Configuration (Windows/Linux)
- Understanding IP address, subnet etc, Connect the computers in Local Area Network.
- Study of basic Network Configuration commands.
- Configure a Network topology using packet tracer software
- Link Layer Error Detection Mechanism (Cyclic Redundancy Check), Data Link Layer Error Control mechanism (Selective Repeat, Go Back N)
- Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window), Data
- Server Setup/Configuration: FTP, TELNET, NFS, DNS, Firewall.
- TCP/UDP Socket Programming: Simple, TCP based, UDP based Multicast & Broadcast Sockets

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (5thEd.) " – TMH
2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:

1.A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**SYSTEM ENGINEERING LAB**
SUBJECT CODE	**:**	**IT 694**
YEAR	**:**	**THIRD**
SEMESTER	**:**	**6th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Knowledge of Operating System, Computer Architecture, Computer Networking

Course Objective:
Understanding in details the embedded programming and embedded system, Explaining the circuit designing using raspberry pi, Preparing project on physical computing

Course Outcome
After completion of this course student will be able to

IT694.1:	Understand and analyze the embedded systems
IT694.2:	Understand and apply the embedded programming concepts
IT694.3:	Analyze and evaluate solution in physical computing fields
IT694.4:	Implement simple to critical circuits using embedded systems.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
IT694. 1:	2	3	3	3	3											
IT694. 2:	2	3	3	3	3											
IT694. 3:	2	3	3	3	3											
IT694. 4:	2	3	3	3	3				3		3	3				

Course Contents:

Embedded System: Embedded Programming, Embedded Device: Introduction to embedded devices, Types of different embedded devices. Python: Your first program or C. Device Input output, Building Circuit on breadboard.

Introduction to the Internet of Things: – Evolution of internet – IoT case studies – Smart vehicles – smart buildings – health care – agriculture - Web based demo of IoT system
IoT Platforms

Raspberry Pi platform: Overview – Raspberry Pi board – Raspberry Pi processor – Raspberry Pi Operating System – Raspberry Pi Configuration and setup

General Purpose Input Output (GPIO): GPIO Pins - Protocol Pins – RPi.GPIO library – GPIO Access – Pulse Width Modulation - Blinking LED – GPIO Simulator

Hardware software interface: Programming device pin, managing memory (Python/C)

Networking IoT:
Overview – Protocols– TCP/IP – Sockets – Gateways – Routers - Standard network extensions of Raspberry Pi 3 - Ethernet - WiFi – Bluetooth - Communicating with Cloud

Final Project Preparation:

Text Books:

1. Programming the Raspberry pi Simon Monk

Reference Books:

1. Raspberry pi cookbook Simon Monk
2. Raspberry pi Projects Dummies Mike Cook

.

7TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**E-COMMERCE**
SUBJECT CODE	**:**	**IT 701**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Concepts of Computer Networking, Operating System, Database Management System

Course Objective:
Explain the characteristics and functions of electronic commerce including mobile commerce. Describe common business models used in B2C and B2B electronic commerce and security and payment process in electronic commerce including mobile commerce, identify the technology used in mobile commerce.

Course Outcome
After completion of this course student will be able to

IT701.1	Understand the policy issues related to privacy, intellectual property rights, and establishing identity those are germane to electronic commerce along with the Internet and related technologies.
IT701.2	Comprehend the underlying economic mechanisms and driving forces of E-Commerce;
IT701.3	Analyze the impact that electronic commerce is facing and outlines the different digital transaction processes and basic concepts of e-commerce.
IT701.4	Identify the importance of digital libraries and specify the development of electronic commerce capabilities in a company.
IT701.5	Appraise the opportunities and potential to apply and synthesize a variety of e-Commerce and M-Commerce concepts and solutions to create business value for organizations, customers, and business partners.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT701.1	2			1	2	2	3	3			3		2			
IT701.2											3	1				1
IT701.3		1		2	2			2			3	2	1			
IT701.4		2		3	3	1					2	2			2	
IT701.5	2	2	2	2		3			1		2	3		1		1

Course Contents:

Introduction to E-Commerce [3L]
Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle,Electronic Markets, Electronic Data Interchange and Internet Commerce.

Business to Business E-Commerce [7L]
Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT),Communications, Implementations, Agreements, Security, EDI and Business, Inter-OrganizationalE-commerce. Business models for E-commerce, Business Process Re-Engineering.

Legal issues [5L]
Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws,Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues,Service provider liability, Enforceable online contract.

Security Issues [7L]
Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital signature,Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines, Intelligent agents in E-Commerce Electronic payment systems, E-security, Mobile commerce.

Business to Consumer E-Commerce and E-Business [7L]
Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business.Integrating Intranet and internet web applications across multiple networks. Internet bookshops,Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, OnlineShare Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Mobile Commerce [4L]
Overview, Infrastructure, Applications, Mobile Payment, Limitations, Security in M-Commerce

Text Books:
1.E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Handbook on Electronic Commerce, Shaw et al., Springer publication.

Reference Books:
1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Applied E-Commerce, Langer, John Wiley Publication.
3. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
4. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER GRAPHICS AND MULTIMEDIA**
SUBJECT CODE	**:**	**IT702A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Programming, Mathematics

Course Objective:
The objective of the course is to provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations;to make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations and become familiar with various software programs used in the creation and implementation of multimedia and to gain knowledge about hardware devices and software used.

Course Outcome
After completion of this course student will be able to

IT702A.1:	Understand the comprehension of windows, clipping and view-ports object representation in relation to images displayed on screen.
IT702A.2:	Comprehend the concept of geometric, mathematical and algorithmic concepts necessary for programming computer graphics.
IT702A.3:	Apply different coding techniques for solving real world problems.
IT702A.4:	Know the foundations of computer graphics and Identify different media representations of different multimedia data and data formats.
IT702A.5:	Identify the software utilized in constructing computer graphics and multimedia applications.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSo**	**PSO4**
IT702A.1	2	3		2	1	2		1								
IT702A.2	2	2	1		3		2		1							
IT702A.3	2	2	3	3		1		1								
IT702A.4	3	1	2	2	2		1					2				
IT702A.5	2	1	1		2							2				

Course Contents:

TWO-DIMENSIONAL GRAPHICS: [7L]
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.

ILLUMINATION AND COLOR MODELS: [7L]

Height sources, basic illumination models, halftone patterns and dithering techniques, 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.

THREE-DIMENSIONAL GRAPHICS: [7L]
Three dimensional concepts, Three dimensional object representations, Polygon surfaces, Polygon tables, Plane equations, Polygon meshes, Curved Lines and surfaces, Spline representations, Bezier curves and surfaces, B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations, Translation, Rotation, Scaling; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping.

MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING: [7L]
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.

HYPERMEDIA: [7L]
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.

Text Books:

1. Hearn Baker Carithers, - “Computer Graphics with Open GL”, Pearson New International Edition
2. Donald Hearn and Pauline Baker M, ―Computer Graphics”, Prentice Hall, New Delhi, 2007
3. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003

Reference Books:

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 McConnel, ―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.Sproul, ― Principles of Interactive Computer Graphics, Mc Graw Hill 1978.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PATTERN RECOGNITION**
SUBJECT CODE	**:**	**IT 702B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Fundamentals of probability and linear algebra.

Course Objective:

The objective of this course is to learn the fundamentals of pattern recognition and its relevance to classical and modern problems. The main objective is to be able to identify where, when and how pattern recognition can be applied.

