Department of Computer Science and Engineering

Curriculum Structure & Syllabus

of

1st to 8th Semester under

Autonomy Batch

to be effective from 2016-2017

Curriculum for BTech in Computer Science and Engineering

Under Autonomy

1st Semester							
Sl No	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	M 101	Mathematics -I	3	1	0	4	4
2	CH 101/ PH 101	Chemistry (Gr. A) / Physics - I(Gr. B)	3	1	0	4	4
3	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)	3	1	0	4	4
4	HU 101	Communicative English	2	0	0	2	2
5	ME 101	Engineering Mechanics	3	1	0	4	4
Total of Theory						18	18
A. PRACTICAL							
6	HU191	Lang. Lab. and Seminar Presentation	0	0	2	2	1
7	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics -I Lab(Gr. B)	0	0	3	3	2
8	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab(Gr. B)	0	0	3	3	2
9	ME 191/ ME 192	Engg Drawing & Graphics(Gr A)/ Workshop Practice (Gr-B)	0	0	3	3	2
B. SESSIONAL							
10	XC181	Extra Curricular Activity (NSS/ NCC)	0	0	2	2	1
Total of Practical &Sessional						13	08

2nd Semester							
Sl No	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	M 201	Mathematics -II	3	1	0	4	4
2	CH 201/ PH 201	Chemistry (Gr. B) / Physics - I(Gr. A)	3	1	0	4	4
3	EE 201/ EC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	1	0	4	4
4	CS 201	Computer Fundamentals & Principle of Computer Programming	3	1	0	4	4
5	ME 201	Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
Total of Theory						20	20
B. PRACTICAL							
6	CS291	Computer Fundamentals & Principle of Computer Programming Lab	0	0	3	3	2
7	CH 291/ PH291	Chemistry Lab (Gr. B) / Physics -I Lab(Gr. A)	0	0	3	3	2
8	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab(Gr. A)	0	0	3	3	2
9	ME 291/ ME 292	Engg Drawing & Graphics(Gr B)/ Workshop Practice (Gr-A)	0	0	3	3	2
Total of Practical						12	08
C.SESSIONAL							
10	MC 281	Soft Skill Development	0	0	2	2	0

			3rd Semester					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	BS	M(CSE)301	Mathematics-III	3	1	0	4	4
2	BS	PH301	Physics-II	3	0	0	3	3
3	ES	EE(CSE) 301	Circuit Theory and Network	3	0	0	3	3
4	PC	CS301	Data Structures	3	0	0	3	3
5	PC	CS302	Digital Electronics and Computer Organization	3	0	0	3	3
			Total Theory				16	16
			B. PRACTICAL					
6	BS	PH391	Physics-II Lab	0	0	3	3	2
7	ES	EE(CSE)391	Circuit Theory and Network Lab	0	0	3	3	2
8	PC	CS391	Data Structures Lab	0	0	3	3	2
9	PC	CS392	Digital Electronics and Computer Organization Lab	0	0	3	3	2
			Total Practical				12	8
C. SESSIONAL								
10	HU	HU381	Technical Report writing and Language Practice Lab	0	0	2	2	1
Total							**30**	**25**

			4th Semester					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	BS	M(CSE)401	Numerical Methodsand Statistics	3	0	0	3	3
2	HS	HU401	Environmental science	2	0	0	2	2
3	PC	CS401	Computer Architecture	3	0	0	3	3
4	PC	CS402	Design and Analysis of Algorithms	3	0	0	3	3
5	PC	CS 403	Formal Language And Automata Theory	3	0	0	3	3
Total Theory							14	14
			B. PRACTICAL					
6	BS	M(CSE)491	Numerical Methods and Statistics Lab	0	0	3	3	2
7	PC	CS491	Computer Architecture Lab	0	0	3	3	2
8	PC	CS492	Algorithms Lab	0	0	3	3	2
9	PC	CS493	Programming with C++ Lab	1	0	2	3	2
Total Practical							12	8
			C. MANDATORY COURSES					
10	MC	MC 481	Technical Communication & Soft Skills	0	0	3	3	2 Unit
Total							**29**	**22**

SL No			**5th Semester**					
				Contact hours				Cr. Points
	Type	**Code**	**A. THEORY**	L	T	P	Total	
1	PC	CS501	Computer Graphics	3	0	0	3	3
2	PC	CS502	Operating System	3	0	0	3	3
3	HS	HU 503	Economics for Engineers	2	0	0	2	2
4	PC	CS503	Data Base Management System	3	0	0	3	3
5	FE	CS(IT)504A	Object Oriented Programming using Java					
		CS(IT)504B	Multimedia Technology					
		CS(ECE)504C	Communication Engineering	3	0	0	3	3
6	PE	CS505A	Operations Research					
		CS505A	Computational Geometry					
		CS505A	Digital Signal Processing	3	0	0	3	3
Total Theory							17	17
			B. PRACTICAL					
7	PC	CS591	Computer Graphics Lab	0	0	3	3	2
8	PC	CS592	Operating System Lab	0	0	3	3	2
9	PC	CS 593	Data Base Management System Lab	0	0	3	3	2
10	FE	CS(IT)594A	Object Oriented Programming Lab					
		CS(IT)594B	Multimedia Technology Lab					
		CS(ECE)594C	Communication Engineering Lab	**0**	**0**	3	3	2
Total Practical							12	8
			C. MANDATORY COURSES					
11	MC	MC581	General Aptitude /Foreign Language	0	0	3	3	2 Unit
Total							32	25

			6TH SEMESTER					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	PC	CS601	Computer Network	3	0	0	3	3
2	PC	CS602	Microprocessor and Microcontroller	3	0	0	3	3
3	PC	CS603	Software Engineering	3	0	0	3	3
4	PE	CS604A	Compiler Design					
		CS604B	Robotics					
		CS604C	Simulation and modeling	3	0	0	3	3
5	FE	IT(CSE)605A	Pattern Recognition					
		IT(CSE)605B	Distributed Operating System					
		IT(CSE)605C	Distributed Database					
		IT(CSE)605D	Computer Vision	3	0	0	3	3
6	FE	IT(CSE)606A	Data Warehousing and Data Mining					
		IT(CSE)606B	Digital Image Processing					
		IT(CSE)606C	E-commerce and ERP	3	0	0	3	3
Total Theory							18	18
			B. PRACTICAL					
7	PC	CS691	Computer Network Lab	0	0	3	3	2
8	PC	CS692	Microprocessor and Microcontroller Lab	0	0	3	3	2
9	PC	CS693	Software Engineering Lab	0	0	3	3	2
10		CS682	Mini Project	0	0	3	3	2
Total Practical							12	8
C. SESSIONAL								
10		CS681	Group Discussion and Seminar	0	0	3	3	2
Total							33	28

			7TH SEMESTER					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	PC	CS701	Artificial Intelligence	3	0	0	3	3
2	HS	HU702	Values & Ethics in Profession	2	0	0	2	2
3	PE	CS702A	Soft Computing					
		CS702B	Natural Language Processing					
		CS702C	Web technology	3	0	0	3	3
4	PE	CS703A	Cloud Computing					
		CS703B	Data Analytics	3	0	0	3	3
		CS703C	Sensor Network and IOT					
5	PE	CS704A	Distributed Algorithms					
		CS704B	Bio-informatics					
		CS704C	Cryptography and Network Security	3	0	0	3	3
Total Theory							14	14
			B. PRACTICAL					
6	PC	CS791	Artificial Intelligence Lab	0	0	3	3	2
7	PE	CS792A	Soft Computing Lab					
		CS792B	Natural Language Processing Lab					
		CS792C	Web Technology Lab	0	0	3	3	2
8		CS795	Project-1	0	0	3	3	2
Total Practical							9	6
			C. SESSIONAL					
9		CS781	Industrial Training	0	0	0	0	2
Total Sessional								
			D. MANDATORY COURSES					
10	MC	MC781	Technical Skill Development	0	0	3	3	2Unit
Total							26	22

			8TH SEMESTER					
				Contact hours				Cr. Points
			8th Semester	L	T	P	Total	
SL No	**Type**	**Code**	**A. THEORY**					
1	HS	HU804	Principles of Management	2	0	0	2	2
2	PE	CS801A	Mobile Computing	3	0	0	3	3
		CS801B	Human computer Interaction					
		CS801C	Cyber Law and Security Policy					
		CS801D	VLSI Design					
3	PE	CS802A	Parallel Computing	3	0	0	3	3
		CS802B	Machine Learning					
		CS802C	Real Time Operating System and Embedded System					
		CS802D	Advanced Computer Architecture					
Total Theory							8	8
			B. PRACTICAL					
4	PC	CS891	Design lab	0	0	3	3	2
5		CS892	Project 2	0	0	12	9	6
6		CS893	Seminar Presentation	0	0	3	3	2
Total Practical							15	10
			C. SESSIONAL					
7		CS881	Grand Viva	0	0	0	0	4
Total							26	22
Grand Total								198

Department of Computer Science and Engineering

Curriculum Structure

& Syllabus

(2016-2017)

(Autonomy)

of

1st Semester

Curriculum for BTech in Computer Science and Engineering

Under Autonomy

1st Semester							
Sl No	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	M 101	Mathematics -I	3	1	0	4	4
2	CH 101/ PH 101	Chemistry (Gr. A) / Physics - I(Gr. B)	3	1	0	4	4
3	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)	3	1	0	4	4
4	HU 101	Communicative English	2	0	0	2	2
5	ME 101	Engineering Mechanics	3	1	0	4	4
Total of Theory						18	18
A. PRACTICAL							
6	HU191	Lang. Lab. and Seminar Presentation	0	0	2	2	1
7	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics -I Lab(Gr. B)	0	0	3	3	2
8	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab(Gr. B)	0	0	3	3	2
9	ME 191/ ME 192	Engg Drawing & Graphics(Gr A)/ Workshop Practice (Gr-B)	0	0	3	3	2
B. SESSIONAL							
10	XC181	Extra Curricular Activity (NSS/ NCC)	0	0	2	2	1
Total of Practical &Sessional						13	08

Syllabus:

Theory

Paper Name: Mathematics –I
Paper Code: M101
Total Contact Hours: 40
Credit: 4

Prerequisite: Any introductory course on matrix algebra, calculus, geometry.

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

Course outcome:

After completion of the course students would be able to

CO1	Understand and recall the properties and formula related to matrix algebra, differential calculus, integral calculus and vector algebra.
CO2	Determine the solutions of the problems related to matrix algebra, differential calculus, multivariable calculus, vector calculus and infinite series.
CO3	Apply the appropriate mathematical tools of matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus and infinite series for the solutions of the related problems.
CO4	Analyze different engineering problems linked with matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus,
CO5	Apply different engineering problems linked with matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus.

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), Eigen values and Eigen vectors of a square matrix (of order 2 or 3), Characteristic polynomials, Caley-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 revolutionand 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. House, 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.

ReferenceBooks:

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M101.1	3	3	2	-								2
M101.2	3	3	3	3								2
M101.3	3	3	3	3								2
M101.4	3	3	3	3								2
M101.5	3	3	3	3								2

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
M101.1	2	2	2
M101.2	2	2	2
M101.3	2	2	2
M101.4	2	2	2
M101.5	2	2	2

Paper Name: Chemistry
Paper Code: CH 101
Total Contact Hours: 40
Credit: 4

Pre requisites: 10+2 science with chemistry

Course Objective
Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nanomaterials. Learning about theSynthesis, 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 Outcomes (COs):

After completion of the course students would be able to

CO1	Describe and apply fundamental concepts of the chemical thermodynamics to engineering applications
CO2	Ability to analyze & design different energy storage devices
CO3	Determine, analyze and interpret the structure of organic molecules using different spectroscopic techniques
CO4	Apply the knowledge of fuel, composites, polymers and organic reactions to different industries.
CO5	Evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

Course contents

Module 1 [8L]

Chemical Thermodynamics –I
1.1 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. **2L**

1.2 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 processes, law of Lavoisier and Laplace, Hess's law of constant heat summation. **3L**

1.3 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. **3L**

Module 2 [7L]

2.1 Reaction Dynamics

Reaction laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudounimolecular reaction, Arrhenius equation. **3L**

Mechanism and theories of reaction rates (Content beyond the syllabus)

2.2 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, photo voltaic cell, fabrication of integrated circuits. **4L**

Module 3 [8L]

Electrochemistry

3.1 Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). **1L**

3.2 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). **3L**

3.3 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). **2L**

3.4 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. **2L**

Module 4 [12L]

4.1 Structure and reactivity of Organic molecule

Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals.Brief study of some addition, eliminations and substitution reactions. **3L**

4.2 Polymers

Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.: Theory and mathematical expression only), Poly dispersity 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 bio-polymers. **7L**

4.3 Nano material

Basic principles of nano science and technology, classification, preparation, properties and application of nano material. **2L**

Module 5 [5L]

5.1 Industrial Chemistry

Fuels

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 **3L**

5.2 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. **2L**

Short overview of water treatment plants(Content beyond the syllabus)

Reference Books

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH101.1	3	2	2	2		3	3					
CH101.2	3	3	3	3		3	3					
CH101.3	3	3	2	2		3	3					
CH101.4	3	2	3	2		3	3					
CH101.5	3	3	3	3		3	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH101.1	2	2	2
CH101.2	2	2	2
CH101.3	2	2	2
CH101.4	2	2	2
CH101.5	2	2	2

Paper Name: Physics -I
Paper Code: PH 101
Total Contact Hours: 41
Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

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 Outcomes (COs):

After completion of the course students would be able to

PH101.1	Describe various types of mechanical resonance and its electrical equivalence
PH101.2	Explain basic principles of Laser, Optical fibers and Polarization of light
PH101.3	Apply superposition principle to explain interference and diffraction
PH101.4	Analyze different crystallographic structures according to their co-ordination number and packing factors
PH101.5	Determine and justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

Course contents

Module 1 (8L):-
Oscillations
1.1Simple harmonic motion: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions:Lissajous' figures, Engineering Applications and related Numerical problems 2L

1.2Damped vibration: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems. 3L

1.3Forced vibration: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems 3L

Module 2 (10L):-

Classical Optics:

2.1Interference 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. 3L

Fresnel's biprism (beyond the syllabus). 1L(ext)

2.2Diffraction 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. 4L

2.3Polarization: Definition, plane of polarization,p**l**ane 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. 3L

Module 3 (9L):-
Quantum Physics:

3.1 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. 4L

3.2 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). 4L

Module 4 (6L):
X-ray & Crystallography

4.1 X**-rays** – Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant, Applications, Numerical problems. 2L

4.2Elementary 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, Co-ordination number and Atomic packing factor, Applications, Numerical problems. 4L

Module 5 (8L):
Modern Optics-I:

5.1Laser: 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. 5L

5.2 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. 3L

Recommended Text Books for Physics I (PH101//201):

Oscillations:

1. Classical Mechanics- J. C. Upadhyay (Himalya Publishers)
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwal & 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 text book 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,Wavesand Acoustics)

Classical Optics & Modern Optics-I:

13. A text book of Light- K.G. Mazumder & B.Ghoshs (Book& Allied Publisher)
14. A text book 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(PhysicalOptics)
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 Lokenathan
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 (Chaya 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)
4. University Physics-Sears & Zemansky (Addison-Wesley)
5.B. Dutta Roy (Basic Physics)
6. R.K. Kar (Engineering Physics)
7.Mani and Meheta (Modern Physics)
8. Arthur Baiser (Perspective & Concept of Modern Physics)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH101.1	3	3	2	2								
PH101.2	3	3	2	2								
PH101.3	3	3	2	2								
PH101.4	3	3	2	2								
PH101.5	3	3	2	2								

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
PH101.1	2	2	2
PH101.2	2	2	2
PH101.3	2	2	2
PH101.4	2	2	2
PH101.5	2	2	2

Paper Name: Basic Electrical Engineering
Paper Code: EE101
Total Contact Hours: 41
Credit: 4

Pre requisite: Basic 12st standard Physics and Mathematics

Course Objective:
Basic electrical engineering is an introductory course in electrical engineering. Students are introduced to simple applied electrical circuits, theories and practice to impart skill set to have visualization of electrical
engineering applications. It is a course suitable for students pursuing electrical engineering as well as other related engineering disciplines.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand and analyze basic electric circuits
CO2	Determine and study the working principles of electrical machines.
CO3	Understand the components of low voltage electrical installations
CO4	Design the fundamentals of electrical Power systems and Control Systems
CO5	Analyze and study the fundamentals of electrical Power systems and Control Systems

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, band width of resonant circuit.

THREE PHASE CIRCUITS (3L)
Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters 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, Willey Press
2. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .
3. Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE101.1	3	3	3	3								
EE101.2	3	3	3	3								
EE101.3	3	3	3	3								
EE101.4	3	3	3	3								
EE101.5	3	3	3	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE101.1	2	2	2
EE101.2	2	2	2
EE101.3	2	2	2
EE101.4	2	2	2
EE101.5	2	2	2

Paper Name: Basic Electronics Engineering
Paper code: EC101
Total Contact Hours: 40
Credits: 4

Prerequisites

A basic course in Electronics and Communication Engineering Progresses from the fundamentals of electricity, direct current (DC) devices and circuits , series and parallel circuits to the study of active and passive components, Ohm's Law, Kirchoff's Law i.e. KVL,KCL, Ampere's Law etc.

Course objectives:

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 n 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 concept 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 Outcomes (COs):

After completion of the course students would be able to

CO1	Study PN junction diode, ideal diode, diode models and its circuit analysis, application of
CO2	Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation on electronic signals
CO3	Study the concepts of both positive and negative feedback in electroniccircuits
CO4	Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
CO5	Learn how the primitives of Boolean algebra are used to describe the processing of binary signals.

Course contents

Module-I: Basics of semiconductor 6L

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: P-N Junction Diode and its applications 8L

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 (I_{DC} , I_{rms} , V_{Dc} , V_{rms}) , 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 : Bipolar junction transistor(BJT) 6L

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: Field effect transistor (FET) 4L

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: Feedback and Operational Amplifier 10L

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 topic may be discussed or assigned.

Module-VI: Cathode Ray Oscilloscope (CRO) 2L

Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

Module-VII: Digital Electronics 4L

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. Boyelstad & 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.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC101.1	2	3	3	3								
EC101.2	3		3									
EC101.3	3		3	3								
EC101.4	2	3	3									
EC101.5	3	3	2	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EC101.1	2	2	2
EC101.2	2	2	2
EC101.3	2	2	2
EC201.4	2	2	2
EC201.5	2	2	2

Paper Name: Communicative English
Paper Code: HU101
Total Contact Hours: 26
Credits: 2

Pre requisites:

Basic knowledge of high school English.

Course Objectives:

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 Outcomes:

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand about and use the modalities and nuances of communication in a workplace context.
CO2	Understand about communicating across cultures and societies.
CO3	Understand and know about and apply the basic formats, templates of business and official communication.
CO4	Understand and know about and employ formal communication modes in meetings and reports.
CO5	Understand and know about and use objective and culturally neutral language in interpersonal and business communication.

Course Content:

The proposed revised syllabus is as follows:

Module 1: Communication: Interface in a Globalized World [5L]

a .Definition of Communication& Scope of Communication

b. Process of Communication—Models and Types

c. Verbal—Non-Verbal Communication, Channels of Communication

d. Barriers to Communication & surmounting them

[to be delivered through case studies involving intercultural communication]

Module 2: Vocabulary and Reading [5L]

a. Word origin—Roots, Prefixes and Suffixes, Word Families, Homonyms and Homophones

b. Antonyms and Synonyms, One-word substitution

c. Reading—Purposes and Skills

d. Reading Sub-Skills—Skimming, Scanning, Intensive Reading

e. Comprehension Practice (Fiction and Non fictional Prose/Poetry)

Texts:

(i)Isaac Asimov, *I Robot* (―Robbie OR ―Little Lost Robot)

(ii)George Orwell, ―Shooting an Elephant

(iii)Ruskin Bond, ―The Cherry Tree OR ―The Night Train at Deoli

(iv) Robert Frost, ―Stopping by the Woods on a Snowy Evening.

f. Precis Writing

(Use of daily newspapers for reading practice is recommended)

Module 3: Functional Grammar and Usage [6L]

a. Articles, Prepositions, Verbs

b. Verb-Subject Agreement

c. Comparison of Adjectives

d. Tenses and their Use

e. Transformation of Sentences (Singular-Plural, Active-Passive, Direct-Indirect, Degrees of Comparison)

f. Error Correction

Module 4: Business writing [10L]

a. Business Communication in the Present-day scenario

b. Business Letters (Letters of Inquiry, Sales Letters, Complaint and Adjustment Letters, Job Application Letters)

c. Drafting of a CV and Résumé

d. Memo, Notice, Advertisement, Agenda, Minutes of Meetings

e. E-mails (format, types, jargons, conventions)

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.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU101.1							2		3	3		3
HU101.2							2		3	3		3
HU101.3							2		3	3		3
HU101.4							2		3	3		3
HU101.5							2		3	3		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU101.1	2	2	2
HU101.2	2	2	2
HU101.3	2	2	2
HU101.4	2	2	2
HU101.5	2	2	2

Paper Name: Engineering Mechanics
Paper Code: ME101
Total Contacts Hours: 45
Credit: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
1. Understand the vector and scalar representation of forces and moments.
2. Describe static equilibrium of particles and rigid bodies in two dimensions and three dimensions including the effect of Friction
3. Analyze the properties of surfaces & solids in relation to moment of inertia.
4. Illustrate the laws of motion, kinematics of motion and their interrelationship.
5. Study the concepts of engineering mechanics on deformable materials under applied loads.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.
CO2	Study the effect of friction in static and dynamic conditions.
CO3	Understand the different surface properties, property of masses and material properties.
CO4	Analyze and solve different problems of kinematics and kinetics.
CO5	Analyze and study the fundamentals of electrical Power systems and Control Systems

Course Content:

Module1: 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). 2L

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.
3L+1T
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
4L+1T

Module2: 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.
3L+1T

Module3: Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, composite areas consisting of above figures. 4L+1T

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. 3L+1T

Principle of virtual work with simple application. 1L+1T

Module4: 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. 2L+1T

Module5: 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, v-t and a-t graphs. 3L+1T

Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). 2L+1T

Module6: 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. 3L+2T

Books Recommended

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
5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
6. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
7. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME101.1	2	2	2	2	3							
ME101.2	3	3	3	3	2							
ME101.3	3	3	3	2	2							
ME101.4	2	2	3	2	2							
ME101.5	2	3	2	2	2							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME101.1	2	2	2
ME101.2	2	2	2
ME101.3	2	2	2
ME101.4	2	2	2
ME101.5	2	2	2

Practical

Paper Name: Lang. Lab. and Seminar Presentation
Paper Code: HU191
Total Contact Hours: 26
Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

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

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Able to understand advanced skills of Technical Communication in English through Language Laboratory.
CO2	Able to apply listening, speaking, reading and writing skills in societal and professional life.
CO3	Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
CO4	Able to analyze communication behaviors.
CO5	Able to adapt to multifarious socio-economical and professional arenas with the help ofeffective communication and interpersonal skills.

Course Contents:

Module 1: Introduction to the Language Lab
a. The Need for a Language Laboratory
b. Tasks in the Lab
c. Writing a Laboratory Note Book

Module 2: 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 3: Speaking
a. Speaking (Choice of words, Speech Syntax, Pronunciation, Intonation)
b. Language Functions/Speech Acts
c. Speaking using Picture Prompts and Audio Visual inputs
c. Conversational Role Plays (including Telephonic Conversation)
d. Group Discussion: Principles and Practice

Module 4: 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.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU191.1							2		3	3		2
HU191.2							2		3	3		2
HU191.3							2		3	3		2
HU191.4							2		3	3		2
HU191.5							2		3	3		2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU191.1	2	2	2
HU191.2	2	2	2
HU191.3	2	2	2
HU191.4	2	2	2
HU191.5	2	2	2

Paper Name: Chemistry Lab
Paper Code: CH 191
Total Contact hour: 36
Credit: 2

Pre requisites: 10+2 science with chemistry

Course Objective

Acquiring knowledge on Standard solutions and the various reactions in homogeneous and heterogenous medium. 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 Nanomaterials.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand different types of instruments for estimation of small quantities chemicals used in industries, scientific and technical fields.
CO2	Analyze and determine the composition of liquid and solid samples working as an individual and also as a team member.
CO3	Analyze different water quality parameters considering public health and environment.
CO4	Synthesize drug and polymer materials considering public health and environmental safety.
CO5	Design innovative experiments applying the fundamental theory of chemistry.

Course contents

List of Experiments:

1. To Determine the alkalinity in 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 andwater).
7. Conductometric titration for determination of the strength of a given HCl solution by titration against astandard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOHsolution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicatorsolution).

Innovative experiment:
Preparation of silver nano-particles.

Note: From the list of 10 (Ten) 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.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH291.1	2	3	3	3	3	2	3					
CH291.2	2	3	3	3	3	2	3					
CH291.3	2	3	3	3	3	2	3					
CH291.4	2	3	3	3	3	2	3					
CH291.5	2	3	3	3	3	2	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH291.1	2	2	2
CH291.2	2	2	2
CH291.3	2	2	2
CH291.4	2	2	2
CH291.5	2	2	2

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: PhysicsI Lab
Paper Code: PH 191
Total Contact Hours: 40
Credit: 4
Pre requisites: Knowledge of Physics upto 12th standard.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Demonstrate experiments allied to their theoretical concepts
CO2	Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer
CO3	Analyze and participate as an individual and as a member or leader in groups in laboratory sessions actively.
CO4	Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.
CO5	Design solutions for real life challenges.

General idea about Measurementsand Errors(One Mandatory):
i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment. ii) Proportional error calculation using CarreyFosterBridge.
Any 7 to be performed from the following experiments

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

Experiments on Optics:
5. Determination of wavelength of light by Newton's ring method.
6. Determination of wavelength of light by Laser diffraction method.
7. Determination of numerical aperture and the energy losses related to optical fiber experiment
8. Measurement of specific rotation of an optically active solution by polarimeter.

Experiments on Quantum Physics:
11. Determination of Planck's constant using photoelectric cell.
12. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.

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

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH191.1	2	3	3	2	3							
PH191.2	2	3	3	2	3							
PH191.3	2	3	3	2	3							
PH191.4	2	3	3	2	3							
PH191.5	2	3	3	2	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PH191.1	2	2	2
PH191.2	2	2	2
PH191.3	2	2	2
PH191.4	2	2	2
PH191.5	2	2	2

Paper Name: Basic Electrical Engineering
LAB Paper Code: EE191
Total Contact Hours: 36
Credit: 2

Pre requisites:

1. Basic Physics and applied physics.
2. Basic Mathematics.
3. Basic concept of Electric Circuit

Course Objective:

1. Provide knowledge for the analysis of basic electrical circuit.
2. To introduce electrical appliances, machines with their respective characteristics.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Identify and use common electrical components
CO2	To develop electrical networks by physical connection of various components and analyze the circuit behaviour.
CO3	Apply and analyze the basic characteristics of transformers and electrical machines.
CO4	Illustrate the venin's, Norton's, superposition and maximum power transfer theorem.
CO5	Create resonance condition in R-L-C series and parallel circuit and learn how to draw phasor diagram for the circuit

Course contents

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE191.1	2	2	3	3	3							
EE191.2	3	2	2	3	3							
EE191.3	2	3	2	3	2							
EE191.4	2	2	2	3	2							
EE191.5	2	3	2	3	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE191.1	3		2
EE191.2	3		
EE191.3	3	2	3
EE191.4	3	2	3
EE191.5	3		

Paper Name: Basic Electronics Engineering Lab
Paper Code: EC191
Total Contact Hours: 36
Credit: 2

Prerequisites

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 objectives:

Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias, They will also be 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. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET .

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
CO2	Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
CO3	Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
CO4	Able to know the application of Diode, BJT &OPAMP.
CO5	Familiarization and basic knowledge of Integrated Circuits

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, millimeters 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 OPAMP 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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC191.1	3		3	2	3							
EC191.2	3	3	3		3							
EC191.3	3	3		2	3							
EC191.4	3		3		3							
EC191.5	3	3		1	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EC191.1	2	2	2
EC191.2	2		2
EC191.3		2	2
EC191.4	2		
EC191.5	2	2	2

Paper Name: Engineering Drawing & Graphics
Paper Code: ME 191

Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:

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

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
CO4	Become familiar with computer aided drafting useful to share the design model to different section of industries
CO5	Become familiar with computer aided drafting useful to share the design model to different section of for research & development.

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.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME191.1	3	3	3	3	3							
ME191.2	3	3	3	3	3							
ME191.3	3	3	3	3	3							
ME191.4	3	3	3	3	3							
ME191.5	3	3	3	3	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME191.1	2	2	2
ME191.2	2	2	2
ME191.3	2	2	2
ME191.4	2	2	2
ME191.5	2	2	2

Paper Name: Workshop Practice
Paper Code: ME192
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:

1. To understand the basic knowledge of Workshop Practice and Safety.
2. To 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.
3. To get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Identify and operate various hand tools related to variety of manufacturing
CO2	Apply safely fabricate simple components with their own hands.
CO3	Apply practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO4	Apply and produce small devices of their interest in project or research purpose.
CO5	Apply safety measures with simple components with their own hands.

Course contents

List of Activities:

Sl. No.	Syllabus	Contact Hrs
Module 1	Pattern Making	6
Module 2	Sheet Metal Work	6
Module 3	Fitting	9
Module 4	Machining in Lathe	9
Module 5	Welding	6

MODULE 1 – PATTERN MAKING.

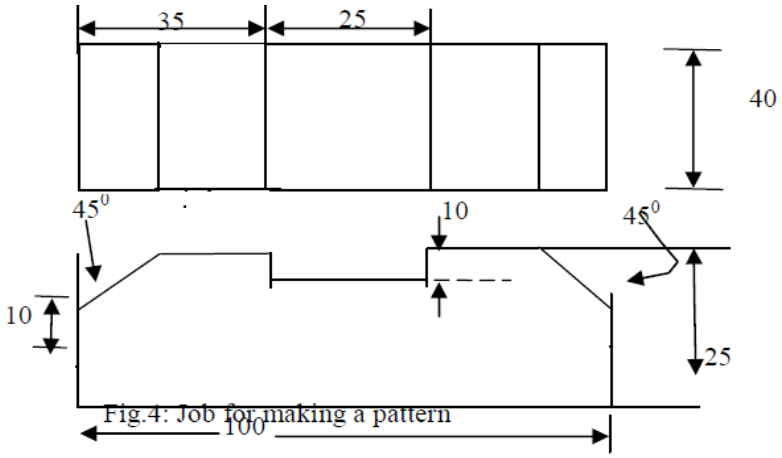
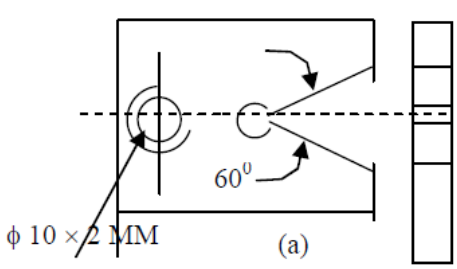
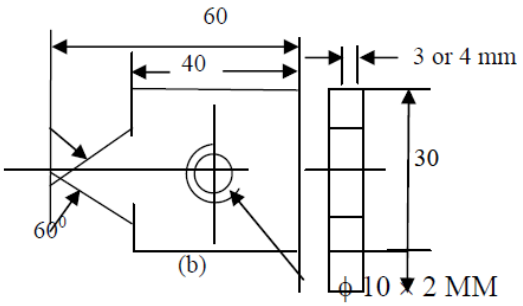


Fig.4: Job for making a pattern

MODULE 3- FITTING SHOP.



OR



MODULE 4 – MACHINING IN LATHE & SHAPING M/C

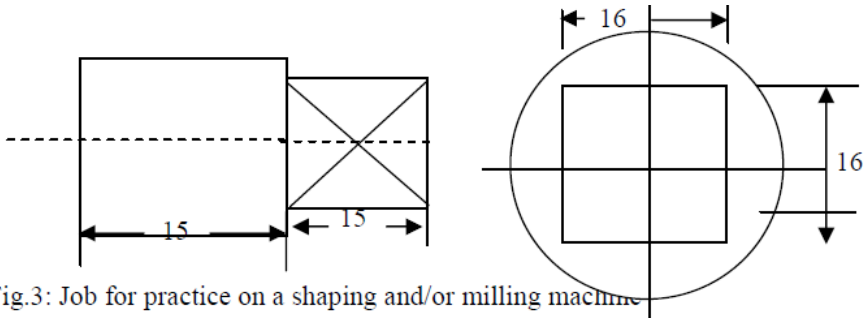
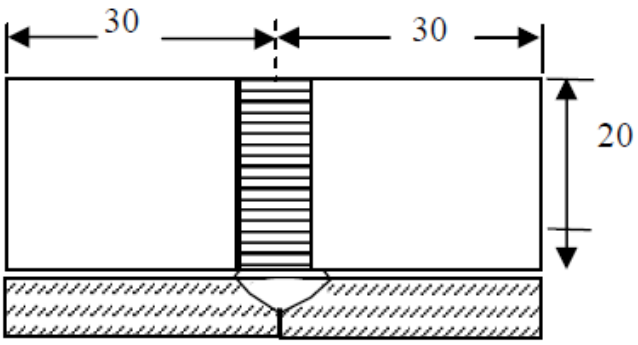


Fig.3: Job for practice on a shaping and/or milling machine

MODULE 5 – WELDING



CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME291.1	3	3	3	3	3							
ME291.2	3	3	3	3	3							
ME291.3	3	3	3	3	3							
ME291.4	3	3	3	3	3							
ME291.5	3	3	3	3	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME291.1	2	2	2
ME291.2	2	2	2
ME291.3	2	2	2
ME291.4	2	2	2
ME291.5	2	2	2

Sessional

Paper Name: Extra Curricular Activity (NSS/ NCC)
Paper Code: XC 181
Total Contact hours: 20
Credit: 1

Course Objectives: The objectives of the course are as follows:

- To increase student awareness about the weaker and unprivileged sections of society
- To expose students to environmental issues and ecological concerns
- To make students self aware about their participatory role in sustaining society and the environment

Course contents

List of Activities:

a) Creating awareness in social issues
b) Participating in mass education programmes
c) Proposal for local slum area development
d) Waste disposal
e) Environmental awareness ``
f) Production Oriented Programmes
g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women's development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children's Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
6. Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes

1.Adult education
2. Children's education

Proposal for local slum area development

One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

• Resource conservation – Awareness to be developed on water, energy,soil.
• Preservation of heritage monuments- Marches, poster campaigns
• Alternative energy consciousness amongst younger school-children.
• Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
• Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices

6. Rodent control land pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;
9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
j) Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;

Department of Computer Science and Engineering

Curriculum Structure

& Syllabus

(2016-2017)

(Autonomy)

of

2nd Semester

Curriculum

THEORY							
Sl No	Paper Code	Theory	Contact Hours /Week				Credit Points
			L	T	P	Total	
1	M 201	Mathematics -II	3	1	0	4	4
2	CH 201/ PH 201	Chemistry (Gr. B) / Physics - I(Gr. A)	3	1	0	4	4
3	EE 201/ EC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	1	0	4	4
4	CS 201	Computer Fundamentals & Principle of Computer Programming	3	1	0	4	4
5	ME 201	Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
Total of Theory						20	20
PRACTICAL							
6	CS291	Computer Fundamentals & Principle of Computer Programming Lab	0	0	3	3	2
7	CH 291/ PH291	Chemistry Lab (Gr. B) / Physics -I Lab(Gr. A)	0	0	3	3	2
8	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab(Gr. A)	0	0	3	3	2
9	ME 291/ME 292	Engg Drawing & Graphics(Gr B)/ Workshop Practice (Gr-A)	0	0	3	3	2
Total of Practical						12	08
C.SESSIONAL							
10	MC 281	Soft Skill Development	0	0	2	2	0

Theory

Paper Name: Mathematics-II
Paper Code: M 201
Total Contact Hours: 40
Credit: 4

Prerequisite: Any introductory course on calculus.

Course Objective: The purpose of this course is to provide fundamental conceptsOrdinary Differential Equations, Graph Theory and Laplace Transform.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Determine and recall the properties and formula related to Ordinary differential equations, Basic Graph Theory and Laplace transform.
CO2	Determine the solutions of the problems related to Ordinary differential equations, Basic Graph Theory and Laplace transform.
CO3	Apply appropriate mathematical tools of Ordinary differential equations, Basic Graph Theory and Laplace transform.
CO4	Analyze engineering problems on Ordinary differential equations, Basic Graph Theory and Laplace transform.
CO5	Apply engineering solutions by using Ordinary differential equations, Basic Graph Theory and Laplace transform.

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.
** Extra lecture hours may be taken for this module

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 $\int f(u)\,du$. 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 Text Books:

4. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley, 2005.
5. R.K. Ghosh and K.C.Maity, An Introduction to Differential Equations, New Central Book Agency.
6. V. K. Balakrishnan,Graph Theory, Schaum's Outline, TMH.
7. J. Clark and D. A. Holton, A first course at Graph Theory,Allied Publishers LTD.
8. D. B. West, Introduction to Graph Theory,Prentice-Hall of India.
9. N. Deo, Graph Theory, Prentice-Hall of India.
10. J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier, 2006.
11. L. Rade and B. Westergen, Mathematics Handbook: for Science and Engineering (5th edition,1st Indian Edition), Springer, 2009.
12. Murray R.Spiegel, Laplace Transform, Schaum's Outline Series, McGRAW-HILL.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M201.1	3	3	2	-								2
M201.2	3	3	3	3								2
M201.3	3	3	3	3								2
M201.4	3	3	3	3								2
M201.5	3	3	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M201.1	2	2	2
M201.2	2	2	2
M201.3	2	2	2
M201.4	2	2	2
M201.5	2	2	2

Paper Name: Chemistry
Paper Code: CH 201
Total Contact Hours: 40
Credit: 4

Pre requisites: 10+2 science with chemistry

Course Objective

Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nanomaterials. Learning about theSynthesis, 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 Outcomes (COs):

After completion of the course students would be able to

CO1	Describe and apply fundamental concepts of the chemical thermodynamics to engineering applications
CO2	Ability to analyze & design different energy storage devices
CO3	Determine, analyze and interpret the structure of organic molecules using different spectroscopic techniques
CO4	Apply the knowledge of fuel, composites, polymers and organic reactions to different industries.
CO5	Evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

Course contents

Module 1 [8L]

Chemical Thermodynamics –I

1.1 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.

2L

1.2 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 processes, law of Lavoisier and Laplace, Hess's law of constant heat summation. **3L**

1.3 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. **3L**

Module 2 [7L]

2.1 Reaction Dynamics

Reaction laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudounimolecular reaction, Arrhenius equation. **3L**

Mechanism and theories of reaction rates (Content beyond the syllabus)

2.2 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, photo voltaic cell, fabrication of integrated circuits. **4L**

Module 3 [8L]

Electrochemistry

3.1 Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). **1L**

3.2 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). **3L**

3.3 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). **2L**

3.4 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. **2L**

Module 4 [12L]

4.1 Structure and reactivity of Organic molecule

Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation,

electromeric effect, carbocation, carbanion and free radicals.Brief study of some addition, eliminations and substitution reactions. **3L**

4.2 Polymers

Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.: Theory and mathematical expression only), Poly dispersity 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 bio-polymers. **7L**

4.3 Nano material

Basic principles of nano science and technology, classification, preparation, properties and application of nano material. **2L**

Module 5 [5L]

5.1 Industrial Chemistry

Fuels

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 **3L**

5.2 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.

2L

Short overview of water treatment plants(Content beyond the syllabus)

Reference Books

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH201.1	3	2	2	2		3	3					
CH201.2	3	3	3	3		3	3					
CH201.3	3	3	2	2		3	3					
CH201.4	3	2	3	2		3	3					
CH201.5	3	3	3	3		3	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH201.1	2	2	2
CH201.2	2	2	2
CH201.3	2	2	2
CH201.4	2	2	2
CH201.5	2	2	2

Paper Name:
Physics -I Paper
Code: PH 201
Total Contact Hours: 41
Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

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 Outcomes (COs):

After completion of the course students would be able to

CO1	Describe various types of mechanical resonance and its electrical equivalence
CO2	Explain basic principles of Laser, Optical fibers and Polarization of light
CO3	Apply superposition principle to explain interference and diffraction
CO4	Analyze different crystallographic structures according to their co-ordination number and packing factors
CO5	Determine and justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

Course contents

Module 1 (8L):-
Oscillations
1.1Simple harmonic motion: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions:Lissajous' figures, Engineering Applications and related Numerical problems 2L

1.2Damped vibration: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems. 3L

1.3Forced vibration: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems 3L

Module 2 (10L):-
Classical Optics:
2.1Interference 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. 3L

Fresnel's biprism (beyond the syllabus). 1L(ext)

2.2Diffraction 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. 4L

2.3Polarization: Definition, plane of polarization,p**l**ane 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. 3L

Module 3 (9L):-
Quantum Physics:

3.1 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. 4L

3.2 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). 4L

Module 4 (6L):
X-ray & Crystallography

4.1 X-**rays** – Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant, Applications, Numerical problems. 2L

4.2Elementary 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, Co-ordination number and Atomic packing factor, Applications, Numerical problems. 4L

Module 5 (8L):
Modern Optics-I:

5.1Laser: 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. 5L

5.2 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. 3L

Recommended Text Books for Physics I (PH101//201):

Oscillations:

1. Classical Mechanics- J. C. Upadhyay (Himalya Publishers)
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwal & 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 text book 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,Wavesand Acoustics)

Classical Optics & Modern Optics-I:

13. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
14. A text book 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(PhysicalOptics)
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 Lokenathan
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 (Chaya 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)
4. University Physics-Sears & Zemansky (Addison-Wesley)
5.B. Dutta Roy (Basic Physics)
6. R.K. Kar (Engineering Physics)
7.Mani and Meheta (Modern Physics)
8. Arthur Baiser (Perspective & Concept of Modern Physics)

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH201.1	3	3	2	2								
PH201.2	3	3	2	2								
PH201.3	3	3	2	2								
PH201.4	3	3	2	2								
PH201.5	3	3	2	2								

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
PH201.1	2	2	2
PH201.2	2	2	2
PH201.3	2	2	2
PH201.4	2	2	2
PH201.5	2	2	2

Paper Name: Basic Electrical Engineering
Paper Code: EE 201
Total Contact Hours: 41
Credit: 4

Pre requisite: Basic 12st standard Physics and Mathematics

Course Objective:
Basic electrical engineering is an introductory course in electrical engineering. Students are introduced to simple applied electrical circuits, theories and practice to impart skill set to have visualization of electrical engineering applications. It is a course suitable for students pursuing electrical engineering as well as other related engineering disciplines.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand and analyze basic electric circuits
CO2	Determine and study the working principles of electrical machines.
CO3	Understand the components of low voltage electrical installations
CO4	Design the fundamentals of electrical Power systems and Control Systems
CO5	Analyze and study the fundamentals of electrical Power systems and Control Systems

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, band width of resonant circuit.

THREE PHASE CIRCUITS (3L)
Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters 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

5. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
6. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
7. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
8. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

4. H. Cotton, Willey Press
5. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .
6. Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE201.1	3	3	3	3								
EE201.2	3	3	3	3								
EE201.3	3	3	3	3								
EE201.4	3	3	3	3								
EE201.5	3	3	3	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE201.1	2	2	2
EE201.2	2	2	2
EE201.3	2	2	2
EE201.4	2	2	2
EE201.5	2	2	2

Paper Name: Basic Electronics Engineering
Paper code: EC201

Total Contact Hours: 40
Credits: 4

Prerequisites

A basic course in Electronics and Communication Engineering Progresses from the fundamentals of electricity, direct current (DC) devices and circuits , series and parallel circuits to the study of active and passive components, Ohm's Law, Kirchoff's Law i.e. KVL,KCL, Ampere's Law etc.

Course objectives:

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 nCB, 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 concept 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 Outcomes (COs):

After completion of the course students would be able to

CO1	Study PN junction diode, ideal diode, diode models and its circuit analysis, application of
CO2	Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation on electronic signals
CO3	Study the concepts of both positive and negative feedback in electroniccircuits
CO4	Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
CO5	Learn how the primitives of Boolean algebra are used to describe the processing of binary signals.

Course contents

Module-I: Basics of semiconductor 6L

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: P-N Junction Diode and its applications 8L

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 (I_{DC} , I_{rms} , V_{Dc} , V_{rms}) , 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 : Bipolar junction transistor(BJT) 6L

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: Field effect transistor (FET) 4L

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: Feedback and Operational Amplifier 10L

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 topic may be discussed or assigned.

Module-VI: Cathode Ray Oscilloscope (CRO) 2L

Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

Module-VII: Digital Electronics 4L

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

Text Books:

4. D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
5. Millman & Halkias, Integrated Electronics, Tata McGraw Hill.
6. Boyelstad & 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.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC201.1	2	3	3	3								
EC201.2	3		3									
EC201.3	3		3	3								
EC201.4	2	3	3									
EC201.5	3	3	2	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EC201.1	2	2	2
EC201.2	2	2	2
EC201.3	2	2	2
EC201.4	2	2	2
EC201.5	2	2	2

Computer Fundamentals & Principle of Computer Programming
Code: CS 201
Total No. of Lectures: 40
Credits: 4

Prerequisites:

1. Number system
2. Boolean Algebra

Course Objective(s)

1. To develop the programming skills of students
2. To know the principles of designing structured programs
3. To write basic C programs using
   - i) Selection statements
   - ii) Repetitive statements
   - iii) Functions
   - iv) Pointers
   - v) Arrays
   - vi) Strings

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand the fundamental concept of Computer and mathematical knowledge and apply them in designing and analyzing solution to engineering problem.
CO2	Understand the basic concept of C programming and use of data types/operators/input/output function for developing and implementing complete program leading to solution of mathematical and engineering problem.
CO3	Use conditional branching, iteration, recursion and formulate algorithms and programs in solving
CO4	Understand the concept of arrays, pointers, file and dynamic memory allocation and apply it for problem solving and also create new data types using structure, union and enum.
CO5	Understand how to decompose a problem into functions and assemble into a complete program by means of modular programming possibly as a team.

Usedifferentdatastructuresandcreate/ manipulatebasicdatafilesanddeveloping applicationsforrealworldproblems.