Course Outcome

After completion of this course student will be able to

IT702B.1:	Understand basic concepts in pattern recognition.
IT702B.2:	Summarize pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
IT702B.3:	Apply knowledge about state-of-the-art algorithms used in pattern recognition research.
IT702B.4:	Analysis and Formulate and describe various applications in pattern recognition.
IT702B.5:	Design successful applications to process and analyze images, and to make automatic decisions based on extracted feature information.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT702B.1	2											1				
IT702B.2	2	2	2	1		1										
IT702B.3					3											
IT702B.4	2															
IT702B.5		3	2	2			1					2				

Course Content:

Introduction to Pattern Recognition: [5L]

Importance of Pattern Recognition, Features, Feature Vectors, and Classifiers, Supervised, Unsupervised, and Semi-Supervised Learning

Classifiers Based on Bayes Decision Theory:[10L]

Introduction, Bayes Decision Theory: Minimizing the Classification Error Probability, Minimizing the Average Risk, Discriminant Functions and Decision Surfaces, Bayesian Classification for Normal Distributions: The Gaussian Probability Density Function, The Bayesian Classifier for Normally Distributed Classes, Decision Hyperplanes, Minimum Distance Classifiers, Estimation of Unknown Probability Density Functions: Maximum

Likelihood Parameter Estimation, Maximum a Posteriori Probability Estimation, Bayesian Inference, Maximum Entropy Estimation, Mixture Models, The Expectation Maximization (EM) Algorithm, Application to the Mixture Modeling Problem, Nonparametric Estimation, The Naive-Bayes Classifier, The Nearest Neighbor Rule, Bayesian Networks, Problems.

Linear Classifiers:[10L]

Introduction, Linear Discriminant Functions and Decision Hyperplanes, The Perceptron Algorithm: Proof of the Perceptron Algorithm Convergence, Variants of the Perceptron Algorithm, The Perceptron, The Pocket Algorithm, Kesler's Construction, Least Squares Methods: Mean Square Error Estimation, Multiclass Generalization, Stochastic Approximation and the LMS Algorithm, Sum of Error Squares Estimation, Mean Square Estimation Revisited: Mean Square Error Regression, MSE Estimates Posterior Class Probabilities, The Bias–Variance Dilemma, Logistic Discrimination, Support Vector Machines: Separable Classes, Nonseparable Classes, The Multiclass Case, *v*-SVM, Support Vector Machines: A Geometric Viewpoint, Reduced Convex Hulls, Problems

Feature Selection: [10L]

Introduction, Preprocessing: Outlier Removal, Data Normalization, Missing Data, The Peaking Phenomenon, Feature Selection Based on Statistical Hypothesis Testing: Hypothesis Testing Basics- The Known Variance Case,The Unknown Variance Case, Application of the *t*-Test in Feature Selection. The Receiver Operating Characteristics (ROC) Curve, Class Separability Measures, Divergence, Chernoff Bound and Bhattacharyya Distance, Scatter Matrices, Feature Subset Selection: Scalar Feature Selection, Feature Vector Selection,Suboptimal Searching Techniques,Optimal Feature Generation,Neural Networks and Feature Generation/Selection,

Support Vector Machines: A Last Touch, The Bayesian Information Criterion

Text Books:

1. Pattern Recognition, S.Theodoridis and K.Koutroumbas, 4th Ed., Academic Press, 2009

Reference Books:

1. Pattern Recognition and Machine Learning, C.M.Bishop, Springer, 2006
2. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley, 2001

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**INTERNET TECHNOLOGY**
SUBJECT CODE	**:**	**IT 702C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Digital Electronics, Computer Networking, Web Technology

Course Objective:
Understanding advanced networking and web application development architecture; explaining the advanced routing protocols and .Net framework; analyzing different networking concepts and features for developing solutions; analyzing different web application components for developing web applications.

Course Outcome
After completion of this course student will be able to

IT702C.1:	Understand advanced networking concepts and internet and web application architectures
IT702C.2:	Summarize and understand different advanced routing protocols being used in web application development
IT702C.3:	Apply and evaluate different solution available in the field of networking and web application development such as http and the World Wide Web, HTML, and JavaScripts;
IT702C.4:	Analysis solution for different critical network related issues as; implementing the design using the client/server model, testing and documenting the solutions developed.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSo3**	**PSO4**
IT702C.1	2	2	2	2									1	2	1	3
IT702C.2	2	3	2	2	2							1	2	-	3	-
IT702C.3	3	3	3	2	2							1	1	-	2	-
IT702C.4	3	3	3	3	3						2	3	3	-	1	2

Course Content:

An Overview on Internet: [2L]
Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet.

Internet Address: [3L]
Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address,Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing. IPV6, Conversion from IPV4 to IPV6

Internet Protocol : [4L]
The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

Routing: [4L]

The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways,Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to GatewayProtocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

Internet Servers: [4L]
DNS, DHCP Servers, FTP, TELNET, E-Mail

Firewall & Networking :[8L]
Introduction, Implementation of Firewall, Activities of Firewall,Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

ASP .NET : [10L]
Architecture and Component, Page life cycle, Control: Check Box, Radio Button, List, Label. Session Management, Web Form Handling, Accessing database, Hosting of Web application.

Text Books:
1.Computer Networks and Internets - Douglas E. Comer; PE.
2.ASP .NET Complete Reference Matthew MacDonald

Reference Books:
1. Communication Networks - Leon-Garcia-Widjaja; TMH.
2. Internetworking with TCP / IP - Douglas E .Comer; PE.
3. TCP/IP protocol suite - Forouzan Behrouz A; TMH.
4. Computer Networks – Andrew S. Tanenbaum; PHI.
5. Data and Computer Communication - William Stallings; PHI.
6. The Complete reference of Networking - Craig Zacker; TMH.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CLOUD COMPUTING**
SUBJECT CODE	**:**	**IT 703A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Networking, Operating System

Course Objective:

The objective of the course is to introduce and describe cloud computing architecture, models and security issues and service level agreements.

Course Outcome
After completion of this course student will be able to

IT703A.1:	Understand the basic architecture of cloud computing
IT703A.2:	Apply the knowledge of cloud computing in the evaluation of the computing model.
IT703A.3:	Analyze different problems in the domain of cloud computing.
IT703A.4:	Evaluate the different models and solutions provided in the field of cloud computing.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT703A.1	3 m	3														
IT703A.2	3	3	3	2	3											
IT703A.3	3	3	3	2	3							2				
IT703A.4	3	3	3	3	2											

Course Content:

Overview of Computing Paradigm: [2L]
Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, UtilityComputing, Cloud Computing Evolution of cloud computingBusiness driver for adopting cloud computing

Introduction to Cloud Computing: [3L]
Cloud Computing (NIST Model)Introduction to Cloud Computing, History of Cloud Computing,
Cloud service providers Properties, Characteristics And DisadvantagesPros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid Computing Role of Open Standards

Cloud Computing Architecture: [4L]
Cloud computing stackComparison with traditional computing architecture (client/server), Servicesprovided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing,protocols used, Role of Web services Service Models (XaaS) Infrastructure as a

Service(IaaS)Platform as a Service(PaaS) Software as a Service(SaaS) Deployment Models Public cloud Privatecloud Hybrid cloud Community cloud