Course content

Fundamentals of Computer: (10 L)

History of Computer, Generation of Computer, Classification of Computers 1L

Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices 2L

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) 2L

Logic gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR - only truth tables, logic gate symbols and logic equations for gates only 1L

Assembly language, high level language, machine level language, compiler and assembler (basic concepts) 1L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX 1L

Problem solving-Algorithm & flow chart 2L

C Fundamentals: (30 L)

Variable and Data Types:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L

C Operators & Expressions:
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 5L

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

Fundamentals and Program Structures:
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

6L

Arrays, Strings and Pointers:
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 6L

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

Structures and Unions:
Basic of structures, arrays of structures, structures and pointers, structures and functions

3L

Text book:
Kerninghan B.W. & Ritchie D.M. - The C Programming Language

Gottfried - Programming with C Schaum

Kanetkar Y. - Let us C

Balaguruswamy - Programming in C

Recommended reference Books:

Pohl and Kelly - A Book on C

Kerninghan, B.W. - The Elements of Programming Style

Schied F.S. Theory and Problems of Computers and Programming

Rajaraman V. Fundamental of Computers

M.M.Oka Computer Fundamentals,EPH

Leon Introduction to Computers,Vikas

Leon- Fundamental of Information Technology,Vikas Ram

B. Computer Fundamentals, New Age International

Ravichandran D. Programming in C, New Age International

Xavier C. Introduction to Computers, New Age International

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS201.1	3	3	3	2	2							
CS201.2	3	2	2	2	2							
CS201.3	3	3	3	2	2							
CS201.4	3	3	3	2	2							
CS201.5	3	3	3	2	2							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS201.1	3	3	3
CS201.2	3	3	3
CS201.3	3	3	3
CS201.4	3	3	3
CS201.5	3	3	3

Paper Name: Engineering Thermodynamics & Fluid Mechanics
Paper Code: ME 201
Total Contact Hours: 48
Credits: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:

1. To understand the basic principles of thermodynamics, heat and work transfer.
2. To acquire the knowledge of basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
3. To get the knowledge of thermodynamic properties of a pure substance and inter-relationships between key properties of a system or state possessed by the substance.
4. To understand the basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Know about thermodynamic equilibrium, heat & work transfer, First law and its application.
CO2	Understand the basic concepts of Heat Engine, Entropy from Second law of thermodynamics
CO3	Know the thermodynamic characteristics of a pure substance and its application in power cycles (Simple Rankine cycles, Air Standard cycles)
CO4	Knowledge of basic principles of fluid mechanics.
CO5	Ability to analyze fluid flow problems with the application of the momentum and energy equations.

Course content

Module 1: 8L+3T

Basic Concepts of Thermodynamics

Introduction: Microscopic and Macroscopic view points

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 empiricaltemperature.

Heat and Work

Definition & units of the rmodynamic work.

Examples of different forms of thermodynamic works; example of electricity flow as work.

Work done during expansion of a compressible simplesystem

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 & poly tropic 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 ofsteam.

Module 2: 4L+3T

1st Law of Thermo dynamics

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 EnergyEquation.

Module 3: 6L+3T

2nd Law of The rmodynamics

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 oftemperature, Clausius Integral Entropy

Entropy change calculation for ideal gas processes. Carnot Cycle & Carnotefficiency

PMM-2; definition & itsimpossibility

Module 4: 6L+3T

Air standard Cycles for ICengines

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'sChart)

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: 9L+3T

Properties & Classification of Fluids

Ideal & Realfluids

Newton's law of viscosity; Newtonian and Non-Newtonian fluids

Compressible and Incompressible fluids

Fluid Statics

Pressure at apoint

Measurement of Fluid Pressure

Manometers: simple & differential U-tube

Inclinedtube

Fluid Kinematics

Streamline

Laminar & turbulent flow

external & internal flow

Continuityequation **Dynamics of ideal fluids** Bernoulli's equation

Total head; Velocity head; Pressure head Application of Bernoulli'sequation

Measurement of Flow rate: Basicprinciples

Venturimeter, Pilot tube, Orificemeter

(Problems are to be solved for eachmodule)

Engineering Thermodynamics

Text:

1 Engineering Thermodynamics - P K Nag, 4th edn,TMH.

References:

1 "Fundamentals of Thermodynamics" 6e by Sonntag &Van Wylin published by WileyIndia.

2 Engineering Thermodynamics – Russel & Adeliyi (Indian edition),OUP

3 Engineering Thermodynamics – Onkar Singhh, New Age International PublishersLtd.

4 Basic Engineering Thermodynamics – R Joel, 5th Ed.,Pearson

FluidMechanics

Text:

1 Fluid Mechanics and Hydraulic Machines - RBansal

References:

1 Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn,TMH

2 Fluid Mechanics byA.K.Jain.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME201.1	3	3	3	3								
ME201.2	3	3	3	3								
ME201.3	3	3	3	3								
ME201.4	3	3	3	3								
ME201.5	3	3	3	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3

ME201.1	2	2	2
ME201.2	2	2	2
ME201.3	2	2	2
ME201.4	2	2	2
ME201.5	2	2	2

Practical

Paper Name: Computer Fundamentals & Principle of Computer Programming Lab
Paper Code: CS291
Total Contact Hours: 36
Credit: 2

Prerequisites:

3. Basic Computer Knowledge

Course Objective(s):

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

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand and propose appropriate command or function in running system or developing program for engineering and mathematical problems depending on the platform used even in changed environment leading to their lifelong learning.
CO2	Identify and propose appropriate data type, arithmetic operators, input/output functions and also conditional statements in designing effective programs to solve complex engineering problem using modern tools.
CO3	Design and develop effective programs for engineering and mathematical problems using iterative statements as well as recursive functions using modular programming approach possibly as a team maintaining proper ethics of collaboration.
CO4	Explain and organize data in arrays, strings and structures and manipulate them through programs and also define pointers of different types and use them in defining self-referential structures and also to construct and use files for reading and writing to and from leading to solution of engineering and mathematical problem.
CO5	Prepare laboratory reports on interpretation of experimental results and analyze it for validating the same maintaining proper ethics of collaboration.

Experiment should include but not limited to the following:

- 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.

- Writing C Programs on variable, expression, operator and type-casting.

- Writing C Programs using different structures of if-else statement and switch-case statement.
- Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.
- Writing C Programs demonstrating concept of Single & Multidimensional arrays.
- Writing C Programs demonstrating concept of Function and Recursion.
- Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.
- Writing C Programs demonstrating concept of structures, union and pointer to structure.
- Writing C Programs demonstrating concept of String and command line arguments.
- Writing C Programs demonstrating concept of dynamic memory allocation.
- Writing C Programs demonstrating concept of File Programming.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS291.1	3	3	3	3	3							
CS291.2	3	3	2	3	3							
CS291.3	3	3	3	3	3							
CS291.4	3	3	3	3	3							
CS291.5	3	3	3	3	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS291.1	3	3	3
CS291.2	3	3	3
CS291.3	3	3	3
CS291.4	3	3	3
CS291.5	3	3	3

Paper Name: Chemistry Lab
Paper Code: CH 291
Total Contact Hours: 36
Credit: 2

Pre requisites: 10+2 science with chemistry

Course Objective
Acquiring knowledge on Standard solutions and the various reactions in homogeneous and heterogenous medium. 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 Nanomaterials.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand different types of instruments for estimation of small quantities chemicals used in industries, scientific and technical fields.
CO2	Analyze and determine the composition of liquid and solid samples working as an individual and also as a team member.
CO3	Analyze different water quality parameters considering public health and environment.
CO4	Synthesize drug and polymer materials considering public health and environmental safety.
CO5	Design innovative experiments applying the fundamental theory of chemistry.

Course contents

List of Experiments:

1. To Determine the alkalinity in 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 andwater).
7. Conductometric titration for determination of the strength of a given HCl solution by titration against astandard NaOH solution.
8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOHsolution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicatorsolution).

Innovative experiment:
Preparation of silver nano-particles.

Note: From the list of 10 (Ten) 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.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH291.1	2	3	3	3	3	2	3					
CH291.2	2	3	3	3	3	2	3					
CH291.3	2	3	3	3	3	2	3					
CH291.4	2	3	3	3	3	2	3					
CH291.5	2	3	3	3	3	2	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH291.1	2	2	2
CH291.2	2	2	2
CH291.3	2	2	2
CH291.4	2	2	2
CH291.5	2	2	2

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: PhysicsI Lab
Paper Code: PH 291
Total Contact Hours: 40
Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Demonstrate experiments allied to their theoretical concepts
CO2	Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer
CO3	Analyze and participate as an individual and as a member or leader in groups in laboratory sessions actively.
CO4	Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.
CO5	Design solutions for real life challenges.

General idea about Measurementsand Errors(One Mandatory):
i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
ii) Proportional error calculation using CarreyFosterBridge.

Any 7 to be performed from the following experiments

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

Experiments on Optics:
5. Determination of wavelength of light by Newton's ring method.
6. Determination of wavelength of light by Laser diffraction method.
7. Determination of numerical aperture and the energy losses related to optical fiber experiment
8. Measurement of specific rotation of an optically active solution by polarimeter.

Experiments on Quantum Physics:
11. Determination of Planck's constant using photoelectric cell.
12. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.

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

Probable experiments beyond the syllabus:

1. Determination of wavelength of light by Fresnel's bi-prism method (beyond the syllabus).
2. Study of half-wave, quarter-wave plate (beyond the syllabus)
3. Study of dispersive power of material of a prism.
4. Study of viscosity using Poyseullie's caplillary flow method/using Stoke's law.
5. Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
6. Any other experiment related to the theory**.**

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH291.1	2	3	3	2	3							
PH291.2	2	3	3	2	3							
PH291.3	2	3	3	2	3							
PH291.4	2	3	3	2	3							
PH291.5	2	3	3	2	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PH291.1	2	2	2
PH291.2	2	2	2
PH291.3	2	2	2
PH291.4	2	2	2
PH291.5	2	2	2

Paper Name: Basic Electrical Engineering LAB
Paper Code: EE 291
Total Contact Hours: 36
Credit: 2

Pre requisites:

4. Basic Physics and applied physics.
5. Basic Mathematics.
6. Basic concept of Electric Circuit

Course Objective:

3. Provide knowledge for the analysis of basic electrical circuit.
4. To introduce electrical appliances, machines with their respective characteristics.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Identify and use common electrical components
CO2	To develop electrical networks by physical connection of various components and analyze the circuit behaviour.
CO3	Apply and analyze the basic characteristics of transformers and electrical machines.
CO4	Illustrate the venin's, Norton's, superposition and maximum power transfer theorem.
CO5	Create resonance condition in R-L-C series and parallel circuit and learn how to draw phasor diagram for the circuit

Course contents

LIST OF EXPERIMENTS

11. Characteristics of Fluorescent ,Tungsten and Carbon filament lamps
12. Verification of Thevenin's and Norton's Theorem
13. Verification of Superposition Theorem
14. Calibration of Ammeter and Wattmeter
15. Study of R-L-C series circuit
16. Open circuit and short circuit test of a single phase Transformer
17. Starting, Reversing of a and speed control of D.C shunt motor
18. Test on single phase Energy Meter
19. Familiarization of PMMC and MI type Meter
20. Familiarization with house wiring practice

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE291.1	2	2	3	3	3							
EE291.2	3	2	2	3	3							
EE291.3	2	3	2	3	2							
EE291.4	2	2	2	3	2							
EE291.5	2	3	2	3	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE291.1	3		2
EE291.2	3		
EE291.3	3	2	3
EE291.4	3	2	3
EE291.5	3		

Paper Name: Basic Electronics Engineering Lab
Paper Code: EC291
Total Contact Hours: 36
Credit: 2

Prerequisites
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 objectives:
Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias, They will also be 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. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET .

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
CO2	Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
CO3	Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
CO4	Able to know the application of Diode, BJT &OPAMP.
CO5	Familiarization and basic knowledge of Integrated Circuits

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, millimeters 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 OPAMP 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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC291.1	3		3	2	3							
EC291.2	3	3	3		3							
EC291.3	3	3		2	3							
EC291.4	3		3		3							
EC291.5	3	3		1	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EC291.1	2	2	2
EC291.2	2		2
EC291.3		2	2
EC291.4	2		
EC291.5	2	2	2

Paper Name: Engineering Drawing & Graphics
Paper Code: ME 291
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:

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

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
CO4	Become familiar with computer aided drafting useful to share the design model to different section of industries
CO5	Become familiar with computer aided drafting useful to share the design model to different section of for research & development.

Course contents:

List of Experiments:

1. Lines, Lettering, Dimensioning, Scales (Plain scale & diagonal Scale).

2. Geometrical Construction and Curves – Construction of Polygons, Parabola, Hyperbola & elli pse

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.

CO Codes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
ME 291.1	2	-	1	2	-	1	-	-	1	-	-	1
ME 291.2	3	-	2	2	-	1	-	-	1	1	-	1
ME 291.3	2	2	2	1	-	1	-	-	1	-	-	1
ME 291.4	1	-	2	2	2	1	-	-	1	1	-	1

Paper Name: Workshop Practice
Paper Code: ME 292
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:

1. To understand the basic knowledge of Workshop Practice and Safety.
2. To 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.
3. To get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Course Outcome:

Upon successful completion of this course, the student will be able to:

ME 291.1 Gain basic knowledge of Workshop Practice and Safety useful for our daily living.

ME 291.2 Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.

ME 291.3 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 manufacturing.

ME 291.4 Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

Course contents

List of Activities:

Sl. No.	Syllabus	Contact Hrs
Module 1	Pattern Making	6
Module 2	Sheet Metal Work	6
Module 3	Fitting	9
Module 4	Machining in Lathe	9
Module 5	Welding	6

MODULE 1 – PATTERN MAKING.

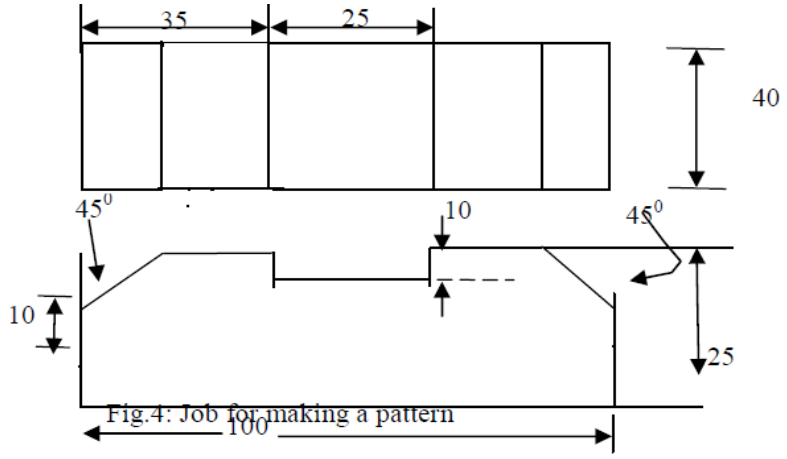
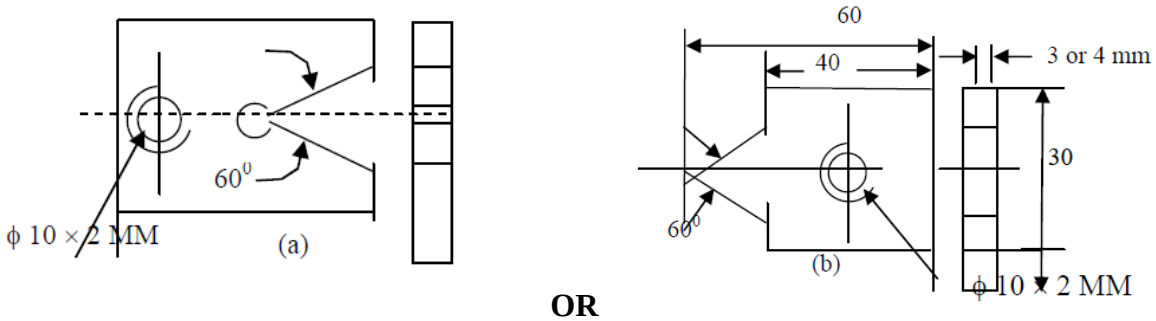


Fig.4: Job for making a pattern

MODULE 3- FITTING SHOP.



OR

MODULE 4 – MACHINING IN LATHE & SHAPING M/C

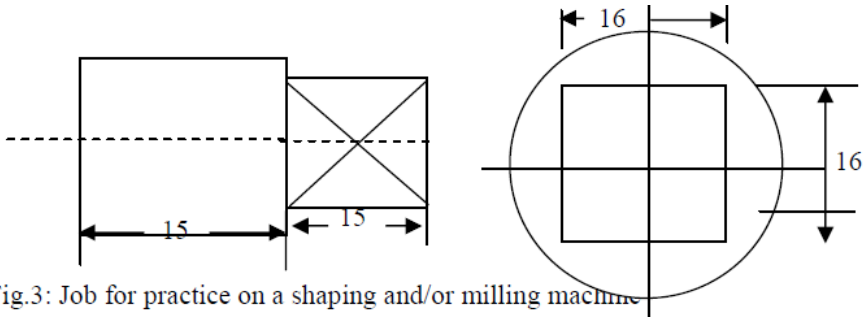
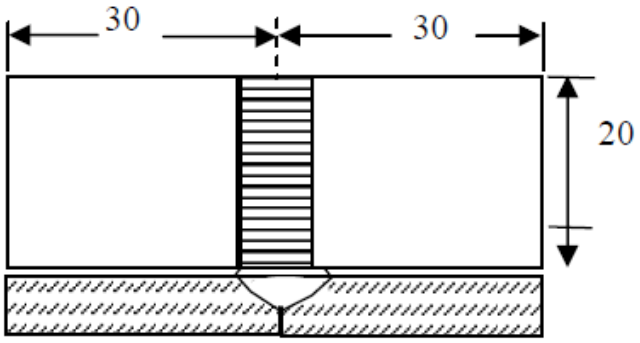


Fig.3: Job for practice on a shaping and/or milling machine

MODULE 5 – WELDING



CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME291.1	3	3	3	3	3							
ME291.2	3	3	3	3	3							
ME291.3	3	3	3	3	3							
ME291.4	3	3	3	3	3							
ME291.5	3	3	3	3	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME291.1	2	2	2
ME291.2	2	2	2
ME291.3	2	2	2
ME291.4	2	2	2
ME291.5	2	2	2

Paper Name: Soft Skills Development
Paper Code: MC-281
Total Contact hours: 26
Course Objectives:

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

MODULE	CONTENT
One	Communication Training
Two	Communication Training (Accent Neutralization)
Three	Business Etiquette
Four	CV / Resume Writing
Five	Corporate Life and Protocols
Six	Group Discussion
Seven	Leadership Skill
Eight	Team Work
Nine	Public Speaking and Interview Basics
Ten	Business Telephone Etiquette
Eleven	Reading skill

Rearrange ?

MODULE ONE – COMMUNICATION TRAINING (2L)

1. Organisational Communication and Structure.
2. Vocabulary related to Corporate Operation.
3. Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.

4. Communication with Clients, Customers, Suppliers etc.
5. Verbal and Non-Verbal Communication, Proxemics and Para Language.
6. Vocabulary Building (Synonym / Antonym / One word Substitution etc.)

MODULE TWO- COMMUNICATION TRAINING (ACCENT NEUTRALISATION) (2L)

7. Mother Tongue Influence
8. Vowel Sounds and Consonantal Sounds
9. Pronunciation and Neutral Accent.
10. Intonation.
11. Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE THREE – BUSINESS ETIQUETTE (2L)

12. Presenting oneself in the Business Environment.
13. Corporate Dressing and Mannerism.
14. Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
15. Multi Cultural Etiquette.
16. Cultural Difference.
17. E-mail Etiquette.

MODULE FOUR – JOB APPLICATION AND CV / VIDEO RESUME (2L)

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

MODULE FIVE - INTRODUCTION TO CORPORATE LIFE AND PROTOCOLS (2L)

22. Introduction of Companies (Domain Specific)
23. Opportunities and Growth Plan.
24. Performance and Corporate Behaviour.
25. Service Level Agreement and Corporate Jargon.
26. Networking and Adapting to Culture, Technology and Environment.

MODULE SIX – GROUP DISCUSSION (2L)

27. Introduction, Definition and Purpose.
28. Types of Group Discussion.
29. Strategies and Protocols of Group Discussion.
30. Skills and Parameters of Evaluation.
31. Practice Session and Video Viewing Task.

MODULE SEVEN – LEADERSHIP SKILL (2L)

32. Leadership Theories.
33. Traits and Skills of the Leader.
34. Roles, Duties and Responsibilities.
35. Case Study of Leaders.
36. Interpersonal relationship with Team.

MODULE EIGHT – TEAM WORK (2L)

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

MODULE NINE – PUBLIC SPEAKING AND INTERVIEW BASICS (2L)

42. Extempore.
43. JAM.
44. Interview Skill
45. Interview over Telephone, Video Conference Interview etc.

MODULE TEN – BUSINESS TELEPHONE ETIQUETTE (2L)

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

MODULE ELEVEN- READING SKILL

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

ASSESSMENT		
1.	**Viva**	**10**
2.	**Personal Skill Enhancement Log**	**25**
3.	**Movie Making: Video Resume**	**25**
4.	**Term End Project**	**40**

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1. Effective Communication and Soft-Skills: Strategies for Success, Nitin Bhatnagar and Mamta Bhatnagar, Pearson, 2012.

2. Soft Skills: Know yourself and know the World, Dr. K.Alex, S Chand, 2009.

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6. The CV Book: Your Definitive Guide to Writing the Perfect CV, James Innes, Pearson.

7. Understanding American Business Jargon: A Dictionary, W. Davis Folsom, Greenwood Press, 2005.

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9. Group Discussion: A Practical Guide to Participation and Leadership, Kathryn Sue Young, Julia T. Wood, Gerald M. Phillips and Douglas J. Pedersen, Waveland Press Inc., 2007.

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11. Teamwork Training, Sharon Boller, ASTD Press, 2005.

12. Public Speaking for Success, Dale Carnegie, Penguin, 2005.

13. Effective Interviewing Skills, Tracey A. Swift and Ivan T. Robertson, BPS Books, 2000.

14. Telephone Etiquette: Making Lasting First Impressions, Theo Gilbert-Jamison, Performance Solutions, 2013.

15. Reading Comprehension Strategies: Theories, Interventions and Technologies, Danielle S. McNamara, Lawrence Earlbaum Associates, 2007.

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Department of Computer Science and Engineering

Curriculum Structure

&

Syllabus

2016-2017

(Autonomy)

of

3rd Semester

			3RD SEMESTER					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	BS	M(CSE)301	Mathematics-III	3	1	0	4	4
2	BS	PH301	Physics-II	3	0	0	3	3
3	ES	EE(CSE) 301	Circuit Theory and Network	3	0	0	3	3
4	PC	CS301	Data Structures	3	0	0	3	3
5	PC	CS302	Digital Electronics and Computer Organization	3	0	0	3	3
			Total Theory				16	16
			B. PRACTICAL					
6	BS	PH391	Physics-II Lab	0	0	3	3	2
7	ES	EE(CSE) 391	Circuit Theory and Network Lab	0	0	3	3	2
8	PC	CS391	Data Structures Lab	0	0	3	3	2
9	PC	CS392	Digital Electronics and Computer Organization Lab	0	0	3	3	2
			Total Practical				12	8
C. SESSIONAL								
10	HU	HU381	Technical Report writing and Language Practice Lab	0	0	2	2	1
Total							**30**	**25**

Syllabus

Theory

Paper Name: Mathematics-III
Paper Code: M (CSE)301
Contact: 3L+1T
Credits: 4
Course: B.Tech
Contact Hours: 4:0:0/Week
Total Lectures: 44L

Prerequisites:

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 and Advanced Graph Theory.

Course Outcome(s):
After completion of the course students will be able to

CO1	Understand the fundamental concepts of Set Theory to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of Mathematical Logic and Proof Techniques so that they can Prove theorems using Proof Techniques and Mathematical Logic Frameworks to justify a claim.
CO3	Explain or Illustrate the fundamental Theory of Numbers and Identify problems where students can Use the concept appropriately to Solve them.
CO4	Explain or Illustrate the fundamental principles of Algebraic Structures and Identify problems where students can Apply the concept appropriately to Solve them.
CO5	Develop ideas to Propose solutions to the problems of Graph Theory and Identify problems where students can Apply the concept appropriately and Analyze the effectiveness as well as limitations of solutions making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

Course content

MODULE I:

Basic Probability Theory:

Classical and Axiomatic definition of Probability (elementary properties), conditional probability, Baye's theorem and related problems.