Infrastructure as a Service: [5L]
Introduction to IaaS: IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) Resource Virtualization ServerStorage NetworkVirtual Machine(resource) provisioning and manageability, storage as a service,Data storage in cloud computing(storage as a service) Examples Amazon EC2 Renting, EC2 ComputeUnit, Platform and Storage, pricing, customers Eucalyptus

Platform as a Service: [4L]
Introduction to PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage Examples Google App Engine Microsoft Azure

Software as a Service: [4L]
Introduction to SaaS Web services Web 2.0 Web OS Case Study on SaaS

Service Management in Cloud Computing: [5L]
Service Level Agreements Billing And Accounting Comparing Scaling Hardware: Traditional Vs. Cloud Economics of scaling: Benefitting enormously Managing Data Looking at Data, ScalabilityAnd Cloud Services Database And Data Stores in Cloud Large Scale Data Processing

Cloud Security: [6L]
Infrastructure SecurityNetwork level security, Host level security, Application level security Data Security and StorageData privacy and security Issues, Jurisdictional issues raised by Data locationIdentity And Access Management Access Control Trust, Reputation, Risk Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

Case Study on Open Source And Commercial Clouds: [2L]
Eucalyptus Microsoft Azure Amazon EC2

Text Books:

1. 1.Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Gościński, Wile, 2011

Reference Books:

1. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee
   Gillam, Springer, 2012
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DISTRIBUTED SYSTEM**
SUBJECT CODE	**:**	**IT 703B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Operating System, Computer Networking

Course Objective: This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission

Course Outcome
After completion of this course student will be able to

IT703B.1:	Understand the knowledge of the basic elements and concepts related to distributed system technologies for identify core architectural aspects of distributed systems;
IT703B.2:	Design and implement distributed applications;
IT703B.3:	Identify the main underlying components of distributed systems (such as RPC, file systems) and use those components for building a distributed system
IT703B.4:	Use and apply important methods in distributed systems to support scalability and fault tolerance;
IT703B.5:	Demonstrate experience in building large-scale distributed applications.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT703B.1	3															
IT703B.2	2	2	3	3	3											
IT703B.3	2															
IT703B.4	3	2		2								2				
IT703B.5	2		3	2	1	1					2	2				

Course Content:
Introduction to distributed Systems: [2L]
Definition and goals, Hardware and Software concepts, Design issues

Communication in Distributed System: [4L]
Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC

Synchronization in Distributed Systems: [4L]
Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems

Processes and Processors in Distributed Systems: [3L]
Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues

Distributed File Systems:[4L]
Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study

Distributed Shared Memory: [5L]
Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing.

Naming: [4L]
Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS.

Distributed Web-based Systems: [3L]
Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications

Security: [3L]
Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management

Case Study: [3L]
Oracle Network File System, Google case study

Text Books:
1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,Tim Kindberg, Pearson

Reference Books:
1. Distributed Operating Systems by Andrew S Tannebaum, Pearson

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**DATA WAREHOUSING AND DATA MINING**
SUBJECT CODE	**:**	**IT703C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Database Management System, Mathematics

Course Objective:
The student should be made to be familiar with the concepts of data warehouse and data mining and be acquainted with the tools and techniques used for knowledge discovery in databases

Course Outcome
After completion of this course student will be able to

IT703C.1:	Understand the concepts of data warehousing and data mining
IT703C.2:	Summarize and apply the dimensional modeling technique for designing a data warehouse applying warehouse architectures
IT703C.3:	Apply OLAP and the project planning aspects in building a data warehouse and. explain the knowledge discovery process
IT703C.4:	analysis the data mining tasks and study their well-known techniques
IT703C.5:	Design an understanding of the role played by knowledge in a diverse range of intelligent systems

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT703C.1	3												1	-	-	2
IT703C.2	3			1									-	3	1	-
IT703C.3	2	1	2	1	3								2	1	-	1
IT703C.4	2	1											1	3	-	2
IT703C.5	2	2	3	2	2	2						2	3	1	1	-

Course Content:

DATA WAREHOUSING: [7L]
Data Warehousing Components, Building A Data Warehouse, Mapping The Data Warehouse To A Multiprocessor Architecture, DBMS Schemas For Decision Support, Data Extraction, Cleanup, And Transformation Tools, Metadata.

BUSINESS ANALYSIS: [7L]
Reporting And Query Tools And Applications, Tool Categories, The Need For Applications, Cognos Impromptu, Online Analytical Processing (OLAP), Need, Multidimensional Data Model, OLAP Guidelines, Multidimensional Versus Multi-relational OLAP, Categories of Tools, OLAP Tools And The Internet.

DATA MINING: [7L]
Introduction, DataTypes, Data Mining Functionalities, Interestingness of Patterns, Classification Of Data Mining Systems, Data Mining Task Primitives, Integration Of A Data Mining System With A Data Warehouse, Issues, Data Pre-processing.

ASSOCIATION RULE MINING AND CLASSIFICATION: [7L]
Mining Frequent Patterns, Associations And Correlations, Mining Methods, Mining Various Kinds Of Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification And Prediction, Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification By Back Propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction.

CLUSTERING AND TRENDS IN DATA MINING: [7L]
Cluster Analysis, Types Of Data, Categorization Of Major Clustering Methods, K-Means, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint, Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

Text Books:

1. Alex Berson And Stephen J.Smith, "Data Warehousing, Data Mining And OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han And Micheline Kamber, "Data Mining Concepts And Techniques", Third Edition, Elsevier, 2012.

Reference Books:

1. Data Mining, Practical Machine Learning Tools and Techniques, Third Edition; Ian H.
2. Witten, Eibe Frank, Mark A. Hall
3. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and
4. Stephen J. Smith, TataMcGraw Hill Education
5. Data warehouse Toolkit by Ralph Kimball, Wiley India
6. Data Warehousing in the real world; Anahory; Pearson Education.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MODELLING AND SIMULATION**
SUBJECT CODE	**:**	**IT704A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Programming and Data Structures, Discrete Mathematics and Probability, Numerical Analysis, Basic Electronics

Course Objective:
The objective of the course is to conceptualize basics of simulation and modeling for applying dynamic and probability concepts of simulation and discrete simulation system; to enable students to analyze Continuous Uniformly Distributed Random Numbers and to assess the strengths and weaknesses of various methods and to analyze their behavior.

Course Outcome
After completion of this course student will be able to

IT704A.1:	Summarize the issues in Modeling and Simulation
IT704A.2:	Explain the System Dynamics & Probability concepts in Simulation.
IT704A.3:	Solve the Simulation of Queuing Systems
IT704A.4:	Analyze the Simulation output
IT704A.5:	Identify the application area of Modeling and Simulation and apply in the corresponding fields

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT704A.1	3	3	2													
IT704A.2	3	2	3	2	3							2				
IT704A.3	3	3	2	2	3							2				
IT704A.4	3	3	2	2	3							2				
IT704A.5	2	3	2	2	3							2				

Course Content:

Introduction to Modeling and Simulation: [10L]
Nature of Simulation. Systems, Models and Simulation, Continuous and Discrete Systems, system modeling, Components of a simulation study, Introduction to Static and Dynamic System simulation , Application areas, Advantages,Disadvantages and pitfalls of Simulation.

System Dynamics & Probability concepts in Simulation: [10L]
Exponential growth and decay models, Generalization of growth models, Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

Simulation of Queuing Systems and Discrete System Simulation: [10L]
Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queues. Application of queuing theory in computer systems. Discrete Events ,Generation of arrival patterns ,Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times.

Analysis of Simulation output: [5L]
Sensitivity Analysis, Validation of Model Results

Text Books:

1. Jerry Banks, John Carson, B.L.Nelson and D.M.Nicol " Discrete Event System Simulation", Fifth Edition, Pearson
2. Narsingh Deo, 1979, System Simulation with Digital Computers, PHI.

Reference Books:

1. Geoffrey Gordon, "System Simulation", PHI.
2. Averill M. Law and W.David Kelton, "Simulation Modelling and Analysis", Third Edition, McGraw Hill
3. J. N. Kapoor.. Mathematical Modelling, Wiley eastern Limited.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CONTROL SYSTEM**
SUBJECT CODE	**:**	**EE(IT)704B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Basic Electrical Engineering, Mathematics

Course Objective:

Understanding and explaining basics of control systems; explaining and analyzing transfer function, and time and frequency domain response; analyzing control system design technique**.**

Course Outcome
After completion of this course student will be able to

EE(IT)704B.1:	Understand and explain basic structure of control systems, basic terminologies, components.
EE(IT)704B.2:	Analyze system stability and design controllers, compensators in frequency domain.
EE(IT)704B.3:	Represent physical systems into transfer function form and thus can analyze system dynamic and steady state behavior.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
EE(IT)704B.1		2														
EE(IT)704B.2	3	2		2												
EE(IT)704B.3	3	2	2	2	2											

Course Content:
Introduction: [4L]
Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

Transfer Function Representation: [4L]
Transfer Function of linear systems, Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

Time Response Analysis: [4L]
Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

Stability Analysis In S-Domain: [5L]
The concept of stability – Routh's stability criterion – limitations of Routh's stability. Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Frequency Response Analysis: [5L]
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

Stability Analysis In Frequency Domain: [4L]
Polar Plots, Nyquist Plots Stability Analysis.

Classical Control Design Techniques: [4L]
Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

State Space Analysis Of Continuous Systems: [5L]
Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties – Concepts of Controllability and Observability

Text Books:
1.Automatic Control Systems 8th edition– by B. C. Kuo 2003– John Wiley

Reference Books:
1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems Engg. by NISE 3rd Edition – John Wiley

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MICROELECTRONICS AND VLSI DESIGN**
SUBJECT CODE	**:**	**ECE(IT)704C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Digital Electronics, Microprocessor, Computer Architecture.

Course Objective:
The course is designed to give the student an understanding of the different design steps required to carry out a complete digital VLSI design in silicon.

Course Outcome
After completion of this course student will be able to

ECE(IT)704C.1:	Understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.
ECE(IT)704C.2:	Complete a significant VLSI design project having a set of objective criteria and design constraints
ECE(IT)704C.3:	Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
ECE(IT)704C.4:	Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects
ECE(IT)704C.5:	Create models of moderately sized CMOS circuits that realize specified digital function

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
ECE(IT)704C.1	3	2		2												
ECE(IT)704C.2	2		3	2	1											
ECE(IT)704C.3	2	3		2	1											
ECE(IT)704C.4	3	2		2												
ECE(IT)704C.5	2				2			2	2	2		2				

Course Content:

Introduction to VLSI Design:[10L]
VLSI Design Concepts, Moore's Law,Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI –Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), YChart,Digital VLSI Design Steps.MOS structure: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat-band voltage, Potential balance & Charge balance, Inversion, MOS capacitances.

Micro-electronic Processes for VLSI Fabrication:[10L]

Silicon Semiconductor Technology- AnOverview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion,Cleaning, Etching, Photo-lithography – Positive & Negative photo-resistBasic CMOS Technology(Steps in fabricating CMOS), Basic n-well CMOS process, p-wellCMOS process, Twin tub process, Silicon on insulatorLayout Design Rule: Stick diagram with examples, Layout rules.

Three Terminal MOS Structure: [10L]

Body effect. Four Terminal MOS Transistor: Drain current, I-V Characteristics. Current-voltage equations(simple derivation).Scaling in MOSFET: Short Channel Effects, General scaling, Constant Voltage & Field scaling.CMOS: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.

Hardware Description Language: [5L]

VHDL or Verilog Combinational & Sequential Logic circuitDesign.

Text Books:

1. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
2. Modern VLSI Design, Wayne Wolf, Pearson Education.

Reference Books:

1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. Advance Digital Design Using Verilog , Michel D. Celliti, PHI
3. VHDL, Bhaskar, PHI.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**MOBILE COMMUNICATION**
SUBJECT CODE	**:**	**IT704D**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Computer Networking, Operating System, Mathematics.

Course Objective:
The objective of the course is to present the basic principles of mobile communication systems,and analyze the operation of mobile communications systems with wireless media.

Course Outcome
After completion of this course student will be able to

IT704D.1:	Understand the limitations of fixed networks; the need and the trend toward mobility; the concepts portability and mobility.
IT704D.2:	Apply the knowledge of the network infrastructure requirements to support mobile devices and users.
IT704D.3:	Analyze the concepts, techniques, protocols and architecture employed in wireless local area networks, cellular networks, and perform basic requirements analysis.
IT704D.4:	Evaluate the techniques and technologies to design and communicate a simple mobile application for smaller devices.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT704D.1	3			2	2											
IT704D.2	1	2		2	3											
IT704D.3	1		3	3	2											
IT704D.4	3	2	2		3							2				

Course Content:

Overview: [5L]
History, Transmission Medium, Need, Advantages, Disadvantages. Introduction to Personal Communications Services: PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

General Packet Radio Services:[9L]
GPRS Architecture, GPRS Network Nodes.Wireless LANs [6L]: Characteristics, IEEE 802.11: Architecture, Physical Layer, MAC Layer, And MAC Management, 802.11a and 802.11b. HIPERLAN: History, WATM, BRAN and HiperLAN2.Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Management Protocol, L2CAP and Security.

Network Layer: [10L]
Introduction, Traditional TCP: Congestion Control, SlowStart, Fast Retransmit and Implications of Mobility. Classical TCP Improvements: Indirect TCP,Snooping TCP, Mobile TCP and Fast Retransmit. Mobile IP: Introduction, IP Packet Delivery, AgentDiscovery, Registration, Tunneling and Encapsulation, Optimizations and Reverse Tunneling. Mobile Ad-hoc Networks: Routing, Destination Sequenced Distance Vector, Dynamic Source Routing and Alternative Metrics.

Cellular Networks: [8L]
Cellular Concept, Frequency Reuse, Channel Allocation Management, CallSetup, Location Management, Cell Handoffs, Interference: Co-channel and Adjacent Interference. SystemCapacity, Improving Cell Capacity and Coverage: Cell Splitting, Sectoring, Repeaters and MicrocellZone Concept

Wireless Application Protocol:[3L]
The Mobile Internet standard, WAP Gateway and Protocols,

Text Books:
1. J. Schiller, Mobile Communications, Addison –Wesley, 2003

Reference Books:
1. T. S. Rapport, Wireless Communications, Principle and Practices
2. Forouzan, Data Communications and Networking, TMH

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**E-COMMERCE LAB**
SUBJECT CODE	**:**	**IT 791**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Object Oriented Programming, Computer Networking, Web Application Development, Database Management System.

Course Objective:
Understanding basic concepts of object oriented programming and PHP framework, explaining the client side components, applying the PHP web application development concept in web application development.