Probability Distributions:

Definition of random variable.Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof).Examples.Definitions of Expectation & Variance, properties & examples. Some important discrete distributions: Binomial, Poisson. Continuous distributions: Normal. Determination of Mean, Variance and standard deviation of the distributions.

Discussions on application of the topic related to CSE

10L

Module II:

Propositional Logic

Introduction to Propositional Calculus**,** Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Bi-conditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related examples.

Discussions on application of the topic related to CSE

6L

Module III:

Number Theory

Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples; Congruence, Residue classes of integer modulo (n) Z_n and its examples.

Partial order Relation and Lattices

PO set, Hasse Diagram, Minimal , Maximal, Greatest and Least elements in a PO set, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices.

Discussions on application of the topic related to CSE

8L

Module IV:

Principles of Counting Techniques

Permutations, Combinations, Binomial coefficients, Pigeon- hole Principle, Principles of inclusion and exclusions; Recurrence relations: Formulation/Modelling of different counting problems in terms of recurrence relations, Solution of linear recurrence relations with constant coefficients (up to second order) by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method.

Discussions on application of the topic related to CSE

6L

Module V:

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.

Discussions on application of the topic related to CSE

6L

Module VI:

Advanced Graph Theory

Planar and Dual Graphs.Kuratowski's graphs.Homeomorphic graphs. Eulers formula (n - e + r = 2) for connected planar graph and its generalisation 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.

Discussions on application of the topic related to CSE

8L

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.

8.Grewal B S: Higher Engineering Mathematics (thirtyfifthedn) - Khanna Pub.

9. Kreyzig E: Advanced Engineering Mathematics - John Wiley and Sons.

10. J.K. Sharma, Discrete Mathematics, Macmillan

11. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.

12. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.

11. Douglas B. West, Introduction to graph Theory, PHI

13. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.

14. Wilson: Introduction to graph theory, Pearson Edication.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M(CSE)301.1	3	3	2									
M(CSE)301.2	3	3	2	2								
M(CSE)301.3	3	3	2									
M(CSE)301.4	3	3	2									
M(CSE)301.5	3	3	2	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M(CSE)301.1	2	2	2
M(CSE)301.2	2	2	2
M(CSE)301.3	2	2	2
M(CSE)301.4	2	2	2
M(CSE)301.5	2	2	2

Physics-II (Gr-B)
Code: PH 301 [For CSE and IT] Contacts: 3L/Week
Credit: 3
Total no. of lectures: 33 L

Prerequisite:

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

Course Objective(s)

The Physics-II course will provide

- 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 (COs):

After completion of the course students would be able to

CO1	Understand basic postulates of Quantum Mechanics.
CO2	Understand the basic postulates of Quantum Mechanics.
CO3	Understand the macro state for thermodynamic system, thermodynamic probability and phase space.
CO4	Understand Guass's law, Faraday's law and Ampere's critical law.
CO5	Understand the properties of Nano material.

Module 1: Electricity and Magnetism (8L)

Module 1.01: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). 3L

Module 1.02: 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. 3L

Module 1.03: 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.
2L

Module 2: Quantum Mechanics-II, Quantum Computation and Communication (12L)

2.01: 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-Eigen value, Eigen function, Schrödinger's equation as energy eigen value equation. 4L

2.02: 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. 2L

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. 3L

Module 3: Statistical Mechanics (6L)

Module 3.01: 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. 4L

Module 3.02: 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). 2L

Module 4: Storage and display devices (4L)

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-rayDisc.

Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin filmtransistordisplay).
4
L

Module 5: Physics of Nanomaterials (3L)

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). 3L

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH301.1	3	2	3	3								
PH301.2	3	3	2	2								
PH301.3	3	2	3	3								
PH301.4	3	2	2	2								
PH301.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PH301.1	3	2	2
PH301.2	2	3	2
PH301.3	3	2	2
PH301.4	2	2	2
PH301.5	3	3	3

Subject Name: Circuit Theory & Networks
Subject Code: EE(CSE)301
Contact Hours/Week: (3L+ 0T)
Credit: 3

Total Contact Hours: 34L

Prerequisite:

1. Basic Electrical Engineering
2. Basic Electronics Engineering

Course Objective(s)

This course is intended for CSE Engineering students to facilitate the student's development into computer engineering investigation. The course has been designed to introduce fundamental principles of electrical circuits as well as the technical skills to analyze such simple circuits. It is a course suitable for students pursuing computer engineering as well as other related engineering disciplines.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand various kinds of sources and their symbols, identify and use Kirchhoff's Laws and Networks theorem for simple circuit analyses.
CO2	Understand the concept of DC & AC transient analysis.
CO3	Understand expressions and perform calculations relating to the Transient response, Laplace transform, Two port network and Graph theory
CO4	Understand initial & final value theorem and its applications both time & s domain.
CO5	Will solve circuits using node, branch, cutest & tie set and tree the properties of Nano material.

Module 1

Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals. 3L

Module 2

Network Equations: Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem and Millman's theorem. Solution of Problems with DC & AC sources. 6L

Module 3

Resonance circuits: Series and parallel resonance- their frequency response, Impedance and Admittance Characteristics, Quality factor, Half Power Points, and bandwidth. Phasor diagrams, Transform diagrams**,** Practical resonant and series circuits, Solution of Problems. 4L

Module 4

Coupled circuits: Magnetic coupling, polarity of coils, polarity of induced voltage, concept of Self and
mutual inductance, Coefficient of coupling, Solution of Problems. 3L

Module 5

Graph of Network: Concept of Tree and Branch, tree link, junctions, **(*)** Incident matrix, Tie set matrix, Determination of loop current and node voltages. 4L

Module 6

Circuit transients: DC transients in R-L and R-C Circuits with and without initial charge, (*) R-L-C Circuits, AC Transients in sinusoidal R-L, R-C and R-L-C Circuits, Solution of Problems. 2L

Module 7

Laplace transforms: Concept of Complex frequency , transform of *f(t)* into *F(s)* , transform of step, exponential, over damped surge, critically damped surge, damped and un-damped sine functions , properties of Laplace transform , linearity, real differentiation, real integration, initial value theorem and final value theorem , inverse Laplace transform , application in circuit analysis, Partial fraction expansion, Solution of problems.
8L

Module 8

Two Port Networks Analysis: Relationship of Two port network variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, relationship between parameter sets, network functions for ladder network and general network. 4L

Text books :

1. Sudhakar:Circuits& Networks:Analysis & Synthesis 2/e TMH New Delhi
2. Valkenburg M. E. Van, “Network Analysis”, Prentice Hall.
3. Roy Choudhury D., “Networks and Systems”, New Age International Publishers.
1. Engg Circuit Analysis,: Hayt 6/e Tata Mcgraw-Hill
2. A. Chakrabarti: Circuit Theory Analysis & Synthesis
3. D.Chattopadhyay and P.C.Rakshit: Electrical Circuits

4. A.V. Oppenheimer and A.S.Wilsky: Signals & Systems, PHI
5. R.V.Jalgaonkar.: Network Analysis & Synthasis.EPH.
6. Sivandam- Electric Circuits Analysis.,Vikas

References :

a. Reza F. M. and Seely S., "Modern Network Analysis", Mc.Graw Hill Book Company
b. Roy Choudhury D., "Networks and Systems", New Age International Publishers.
c. Kuo F. F., "Network Analysis & Synthesis", John Wiley & Sons.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE(CSE)301.1	3	2	2	2								
EE(CSE)301.2	3	2	3	2								
EE(CSE)301.3	3	2	2	2								
EE(CSE)301.4	3	2	2	2								
EE(CSE)301.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE(CSE)301.1	2	2	2
EE(CSE)301.2	3	3	2
EE(CSE)301.3	2	3	2
EE(CSE)301.4	2	3	2
EE(CSE)301.5	2	3	2

Name of the Paper: Data Structures
Paper Code: CS301
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 36

Prerequisite:

1. Familiarity with the fundamentals of C or other programming language
2. A solid background in mathematics, including probability, set theory.

Course Objective(s)

- To learn the basics of abstract data types.
- To learn the principles of linear and nonlinear data structures.
- To build an application using sorting and searching.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the concept of data structure and create new data structure to propose efficient solution by writing appropriate algorithm and program for engineering and mathematical problem after analyzing the efficiency of the same.
CO2	Identify and differentiate different types of data structures and implement the appropriate data structure after analyzing complex engineering problem leading to their lifelong
CO3	Understand and implement stack, queue and dequeue by selecting appropriate methods and use it for solving real life and engineering problem choosing appropriate modern
CO4	Understand and implement different non-linear data structures by selecting appropriate methods and apply it for solving complex engineering problem and also argue and judge maintaining the professional ethics to validate the same.
CO5	Understand different factors of sorting and searching algorithm and select the appropriate algorithm for solving complex engineering problem and also implement and analyze the algorithm.

Module I: Linear Data Structure 10L

Introduction (2L):

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.

Algorithms and programs, basic idea of pseudo-code **(1L)**

Algorithm efficiency and analysis, time and space analysis of algorithms – order notations **(1L)**

Array (2L):

Different representations – row major, column major **(1L)**

Sparse matrix - its implementation and usage, Array representation of polynomials **(1L)**

Linked List (4L):

Singly linked list – operations, Doubly linked list – operations **(3L)**

Circular linked list – operations, Linked list representation of polynomial and applications **(3L)**

Module II: Linear Data Structure 6L

Stack and Queue (4L):
Stack and its implementations (using array, using linked list) (1L)
Applications (infix to Postfix, Postfix Evaluation) (1L)
Queue, circular queue de-queue (1L)
Implementation of queue- both linear and circular (using array, using linked list) (1L)
Recursion (2L):
Principles of recursion - use of stack, tail recursion. (1L)
Applications - The Tower of Hanoi, Eight Queens Puzzle (1L)

Module III: Nonlinear Data structures 12L

Trees (8L):
Basic terminologies, forest, tree representation (using array, using linked list) **(1L)**
Binary trees - binary tree traversal (pre-, in-, post- order) **(1L)**
Threaded binary tree **(1L)**
Binary search tree- operations (creation, insertion, deletion, searching) **(1L)**
Heap(creation, insertion, deletion, searching) **(1L)**
Height balanced binary tree – AVL tree (insertion with examples only) **(1L)**
Height balanced binary tree – AVL tree (deletion with examples only) **(1L)**
m –Way Search Tree, B^+ Tree – operations (insertion, deletion with examples only) **(1L)**

Graphs (4L):
Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism) **(1L)**

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, and forward-edge) **(2L)**
Minimal spanning tree – Prim's algorithm, Kruskal's algorithm (basic idea of greedy methods) **(1L)**

Module IV: Searching, Sorting 8L
Sorting Algorithms (4L):
Bubble sort, Insertion sort, Selection sort– with complexity (1L)
Quick sort, Merge sort – with complexity (2L)
Radix sort – with complexity (1L)
Searching (2L):
Sequential search – with complexity (1L)
Binary search, Interpolation Search– with complexity(1L)
Hashing (2L):
Hashing functions (1L)
Collision resolution techniques (1L)

Text books:

1. "Fundamentals of Data Structures of C" by Ellis Horowitz, SartajSahni, Susan Anderson-freed

Recommended books:

1. **"The Art of Computer Programming" by Donald Knuth**
2. **"Data Structures, Algorithms, and Software Principles in C" by Thomas A. Standish**
3. **"Data Structures" by S. Lipschutz**
4. **"Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung**
5. **"Data Structures in C" by Aaron M. Tenenbaum**

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS301.1	3	3	3	3	2							
CS301.2	3	3	3	3								3
CS301.3	3	3	3	3								
CS301.4	3	3	3	3	2			2				
CS301.5	3	3	3	3	2							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS301.1	3	3	3
CS301.2	3	3	3
CS301.3	3	3	2
CS301.4	3	3	3
CS301.5	3	2	3

Paper Name: Digital Electronics and Computer Organization
Paper Code: CS302
Contact Hours/Week: 3
Credit:3
Total Contact Hours: 36L

Prerequisite:

1. Computer Fundamentals and principal of computer programming
2. Basic Electronics Engineering

Course Objective(s)

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.
- To know how Computer Systems work & its basic principles,
- To know how I/O devices are being accessed and its principles etc

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic gate operations and laws Boolean algebra.
CO2	Understand basic mechanism of digital computer and digital logic behind different arithmetic and control unit operations.
CO3	Design combinational circuits and combinational functions for larger more complex circuits.
CO4	Perform different operations with sequential circuits.
CO5	Understand fundamental concepts and techniques used in Logic families and PLDs.

Module – 1: [**3L**]

Introduction, concepts and laws of Boolean algebra [1L], Boolean functions and Representation in SOP and POS forms [1L], Minterm and maxterm , Minimization of logic expressions by Karnaugh Map [1L]

Module – 2: [**7L**]
Combinational circuits:
Adder and Subtractor (half-full adder & subtractor) [2L],Carry look ahead adder and Parity Generator[1L], Encoder, Decoder, Multiplexer [2L], De-Multiplexer ,Comparator[[1L], Basic Concepts of A/D and D/A converters[1L]

Module – 3: [**8L**]
Sequential Circuits:
Basic Flip-flop- SR, JK, D, T and JK Master-slave Flip Flops [3L], Registers (SISO, SIPO, PIPO, PISO) [2L]
Ring counter, Johnson counter [1L], Basic concept of Synchronous and Asynchronous counters [1L], Design of Modulo-N Counter [1L],

Module – 4:[9L]
Stored program concept-Von Neumann and Harvard architecture [1L]
Introduction to CPU and concepts of ALU [2L], Instruction format and Instruction Cycle [1L], Addressing Modes [1L]
Fixed-point multiplication - Booth's algorithm.[1L], Fixed-point division - Restoring and non-restoring algorithms. [1L]
Floating-point number representation- IEEE 754 format and Floating-point arithmetic operation [2L]

Module – 5: [**4L**]
Introduction to memory-RAM and ROM [2L], Register transfer, memory transfer, Tri-state bus buffer [1L], Microprogrammed and hardwired control unit [1L]

Module – 6:[5L]
Introduction to I/O operations [1L], Synchronous and asynchronous transfer [1L], Modes of transfer [1L], Bus Arbitration [1L], Input-output processor [1L]

Text Book:
David A. Patterson and John L. Hennessy- Computer Organization and Design: The Hardware/Software Interface
Morries Mano- Digital Logic Design- PHI

Reference Book:
Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
William Stallings,Computer Organization and Architecture: Designing for Performance

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS302.1	3	3	3	2	3							2
CS302.2	3	3	3	2	3							2
CS302.3	3	3	3	2	3							2
CS302.4	3	3	3	2	3							2
CS302.5	3	3	3	2	3							2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS302.1	3	3	3
CS302.2	3	3	3
CS302.3	3	3	3
CS302.4	3	3	3
CS302.5	3	3	3

Practical

Subject Name: Circuit Theory & Network Lab
Subject Code: EE(CSE)391
Contact Hours/Week: 3P
Credits: 2

Prerequisite: Concepts of Basic Electrical Engineering, Software Tools (Pspice/ Multisim/Matlab)

Course Objective:
This course enables the students to

1. The ability to conduct testing and experimental procedures on circuit analysis by using software and hardware tools

2. To prepare the students to have a basic constructional knowledge of Step, Ramp, Impulse, Sinusoidal, signals

3. Transient analysis of different electrical circuits with and without initial conditions using Laplace Transform.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Evaluate lecture material with circuit simulation software and laboratory benchexperiments
CO2	Analyze the response of Step, Ramp, Impulse and Sinusoidal signals
CO3	Solve the Laplace Transform and Inverse Laplace Transform.
CO4	Perform different operations with sequential circuits.
CO5	Conduct experimental investigation and gain knowledge of Two-port networks

1. Characteristics of Series & Parallel Resonant circuits; simulation/hardware
2. Verification of Network Theorems (Thevenin's and Norton's); simulation / hardware
3. Verification of Network Theorems : Maximum Power Transfer ; simulation / hardware
4. Transient response in R-L and R-C Network: Simulation/hardware
5. Transient Response in RLC Series & Parallel Circuits & Networks ; simulation / hardware
6. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form
7. Representation of Poles and Zeros in s-plane, determination of partial fraction expansion in s-domain and cascade connection of second-order systems using MATLAB
8. Determination of Laplace Transform, different time domain functions, and Inverse Laplace using MATLAB
9. Determination of Impedance (Z), parameters of Two-port networks
10. Determination of Admittance (Y) parameters of Two-port networks

Text books :

1. M. H. Rashid: "Introduction to PSpice using OrCAD for circuits and electronics", Pearson/PHI
2. Valkenburg M. E. Van, "Network Analysis", Prentice Hall.
3. Roy Choudhury D., "Networks and Systems", New Age International Publisher
4. D.Chattopadhyay and P.C.Rakshit: Electrical Circuits

References :

1. Circuit theory (Analysis and Synthesis) by A. Chakrabarti-Dhanpat Rai&Co.
2. Network Theory by Prof.B.N.Yoganarasimham.
3. Circuit Theory by Sudhakar and ShyamMohan.

Electrical Machines-I by B.I.Theraja.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE(CSE)391.1	3	2	2	3	3							
EE(CSE)391.2	3	2	3	3	3							
EE(CSE)391.3	3	2	2	2	3							
EE(CSE)391.4	3	2	2	2	3							
EE(CSE)391.5	2	2	2	2	3							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE(CSE)391.1	2	2	2
EE(CSE)391.2	3	3	2
EE(CSE)391.3	2	3	2
EE(CSE)391.4	2	3	2
EE(CSE)391.5	2	3	2

Name of the Paper: Data Structures Lab
Paper Code: CS391
Contact (Periods/Week): L-T-P=0-0-3
Credit Point: 2
No. of Lab: 11

Perquisite

1. Computer Fundamentals and principal of computer programming Lab

Objectives:

- To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
- To write and execute write programs in C to implement various sorting and searching methods.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify and propose appropriate data structures and data types to implement list using array and linked list and design effective programs to solve complex engineering problem using list and modern tools.
CO2	Design and develop effective programs for engineering and mathematical problems using stack, queue and recursive functions after implementing stack and queue using modular programming approach possibly as a team maintaining proper ethics of
CO3	Implement different data structures like binary tree, heap and use them to explain and organize data and manipulate them through programs leading to solution of complex engineering problem.
CO4	Implement different sorting and searching algorithm selecting appropriate data structures and analyze the efficiency of the resulting program using modern engineering tools and methods leading to lifelong learning.
CO5	Prepare laboratory reports on interpretation of experimental results and analyze it for validating the same maintaining proper ethics of collaboration.

Module 1

1. Write a C program that uses functions to perform the following:

a. Create a singly linked list of integers.
b. Delete a given integer from the above linked list.
c. Display the contents of the above list after deletion.

2. Write a C program that uses functions to perform the following:

a. Create a doubly linked list of integers.
b. Delete a given integer from the above doubly linked list. c.
Display the contents of the above list after deletion.

3. Write a C program to implement Polynomial addition and Polynomial multiplication using Linked List.

4. Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.

5. Write C programs to implement a queue ADT using i) array and ii) doubly linked list respectively.

Module 2

6. Write a C program that uses functions to perform the following:

   a. Create a binary search tree of characters.
   b. Traverse the above Binary search tree recursively in Postorder.

7. Write a C program that uses functions to perform the following:

   a. Create a binary search tree of integers.
   b. Traverse the above Binary search tree non recursively in inorder.

Module 3

8. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

   a. Insertion sort b.
   Merge sort

9. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

   a. Quick sort
   b. Selection sort

10. Write C programs for implementing the following searching methods:

    a. Linear Search
    b. Binary Search

Write a C program to implement all the functions of a dictionary (ADT) using hashing.

Module 4

11. Write C programs for implementing the following graph traversal algorithms:

    a. Depth first search
    b. Breadth first search

Text Books:

1. C and Data Structures, Third Edition, P.Padmanabham, BS Publications.
2. C and Data Structures, Prof. P.S.Deshpande and Prof. O.G. Kakde, Dreamtech Press.
3. Data structures using C, A.K.Sharma, 2nd edition, Pearson.
4. Data Structures using C, R.Thareja, Oxford University Press.
5. C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand.

6. C Programming and Data Structures, P.Radha Krishna, Hi-Tech Publishers.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS391.1	3	3	3	2	3							2
CS391.2	3	3	3	2	3							2
CS391.3	3	3	3	2	3							2
CS391.4	3	3	3	2	3							2
CS391.5	3	3	3	2	3							2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS391.1	3	3	3
CS391.2	3	3	3
CS391.3	3	3	3
CS391.4	3	3	3
CS391.5	3	3	3

Paper Name: Digital Electronics and Computer Organization Lab
Paper Code: CS392
Contact Hours/Week: 3
Credit: 2

Prerequisite:

Basic concepts of Logicgates, Truth Tables, function realization –minimization of Logic expressions by K-map, Concept of basic components of a digital computer, Binary Arithmetic

Course objective:

This subject will act as prerequisite for computer architecture. The aims of this lab are to make students familiar with the principles of combinational and sequential digital logic design and optimization at a gate level and designing various circuits with ICs.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic gate operations.
CO2	Understand and realize the process of Analog to Digital conversion and vice versa
CO3	Understand basic structure of different combinational circuit components- multiplexer, decoder, encoder etc.
CO4	Understand and apply different operations with flip-flop.
CO5	Understand, realize and apply different PLD operations for the given logical problem.