Course Outcome
After completion of this course student will be able to

IT791.1:	Understand the concept of PHP framework.
IT791.2:	Analyzing different client and server side components for developing application and build dynamic website using server sidePHP programming and database connectivity
IT791.3:	Apply and concept for developing MVC application and describe and differentiate differentWeb Extensions andWeb Services.
IT791.4:	Apply and implement the solution to real life problem using PHP concepts and Demonstrate web application usingPython webFramework.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT791.1	2		3	2									2			
IT791.2	2	3	3	3	3							3			1	
IT791.3	2	3	3	3	3							3		2		
IT791.4	2	3	3	3	3				3		3	3				1

Course Content:

Introduction to PHP: Evaluation of PHP, Basic syntax, Variable constant, Data Types, control structure, function, array, string.

Introduction to OOPS: Introduction objects declaring a class The new keyword and constructor destructor access method and properties using this variable public,private, protected properties and methods Static properties and method Class constant Inheritance & code reusability Polymorphism Parent & self keyword Instanceof operator Abstract method and class Interface Final, Understanding Exception and error Try, catch, throw.

Web Designing: Introduction to HTML: HTML Tags Creating Forms Creating tables Managing home page, Java Script, CSS.

Database Connectivity with MySQL: Introduction to RDBMS Connection with MySql: Database Performing basic database operation(DML) (Insert, Delete, Update, Select) Setting query parameter Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.)

MVC: Request & Response Parameter Controller Action Request Life Cycle callbacks Controller method Redirection Working with component, Creating Model for Database Table Retrieving Data Using Model Method for all Basic CURD(Create ,Read, Update, Delete) Create own Model method Making custom SQL Queries Data Validation, Working with Simple association one to-one, one-to-many, many-to-many, Working with layout Create custom Layout Working with Helper class Creating and using user define Helper Working with element

E-Commerce/M-Commerce Applications: Online Store, Online Banking, Credit Card Transaction Processing. Comparison Shopping in B2C, Exchanges Handling in B2B, Interaction Examples: Virtual Shopping Carts.

Text Books:

1. Learn PHP, MySQL, Java Script, by Robin Nixon, Oreilly Publications
2. PHP Complete Reference bySteven Holzner

Reference Books:

1. Programming PHP by Kevin Tatroe

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**COMPUTER GRAPHICS AND MULTIMEDIA LAB**
SUBJECT CODE	**:**	**IT792A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Computer Programming, Mathematics

Course Objective:
The objective of the course is to become familiar with graphics programming and expertise in text, image, audio, video enhancement and manipulation using different software/tools through projects.

Course Outcome
After completion of this course student will be able to

IT792A.1:	Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.
IT792A.2:	Analyze the effects of scale and use on both presentation and lower level requirements
IT792A.3:	Implement image manipulation, enhancement, and basic transformations on objects and clipping algorithm on lines
IT792A.4:	Create 3D graphical scenes using open graphics library suits.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT792A.1	1	3	2	3	1	2										
IT792A.2	1	2	3	2	2											
IT792A.3	2	3	2	1	1							1				
IT792A.4	1	1	1	1	1							2				

Course Content:
IMPLEMENT THE EXERCISES USING C /C++/ OPENGL / JAVA

- Implementation of Algorithms for drawing 2D Primitives – Line(DDA, Bresenham) – all slopes, Circle (Midpoint)
- 2D Geometric transformations –Translation, Rotation Scaling , Reflection Shear, Window-Viewport
- Composite 2D Transformations
- Line Clipping
- 3D Transformations - Translation, Rotation, Scaling.
- 3D Projections – Parallel, Perspective.
- Creating 3D Scenes.
- Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
- 2D Animation – To create Interactive animation using any authoring tool.
- VLC and Video Streaming

- HTML 5 and media publishing with Projects based learning.
- Web document creation using Dreamweaver.
- Creating Animation using Flash.

Text Books:

1. Hearn Baker Carithers, - “Computer Graphics with OpenGL”, Pearson New International Edition

Reference Books:

1. Donald Hearn and Pauline Baker M, ―Computer Graphics”, Prentice Hall, New Delhi, 2007
2. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**PATTERN RECOGNITION LAB**
SUBJECT CODE	**:**	**IT 792B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:

Mathematics, Image Processing.

Course Objective:

The objective of this course is to understand various features representation techniques and to analyze different pattern recognition techniques.

Course Outcome

After completion of this course student will be able to

IT792B.1:	Understand pattern recognition concepts.
IT792B.2:	Analyze pattern recognition techniques.
IT792B.3:	Apply different pattern recognition techniques for providing solutions.
IT792B.4:	Implement solutions to real life problems using pattern recognition techniques.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
IT792B.1	2				2	2						2
IT792B.2		3	2	3								
IT792B.3	2	2	2	3	2							
IT792B.4		2	2	2	3	3			3		2	2

Course Content:

Environment : MAT LAB

1. Feature Representation
2. Mean and Covariance
3. Linear Perceptron Learning
4. Generation of Random Variables
5. Bayesian Classification
6. MLE: Learning the classifier from data
7. Data Clustering: K-Means, MST-based

Text Books:

1. Pattern Recognition , S.Theodoridis and K.Koutroumbas, 4th Ed., Academic Press , 2009.

Reference Books:

1. Pattern Classification, R.O.Duda, P.E Hart and D.G Stork, Johm Wiley,2001.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**INTERNET TECHNOLOGY LAB**
SUBJECT CODE	**:**	**IT792C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**7th Semester**
CONTACT HOURS	**:**	**3P**
CREDITS	**:**	**2**

Prerequisite:
Computer Networking, Web Technology

Course Objective:

The objective of the course is to make students understand different routing algorithm and mail server configurations and explaining C# and .NET Framework for implementing web applications

Course Outcome
After completion of this course student will be able to

IT792C.1:	Understanding and applying the basic networking concepts for configuration of network server and routing protocols.
IT792C.2:	Analyzing and understanding the concept of .NET framework
IT792C.3:	Apply the concept of .NET for implementing web applications
IT792C.4:	Evaluate different web applications to implement optimal solutions for real life problems.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT792C.1	2	3	2	3	3								1	2	-	1
IT792C.2	2	3	2	3	3								2	-	1	3
IT792C.3	2	3	3	3	3								3	-	-	1
IT792C.4	2	3	3	3	3				3		3	3	-	1	2	-

Course Content:

Configuration of Routing Protocol
Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)

Mail Server Configuration
Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mail.

C#
Getting Started with .Net Framework, Exploring Visual Studio .NET, Inside a C# Program, Data Types, Statements, Arrays, Using Strings, Objects, Classes and Structs, Properties, Inheritance, Indexers, Delegates, Events, Namespaces, Generics, Collections and Data

Structures, Exception Handling, Threading, Using Streams and Files, Reflection, Assemblies, versioning, Windows Forms, Controls, Data binding to Controls, Advanced Database Programming using ADO.net, Using GDI +,Networking,.net Remoting, Manipulating XML.

ASP.NET

Building a Web Application, Examples Using Standard Controls, Using HTML Controls, Validating Form Input Controls using Validation Controls, Understanding Applications and State, Applying Styles, Themes, and Skins, Creating a Layout Using Master Pages, Binding to Databases using Controls, Data Management with ADO.net, Creating a Site Navigation Hierarchy, Navigation Controls , Membership and Role Management, Login Controls, Securing Applications, Caching For Performance, Working with XML, Using Crystal Reports in Web Forms

DBMS

Introduction, Using SQL to work with databases, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site. Crystal reports. LINQ: Operators, implementations, LINQ to objects, XML, ADO.NET, Query Syntax.

Text Books:

1. Beginning ASP.NET 4 in C# 2010Matthew MacDonald

Reference Books:

1. 1.ASP .NET Complete Reference Matthew MacDonald
2. 2.C# Complete Reference Herbert Schildt

8TH SEMESTER

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ADVANCED COMPUTER ARCHITECTURE**
SUBJECT CODE	**:**	**IT801A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics **,** Computer Organization and Architecture,

Course Objective:

The objective of the course is to learn technical competence in computer architecture and performance comparisons of modern and high performance computer systems.

Course Outcome:
After completion of this course student will be able to

IT801A.1:	Understand the operations of modern and high performance computer systems.
IT801A.2:	Analyze performance of different ILP techniques of computer architecture I
IT801A.3:	Identify cache and memory related issues in multiprocessors architecture.
IT801A.4:	Evaluate performance of different architectures with respect to various parameters.
IT801A.5:	Design the mechanism by which the performance of the system is enhanced.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
IT801A.1	2	1										1
IT801A.2	2	2	1									
IT801A.3	3	2	2	1	2							
IT801A.4	2	3	3	2	2							1
IT801A.5	2	3	3	2	2							1

Course Content:

Module1: [7L]
Fundamentals of Computer Design: Review of Fundamentals of CPU, Memory and I/O, Trends in technology, power, energy and cost, Dependability, Performance Evaluation

Module 2: [7L]
Instruction Level Parallelism: ILP concepts, Pipelining overview ,Compiler Techniques for Exposing ILP, Dynamic Branch Prediction, Dynamic Scheduling, Multiple instruction Issue, Hardware Based Speculation, Static scheduling, Multi-threading, Limitations of ILP, Case Studies.

Module 3: [7L]
Data Level Parallelism: Vector architecture, SIMD extensions, Graphics Processing units, Loop level Parallelism.

Module 4: [7L]
Thread Level Parallelism: Symmetric and Distributed Shared Memory Architectures, Performance Issues, Synchronization, Models of Memory Consistency, Case studies: Intel i7 Processor, SMT & CMP Processors

Module 5: [7L]
Memory and I/O: Cache Performance, Reducing Cache Miss Penalty and Miss Rate, Reducing Hit Time, Main Memory and Performance, Memory Technology.Types of Storage Devices, Buses, RAID, Reliability, Availability and Dependability, I/O Performance Measures.

Text Books:

1. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", Mc Graw-Hill International Edition, 2000.
2. Sima D, Fountain T and Kacsuk P, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

Reference Books:

1. Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CRYPTOGRAPHY AND NETWORK SECURITY**
SUBJECT CODE	**:**	**IT801B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:

Mathematics, Computer Networking,

Course Objective:

The objective of the course is to study how to maintain the Confidentiality, Integrity and Availability and Authenticity of the data over insecure channels by various means and to understand various protocols for network security to protect against the threats in the networks.

Course Outcome:

After completion of this course student will be able to

IT801B.1:	Understand and Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.
IT801B.2:	Analyze existing authentication and key agreement protocols, identify the weaknesses of these protocols.
IT801B.3:	Develop SSL or Firewall based solutions against security threats, employ access control techniques to the existing computer platforms.
IT801B.4:	Write an extensive analysis report on any existing security product or code, investigate the strong and weak points of the product or code.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT801B.1	2	3	2										1	2		
IT801B.2	2	3	3	2	1	1	1						3	3		
IT801B.3	2	2	3	3	2										3	3
IT801B.4	2	3	3	2	2	1	1					3			2	2

Course Content:

Module1: [5L]

Attacks on Computers & Computer Security Introduction, Need for Security, Security approaches, Principles of Security, Types of attack.

Module 2: [7L]

Cryptography: Concepts & Techniques Introduction, Plaintext & Ciphertext, Substitution Techniques, Transposition Techniques, Encryption & Decryption, and Symmetric & Asymmetric key Cryptography, Key Range & Key Size

Module 3: [8L]

Symmetric Key Algorithm Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA (International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.

Module 4: [5L]
Asymmetric Key Algorithm, Digital Signature and RSA Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).

Module 5: [6L]
Internet Security Protocols, User Authentication Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.

Module 6: [4L]
Electronic Mail Security Basics of mail security, Pretty Good Privacy, S/MIME.

Module7: [3L]
Firewall Introduction, Types of firewall, Firewall Configurations, DMZ Network

Text Books:

1. Cryptography and Network Security, William Stallings, 2nd Edition, Pearson Education Asia
2. Network Security private communication in a public world, C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.

Reference Books:

1. Network Security Essentials: Applications and Standards by William Stallings, Pearson
2. Designing Network Security, Merike Kaeo, 2nd Edition, Pearson Books
3. Building Internet Firewalls, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition
4. Practical Unix & Internet Security, Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**NATURAL LANGUAGE PROCESSING**
SUBJECT CODE	**:**	**IT801C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Mathematics, Computer Programming, Formal Language and Automata Theory

Course Objective:
The objective of the course is to learn the basics of NLTK toolkit, principles of NLP through programming, to build an application using different algorithms and natural language processing techniques.

Course Outcome:
After completion of this course student will be able to

IT801C.1:	Understand the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks.
IT801C.2:	Apply core computer science concepts and algorithms in the processing of natural language.
IT801C.3:	Apply the methods to new NLP problems and will be able to apply the methods to problems outside NLP.
IT801C.4:	Familiar with research field and able to implement a system which processes a natural language

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
IT801C.1	2	2	3	2	2							
IT801C.2	3	3	3	3	3							
IT801C.3	3	3	3	3	3							
IT801C.4	2	3	2	2	3							2

Course Content:

Module I: [5L]
Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms,Language, Thought, and Understanding, The State of the Art and the Near-Term Future.Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSAs.

Module II: [5L]
Word Classes and Part-of –Speech Tagging: (Mostly) English Word Classes, Tagsets for English,Part-of –Speech Tagging, Rule-Based Part-of –Speech Tagging, Stochastic Part-of –Speech Tagging,Transformation-Based Tagging, Other Issues.

Module III: [5L]
Context-Free Grammars for English: Constituency, Context-Free Rules and Trees, Sentences-Level Constructions, The Noun Phrase, Coordination, Agreement, The Verb Phrase andSubcategorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form,Finite-State and Context- Free Grammars, Grammars and Human Processing.

Module IV: [5L]
Parsing with Context-Free Grammars: Parsing as Search, A Basic Top-Down Parser, Problems With the Basic Top-Down Parser, The Early Algorithm, Finite – State Parsing Methods.

Module V: [5L]
Features and Unification: Feature Structures, Unification of Features Structures, FeaturesStructures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types And Inheritance.

Module VI: [5L]
Representing Meaning: Computational Desiderata for Representations, Meaning Structure ofLanguage, First Order Predicate Calculus, Some Linguistically Relevant Concepts.Semantic Analysis: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English,Integrating Semantic Analysis into the Early Parser, Idioms and Compositionality, Robust SemanticAnalysis.

Module VII: [7L]
Discourse: Reference Resolution, Text Coherence, Discourse Structure, Psycholinguistic Studies ofReference and Coherence.Natural Language Generation: Introduction to Language Generation, An Architecture forGeneration, Surface Realization, Discourse Planning, Other Issues.