1. A) Realization of basic gates and universal gates.
   B) Realization of basic gates using universal gates.
2. Design a Half adder and Full Adder circuit using basic gates and verify its output.
3. Design a Half subtrator and Full Subtractor circuit using basic gates and verify its output
4. Design an Adder/Subtractor composite unit.
5. Design of a ‘Carry-Look-Ahead’ Adder circuit.
6. Realization of a)Encoder, b)Decoder c) Multiplexer , d) De-MUX , e)Comparator and their Truth Table verification.
7. Realization of RS / JK / D flipflops using logic gates.
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counters.
10. Design of MOD- N Counter
11. Design a composite ALU for multi-bit arithmetic operation.
12. Design of RAM.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS392.1	3	3	3	2	3							2
CS392.2	3	3	3	2	3							2
CS392.3	3	3	3	2	3							2
CS392.4	3	3	3	2	3							2
CS392.5	3	3	3	2	3							2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS392.1	3	3	3
CS392.2	3	3	3
CS392.3	3	3	3
CS392.4	3	3	3
CS392.5	3	3	3

Course Code: HU381
Contact Hours/Week (P): 2
Credits: 1
Program: 2nd Year B. Tech Sem-3

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

Course Objectives: To maximize exposure and train students in the professional use of English in the globalized workplace.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and make use of a wide taxonomy of listening skills & sub-skillsfor comprehending & interpreting data in English
CO2	Speak in English, using appropriate vocabulary and pronunciation incontextualized situations
CO3	Understand and put into effective practice the pragmatics of Group Discussion
CO4	Understand and write a detailed technical report as per organizational needs
CO5	Understand and interact in professional presentations and interviews

Syllabus:

Module 1: The Need for a Language Laboratory [2L+2P]
(a)Introduction to the Language Lab
(b)Skill-building exercises in the lab

Module 2: Power Listening [2L+3P]
(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 [2L+6P]
(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 [2L+6P]
(a)Teaching GD Strategies
(b)In-house video viewing sessions
(c) Group Activities [Topic Brainstorming, Situational Analysis, Frame Story] (d)Extended Practice and feedback

Module 5: Writing a Technical Report[2L+6P] (a)Organizational Needs for

Reports and types (b)Report Formats
(c)Report Writing Practice Sessions and Workshops

Module 6: SWOT Analysis
[2L+3P] (a)SWOT Parameters
(b)Organizational SWOT
(c) Case Study

Module 7: Presentation [2L+6P]
(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
[2L+3P]
(a)Preparing for the Interview: Interview Basics, Dressing and Grooming, Q & A
(b)Mock Interview sessions and feedback

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU381.1	2	2	2	2			3	3	3	3		3
HU381.2	2	2	2	2			3	3	3	3		3
HU381.3	2	2	2	2			3	3	3	3		3
HU381.4	2	2	2	2			3	3	3	3		3
HU381.5	2	2	2	2			3	3	3	3		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU381.1	2	2	2
HU381.2	2	2	2
HU381.3	2	2	2
HU381.4	2	2	2
HU381.5	2	2	2

Department of Computer Science and Engineering

Curriculum Structure

&

Syllabus

2016-2017

(Autonomy)

of

4th Semester

			4th Semester					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	BS	M(CSE)401	Numerical Methodsand Statistics	3	0	0	3	3
2	HS	HU401	Environmental science	2	0	0	2	2
3	PC	CS401	Computer Architecture	3	0	0	3	3
4	PC	CS402	Design and Analysis of Algorithms	3	0	0	3	3
5	PC	CS 403	Formal Language And Automata Theory	3	0	0	3	3
Total Theory							14	14
			B. PRACTICAL					
6	BS	M(CSE)491	Numerical Methods and Statistics Lab	0	0	3	3	2
7	PC	CS491	Computer Architecture Lab	0	0	3	3	2
8	PC	CS492	Algorithms Lab	0	0	3	3	2
9	PC	CS493	Programming with C++ Lab	1	0	2	3	2
Total Practical							12	8
			C. MANDATORY COURSES					
10	MC	MC 481	Technical Communication & Soft Skills	0	0	3	3	2 Unit
Total							**29**	**22**

Syllabus

Theory

Subject Name: Numerical Methods and Statistics
Subject Code: M (CSE) 401
Year: Second Year
Contact Hours: 3L/Week
Credit: 3

Prerequisite: Concept of Calculusand Algebra.

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 Outcomes (COs):

After attending the course students should be able to

CO1	Recall the distinctive characteristics of various numerical techniques and theassociated error measures and Statistics.
CO2	Understand the theoretical workings of various numerical techniques and Statisticsto
CO3	Understand and put into effective practice the pragmatics of Group Discussion
CO4	Understand and write a detailed technical report as per organizational needs
CO5	Understand and interact in professional presentations and interviews

Module I: Numerical Method I
Approximation in numerical computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic. (2L)
Interpolation: Calculus of Finite Differences, Newton forward/backward interpolation, Lagrange's interpolation, Divided differenceand Newton's divided difference Interpolation.(5L)
Numerical integration: Newton Cotes formula, Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3L)
Numerical solution of a system of linear equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method. (3L)
Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Newton-Raphson method. (3L)

Module II: 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. (5L)
Numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method. (2L)

Module III: 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. (10L)

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2. C.Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta& Jana: Introductory Numerical Analysis. PHI Learning
4. J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing
5. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution). New age International Publisher.
6. N. G. Das: Statistical Methods, TMH.
7. D. S. Sancheti *& V.K.*Kapoor *: Statistics Theory , Method & Application,* Sultan chand & sons New delhi

References:

1. Balagurusamy: Numerical Methods, Scitech. TMH
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. SoumenGuha& Rajesh Srivastava: Numerical Methods, Oxford Universities Press.
5. Srimanta Pal: Numerical Methods, Oxford Universities Press.
6. Numerical Analysis, Shastri, PHI
7.Numerical Analysis, S. Ali Mollah. New Central Book Agency.
8.Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI
9.NumericalAnalysis,G.S.Rao,New Age International
10.Programmed Statistics (Questions – Answers),G.S.Rao,New Age International
11.Numerical Analysis & Algorithms, PradeepNiyogi, TMH
12.Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
13.NumericalMethods,Arumugam,ScitechPublication
14.Probability and Statisics for Engineers,Rao,ScitechPublication
15.Numerical Methods in Computer Application,Wayse,EPH
16. Programmed Statistics (Questions – Answers),G.S.Rao,New Age International
17. Probability and Statisics for Engineers,Rao,Scitech

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M(CSE)401.1	3	3	2	2								
M(CSE)401.2	3	3	2	2								
M(CSE)401.3	3	3	2	2								
M(CSE)401.4	3	3	2	2								
M(CSE)401.5	3	3	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M(CSE)401.1	2	2	2
M(CSE)401.2	2	2	2
M(CSE)401.3	2	2	2
M(CSE)401.4	2	2	2
M(CSE)401.5	2	2	2

Subject: Environmental Science
Subject Code: HU 401
Contact Hours: 2L/Week
Credits: 2L

Pre requisites: 10+2 science with chemistry

Course Objective(s)

- Be able to understand the natural environment and its relationships with human activities.
- Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- Be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
- Be able to solve scientific problem-solving related to air, water, noise & land pollution.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the natural environment and its relationships with human activities.
CO2	Apply the fundamental knowledge of science and engineering to assess environmental and health risk.
CO3	Understand guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
CO4	Develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations. Acquire skills for scientific problem-solving related to air, water, noise& land pollution.
CO5	Develop skills for scientific problem-solving related to air, water, noise & land pollution.

1. General **6L**

1.1 Natural Resources: Forest Resource, water resource, mineral resource, energy resources (renewable,non-renewable, potentially renewable)

1.2Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield

1.3Disaster Management: Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control)

1.4Ecology & Ecosystem: Elements of ecology, definition of ecosystem- components types and function, Food chain & Foodweb,

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems

1.5 Environmental Management: Environmental impact assessment, Environmental laws and protection act of India, Different international environmentalagreement.

2. Air pollution and control **6L**

2.1Sources of Pollutants: point sources, nonpoint sources and manmade sources primary & secondary pollutant

2.2 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),

2.3Effects on human health & climate: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion

2.4 Air pollution and meteorology: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion

2.5 control of air pollution (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury),

3. Water Pollution **6L**

3.1 Classification of water (Ground & surface water)

3.2 Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatileorganiccompounds.

3.3 Surface water quality parameters: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BOD

Lake: Eutrophication [Definition, sourceandeffect].

3.4Ground water: Aquifers, hydraulic gradient, ground water flow(Definitiononly),ground water pollution (Arsenic & Fluoride; sources, effects, control)

3.5 Quality of Boiler fed water: DO, hardness , alkalinity, TDS and Chloride

3.7 Layout of waste water treatment plant (scheme only).

4. Land Pollution **2L**

4.1 Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste

4.2 Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

5. Noise Pollution **2L**

5.1 Definition of noise, effect of noise pollution on human health,

5.2 Average Noise level of some common noise sources

5.3 Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18 hr Index).

5.4 Noisepollutioncontrol.

References/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
3. Environmental Engineering, J K Das Mohapatra, Vikas Publication
4.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU401.1			2			3	3					
HU401.2			2			3	3					
HU401.3			2			3	3					
HU401.4			2			3	3					
HU401.5			2			3	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU401.1	2	2	2
HU401.2	2	2	2
HU401.3	2	2	2
HU401.4	2	2	2
HU401.5	2	2	2

Paper Name: Computer Architecture
Paper Code: CS401
Contact Hours/Week: 3
Credit: 3
Total Contact Hours: 36L

Perquisite

Digital Electronics and Computer Organization

Objective(s)

- To learn the basics of stored program concepts.
- To learn the principles of pipelining.
- To learn mechanism of data storage
- To distinguish between the concepts of serial, parallel, pipeline architecture**.**

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate the basic concept of computer architecture and its performance measurement, parallel processing, Flynn's classification and Amdahl's law and apply this knowledge in designing solution for real life engineering problem.
CO2	Summarize the basic concept of pipeline, instruction pipeline, arithmetic pipeline hazards detection and prevention and use this knowledge for designing and implementing mathematical and engineering problem leading to lifelong learning.
CO3	Identify the concept of Instruction-Level Parallelism to solve engineering problem.
CO4	Illustrate and Compare concept of Multiprocessor architecture and parallel architecture and apply this knowledge for developing an approach by means of existing and new methods as a team work.
CO5	Understand the concept of message passing architecture and interconnection network and design an optimized model for building a new solution as a professional engineering practice as a team.

Module – 1: [5L]

Introduction-
Introduction to basic computer architecture [1L]
Stored Program Concepts: Von Neumann & Havard Architecture [1L]
RISC VS CISC[1L]
Amdahl's law. [1L]
Performance Measure: MIPS, Benchman Programs(SPECINT,SPECFP).[1L]

Module – 2: [6L]

Pipelining-
Pipelining: Basic concepts, Linear vs. Non Linear, Static vs. Dynamic, Unifunction vs. Multifunction [2L]
Instruction Pipeline [1L]
Arithmetic pipeline [1L]
Hazards: Data hazards, control hazards and structural hazards[1L]
Techniques for handling hazards [1L]

Module – 3:[4L]
Instruction-level parallelism-
Instruction-Level Parallelism: Basic Concepts [1L]
Techniques For Increasing ILP, Superscalar, Super Pipelined [1L]
VLIW Processor Architectures [1L]
Array and Vector Processors [1L]
Module – 4: [5L]
Memory Hierarchy: Internal Memory, Main Memory, Cache Memory, Secondary memory[2L]
Mapping Technique in cache memory: Direct, Full Associative and Set Associative[2L]
Performance Implementation in Cache Memory.[1L]
Module – 5:[16L]
Multiprocessor architecture-

Introduction to Parallel Architecture-Different Classification scheme, Performance of Parallel Computers, PRAM model(EREW,CREW,CRCW) [6L]
Interconnection Network(Omega,Baseline,Butterfly,Crossbar)[6L]
Multi-Core Processor with case study(INTEL)[2L]
Different Classification scheme:Serial Vs. Parallel, Pipeline vs. Parallel [2L]

Text Book:

1. Patterson D.A. and Hennessy , J.L. "Computer architecture a quantitative approach", 2nd ed., Morgan Kaufman, 1996
4. Stone, H.S., "Advanced Computer", Addison Wesley, 1989
5. Siegel, H.J., "Interconnection Network for Large Scale parallel Processing", 2nd Ed., McGraw Hill, 1990

Reference Book:

1. Hwang & Briggs—Computer Architecture & Parallel Processing, TMH
2. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill
3. Design and Analysis of Prallel Algorithm-Schim G. Akl

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS401.1	3	3	3	2								
CS401.2	3	3	3	3								3
CS401.3	2	2	2	3								
CS401.4	3	3	3	3								
CS401.5	3	3	3	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS401.1	3	3	3
CS401.2	3	3	3
CS401.3	3	3	3
CS401.4	3	3	3
CS401.5	3	3	3

Design & Analysis of Algorithm
Code: CS402
Contact: 3L/Week
Credits: 3
Total Contact hour: 36L

Perquisite

Data Structures

Objective(s)

The aim of this module is to learn how to develop efficient algorithms for simple computational tasks and reasoning about the correctness of them. Through the complexity measures, different range of behaviors of algorithms and the notion of tractable and intractable problems will be understood.

Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand and illustrate the concepts of time and space complexity, worst case, average case and best-case complexities and the asymptotic notation.
CO2	To analyze and apply the design principles and concepts to various basic algorithm design viz. dynamic programming, greedy method etc.
CO3	To understand and analyze various string matching and graph algorithms.
CO4	To understand, illustrate and analyze the different complexity classes
CO5	To discuss, implement and analyze, verify the efficiency of the randomized and approximation algorithms.

Module 1

Complexity Analysis:[2L]
Time and Space Complexity, Different Asymptotic notations – their mathematical significance.Recurrence relations: Solving with generating functions. Master Theorem and its illustrations.
Lower bound theory: $O(n*\log_2 n)$ bound for comparison sorting algorithms.

Module 2

Algorithm Design Techniques:
Divide and Conquer: [3L]
Basic concepts with Examples for – Binary Search, Merge Sort, Quick Sort and their complexity(all three cases) Multiplication of two or more large numbers and its time complexity.

Dynamic Programming: [3L]
Basic concepts withExamples for – Matrix Chain Multiplication, Longest Common Subsequence problem, 0/1 knapsack problem.

Greedy Method: [3L]
Basic concepts with Examples for –Coin change problem, Job sequencing with deadlines, Huffman encoding and decoding.

Backtracking:
Basic concepts with Examples – 8 queens problem, Graph colouring problem.[2L]

Amortized analysis: aggregate, accounting, and potential methods.[1L]

Module 3

Advanced Data structures: Binomial heaps, Fibonacci heaps.[2L]

Disjoint set manipulation: [2L]
Set manipulation algorithm like UNION-FIND, union by rank.

Module 4

Sorting and order statistics: Heapsort, (randomized) quick sort, sorting in linear time, Finding (approximate) median.[2L]

Module 5

Graph algorithms[3L] Breadth first search(BFS), Depth first search(DFS), topological sort
Minimum spanning tree: Prim's algorithm, Kruskal's algorithm; Single source shortest path problems: Bellman-Ford algorithm, Dijkstra's algorithm; All pair shortest paths: Floyd-Warshall Algorithm
Network Flow: [2L]
Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

Module 6

Matrix operations:[2L] Strassen's algorithm for matrix multiplication, Solving systems of linear equations, matrix inversions and boolean matrix multiplication.

Module 7

Selected topics:String matching problem: [3L]
Different techniques – Naive algorithm, string matching using finite automata, and Knuth, Morris, Pratt (KMP) algorithm withtheir complexities.Greatest common divisor, Powers of an element, Primality testing, Polynomial evaluation.

Module 8

Notion of NP-completeness: [3L]
P class, NP class, NP hard class, NP complete class – their interrelationship, Reductions and Polynomial time Reducibility, Satisfiability problem (3-SAT and 2-SAT), Cook-Levin's theorem (Statement only), Clique decision problem.

Approximation Algorithms: [3L]
Necessity of approximation scheme, sub-optimal and pseudo-optimal algorithms, performance guarantee, polynomial time approximation schemes,vertex cover problem, travelling salesman problem.

Text Book:

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

Reference:

1. K.Mehlhorn, "Data Structures and Algorithms" - Vol. I & Vol. 2.
2. A. Aho, J.Hopcroft and J.Ullman "The Design and Analysis of Algorithms"
3. D.E.Knuth "The Art of Computer Programming", Vol. 3
4. Jon Kleiberg and Eva Tardos, "Algorithm Design"
5. S.Baase "Computer Algorithms"
6. E.Horowitz and Shani "Fundamentals of Computer Algorithms"
7. E.M.Reingold, J.Nievergelt and N.Deo- "Combinational Algorithms- Theory and Practice", Prentice Hall, 1997

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS402.1	2	2	2	2								2
CS402.2	3	3	3	3								2
CS402.3	3	3	3	3								2
CS402.4	3	3	3	3								2
CS402.5	3	3	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS402.1	3	3	3
CS402.2	3	3	3
CS402.3	3	3	3
CS402.4	3	3	3
CS402.5	3	3	3

Paper: Formal Language and Automata Theory
Code: CS403
Contacts: 3L/Week
Credits: 3
Total Lectures: 35L

Prerequisites:

1. Digital Logic
2. Computer organization
3. Computer Fundamentals

Objective(s)

- Be able to construct finite state machines and the equivalent regular expressions.
- Be able to prove the equivalence of languages described by finite state machines and regular expressions.
- Be able to construct pushdown automata and the equivalent context free grammars.
- Be able to prove the equivalence of languages described by pushdown automata and context free grammars.
- Be able to construct Turing machines and Post machines.
- Be able to prove the equivalence of languages described by Turing machines and Post machines

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the fundamental concepts of Finite State Automata to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of Regular Expressions and its relation with DFA so that they can Develop regular expression for a specified language and Validate it.
CO3	Understand the fundamental concepts of Context Free Grammar so that they can Design grammar for a specified language and Validate it.
CO4	Explain or Illustrate the fundamental operating principles of Push Down Automata and Use it appropriately to Solve problems.
CO5	Understand the operating principles of Turing Machine and Design Turing Machines to Propose solutions to the related problems appropriately and validate the effectiveness as well as limitations of computations making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

Module-1: [9 L]

Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relatedto Automata concept of sequential circuit concept) Design of sequence detector**[2L]**
Introduction to Finite State Model (FSM), Finite State Machine, Finite Automata, Deterministic Finite Automation (DFA) and Non-deterministic Finite Automation (NFA), Transition diagrams, Transition tables and Language recognizers. **[2L]**
NFA with empty transitions, Equivalence between NFA with and without empty transitions. NFA to DFA conversion. **[2L]**
Minimization of FSM: Minimization Algorithm for DFA, Myhill-Nerode Theorem (proof not required)**[2L]**
Limitations of FSM, Application of Finite Automata **[1L]**

Module-2: [7 L]

Finite Automata with output − Moore & Mealy machine. Representation of Moore & Mealy Machine, Processing of the String through Moore & Mealy Machine, Equivalence of Moore & Mealy Machine – Inter-conversion. **[2L]**
Equivalent states and Distinguishable States, Equivalence and k-equivalence, Minimization of Mealy Machine **[1L]**
Minimization of incompletely specified machine − Merger Graph, Merger Table, Compatibility Graph **[2L]**
Lossless and Lossy Machine – Testing Table, Testing Graph **[2L]**

Module-3: [5 L]

Regular Languages, Regular Sets, Regular Expressions, Algebraic Rules for Regular Expressions, Arden's Theorem statement and proof**[1L]**
Constructing Finite Automata (FA) for given regular expressions, Regular string accepted by FA **[2L]**
Constructing Regular Expression for a given Finite Automata **[1L]**
Pumping Lemma of Regular Sets. Closure properties of regular sets (proofs not required). **[1L]**

Module-4: [9 L]

Grammar Formalism - Context Free Grammars,Derivation trees, sentential forms. Right most and leftmost derivation of strings,Parse Tree, Ambiguity in context free grammars. **[1L]**
Minimization of Context Free Grammars. **[1L]**
Chomsky normal form and Greibach normal form. **[1L]**
Pumping Lemma for Context Free Languages. **[1L]**
Enumeration of properties of CFL (proofs omitted). Closure property of CFL, Ogden's lemma & its applications **[1L]**

Regular grammars − right linear and left linear grammars**[1L]**

Push down Automata: Push down automata, definition.Introduction to DCFL, DPDA, NCFL, NPDA**[1L]**
Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. **[1L]**
Equivalence of CFL and PDA, inter-conversion. (Proofs not required)**[1L]**

Module-5: [5L]

Turing Machine: Turing Machine, definition, model **[1L]**
Design of TM, Computable functions **[1L]**
Church's hypothesis, counter machine **[1L]**
Types of Turing machines **[1L]**
Universal Turing Machine, Halting problem **[1L]**

TEXT BOOKS:

1. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D., Pearson Education.

REFERENCES:

1. "Formal Languages and Automata Theory", C.K.Nagpal, Oxford

2. "Switching & Finite Automata", ZVI Kohavi, 2nd Edition., Tata McGraw Hill

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS403.1	3	3	3	3								3
CS403.2	2	2	2	2								3
CS403.3	3	3	3	3								3
CS403.4	3	3	3	3								3
CS403.5	3	3	3	3					2	2		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS403.1	3	3	3
CS403.2	3	3	3
CS403.3	3	3	3
CS403.4	3	3	3
CS403.5	3	3	3

Practical

Subject Name: Numerical Methods and Statistics Lab
Subject Code: M (CSE) 491
Year: Second
Contact Hours: 3P/Week
Credit: 2

Prerequisite: Any introductory course on C/ Matlab.

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

Course Outcomes (COs):

After attending the course students should be able to

CO1	Describe and explain the theoretical workings of numerical techniques with the help of C
CO2	Compute basic command and scripts in a mathematical programming language
CO3	Apply the programming skills to solve the problems using multiple numerical
CO4	Analyze if the results are reasonable, and then interpret and clearly communicate the
CO5	Apply the distinctive principles of numerical analysis and the associated error

Experiments

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, Newton-Raphson method.
5. Assignments on ordinary differential equation: 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 engineering field.

Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematica/NAG (Numerical Algorithms Group/Python.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M(CSE)491.1	3	3	2	2	3				3			
M(CSE)491.2	3	3	2	2	3				3			
M(CSE)491.3	3	3	2	2	3				3			
M(CSE)491.4	3	3	2	2	3				3			
M(CSE)491.5	3	3	2	2	3				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M(CSE)491.1	2	2	2
M(CSE)491.2	2	2	2
M(CSE)491.3	2	2	2
M(CSE)491.4	2	2	2
M(CSE)491.5	2	2	2

Paper Name: Computer Architecture Lab
Paper Code: CS491
Contact Hours: 3/Week
Credit: 2

Prerequisite:

Computer Organization Lab

Course Objective(s):

Simulate digital circuit using Xilinx tools

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate and use proper syntax in appropriate platform for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
CO2	Apply the knowledge of algorithms in the computational area to efficient programming codes to design the problem using modern tools for solving complex engineering problems.
CO3	Outline different types of digital electronic circuits such as adder, subtract or, encoder, decoder, multiplexer, de-multiplexer, flip-flops, register, counter using various mapping and modern tools to prepare the most simplified circuit and optimize using various mapping and mathematical methods for solving the problem as a professional engineering practice as a team.
CO4	Apply the knowledge of digital electronic circuits to design memory and ALU and analyse the same to solve engineering-related computational problems as a team.
CO5	Interpret the result of the experiments, prepare laboratory reports based on observed output and analyse it to validate professional ethics and responsibilities and norms of the engineering practice.

1. Implement different types of Basic gates and simulate for truth table verification.
2. Implement half adder circuit and simulate for truth table verification.
3. Implement full adder circuit and simulate for truth table verification.
4. Implement half subtractor circuit and simulate for truth table verification.
5. Implement full subtractor circuit and simulate for truth table verification.
6. Implement Multiplexer, DeMultiplexer circuit and simulate for truth table verification.
7. Implement Encoder, Decoder circuit and simulate for truth table verification.
8. Implement different types of flip flop and simulate for truth table verification.
9. Implement different types of parallel circuits (SISO,SIPO,PISO,PIPO) and simulate the result.
10. Implement ALU and simulate the result.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS491.1	3	3	3	2	3				3			
CS491.2	3	3	3	3	3				3			
CS491.3	3	3	3	3	3				3			
CS491.4	3	3	3	3	3				3			
CS491.5	3	3	3	3	3				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS491.1	3	3	3
CS491.2	3	3	3
CS491.3	3	3	3
CS491.4	3	3	3
CS491.5	3	3	3

Subject Name: Algorithms Lab
Subject Code: CS492
Contact Hours: 3P/Week
Credits: 2

Perquisite

Computer Fundamental and Principles of Computer Programming

Course Objective(s)

In this laboratory after completing experiments student has to learn how to analyze a problem & design the solution for the problem. In addition to that, solution must be optimum, i.e., time complexity & memory usage of the solution must be very low.

Course Outcomes (COs):

After attending the course students should be able to

CO1	To identify and prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
CO2	To understand and illustrate methods for analyzing the efficiency and correctness of algorithms (such as exchange arguments, recurrence, induction, and average case analysis)
CO3	To analyze and design algorithms using the dynamic programming, greedy method, Backtracking, Branch and Bound strategy, and recite algorithms that employ this strategy.
CO4	To understand, compare, contrast, and choose appropriate implementation of the algorithmic design techniques to present an algorithm that solves a given problem.
CO5	To Identify and analyze criteria and specifications appropriate to new problems.