Text books:

1. Steven Bird, Ewan Klein, and Edward Loper. "Natural Language Processing– Analyzing Text with the Natural Language Toolkit". 2009, O'Reilly, 1ed.
2. Robert Dale, Hermani Moisi, Harold Somers, Handbook Of Natural Language Processing, Marcel Dekker Inc.

Reference books:

1. Ruslan Mitkov, The Oxford Handbook Of Computational Linguistics, Oxford University Press, 2003.
2. Daniel Jurafsky,James Martin, Speech and Language Processing,Prentice Hall,
3. James Allen, Natural Language Processing, Pearson Education, 2003.
4. Christopher D.Manning & Henrich Schutze, Foundations Of Statistical Natural Language Processing, TheMIT Press, 2001
5. Douglas Biber, Susan Conrad, Randi Reppen, Corpus Linguistics – Investigating Language Structure AndUse, Cambridge University Press, 2000.
6. David Singleton, Language And The Lexicon: An Introduction, Arnold Publishers, 2000.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BIOINFORMATICS**
SUBJECT CODE	**:**	**IT801D**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**3L**
CREDITS	**:**	**3**

Prerequisite:
Concepts of Computer Networking, Network Security, Database Management Systems

Course Objective:

The basic objective is to learn about different biomolecules, their structures and functions, various data sets in bioinformatics, computational techniques useful in bioinformatics.

Course Outcome:
After completion of this course student will be able to

IT801D.1:	Understand the concept and techniques of different types of Data Organization and Sequence Databases with different types of Analysis Tools for Sequence Data Banks
IT801D.2:	Analyze the performance of different types of Probabilistic models used in Computational Biology
IT801D.3:	Acquire the knowledge of the DNA Sequence Analysis
IT801D.4:	Acquire the knowledge of Bioinformatics technologies with the related concept of DNA, RNA and their implications

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT801D.1	3	1	1	1								1				
IT801D.2	3	2	2	2												
IT801D.3	2	2	2	2								1				
IT801D.4	2	2	2	2								1				

Course Contents

Introduction To Molecular Biology: [5L]
Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and GeneConcept.Concepts of RNA : Basic structure, Difference between RNA and DNA. Types of RNA.Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Translation Introduction to Metabolic Pathways.

Sequence Databases: [4L]
Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases.sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank, OMIM, Taxonomy browser, PubMed

DNA Sequence Analysis: [14L]

DNA Mapping and Assembly: Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization andMicroarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijnGraph.Sequence Alignment: Introduction, local and global alignment, pairwise and multiple alignment, Dynamic ProgrammingConcept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.

Introduction Probabilistic models used in Computational Biology [8L]
Probabilistic Models; Hidden Markov Model : Concepts, Architecture, Transition matrix, estimation matrix. Application ofHMM in Bioinformatics : Genefinding, profile searches, multiple sequence alignment and regulatory site identification.Bayesian networks Model :Architecture, Principle ,Application in Bioinformatics.

Biological Data Classification and Clustering : [4L]
Assigning protein function and predicting splice sites: Decision Tree

Text Books:
1. Bioinformatics and Molecular Evolution by Paul G. Higgs and Teresa K. Attwood
2. BioInformatics Computing by Bryan Bergeron

Reference books:
1. Bioinformatics and Functional Geneomics, by Jonathan Pevsner
2. Gene Cloning DNA Analysis, by T.A. Brown

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**BUSINESS ANALYTICS**
SUBJECT CODE	**:**	**IT802A**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:
Basic knowledge of Statistical Inference, Multiple Linear Regression and Probability Distributions. Proficiency in Algorithms and Computer Programming Skills.

Course Objective:
The objective of this course is to cover fundamental algorithms and techniques used in Business Analytics and its applications along with the statistical foundations.

Course Outcome:
After completion of this course student will be able to

IT802A.1:	Find a meaningful pattern in data
IT802A.2:	Graphically interpret data
IT802A.3:	Implement the analytic techniques
IT802A.4:	Handle large scale analytics projects from various domains

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT802A.1	2	3	2	2	3				2							
IT802A.2	2	3	3	3	3											
IT802A.3	2	3	3	3	3				2							
IT802A.4	2	3	3	3	3				2	1		2				

Course Content:

Module 1: [4L]
Foundations of Business Analytics: Introduction to Business Analytics, Analytics on Spreadsheets. Data Definitions and Analysis Techniques. Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning and R-Programming

Module 2: [6L]
Product-Market Fit: Gap Analysis, Carrying Out Gap Analysis, Steps in Gap Analysis, Conducting a Representative Survey for Gap Analysis, Predicting Consumer Behaviour and Gap Analysis in Smartphone Market.

Module 3: [7L]
Analytical Modeling by Factor and Cluster Analysis, Factor Analysis Concepts, Application of Factor Analysis Concepts of Cluster Analysis, Similarity Measures, Application of Cluster Analysis.

Module 4: [10L]
Analytical Modeling by Logistics Regression and Discriminant Analysis: Linear Discriminant Analysis Model, Predictive Modeling using Discriminant Analysis, Application of Linear Discriminant Analysis for Credit Scoring of Loan Applicants. Theoretical Formulation of Logistics Regression, Mathematical Interpretation of Logistics Regression, Indicator for Model Fit, Applying Logistics Regression, Application of Logistics Regression in Predicting Risk in Portfolio Management Testing the Reliability/Consistency of the Different Factors Measured.

Module 5: [4L]
Segmentation of primary target market by Heuristic Modeling: Introduction to RFM Analysis, Enhancing Response Rates with RFM Analysis.

Module 6: [6L]
Segmentation of target market based on large databases using Decision Tree approach. Introduction to Chi-square Automatic Interaction Detection (CHAID), Predictive Modelling by CHAID.

Case Studies and Projects: [6L]
Understanding business scenarios, Feature engineering and visualization.Scalable and parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis, Practice and analysis with R.

Text books:
1. Business Analytics: An Application Focus, Purba Halady Rao, Prentice Hall.
2. Business Analytics, James R. Evans, Pearson.

Reference books:
1. Modeling Techniques in Predictive Analytics, Thomas W. Miller, Pearson
2. Enterprise Analytics: Optimize Performance, Process, and Decisions Through Big Data, Thomas H. Davenport, Pearson.
3. Fundamentals of Business Analytics, Seema Acharya, Wiley India.
4. Business Intelligence: A Managerial Perspective on Analytics, Ramesh Sharda, Dursun Delen, Efraim Turban, David King, Prentice Hall

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**CYBER LAW AND SECURITY POLICY**
SUBJECT CODE	**:**	**IT802B**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**3L+1T**
CREDITS	**:**	**4**

Prerequisite:

Concepts of Computer Networking, Network Security

Course Objective:

The objective of the course is to explain critical information infrastructure related to cyber security, explain the legal and regulatory framework to enable a safe and vibrant cyberspace, analyze cyber security that promotes safe and appropriate use of cyberspace, describe national/international cyber security capabilities.