Write the following problems in any programming language. Programming Language used: C

1. Divide and Conquer:

a. Implement Binary Search (Recursive & Iterative) using Divide and Conquer approach
b. Implement Merge Sort using Divide and Conquer approach
c. Implement Quick Sort using Divide and Conquer approach
d. Find Maximum and Minimum element from a array of integer using Divide and Conquer approach
e. Implement Multiplication of two large numbers

2. Heap sort:

Implement Heap Sort using Divide and Conquer approach

3. Dynamic Programming:

a. Find the minimum number of scalar multiplication needed for chain of matrix
b. Implement all pair of Shortest path for a graph (Floyed Warshall Algorithm)
c. Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford)
d. Implement Longest Common Subsequence problem

4. Brunch and Bound:

a. Implement 15 Puzzle Problems

5. Backtracking:

a. Implement 8 Queen Problem
b. Graph Colouring Problem

5. Greedy method:

a. Job sequencing with deadlines
b. Minimum Cost Spanning Tree by Prim's Algorithm

Minimum Cost Spanning Tree by Kruskal's Algorithm

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS492.1	3	3	2	2	3				3			3
CS492.2	3	3	3	2	3				3			3
CS492.3	3	3	2	3	3				3			3
CS492.4	3	3	2	2	3				3			3
CS492.5	3	3	3	2	3				3			3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS492.1	3	3	3
CS492.2	3	3	3
CS492.3	3	3	3
CS492.4	3	3	3
CS492.5	3	3	3

Subject Name: Programming with C++ Lab
Subject Code:CS493
Contact: 3P(1L+2P)/Week
Credits: 2

Perquisite

1. Computer Fundamentals and principles of computer programming

Course Objective(s)

- At the end of the course students should be familiar with the main features of the C++ language.
- Be able to write a C++ program to solve a well specified problem.
- Understand a C++ program written by someone else.
- Be able to debug and test C++ programs;
- Understand how to read C++ doc library documentation and reuse library code.
- To make the students understand the features of object oriented principles and familiarize them with virtual functions, templates and exception handling.
- To make the students to develop applications using C++.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Demonstrate a thorough understanding of modular programming by designing programs that requires the use of programmer-defined functions.
CO2	Demonstrate a thorough understanding of arrays by designing and implementing programs that search and sort arrays.
CO3	Demonstrate a thorough understanding of the object-oriented programming concepts of encapsulation, data abstraction and composition by designing and implementing classes including the use of overloaded functions and constructors.
CO4	Demonstrate a thorough understanding of the concept of pointers and dynamic memory allocation, the implementation of programmer-defined functions and classes by writing code, performing unit testing and debugging of multiple complex programs.
CO5	Demonstrate an understanding of the differences between C and C++ in the areas of strings, pass by reference/passing pointers, and structs by designing and implementing programs that use C strings, C++

Experiments

1.Object-Oriented Programming Concepts: Introduction, comparision between procedural programming paradigm and object-oriented proramming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging. **[2]**

2. Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and memberv functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators. **[3]**

3. Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of *const* keyword, friends of a class, empty classes, nested classes, local

classes, abstract classes, container classes, bit fields and classes**. [4]**

4. Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using *new* and *delete* operators, pointer to an object, *this* pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures**. [5]**

5. Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists. **[2]**

6. Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type. **[4]**

7. Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors. **[5]**

8. Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract clasess, virtual destructors. **[3]**

9. Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions. **[2]**

10. Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples. **[3]**

11. Files: File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files. **[3]**

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS493.1	3	3	3	2	2				3			
CS493.2	3	2	2	2	2				3			
CS493.3	3	3	3	2	2				3			
CS493.4	3	3	3	2	2				3			
CS493.5	3	3	3	2	2				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS493.1	3	3	3
CS493.2	3	3	3
CS493.3	3	3	3
CS493.4	3	3	3
CS493.5	3	3	3

Suggested Readings/ Books:

1. Lafore R., **Object Oriented Programming in C++**, Waite Group.

2. E. Balagurusamy, **Object Oriented Programming with C++**, Tata McGraw Hill.

3. R. S. Salaria, **Mastering Object-Oriented Programming with C++**, Salaria Publishing House.

4. Bjarne Stroustrup, **The C++ Programming Language**, Addison Wesley.

5. Herbert Schildt, **The Complete Reference to C++ Language**, McGraw Hill-Osborne.

6. R. S. Salaria, **Test Your Skills in Object-Oriented Programming With C++**, Salaria Publishing House.

Department of Computer Science and Engineering

Curriculum Structure

&

Syllabus

2016-2017

(Autonomy)

of

5th Semester

SL No			**5TH SEMESTER**					
				Contact hours				Cr. Points
	Type	**Code**	**A. THEORY**	L	T	P	Total	
1	PC	CS501	Computer Graphics	3	0	0	3	3
2	PC	CS502	Operating System	3	0	0	3	3
3	HS	HU 503	Economics for Engineers	2	0	0	2	2
4	PC	CS503	Data Base Management System	3	0	0	3	3
5	FE	CS(IT)504A	Object Oriented Programming using Java					
		CS(IT)504B	Multimedia Technology					
		CS(ECE)504C	Communication Engineering	3	0	0	3	3
6	PE	CS505A	Operations Research					
		CS505A	Computational Geometry					
		CS505A	Digital Signal Processing	3	0	0	3	3
Total Theory							17	17
			B. PRACTICAL					
7	PC	CS591	Computer Graphics Lab	0	0	3	3	2
8	PC	CS592	Operating System Lab	0	0	3	3	2
9	PC	CS 593	Data Base Management System Lab	0	0	3	3	2
10	FE	CS(IT)594A	Object Oriented Programming Lab					
		CS(IT)594B	Multimedia Technology Lab					
		CS(ECE)594C	Communication Engineering Lab	**0**	**0**	3	3	2
Total Practical							12	8
			C. MANDATORY COURSES					
11	MC	MC581	General Aptitude /Foreign Language	0	0	3	3	2 Unit
Total							32	25

Computer Graphics
Code : CS501
Contact : 3L/Week
Credits : 3
Allotted Hrs : 36L

Prerequisites:

1. Mathematics – I,III
2. Computer Fundamentals & Principle of Computer Programming
3. Programming with C++

Course Objective(s)

- 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.
- The computer graphics course prepares students for activities involving in design, development and testing of modeling, rendering, and shading.

Course Outcomes (COs):
After attending the course students should be able to

CO1	Understand the fundamental concept of Computer graphics and mathematical knowledge and explain the foundations of computer graphics and different display technology and devices.
CO2	Demonstrate different scan conversion algorithms, drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms, clipping algorithms, surface removal algorithms using graphics tools.
CO3	Understand the basic concept of graphics programming and implement clipping with the comprehension of windows, view-ports in relation to images display on screen.
CO4	Analyze and compare different drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms hidden surface illumination methods
CO5	Develop the concept of geometric models, mathematical and algorithmic approach necessary for programming computer graphics leading to lifelong learning.

Course Contents

Module I

Introduction to computer graphics [3L]

Overview of computer graphics, Basic Terminologies in Graphics, direct coding, lookup table, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software

Display [3L]

Light &Color models, Raster refresh displays, CRT basics, video basics, Flat panel displays,

interpolative shading model; Texture

Module II

Scan conversion: [8L]

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm

Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm

Module III

2D and 3D Transformation [12L]

Basic transformations: translation, rotation, scaling ; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines

3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation

2D and 3D Viewing & Clipping [4L]

Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Viewport clipping, 3D viewing.

Module IV

Curves [3L]

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves

Hidden Surface Removal [3L]

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry

Books:

1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH
4.Computer Graphics (OXFORD) ,Samit Bhattacharya.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS501.1	3	3	3	3	3							3
CS501.2	3	3	3	3	3							3
CS501.3	3	3	3	3	3							3
CS501.4	3	3	3	3	3							3
CS501.5	3	3	3	3	3							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS501.1	3	3	3
CS501.2	3	3	3
CS501.3	3	3	3
CS501.4	3	3	3
CS501.5	3	3	3

Paper Name: Operating System
Paper Code: CS502
Contact Hours: 3/Week
Credit: 3
Total Contact Hours: 32L

Prerequisites:

4. Computer organization
5. Computer Architecture
6. Data Structures

Algorithms & Programming Concept

Objective(s)

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. Students should be able to use system calls for managing processes, memory and the file system.
6. Students should understand the data structures and algorithms used to implement an OS.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the fundamental concepts of Operating System, Protection & Security and differentiate different types of Operating System.
CO2	Understand and implement process & thread; understand, apply, compare different process synchronization algorithm and inter process communication to solve engineering problems.
CO3	Understand/explain/analyze different synchronization techniques, critical section problems and deadlock and apply them to solve engineering problems.
CO4	Understand/explain different memory management techniques including virtual memory management; also able to apply, compare, and implement different page replacement algorithms to solve engineering problems.
CO5	Understand/explain different I/O mechanisms, File structures and disk management techniques and solving engineering problem applying different disk scheduling algorithm.

Course Content

Module – 1: [3L]

Functionalities of Operating System, Evolution of Operating System.
Types of Operating System: batch, multi-programmed, time-sharing, real-time, distributed, parallel, Structural overview, Protection & Security. [3L]

Module – 2: [9L]

Processes: Concept of processes, process states, PCB, process scheduling, co-operating processes, independent process, suspended process, Interaction between processes and OS, Inter-process communication: Message passing. [2L]
Threads: overview, benefits of threads, user and kernel level threads, Thread models. [2L]
CPU scheduling: scheduling criteria, preemptive& non-preemptive scheduling, scheduling algorithms (FCFS, SJF, SRTF, RR, priority, multilevel queue, multilevel feedback queue scheduling). [5L]

Module – 3:[9L]

Process Synchronization: background, critical section problem, synchronization hardware, classical problems of synchronization(producer-consumer, readers-writer, dining philosophers, etc), semaphores, monitors.
[5L]

Deadlocks: deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock. [4L]

Module – 4: [6L]

Background, logical vs. physical address space, swapping, contiguous memory allocation, paging, Segmentation, TLB. [3L]

Virtual Memory: background, demand paging, page replacement algorithms (FCFS, LRU, Optimal), thrashing, Working set model. [3L]

Module – 5:[5L]

Disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN,LOOK,C-LOOK etc),disk reliability, disk formatting, boot block, bad blocks. [2L]

File: File concept, access methods, directory structure, file system structure, UNIX file structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector). [2L]
I/O: I/O hardware, polling, interrupts, DMA, caching, buffering, blocking-non blocking I/O. [1L]

Text Book:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts.
2. *Operating Systems*& Systems Programming by P *Balakrishna Prasad*

Reference Book:

1. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.
2. Andrew Tanenbaum, Modern Operating Systems, Prentice Hall.
3. William Stallings, Operating Systems, Prentice Hall.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS502.1	3	3	3	3								3
CS502.2	3	3	3	3								3
CS502.3	3	3	3	3								3
CS502.4	3	3	3	3								3
CS502.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS502.1	3	3	3
CS502.2	3	3	3
CS502.3	3	3	3
CS502.4	3	3	3
CS502.5	3	3	3

Paper Name: Economics for Engineers
Paper Code: HU503
Contact: L-T-P = 2 – 0 – 0
Credit: 2

Pre-requisites:MATH – College Algebra, Pre-Calculus Algebra and Trigonometry.

Course Objective: This course emphasizes the strong correlation between engineering design and manufacturing of products/systems and the economic issues they involve.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Apply the appropriate engineering economics analysis method(s) for problem solving present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
CO2	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.
CO3	Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
CO4	Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision.
CO5	Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

1. Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
2. Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.
3. Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
4. Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision.
5. Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

Course Content:

MODULE I Introduction 3L

Managerial Economics-Relationship with other disciplines-Firms: Types, Objectives and goals-Managerial Decisions-Decision Analysis.

MODULE II Demand and Supply Analysis 10 L

Demand-Types of demand-determinants of demand-Demand function-Demand Elasticity-Demand forecasting-Supply-Determinants of supply-Supply function-Supply Elasticity.

MODULE III Cost Analysis 10 L

Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – PV ratio,

MODULE IV Elementary economic Analysis – **06 L**
Inflation-Meaning of inflation, types, causes, measures to control inflation.
National Income-Definition, Concepts of national income, Method of measuring national income.

MODULEV: Financial Accounting 08 L
Concepts and Definition of Accounting,Journal,Ledger,Trial Balance.
TradingA/C,Profit & Loss A/C and Balance Sheet.

MODULE VI : Investment Decision 04L

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence. Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH
8.Haniff and Mukherjee,Modern Accounting,Vol-1,TMG
9.Modern Economic Theory – K.K. Dewett (S.Chand)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU503.1							2	3			3	3
HU503.2							2	3			3	3
HU503.3							2	3			3	3
HU503.4							2	3			3	3
HU503.5							2	3			3	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU503.1	2	2	2
HU503.2	2	2	2
HU503.3	2	2	2
HU503.4	2	2	2
HU503.5	2	2	2

DATABASE MANAGEMENT SYSTEM
Code: CS503
ContactHours: 3L /Week
Credits: 3

Prerequisite:

1. Logic of programming language
2. Basic concepts of data structure and algorithms

Course Objectives

1. Tolearnthedata models,conceptualizeanddepicta databasesystem
2. To design system usingE-Rdiagram.
3. TolearnSQL&relationaldatabasedesign.
4. Tounderstandtheinternalstoragestructuresusingdifferentfileandindexingtechniques.
5. To know the concepts of transaction processing, concurrency control techniques and recovery procedure**.**

Course Outcomes (COs):

After attending the course students should be able to

CO1	To Understand and Describe the basic concepts and utility of Database management system, different data models of Database management system.
CO2	To Design an Entity Relationship (E-R) Diagram and relational model for any kind of real-life application and able to Apply relational algebra operations, SQL, Neo4j for solving
CO3	To Analyze and Create the relational database for any real-life applications based on normalization.
CO4	To Apply the query optimization techniques, different file organization techniques and Determine whether the transaction satisfies the ACID properties.
CO5	To Implement and organize the database of an organization as a team.

Module 1:
Introduction [3L]

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

Module 2:
Entity-Relationship and Relational Database Model [11L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features, case study on E-R Model. Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

Module 3:
SQL and Integrity Constraints [6L]

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.

Module 4:

Relational Database Design [8L]

Functional Dependency, Different anamolies in designing a Database., Normalization using funtional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Nomalization using multi-valued dependencies, 4NF, 5NF , Case Study

Module 5:

Internals of RDBMS [9L]

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, Dead Lock handling

Module 6:

File Organization & Index Structures [6L]

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single- Level Index (primary, secondary, clustering), Multilevel Indexes

Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings
Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan KauffmanPublishers.
5. Ullman JD., "Principles of Database Systems", Galgottia Publication.

Reference:

1. Jain: Advanced Database Management System CyberTech
2. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
3. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley PublishingEdition
4. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS503.1	3	3	2	2								3
CS503.2	3	3	2	2								3
CS503.3	3	3	2	2								3
CS503.4	3	3	2	2								3

CS503.5	3	3	2	2								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS503.1	3	3	3
CS503.2	3	3	3
CS503.3	3	3	3
CS503.4	3	3	3
CS503.5	3	3	3

Object Oriented Programming using Java

Code: CS(IT)504A Contact: 3L/Week Credits: 3
Total Lectures: 36

Course Objective(s)

- Be able to explain the difference between object oriented programming and procedural programming.
- Be able to program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
- Be able to build classes using appropriate encapsulation and design principles
- Be able to apply object oriented or non-object oriented techniques to solve bigger computing problems

Course Outcomes (COs):

After attending the course students should be able to

CO1	Design the process of interaction between Objects, classes & methods w.r.t. Object Oriented Programming.
CO2	Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java.
CO3	Analyze various activities of different string handling functions with various I/O
CO4	Discuss basic code reusability feature w.r.t. Inheritance, Package and Interface.
CO5	Implement Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

Course Contact

Module 1: [5L]

Introduction:
Object Oriented Analysis & Design-Concepts of object oriented programming language, Object, Class.**[1L];** Relationships among objects and classes-Generalization, Specialization, Aggregation, Association, Composition, links, Meta-class. **[1L] ;** Object Oriented Programming concepts - Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, Method. **[1L];** Properties of OOP- message passing, inheritance, encapsulation, polymorphism, Data abstraction. **[1L];** Difference between different OOPs Languages. **[1L].**

Module 2: [9L]

Java Basics:
Basic concepts of java programming - Advantages of java, Byte-code & JVM, Data types, Different types of Variables. **[1L] ;**Access specifiers, Operators, Control statements & loops.

[1L]; Array. **[1L] ;**Creation of class, object, method. **[1L];** Constructor- Definition, Usage of Constructor, Different types of Constructor. **[1L];** finalize method and garbage collection, Method & Constructor overloading. **[1L];** this keyword, use of objects as parameter & methods returning objects. **[1L];** Call by value & call by reference. **[1L];** Static variables & methods. Nested & inner classes. **[1L].**

Module 3:[4L]

Basic String handling & I/O :
Basic string handling concepts- Concept of mutable and immutable string, Methods of String class-charAt(), compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(). **[1L];** toCharArray(), toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods, Methods of String buffer class- append(), capacity(), charAt(), delete(), deleteCharAt(). **[1L];** ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString(). **[1L] ;**Command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes. **[1L].**

Module 4: [8L]

Inheritance and Java Packages :
Inheritance - Definition, Advantages, Different types of inheritance and their implementation. **[1L] ;** Super and final keywords, super() method. **[1L];** Method overriding, Dynamic method dispatch. **[1L];** Abstract classes & methods. **[1L];** Interface - Definition, Use of Interface. **[1L];** Multiple inheritance by using Interface. **[1L] ;** Java Packages -Definition, Creation of packages. **[1L];** Importing packages, member access for packages. **[1L]**

Module 5: [10L]

Exception handling, Multithreading and Applet Programming :
Exception handling - Basics, different types of exception classes. Difference between Checked & Unchecked Exception. **[1L];** Try & catch related case studies.**[1L];** Throw, throws & finally. **[1L];** Creation of user defined exception. **[1L];** Multithreading - Basics, main thread, thread life cycle.**[1L];** Creation of multiple threads-yield(), suspend(), sleep(n), resume(), wait(), notify(), join(), isAlive().**[1L] ;**Thread priorities, thread synchronization.**[1L];**Interthread communication, deadlocks for threads**[1L];** Applet Programming - Basics, applet life cycle, difference between application & applet programming**[1L];** Parameter passing in applets. **[1L]**

Recommended Books:

Textbooks:

1. Herbert Schildt – "Java: The Complete Reference " – 9th Ed. – TMH
2. E. Balagurusamy – " Programming With Java: A Primer " – 3rd Ed. – TMH.

References:

1. R.K Das – " Core Java for Beginners " – VIKAS PUBLISHING.
2. Rambaugh, James Michael, Blaha – " Object Oriented Modelling and Design " – Prentice Hall, India.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS504A.1	3	3	2	3	2							
CS504A.2	3	3	3	3	2							
CS504A3	3	3	3	3	2							
CS504A.4	3	3	3	3	2							
CS504A.5	3	3	3	3	2							

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
CS504A.1	3	3	3
CS504A.2	3	3	3
CS504A3	3	3	3
CS504A.4	3	3	3
CS504A.5	3	3	3

Multimedia Technology
CS(IT)504B
Contact:
3L/Week
Credits: 3
Total Lectures: 36L

Prerequisites:

1. Computer Fundamentals & Principle of Computer Programming
2. Algorithms &Programming Concept

Objective(s)

- Discuss the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video and audio content.
- Describe and understand the technical details of JPEG and MPEG families of standards.
- Discuss the significance of "Quality of Service" in multimedia networking.
- Describe the principles and technical details of several wired and wireless networking protocols.
- Develop simple but demonstrative multimedia applications using JAI and JMF.
- Understand and describe technical aspects of popular multimedia web applications including VoD and VoIP.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify different media; representations of different multimedia data and data formats
CO2	Analyze various compression techniques.
CO3	Compare various audio and video file formats.
CO4	Apply different coding technique for solving real world problems
CO5	Choose optical storage media suitable for multimedia applications.

Module 1: Introduction, Text and Audio [6L]
Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications.
Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode,Encryption;
Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate,Sampling Size, Quantization), Audio Formats, Audio tools, MIDI.

Module 2: Image and Video (8L)
Image: Formats, Image Color Scheme, Image Enhancement; Lossless Compression: Huffman Coding Arithmetic and Lempel-Ziv Coding, Lossy Image Compression Systems: Theory of Quantization, Delta Modulation and DPCM, Transform Coding & K-L Transforms, Discrete Cosine Transforms
Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261)

Transmission of Video Signals, Video Capture, and Computer based Animation.

Module 3: Synchronization, Multi-Resolution Analysis, Storage models and Access Techniques [8L]
Temporal relationships, synchronization accuracy specification factors, quality of service.
Magnetic media, optical media, file systems (traditional, multimedia)
Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD
Theory of Wavelets, Theory of Subband Coding (z-transform), Multi-resolution Analysis: Discrete Wavelet Transforms.

Module 4: Image and Video Database (7L)
Image representation, segmentation, and similarity based retrieval, image retrieval by color, shape and texture;indexing- kd trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing

Module 5: Embedded Wavelet Coding and Multimedia Applications (7L)
Zerotree Approach, SPIHT algorithm and EBCOT Algorithm.
Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.

Books:

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
2. Nalin K. Sharda , Multimedia Information System , PHI.
3. Fred Halsall , Multimedia Communications , Pearson Ed.
4. Koegel Buford , Multimedia Systems , Pearson Ed.
5. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
6. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processi
ng , PHI.
7. J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.
8. Prabhat K. Andleigh & Kiran Thakrar , Multimedia Systems Design , PHI.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS504.1	3	3	2	3								
CS504.2	3	3	3	3								
CS504.3	3	3										
CS504.4	3	3	3	3								
CS504.5	3	3	3	3								

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
CS504.1	3	2	2
CS504.2	3	2	2
CS504.3	3	2	3
CS504.4	3	2	3
CS504.5	3	3	3

Subject Name: Communication Engineering
Subject Code:
CS(ECE)504C Contact
Hours: 3l/Week Credits: 3

Prerequisites:

- Knowledge in different types of signals
- Exponential Fourier series
- Fourier transform and its properties
- Energy and power signal
- Probability and statistics

Course Objective(s)

To present the fundamentals of analog and modern digital communication system design. Students should evaluate the performance of analog and digital signaling schemes on realistic communication channels. Emphasis is placed on physical layer digital communications and coding techniques, including waveform analysis, transmitter design and receiver design. The student will learn about theoretical bounds on the rates of digital data transportation systems.

Course Outcome(s)

CS(ECE)504C.1 Apply the fundamental concepts of engineering principles in design issues in various communication systems.

CS(ECE)504C.2 Inspect recent trend and performance issues for different digital modulation techniques.

CS(ECE)504C.3 Demonstrate the concepts of sampling, Pulse Modulation techniques and their comparison.

CS(ECE)504C.4 Design Matched filter, demonstrate the effects of Inter Symbol Interference (ISI) and compare Eye pattern analysis.

CS(ECE)504C.5 Illustrate various types of coherent and non-coherent digital modulation techniques, analyze immunity parameters and calculate their error probabilities.

CS(ECE)504C.6 Apply the basic concepts for analyzing the modulation techniques including amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) that are widely used in analogue communication systemsin the time and frequency domains

Course Content:

Module - 1: **Elements of Communication system, Analog Modulation & Demodulation, Noise, SNR. (Basic ideas in brief) [10]**

Introduction to Base Band transmission & Modulation (basic concept) (1L); Elements of Communication systems (mention of transmitter, receiver and channel); origin of noise and its effect, Importance of SNR in system design (1L); Basic principles of Linear Modulation (Amplitude Modulation, DSB-SC, SSB-SC and VSB) (4L); Basic principles of Non-linear modulation (Angle Modulation - FM, PM) (1L); Sampling theorem, Sampling rate, Impulse sampling, Reconstruction from samples, Aliasing (1L); Analog Pulse Modulation - PAM (Natural & flat topped sampling), PWM, PPM (1L). Multiplexing - TDM, FDM (1L).

Module - 2: Digital Transmission: [9]

Concept of Quantisation & Quantisation error, Uniform Quantiser (1L); Non-uniform Quantiser, A-law & μ-law companding (mention only) (1L); concept of Pulse Code Modulation ; Delta modulation, Adaptive delta modulation, DPCM (basic concept and importance only, no details) (2L); Encoding, Coding efficiency (1L); Line coding & properties, NRZ & RZ, AMI, Manchester coding (1L); Baseband Pulse Transmission, Matched filter (mention of its importance and basic concept only), Error rate due to noise (2L); ISI, Raised cosine function, Nyquist criterion for distortion-less base-band binary transmission, Eye pattern, (1L).

Module - 3:Digital Carrier Modulation & Demodulation Techniques: [5]

Bit rate, Baud rate (1L); M-ary encoding, Introduction to the different digital modulation techniques - ASK, FSK, PSK, BPSK, QPSK, mention of 8 BPSK, 16 BPSK (2L); Introduction to QAM, mention of 8QAM, 16 QAM without elaboration (1L); Spread Spectrum Modulation - concept only (1L).

Module - 4:Information Theory & Coding: [8]

Introduction, News value & Information content (1L); Entropy (1L); Mutual information (1L); Information rate (1L); The Shannon limit, Shanon-Fano algorithm for encoding (1L); Shannon's Theorem - Source Coding Theorem (1L); Channel Coding Theorem, Information Capacity Theorem (basic understanding only) (1L); Error Control & Coding – basic principle only (1L)

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Principles of Communication Systems, H. Taub and D .L.Schilling, TMH Publishing Co.

References:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition).
2. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
3. Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, Oxford University Press.
4. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
5. Communications System (Analog and Digital) by Dr. Sanjay Sharma S K Kataria and Sons.

CO-PO Mapping:

CO & PO Mapping												
PO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CS(ECE)504C .1	3	3	3		1	1			2			3
CS(ECE)504C .2	3	3		3	3		2			1	2	3
CS(ECE)504C .3	3	3	3	3	2	2			1			3
CS(ECE)504C .4	3	3	3	2	3		2			2	2	3
CS(ECE)504C .5	3	3		3	3	2						3
CS(ECE)504C .6	3	3	3			2	2	3	1	2		3

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Principles of Communication Systems, H. Taub and D .L.Schilling, TMH Publishing Co.

References:

1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition).
2. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
3. Modern Digital and Analog Communication Systems, B.P.Lathi and Z.Ding, Oxford University Press.
4. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
5. Communications System (Analog and Digital) by Dr. Sanjay Sharma S K Kataria and Sons.

Subject Name: Operations Research
Subject Code: CS 505A
Contact Hours: 3L/Week
Credits: 3

Prerequisite: Basic Knowledge of Function, plotting of Equation and inequations, Formulation of Mathematical Problem. Finding maximum and minimum from row or column or from Matrix.

Course Objective
Purpose of this course to develop models and then analyze the model using the techniques of Operations Research, Decision making under uncertainty and risk.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand Decision making procedure and its applications - Explain or Illustrate and Identify queuing model and simulation in real life scenario.
CO2	Understand the essential features and scope of optimization techniques - Learn and Analyze the properties of objective function and formalization of optimization problem.
CO3	Learn numerical methods to find optimum point and value of a function - Learn to solve the LPP.
CO4	Explain or Illustrate transportation problems and assignment problems. - Apply in real life situations.
CO5	Learn applications of network models and analyse the model – Learn to use Tabu Search methods in various fields.

Module I
Linear Programming Problem(LPP): Basicsof 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. 4**L+2L+2L=8L**

Module II
Transportation Problem, Assignment Problem.
5L

Module III

Game Theory: Introduction**;**Two person Zero Sum game, Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance. **5L**

Module IV

Network Optimisation Models: CPM / PERT (Arrow networ, 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.**5L**

Module V

Sequencing: Two men two machines, Three Men Two Machines 2**L**

Module VI

Queuing Theory: Introduction and Basic Structure of Queuing Theory; Basic Definations and Notations; Birth-and-Death Model (Poisson / Exponential distribution); Poisson Queue Models: (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) and Problems.**5L**

Module VII

Inventory Control: Determination of EOQ, Components, Deterministic Continuous &Deterministic Periodic Review Models, Stochastic Continuous & Stochastic Periodic Review Models.**3L**

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

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS505A.1	2	3	3	2								
CS505A.2	2	3	3	2								
CS505A.3	2	3	3	2								
CS505A.4	2	3	3	2								
CS505A.5	2	3	3	2								

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
CS505A.1	3	3	3
CS505A.2	3	3	3
CS505A.3	3	3	3
CS505A.4	3	3	3
CS505A.5	3	3	3

Subject Name: Computational Geometry
Subject Code: CS505B
Contact Hours: 3L/Week
Credits: 3

Prerequisites:

1. Mathematics-II
2. Algorithms &Programming Concept

Course Objective(s)

1. The objectives of this course are as follows:
2. Introduce rigorous algorithmic analysis for problems in Computational Geometry.
3. Discuss applications of Computational Geometry to graphical rendering.
4. Introduce the notions of Voronoi diagrams and Delaunay Triangulations.
5. Develop expected case analyses for linear programming problems in small dimensions.

Course Outcome(s)

1. Upon successful completion of this course, students will be able to:
2. Analyze randomized algorithms for small domain problems.
3. Use line-point duality to develop efficient algorithms.
4. Apply geometric techniques to real-world problems in graphics.
5. Solve linear programs geometrically.

Module 1:

CONVEXHULLS ALGORITHMS: Orientation test; Degeneracy; Jarvis' march, Divide & conquer; Graham's scan, Chan's algorithm. [6 hours].

PLANE-SWEEP ALGORITHMS:Line segment intersections (Plane-sweep), Doubly linked edge list, Overlay subdivisions, **Polygon Triangulation** (Triangulating monotone polygons, Partitioning simple polygons), **Convex Partitioning**(Lower and upper bounds, A factor 4 approximation algorithm). [8 hours]

Module 2:

LINEAR PROGRAMMING:Manufacturing with Molds (Necessary and Sufficient condition, Half-Plane Intersections), **Linear Programming** (Feasible Region, Optimal solution; Incremental and randomized algorithms) [6 Hours]

ORTHOGONAL SEARCH:Geometric data structures; **Range search** (Quad-tree, kd-tree), **Improvements on range searching** (Range tree, fractional cascading), **Inverse Range Search** (Segment tree, interval tree, priority search tree) [6 Hours]

Module 3:

VORONOI DIAGRAMS & DELAUNAY TRIANGULATIONS:Voronoi diagrams (furthest point Voronoi diagram, other distance metrics, and Fortune's plane sweep algorithm), **Delaunay triangulation** (Empty circles, local Delaunay hood, edge-flip, lifting, analysis, maxmin angles), **Randomized incremental algorithm** (Incremental construction, backward analysis etc.) , Point Location (DAG structure for point location in triangulations), **Steiner triangulations** (quality measure; quad-trees) **, Delaunayrefinement** (Circumcenter insertion , Sphere packing argument) [9 Hours]

Module 4:

ARRANGEMENTS:Zones (Duality, line arrangements; complexity, incremental algorithm, zone theorem), **Levels and discrepancy** (Super-sampling for rendering; Half-plane discrepancy) [4 Hours]

OTHER GEOMETRY APPLICATIONS:Geometric Approximation Algorithms (TSP, Metric TSP, Euclidean TSP Polynomial Time Approximation Scheme (PTAS)), **Motion Planning** (Trapezoidal Maps, Robotics, Configuration Space. Connectedness, Visibility Graphs) [6 Hours]

Text Book

1. M. de Berg, M. van Kreveld, M. Overmars, and O. Schwarzkopf. Computational Geometry: Algorithms and Applications. Springer-Verlag, 2nd edition, 2000.

Reference Book

1. Franco P. Preparata and Michael Ian Shamos, Computational geometry: An Introduction, 1 st edition, Springer-Verlag New York.
2. M. Bern and D. Eppstein. Mesh generation and optimal triangulation. Computing in Euclidean Geometry (2nd ed.)
3. H. Edelsbrunner. Triangulations and meshes in computational geometry. Acta Numerica (2000), 133-213.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS505B.1	1	1	1									1
CS505B.2	1	1	1								1	1
CS505B.3	1	1	1								1	1
CS505B.4	1	1	1								1	1
CS505B.5	1	1	1								1	1
CS505B	1	1	1								1	1

Paper Name: Digital Signal Processing
Paper Code: CS505C
Contacts: 3L /Week
Credits: 3
Total Contact: 35

Course Objective(s)

- To introduce student with the concept of signal, systems and sampling theorem.
- To study of convolution-sum or response of LTI system.
- To study the z-transform, convolution, correlation and applications of z -transform.
- To introduce students with transforms for analysis of discrete time signals and systems.
- To understand the digital signal processing, sampling and aliasing.
- To use and understand implementation of digital filters.
- To study filter design techniques.
- To study Discrete Fourier Transforms.
- To study Fast Fourier Transforms and application of DSP.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Determine the spectral coefficients and the Fourier series components of discrete-time signals.
CO2	Determine the discrete Fourier transform of discrete-time signals.
CO3	Calculate the outputs of discrete-time systems in response to inputs and design Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, and evaluate the performance to meet expected system specifications using MATLAB.
CO4	Determine the frequency response and the z-transform of discrete-time systems.
CO5	Demonstrate an understanding of contemporary issues by reviewing recent technical articles and establishing between the course material and the content of the article.

Module I:**Discrete-time signals &LTI Systems:** [10L]

Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem.sequences – periodic, energy, power, unit sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences.

Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercises.Properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions.

Module II:**Z-Transform:**[7L]
Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs.

Convolution, correlation and multiplication using Z-transform, initial value theorem, Perceval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises.

Module III:**Discrete Fourier Transform & Fast Fourier Transform** [8L]

Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises. Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises.

Module IV:**Filter Design** [6L]
Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, Design FIR filters using rectangular, Hamming and Blackman windows.

Module V:**Application of DSP**[4L]
Concept of Subband coding, speech analysis and application on image processing etc.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS505C.1	2	3	3	2								
CS505C.2	2	3	3	2								
CS505C.3	2	3	3	2								
CS505C.4	2	3	3	2								
CS505C.5	2	3	3	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS505C.1	3	3	3
CS505C.2	3	3	3
CS505C.3	3	3	3
CS505C.4	3	3	3
CS505C.5	3	3	3

Practical

Computer Graphics Lab
Code: CS 591
Contact: 3P/Week
Credits: 2

Prerequisites: Knowledge of C programming language

Course Objective(s)

- To understand the need of developing graphics application
- To learn algorithmic development of graphics primitives like: line, circle, polygon etc.
- To learn the representation and transformation of graphical images and pictures.

Course Outcomes (COs):
After attending the course students should be able to

CO1	Understand the fundamental concept of Computer graphics and mathematical knowledge and explain the foundations of computer graphics and different display technology and devices.
CO2	Demonstrate different scan conversion algorithms, drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms, clipping algorithms, surface removal algorithms using graphics tools.
CO3	Understand the basic concept of graphics programming and implement clipping with the comprehension of windows, view-ports in relation to images display on screen.
CO4	Analyze and compare different drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms hidden surface illumination methods
CO5	Develop the concept of geometric models, mathematical and algorithmic approach necessary for programming computer graphics leading to lifelong learning.

Experiments

1. Study of basic graphics functions defined in “graphics.h”.
2. Study of graphics standards like CORE, GKS (Graphics Kernel System), GKS3D (Graphics
3. Kernel System -3 Dimensions), PHIGS (Programmer's Hierarchical
4. Interactive Graphics Systems), CGM
5. (Computer Graphics Metafile), CGI (Computer Graphics Interface).
6. Program to implement basic graphics primitives in OpenGL.
7. Program for Line Drawing using DDA algorithm using C and OpenGL.
8. Program for Line Drawing using Bresenhams algorithm using C and OpenGL.
9. Programs using 2-D transformations in C.
10. Implement Polygon filling algorithms [Flood-Fill Algorithm] in C.
11. Programs to study window to viewport transformations in C.
12. Program for Cohen Sutherland Line clipping algorithm in C.
    Programs to study 3-D transformations in C.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS591.1	3	3	3	3	2				3			
CS591.2	3	3	3	3	2				3			
CS591.3	3	3	3	3	2				3			
CS591.4	3	3	3	3	2				3			
CS591.5	3	3	3	3	2				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS591.1	3	3	3
CS591.2	3	3	3
CS591.3	3	3	3
CS591.4	3	3	3
CS591.5	3	3	3

Paper Name: Operating Systems Lab
Code: CS 592
Contacts: 3P/Week
Credits: 2

Prerequisites:

1. Computer organization
2. Computer Architecture
3. Data Structures
4. Algorithms &Programming Concept

Course Objective(s)

- To familiarize the students with the Operating System.
- To demonstrate the process, memory, file and directory management issues under the UNIX/ LINUX operating system
- To introduce LINUX basic commands
- To make students how to make simple programs in LINUX and administrative task of LINUX

Course Outcomes (COs):

After attending the course students should be able to

CO1	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO2	Understand the concepts of deadlock in operating systems.
CO3	Implement them in Multiprogramming system.
CO4	Create process creation and implement inter process communication
CO5	Analyze the performance of the various page replacement schemes

Experiments

1. **Essential Linux Commands[9P]:** Commands for files and directories cd, cp, mv, rm, mkdir, more, less, creating and viewing files, using cat, file comparisons, View files, kill, ps, who, sleep, grep, fgrep, find, sort, cal, banner, touch, file related commands – ws, sat, cut, grep etc. Mathematical commands –expr, factor, units, Pipes(use functions pipe, popen, pclose), named Pipes (FIFOs, accessing FIFO)

2. **Shell Programming [6P]:** Creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).

3. **Process [3P]**: Starting new process, replacing a process image, duplicating a process image.

4. **Semaphore [3P]:** Programming with semaphores (use functions semget, semop, semaphore_p, semaphore_v).

5. **POSIX Threads[6P]:** Programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)

6. **Shared Memory [9P]:**Create the shared memory , Attach the shared memory segment to the address space of the calling process , Read information from the standard input and write to the shared memory,

Read the content of the shared memory and write on to the standard output , Delete the shared memory .

Books:

Yashavant P. Kanetkar, UNIX Shell Programming, 1st edition, BPB Publications

Beej's Guide to Unix IPC

W. Richard Stevens, UNIX Network Programming, 2nd edition, Prentice Hall

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS592.1	3	3	3	3	3				3			
CS592.2	3	3	3	3	3				3			
CS592.3	3	3	3	3	3				3			
CS592.4	3	3	3	3	3				3			
CS592.5	3	3	3	3	3				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS592.1	3	3	3
CS592.2	3	3	3
CS592.3	3	3	3
CS592.4	3	3	3
CS592.5	3	3	3

Database Management System Lab CS593
Contact: 3P/Week
Credits: 2
Prerequisite:

1. Logic of programming language
2. Basic concepts of data structure and algorithms

. To learn database design as well as to design user interface and how to connect with database.

Course Outcomes (COs):

After attending the course students should be able to

CO1	To Understand and Describe the basic concepts and utility of Database management system, different data models of Database management system.
CO2	To Design an Entity Relationship (E-R) Diagram and relational model for any kind of real-life application and able to Apply relational algebra operations, SQL, Neo4j for solving query.
CO3	To Analyze and Create the relational database for any real-life applications based on normalization.
CO4	To Apply the query optimization techniques, different file organization techniques and Determine whether the transaction satisfies the ACID properties.
CO5	To Implement and organize the database of an organization as a team.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS593.1	3	2	2	2	2				3			3
CS593.2	3	2	2	2	2				3			3
CS593.3	3	3	2	2	2				3			3
CS593.4	3	2	2	2	2				3			3
CS593.5	3	2	2	2	2				3			3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS593.1	3	3	3
CS593.2	3	3	3
CS593.3	3	3	3
CS593.4	3	3	3
CS593.5	3	3	3

Text Book:

1) "SQL, PL/SQL the Programming Language of Oracle" by Ivan Bayross, BPB Publications
2) "Oracle Applications Development", by Ivan Bayross, BPB Publications
3) "SQL The Complete Reference 3rd Edition", by James Groff and Paul Weinberg, McGrawHill

Object Oriented Programming Lab

Code: CS(IT)594A
ContactHours : 3P/Week
Credits: 2
Practical Class allotted: 12 no of labs X 3=36

Perquisite:Knowledge of C programming language

Course Objective(s)

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Create the procedure of communication between Objects, classes & methods.
CO2	Understand the elementary facts of Object Orientation with various characteristics as well as several aspects of Java.
CO3	Analyze distinct features of different string handling functions with various I/O
CO4	Discuss simple Code Reusability notion w.r.t. Inheritance, Package and Interface.
CO5	Apply Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

Experiments

1. Assignments on Basic Object oriented programming in java using class-object & method, constructor (Default constructor, parameterized constructor, Copy constructor), method/constructor overloading.

2. Assignments on Inheritance (Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance) method overriding.

3. Assignments on Dynamic method Dispatch, encapsulation, this keyword, super keyword &super () method, static keyword, final keyword.

4. Assignments on developing Data abstraction- Abstract class & abstract methods, interfaces- multiple inheritance, extending interfaces.

5. Assignments on creating and accessing packages, exception handling (Different case studies of try-catch-finally block, chained exception, used defined exception with throw and throws keyword.)

6. Assignments on multithreaded programming-Thread creation, different method implementation of Thread life cycle (yield(), suspend(), resume(), sleep(n), join(), isAlive(), wait(), notify()), Thread priority, Thread Synchronization.
7. Assignments on applet programming.

Textbooks:

1. Herbert Schildt – "Java: The Complete Reference " – 9th Ed. – TMH
2. E. Balagurusamy – " Programming With Java: A Primer " – 3rd Ed. – TMH.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS594A.1	3	3	2	3	2				3			2
CS594A.2	3	3	3	3	2				3			2
CS594A.3	3	3	3	3	2				3			2
CS594A.4	3	3	3	3	3				3			2
CS594A.5	3	3	3	3	3				3			2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS594A.1	3	2	2
CS594A.2	3	2	2
CS594A.3	3	2	3
CS594A.4	3	2	3
CS594A.5	3	3	3

Multimedia Technology Lab
CS(IT)594B Contracts:
3P/Week Credits- 2
Perquisite:

1. Knowledge of C programming language

Course Outcome(s)

CS(IT)594B.1	To understand about various latest interactive multimedia devices, the basic concepts about images and image formats.
CS(IT)594B.2	To understand about data compression techniques, image compression techniques like JPEG, video compression techniques like MPEG, and the basic concepts about animation.
CS(IT)594B.3	To 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.
CS(IT)594B.4	plan experiments to test user perception of multimedia tools
CS(IT)594B.5	analyse the effects of scale and use on both presentation and lower level requirements

Experiments

1. Perceptual and cognitive psychology related to visual and auditory perception. **(9L)**
2. Methods of data sampling and digitization relative to different formats of audio and video media: frequency- and spatial-based sampling., vector-based and sampling-based media representations, audio and video files including AVI and WAV, uses and application of XML, media data compression. **(9L)**
3. Sound capturing & editing using tools like SOUNDFORGE **(9L)**
4. Image editing using tools like Adobe Photoshop **(9L)**
5. Creating/editing motion video/animation clips (using tools like Flash / Adobe Premier) **(9L)**

Books

1. Adobe Photoshop CC Classroom in a Book (2018 release), Pearson Ed.,
2. Anushka Wirasinha , Flash in a Flash- Web Development , PHI
3. Macromedia Flash5 fast and easy Web Development, Design, PHI
4. Lozano, Multimedia- Sound & Video , PHI

Mapping for CS594B

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS(IT)594B.1	3	3	3	3	3	2	1	1	2	2	1	1
CS(IT)594B.2	3	3	3	3	3	2	1	1	2	2	2	1
CS(IT)594B.3	3	3	3	3	3	2	2	1	2	2	2	2
CS(IT)594B.4	3	3	3	3	3	3	2	1	2	1	2	3
CS(IT)594B.5	3	3	3	3	3	3	2	1	2	1	2	2
CS(IT)594B	3	3	3	3	3	2	2	1	2	2	2	2

Communication Engineering Lab
Code:CS (ECE) 594C Contact
Hours: 3P/Week Credits: 2

Prerequisites: Knowledge in basic electronics and communication.

Course Objective(s)

- To provide the basic skills required to understand, develop, and design of various engineering applications involving analog and digital communication theory.
- To provide basic laboratory exposures for communication principles and applications.

Course Outcome(s)

CS (ECE) 594C.1 Clearly distinguish between contemporary digital communicationstechniques. **CS (ECE) 594C.2** Demonstrate to the practical methods of the use of generating communication signals.
CS (ECE) 594C.3 Evaluate practical methods of the use of demodulation communication signals.
CS (ECE) 594C.4 Distinguish the significance of signal constellation and spectral width.
CS (ECE) 594C.5 Develop insight into the relations between the input and output signals in various stages of a transmitter and a receiver.

Experiments

1. Measurement of modulation index of an AM signal.
2. Generation of FM using VCO chip (to view the wave shapes).
3. Study of PAM and demodulation.
4. Study of PCM and demodulation.
5. Study of ASK modulator and demodulator.
6. Study of BPSK modulator and demodulator.
7. Study of BFSK modulator and demodulator.

Text Books:

1. An Introduction to Analog and Digital Communications by Simon Haykin; Published by Wiley India.
2. Principles of Communication Systems, H. Taub and D .L.Schilling, TMH Publishing Co.

Program Outcomes (POs)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CS(ECE)594C.1	3	3	3		1	1			2			3
CS(ECE)594C.2	3	3		3	3		2			1	2	3
CS(ECE)594C.3	3	3	3	3	2	2			1			3
CS(ECE)594C.4	3	3	3	2	3		2			3	2	3
CS(ECE)594C.5	3	3		3	3	2						3

Course Objectives:

1. To generate the elementary signals/ waveforms and perform the various operation on the

signals.

2. To Compute the linear convolutionand verify the properties of convolution.
3. To plot frequency response of a given LTI system.
4. To Implement DFT and FFT of a given sequence.
5. To determine the z-transform of different sequences.
6. To design and Plot of Magnitude and Phase of different types of filters.