Course Outcome:

After completion of this course student will be able to

IIT802B.1:	Understand the policy issues related to electronic filing of documents with the Government agencies and further to amend the Indian Penal Code, the Indian Evidence Act, 1872, the Bankers' Books Evidence Act, 1891 and the Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto.
IIT802B.2:	Summarize the effectiveness of the prevailing information security law practices.
IIT802B.3:	Apply the importance of lawful recognition for transactions through electronic data interchange and other means of electronic communication, commonly referred to as electronic commerce or E-Commerce.
IIT802B.4:	Analysis of the architecture that can cater to the needs of social information security.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IIT802B.1	3	2	2	1		2		2				2	1	2	-	1
IIT802B.2	2	2	1	1		1		3				1	-	1	1	-
IIT802B.3	2	2	2	2		2		1					-	1	1	3
IIT802B.4	3	2	2	2	1	3		3				2	3	1	-	2

Course Contents

Introduction of Cybercrime: [6L]

Definition cybercrime, Forgery, Hacking, Software Piracy, Computer Network intrusion, Category of Cybercrime, how criminals plan attacks, passive attack, Active attacks, cyber stalking. Overview of Indian Legal System, Introduction to IT Act 2000, Amendments in IT Act, Cyber Laws of EU, USA, Australia, Britain.

Computer Ethics, Privacy and Legislation: [6L]

Computer ethics, moral and legal issues, descriptive and normative claims, Professional Ethics, code of ethics and professional conduct. Privacy, Computers and privacy issue, Digital

Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, Legal Policies, legislative background.

Cybercrime Mobile & Wireless Devices: [3L]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cell phones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Cybercrime Mobile & Wireless Devices: [6L]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cell phones, Theft, Virus, Hacking. Bluetooth, Different viruses on laptop.

Tools and Methods used in Cybercrime: [6L]
Proxy servers, password checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection, buffer overflow.

Intellectual Property Rights Issues: [8L]
Copyrights, Jurisdiction Issues and Copyright Infringement, Multimedia and Copyright issues, WIPO, Intellectual Property Rights, Understanding Patents, Understanding Trademarks, Trademarks in Internet, Domain name registration, Software Piracy, Legal Issues in Cyber Contracts, Authorship, Document Forgery.

Text Books:
1.Cyber security by Nina Gobole&SunitBelapune; Pub: Wiley India.
2. Textbook On Cyber Law by Pavan Duggal, Pub:Universal

Reference books:
1. Cyber Law and Cyber Crime simplified by Prashant Mali

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**ADVANCED DBMS**
SUBJECT CODE	**:**	**IT 802C**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8th Semester**
CONTACT HOURS	**:**	**3L + 1T**
CREDITS	**:**	**4**

Prerequisite:
Database Management System, Operating System, Computer Networking

Course Objective:
The objective of the course is to present an introduction to different database management systems, with an emphasis on advanced transaction processing and recovery systems.

Course Outcome
After completion of this course student will be able to

IT802C.1:	Evaluate and Apply Advanced Database Development Techniques.
IT802C.2:	Evaluate different Database Systems
IT802C.3:	Perform administrator's job for database systems.
IT802C.4:	Design & Implement Advanced Database Systems

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSo3**	**PSO4**
IT802C.1	2	3	3	3					2							
IT802C.2	2	3	3	3												
IT802C.3	1	3	3	3					2							
IT802C.4	2	3	3	3					2	1		2				

Course Contents:

Database-System Architectures: [3L]
Centralized and client–server architectures, Server system architectures, Parallel systems, Distributedsystems, Network types.

Parallel Databases: [4L]
Parallel databases, I/O parallelism, Interquery parallelism, Intra Query parallelism, Intra Operation Parallelism, Interoperation parallelism, Design of parallel systems.

Distributed Databases: [8L]
Homogeneous and heterogeneous databases, Distributed data storage, Distributed transactions, Commit Protocols, Concurrency control in distributed databases, Availability, Distributed query processing,Heterogeneous distributed databases, Directory systems.

Object-Based Databases: [4L]
Overview of object-based databases, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset types in SQL, Introduction of object-identity and reference types in SQL, Object-oriented versus object-relational.

Advanced Application Development: [2L]
Performance tuning, Performance benchmarks, Standardization, Application migration.

Advanced Data Types & New Applications: [5L]
Motivation, Time in databases, Spatial and geographic data, Multimedia databases, Mobility and personal databases, Temporal database.

Advanced Transaction Processing : [6L]
Transaction-processing Monitors, Transactional workflows, E-Commerce, Main-memory databases, Real-time transaction systems, Long-duration transactions, Transactionmanagement in multi-databases.

XML: [5L]
Motivation, Structure of XML data, XML document schema, Querying and transformation, Application Program interfaces to XML, Storage of XML data, XML applications, UML.

Text Books:
1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mcgraw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin CummingsPublishing. Company.

Reference Books:
1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill.
2. Peter Rob and Carlos Coronel, Database Systems- Design, Implementation and Management (7/e), Cengage Learning.

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**INTERNET OF THINGS**
SUBJECT CODE	**:**	**IT802D**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8th Semester**
CONTACT HOURS	**:**	**3L +1T**
CREDITS	**:**	**4**

Prerequisite:
Basic concepts of Operating System, Computer Networking, Web Applications, Cloud Computing.

Course Objective:
The objective of the course is to make students understand the concepts of Internet of Things (IoT) and be able to build IoT applications.

Course Outcome
After completion of this course student will be able to

IT802D.1:	Understand the basic concepts of Internet of Things and its architecture.
IT802D.2:	Apply the concepts of IoT to design different tools.
IT802D.3:	Analyze and understand the basic applications of IoT.
IT802D.4:	Evaluate and analyze different solutions for the real life problems of the Internet of Things.

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
IT802D.1	3	3	2	2												
IT802D.2	3	2	2	2												
IT802D.3	3	3	3	3	2											
IT802D.4	3	3	3	2	3	2	3		3		3	3				

Course Content:

IoT-An Architectural Overview [12L]
Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

IoT Architecture-State of the Art [12L]
Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Layers Architecture [12L]
PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP,

MQTT Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer.

Text Books:

1. Internet of Things by Raj Kamal McGraw Hill
2. IOT fundamentals, David, Pearson Education.
3. Internet of Things by Tripathy and Anuradha, CRC Press.

Reference Books:

1. Getting Started With The Internet Of Things: Connecting Sensors and Microcontrollers to the Cloud Cuno Pfister O'Reilly
2. Internet Of Things, Bahga Orient Black Swan

STREAM	**:**	**INFORMATION TECHNOLOGY**
SUBJECT NAME	**:**	**VALUES AND ETHICS IN PROFESSIONS**
SUBJECT CODE	**:**	**HU802**
YEAR	**:**	**FORTH**
SEMESTER	**:**	**8thSemester**
CONTACT HOURS	**:**	**2L**
CREDITS	**:**	**2**

Prerequisite:
Basic knowledge of management, communication, environment science

Course Objective:
To create awareness on professional ethics and Human Values

Course Outcome:
After completion of this course student will be able to

HU802.1:	Understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.
HU802.2:	Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
HU802.3:	Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
HU802.4:	Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
HU802.5:	Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

CO-PO-PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
HU802.1	2			2				1				2				
HU802.2		2											1	2		2
HU802.3	3			3		2		1		1					1	
HU802.4												2	1			
HU802.5	1	2				2				2				3		2

Course Contents:

Module 1: [3L]
Introduction: Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Module 2: [5L]
Psycho-social theories of moral development: View of Kohlberg; Morality and Ideology, Culture and Morality, Morality in everyday Context.

Module 3: [5L]
Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations: Values Crisis in contemporary society Nature of values: Value Spectrum of a good life.

Module 4: [6L]
Ethics of Profession: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Module 5 : [6L]
Self Development: Character strengths and virtues, Emotional Intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module 6 : [8L]
Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology, Movement of Schumacher; Problems of man, machine, interaction.

Text books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994.
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

Reference books:

1. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.