Department of Computer Science and Engineering

Curriculum Structure

&

Syllabus

2016-2017

(Autonomy)

of

6th Semester

			6TH SEMESTER					
				Contact hours				Cr. Points
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	PC	CS601	Computer Network	3	0	0	3	3
2	PC	CS602	Microprocessor and Microcontroller	3	0	0	3	3
3	PC	CS603	Software Engineering	3	0	0	3	3
4	PE	CS604A	Compiler Design					
		CS604B	Robotics					
		CS604C	Simulation and modeling	3	0	0	3	3
5	FE	IT(CSE)605A	Pattern Recognition					
		IT(CSE)605B	Distributed Operating System					
		IT(CSE)605C	Distributed Database					
		IT(CSE)605D	Computer Vision	3	0	0	3	3
6	FE	IT(CSE)606A	Data Warehousing and Data Mining					
		IT(CSE)606B	Digital Image Processing					
		IT(CSE)606C	E-commerce and ERP	3	0	0	3	3
Total Theory							18	18
			B. PRACTICAL					
7	PC	CS691	Computer Network Lab	0	0	3	3	2
8	PC	CS692	Microprocessor and Microcontroller Lab	0	0	3	3	2
9	PC	CS693	Software Engineering Lab	0	0	3	3	2
10		CS682	Mini Project	0	0	3	3	2
Total Practical							9	8
C. SESSIONAL								
10		CS681	Group Discussion and Seminar	0	0	3	3	2
Total							30	28

Name of the Paper: COMPUTER NETWORKS
Paper Code: CS601
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 36

Prerequisite:

3. Familiarity and knowledge of Operating Systems and Computer Architecture
4. Also require little bit programming languages concepts like C, Java.

Course Objective(s)

1. To educate basic knowledge of networking technologies and network management concepts
2. To interpret the layering concepts in computer networks.
3. To analyze the functions of each layer and gain knowledge in different applications that use computer networks.
4. To emphasize the hand-on experience of network topology in a laboratory environment
5. To be familiar with contemporary issues in networking technologies.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand basics of computer network and different architecture and topologies of computer network and analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CO2	Understand/analyze different protocol of data link layer and apply them to solve engineering problems.
CO3	Understand/analyze different protocol of Network and Transport Layer and apply them to solve engineering problems.
CO4	Understand/analyze different protocol of session and application layer and apply them to solve engineering problems.
CO5	Develop Analyze, specify and design the topological and routing strategies using socket programming.

Module I: Introduction [6L]

Introduction (3L):

Introduction: Computer Network, data communication, topology, OSI & TCP/IP Reference Models, layers and characteristics, Wireless Network, comparison to wired and wireless network.

Physical Layer: [3L]

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;

Module II: Data Link Layer [10L]

Framing, Error Control, Error Detection and Correction, Flow Control, Data Link Protocols, Simple Stop-and-Wait Protocol, ARQ mechanism, Sliding Window Protocols, One-Bit Sliding Window Protocol, Go-Back-N and Selective Repeat, HDLC, PPP Medium Access Control Sub-layer, The Channel Allocation. **[5L]**

Multiple Access Protocols **:** ALOHA, Carrier Sense Multiple Access Protocols, IEEE 802.x Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, Wireless LANs - IEEE 802.xx , Bluetooth, RFID, Bridges, Virtual LANs, Switching**.[5L]**

Module III: Network Layer [10L]

IP Addressing, IPv_4 and IPv_6. Difference IPv_4 and $IPv_{6,\ Conversion}$ of IPv_4 and IPv_6 , Subnetting, Supernetting, Design Issues, Store-and-Forward Packet Switching, Virtual-Circuit and Datagram Networks, ARP, IP, ICMP, IPV6, BOOTP and DHCP–Delivery protocols Other Protocols such as mobile IP in wireless Network**.. [5L]**

Routing: Shortest Path Algorithms, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing, : RIP, OSPF, BGP; Routing for Mobile Hosts**. [5L]**

Transport layer: [6L]

Process to Process delivery; UDP; TCP, SCTP, TCP RENO, TCP/IP in Wireless environment, Congestion control in TCP :Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm. **[5L]**

Advanced topic such as Remote Procedure Call, Delay Tolerant Networks.**[1L]**

Module IV: Application Layer [4L]
Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW: Cryptography (Public, Private Key based), Digital Signature, Firewalls

Socket Programming [2L]
Introduction to Socket Programming, UDP socket and TCP Socket

Text books:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI

Recommended books:

1. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
2. Leon, Garica, Widjaja – "Communication Networks" – TMH

Substantial/ High	3
Medium	2
Low	1
No Correlation	

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS601.1	3	3	2	2	2				2	2		3
CS601.2	3	3	3	3	3				2	2		3
CS601.3	3	3	3	3	3				2	2		3
CS601.4	3	3	3	3	3				2	2		3
CS601.5	2	3	3	3	3				2	2		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS601.1	3	3	3
CS601.2	3	3	3
CS601.3	3	3	3
CS601.4	3	3	3
CS601.5	3	3	3

Name of the Paper: Microprocessors & Microcontrollers
Paper Code: CS602
Contact (Periods/Week): 3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

1. Familiarity with the number system
2. A solid background in digital logic.

Course Objective(s)

- To learn the basics of a particular microprocessor.
- To learn the basics of a particular microcontroller.
- To learn the interfacing of microprocessor.

Course Outcomes (COs):

After attending the course students should be able to

CO1	To acquire the knowledge of hardware details of 8085 and 8086 microprocessor AND 8051 microcontroller with the related signals and their implications.
CO2	To develop skill in assembly Language programming of 8085
CO3	To understand the concept and techniques of designing and implementing interfacing of microprocessor with memory and peripheral chips involving system design.
CO4	To analyze the performance of computers and its architecture to real-life applications
CO5	Analyze the data transfer information through serial & parallel ports.

Module -1: [9L]
Introduction to Microcomputer based system. [1L]
History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages. [1L]
Architecture of 8085 Microprocessor, Pin description of 8085. [2L] Address/data bus De-multiplexing, Status Signals and the control signals. [1L]
Interrupts of 8085 processor (software and hardware) [2L]
I/O Device Interfacing - I/O Mapped I/O and Memory Mapped I/O,
Memory interfacing with 8085 [2L]

Module -2: [11L]
Instruction set of 8085 microprocessor, Addressing modes. [3L]
Assembly language programming with examples, Counter and Time Delays, Stack and Subroutine. [6L]
Timing diagram of the instructions (a few examples) [2L]
Module 3: [8L]
The 8086 microprocessor- Architecture, Pin Details, Addressing modes, Interrupts [3L]
Instruction set, Examples of Simple Assembly Language [3L]
Memory interfacing with 8086 [2L]

Module -4: [7L]
Introduction to 8051 Microcontroller – Architecture, Pin Details. [3L]
Addressing modes, Instruction set, Examples of Simple Assembly Language. [4L]

Text Books:

1. MICROPROCESSOR architecture, programming and Application with 8085 - R. Gaonkar (Penram international Publishing LTD.) ***[For Module 1 and 2]***
2. Fundamentals of Microprocessor and Microcontrollers - B. Ram (Paperback) ***[For Module 3]***
3. 8051 Microcontroller – K. Ayala (Cengage learning) ***[For Module 4]***

Recommended books:

1. 8086 Microprocessor – K Ayala (Cengage learning)
2. The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)
3. Microprocessors – The 8086/8088, 80186/80386/80486 and the Pentium family – N. B. Bahadure (PHI).

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS602.1	3	3	3	2								
CS602.2	3	3	3	2								
CS602.3	3	3	3	2								
CS602.4	3	3	3	2								
CS602.5	3	3	3	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS602.1	3	3	3
CS602.2	3	3	3
CS602.3	3	3	3
CS602.4	3	3	3
CS602.5	3	3	3

Paper Name: Software Engineering

Code:CS603

Contacts:3

L Credits:3

Allottedhours:34L

Prerequisite:

1. An understanding of basic computer software
2. Object Oriented programming skills.

Course Objective(s)

1. To develop basic Knowledge in Software Engineering and its applications.
2. To understand software Engineering layered architecture and the process frame work.
3. To analize software process models such as the waterfall, spiral, evolutionary models and agile method for software development.
4. To design software requirements and specifications of documents.
5. To understand project planning, scheduling, cost estimation, risk management.
6. To describe data models, object models, context models and behavioral models.
7. To learn coding style and testing issues.
8. To know about the quality checking mechanism for software process and product.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic concept of Software Engineering and mathematical knowledge and apply them in designing solution to engineering problem including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
CO2	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project
CO3	Design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
CO4	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice team work.
CO5	Identify and Use modern engineering tools necessary for software project management time management and software reuse, and an ability to engage in life-long learning.

ModuleI(6L)

SoftwareEngineering–Characteristics,Components,Application,Definitions,SoftwareProcessmodels-WaterfallModel,Prototypemodel,RAD,EvolutionaryModels,Incremental,Spiral.,SoftwareProjectPlanning-FeasibilityAnalysis,TechnicalFeasibility,Cost-BenefitAnalysis,Basics of estimation : COCOMO (Basic, intermediate, Complete) model

ModuleII(6L)

SystemAnalysis:PrincipleofStructureAnalysis,RequirementAnalysis,DFD,EntityRelationship Diagram,DataDictionary,DataModeling,SoftwareRequirementsSpecification

SoftwareDesignAspects:Objectives,Principles,Concepts,HLD and LLD,Top-DownandBottom- Updesign;Decision tree,decisiontableandstructuredEnglish,Structurechart,TransformanalysisFunctional Vs.Object-Orientedapproach.

ModuleIII(3L)

Introduction to Agile Methodology ,Agile Testing , Quality in agile software development

ModuleIV(4L)

UnifiedModelingLanguage:
Classdiagram,interactiondiagram:collaborationdiagram,sequencediagram,statechartdiagram,activity, diagram,implementationdiagram, Use Case diagram

ModuleV(10L)

Coding&Documentation–
StructuredProgramming,ModularProgramming,ModuleRelationship-Coupling,Cohesion,OOProgramming,InformationHiding,Reuse,SystemDocumentation.

Testing–LevelsofTesting,IntegrationTesting,SystemTesting**.**

TestCases-
WhiteBoxandBlackBoxtestingSoftwareQuality,QualityAssurance,SoftwareMaintenance, SoftwareConfigurationManagement,SoftwareArchitecture.

ModuleVI (5L)

Software Project Management – Project Scheduling, Staffing, Quality Assurance, Risk Management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement Project Monitoring.

Text Book

1. SoftwareEngineering:Apractitioner’sapproach–Pressman(TMH)

ReferenceBooks

1.SoftwareEngineering-PankajJalote(Wiley-India)

2.SoftwareEngineering-RajibMall(PHI)

4. SoftwareEngineering–AgarwalandAgarwal(PHI)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS603.1	3	3	3	2								3
CS603.2	3	3	3	2								3
CS603.3	3	3	3	2								3
CS603.4	3	3	3	2								3
CS603.5	3	3	3	2								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS603.1	3	3	3
CS603.2	3	3	3
CS603.3	3	3	3
CS603.4	3	3	3
CS603.5	3	3	3

Name of the Paper: Compiler Design
Paper Code: CS604A
Contact (Periods/Week): 3L / Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

- Mathematics
- Concept of programming languages
- Data structures
- Computer architecture
- Formal languages and automata theory
- Some advanced math might be required if you adventure in code optimization

Course Objectives:

- To make the student understand the process involved in a compiler, create an overall view of various types of translators, linkers, loaders, and phases of a compiler,
- Understand what is syntax analysis, various types of parsers especially the top down approach, awareness among students the various types of bottom up parsers,
- Understand the syntax analysis and, intermediate code generation, type checking, the role of symbol table and its organization, Code generation, machine independent code optimization and instruction scheduling.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate the basic concept of compilers and discuss on the components as well as the strengths and weaknesses of various phases of designing a compiler.
CO2	Design and analyze algorithms for syntactic or parsing techniques and semantic analysis of the process of designing compilers.
CO3	Develop the parsers and experiment the knowledge of activation tree, activation record and dynamic storage allocation techniques
CO4	Construct the intermediate code representations and generation.
CO5	Apply for various optimization techniques for dataflow analysis.

Syllabus:

Module I [7L]
Compilers, Cousins of the Compiler, Analysis-synthesis model, The phases of the compiler.

The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of tokens, Finite automata, From a regular expression to an NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).

Module II [10L]
The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR, Canonical LR), Parser generators (YACC), Error

Recovery strategies for different parsing techniques.
Syntax directed translation: Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S-attributed definitions, L-attributed definitions, Bottom-up evaluation of inherited attributes.

Module III [7L]

Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions
Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Symbol tables, dynamic storage allocation techniques.

Module IV[3L]

Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Module V [8L]

Consideration for Optimization, scope of optimization, local optimization, loop optimization, folding, DAG representation, Flow Graph, Data flow equation, global optimization, redundant sub expression elimination, induction variable elimination, copy propagation, basic blocks & flow graphs, transformation of basic blocks, DAG representation of basic blocks, peephole optimization
Object code forms, machine dependent code optimization, register allocation and assignment, generic code generation algorithms, DAG for register allocation.

Recommended Text Books:

[1] Alfred Aho, V. Ravi Sethi, D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison Wesley, 2nd edition
[2] Holub Allen. Compiler Design in C, PHI, 1993.

Recommended reference Books:

[1] Chattopadhyay, Santanu. Compiler Design. PHI Learning Pvt. Ltd., 2005
[2] Tremblay and Sorenson Compiler Writing-McgrawHill International

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS604A.1	3	3	2	3								3
CS604A.2	3	3	3	3								3
CS604A.3	3	2	2	3								3
CS604A.4	2	2	3	3								3
CS604A.5	3	2	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS604A.1	3	3	3
CS604A.2	3	3	3
CS604A.3	3	3	3
CS604A.4	3	3	3
CS604A.5	3	3	3

PaperName: ROBOTICS
Code:CS604B Contacts:3L
Credits:3
Allottedhours:35L

Prerequisite:

1. Microprocessor & Microcontroller
2. Computer Organization & √√Architecture

Course Objective

1. To study microcontroller operations for robotics.
2. To study how different interfaces are actually implemented in a microcontroller.
3. To learn how Microchip PIC micro PIC16F627 can be erased and reprogrammed
4. To learn how different sensors, outputs, and peripherals can be wired to a microcontroller to work cooperatively and create a high-level control program.
5. To design robots in a real time environment.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic concepts of robotics exploring the characteristics of its various components, motion control, actuator and drive system and the functions of various sensors in robotics, and robot programming.
CO2	Apply the concepts of robotics for machine loading and their kinematics and analyze the kinematics of serial and parallel robots, motion control systems.
CO3	Illustrate concepts of Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators.
CO4	Understand classical control concepts and use advanced topics in non-linear control of manipulators.
CO5	Develop algorithmic solutions and corresponding robot-programs for designing various robotic systems.

Syllabus:

MODULE I (5L)

Brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.

Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common

sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

MODULE II (8L)

Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.

Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

MODULE III (8L)

Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.

Mass and inertia of links, Lagrangian formulation for equations of motion for serial andparallel manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics, Commercially available multi-body simulation software (ADAMS) and Computer algebra software Maple.

MODULE IV (9L)

Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.

Models of flexible links and joints, Kinematic modeling of multi-link flexible robots, Dynamics and control of flexible link manipulators, Numerical simulations results, Experiments with a planar two-link flexible manipulator.

MODULE V (5L)

Introduction and some well known wheeled mobile robots (WMR), two and three-wheeled WMR on flat surfaces, Slip and its modeling, WMR on uneven terrain, Design of slip-free motion on uneven terrain, Kinematics, dynamics and static stability of a three-wheeled WMR's on uneven terrain, Simulations using Matlab and ADAMS.

Introduction to chaos, Non-linear dynamics and chaos in robot equations, Simulations of planar 2 DOF manipulators, Analytical criterion for unforced motion. Gough-Stewart platform and its singularities, use of near singularity for fine motion for sensing, design of Gough-Stewart platform based sensors. Over-constrained mechanisms and deployable structures, Algorithm to obtain redundant links and joints, Kinematics and statics of deployable structures with pantographs or scissor-like elements (SLE's).

TEXT BOOK

1. Myke Predko, "Programming Robot Controllers" –
2. McGrawHill, 1st edition, 2003.

REFERENCES

1. Michael slater, "Microprocessor – based design: A comprehensive Guide to Effective Hardware Design", Prentice Hall, 1989.
2. Myke Predko, "Programming and customizing the 8051- micro-controller", Tata McGraw- Hill, New Delhi, 2000.
3. Kenneth J. Ayala, "The 8051 micro-controller architecture, programming and applications", Penram International publishers, Mumbai, 1996.
4. Murphy Robin R," Introduction to AI Robotics", MIT Press, 2000.
5. Siegwart R and Nourbakhsh I.R, "Introduction to Autonomous mobile Robots", Prentice Hall India, 2005.
6. Roland Siegwart, Illah R. Nourbakhsh, "Introduction to Autonomous mobile Robots", MIT Press, 2005.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS604B.1	3	3	3	3		3	3					
CS604B.2	3	3	3	3		3	3					
CS604B.3	3	2	3	3		3	3					
CS604B.4	2	2	3	3		3	3					
CS604B.5	3	2	3	3		3	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS604B.1	3	3	3
CS604B.2	3	3	3
CS604B.3	3	3	3
CS604B.4	3	3	3

CS604B.5	3	3	3

Name of the Paper: Simulation andModeling
Paper Code: CS604C
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 36

Prerequisite:

1. Programming and Data Structures
2. Discrete Mathematics and Probability theory
3. Game theory
4. Numerical Analysis

Course Objective(s)

1. To understand the Models and Simulation of Continuous and Discrete Systems.
2. To enable students to analyze Continuous Uniformly Distributed Random Numbers
3. To assess the strengths and weaknesses of various methods and to analyze their behavior.

Course Outcome(s)

On completion of the course students will be able to

CS604C .1. Student will be able to summarize the issues in Modelling and Simulation.

CS604C.2. Student will be able to explain the System Dynamics & Probability concepts in Simulation.

CS604C.3. Student will be able to solve the Simulation of Queuing Systems

CS604C.4. Student will be able to analyze the Simulation output.

CS604C.5. Student will be able to identify the application area of Modelling and Simulation, and apply them.

Module-I: Introduction to Modelling and Simulation 6L

Nature of Simulation. Systems , Models and Simulation, Continuous and Discrete Systems, system modelling, Components of a simulation study, Introduction to Static and Dynamic System simulation , Application areas, Advantages ,Disadvantages and pitfalls of Simulation.

Module –II : 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.

Module-III : Simulation of Queuing Systems and Discrete System Simulation 14L

Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in

computer system. Discrete Events ,Generation of arrival patterns ,Simulation programming tasks , Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times .

Module-IV : Analysis of Simulation output 5L

Sensitivity Analysis, Validation of Model Results

Text Book

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.
3. Geoffrey Gordon, "System Simulation", PHI.

References Book

1. Averill M. Law and W.David Kelton, "Simulation Modelling and Analysis", Third Edition, McGraw Hill 5. J. N. Kapoor.. Mathematical Modelling, Wiley eastern Limited

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS604C.1	3					1						2
CS604C.2	3	2	1									2
CS604C.3	2	3	2	2	3	2	2	2				2
CS604C.4	2	2	3	1	3	1						2
CS604C.5	1	3	1	1	3	1		2				2
CS604C	2	3	2	1	3	1	2	2				2

Paper Name: Pattern Recognition
Code: IT(CSE)605A
Contacts: 3L Credits:
3
Allotted hours: 35L

Prerequisites:

- Probability theory,
- Artificial Intelligence

Course Objectives

- Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms
- Understand the basic methods of feature extraction, feature evaluation, and data mining
- Understand and apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data
- Develop prototype pattern recognition algorithms that can be used to study algorithm behavior and performance against real-world multivariate data

Course Outcomes (COs):

After attending the course students should be able to

CO1	Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
CO2	Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.
CO3	Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
CO4	Apply pattern recognition techniques to real-world problems such as document analysis and recognition.
CO5	Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

Syllabus

Module - I
Introduction[2]: The nature of statistical pattern recognition, Definitions, data sets for Pattern Recognition
Different Paradigms of Pattern Recognition [1]

Representations of Patterns and Classes [1]
Different learning paradigms, The basic structure of a pattern recognition system[1]
Module - II
Feature extraction [2]:
Feature Extraction , Feature subset selection, and classification stages

Dimensionality reduction[4]: Principal component analysis , Fisher discriminant analysis , Factor Analysis

Module - III
Different Approaches to Prototype Selection [2]
Nearest Neighbour Classifier and variants [2]

Bayes Classifier [3]
Decision Trees [3]
Linear Discriminant Function [3]

Module – IV

Support Vector Machines [2]
Clustering [3]
Clustering Large datasets [2]
Combination of Classifiers [2]
Applications - Document Recognition [2]

Text Books:

- R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
- Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.

Reference books:

- S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
- C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS605A.1	3	2	2	2								
CS605A.2	3	2	2	2								
CS605A.3	3	3	2	2								
CS605A.4	3	2	2	2								
CS605A.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS605A.1	3	3	3
CS605A.2	3	3	3
CS605A.3	3	3	3
CS605A.4	3	3	3
CS605A.5	3	3	3

Distributed Operating System
IT(CSE)605B
Contracts: 3L
Credits- 3
Total Lecture: [33L]

Prerequisites

Concept of Operating System

Objective(s)

This course covers general issues of design and implementation of distributed operating systems. The focus is on issues that are critical to the applications of distributed systems and computer networks, which include inter-process communication, distributed processing, sharing and replication of data and files.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Develop the fundamental knowledge of parallel and distributed models
CO2	Design, development, and performance analysis of parallel and distributed algorithms
CO3	Develop and implement parallel and distributed algorithms
CO4	Analyze the performance issues in parallel computing and trade-offs
CO5	Understand the different issues involved in distributed environment

Module 1:

Fundamentals of Distributed System [5]

Definition of distributed system, Examples of distributed system, Types of distributed system, Distributed Operating System, Issues in designing a distributed operation system.
System Architecture: Centralized architecture, decentralized architecture and hybrid architecture.

Communication [4]

Inter-process communication-Message Passing: features, issues, synchronization, multidatagram message,
Remote Procedure Call, RPC message, Marshaling arguments and results, Server management.

Module 2:

Clock Synchronization: [2]

Physical and Logical Clock synchronization algorithms: Cristian’s, Berkley, Lamport's. Global State

Distributed Mutual Exclusion:[4]

Classification of distributed mutual exclusion algorithm. Permission based: Centralized algorithm, Distributed algorithms-Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm.
Election algorithm: Bully algorithm, ring algorithm.

Distributed Deadlock Detection: [4]
Deadlock handling strategies in distributed systems. Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, edge chasing, global state detection algorithm.

Module 3

Distributed file systems: [6]
Issues in the design of distributed file systems: naming, transparency, update semantics and fault resilience,File Model, File accessing Models, File caching schemes, Fault Tolerance, Examples of distributed systems including Sun NFS, the Andrew filestore, CODA file system and OSF DCE.

Distributed Shared Memory: [2]
Architecture and motivations. Algorithms for implementing DSM. Memory Coherence

Module 4

Case Study: [6]
AMOEBA: Introduction, Process management, Communication.
MACH: Introduction, Process management, Communication.
DCE: Introduction, Process management, Communication.

Text Book:

1. Andrew S. Tanenbaum, Distributed Operating Systems,Pearson Education.

Reference Book:

1. Pradeep K. Sinha, Distributed Operating System, PHI Publication
2. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201-61918-0), Addison Wesley 2001.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS605B.1	3	3	3	3								
CS605B.2	3	3	3	3								
CS605B.3	3	3	3	3								
CS605B.4	3	3	3	3								
CS605B.5	3	3	3	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS605B.1	3	3	3
CS605B.2	3	3	3
CS605B.3	3	3	3
CS605B.4	3	3	3
CS605B.5	3	3	3

Name of the Paper: Distributed Database
Paper Code: IT(CSE)605C
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 41

Prerequisite:

3. Good knowledge in Database Management System.
4. Determination to learn new and difficult things.

Course Objective(s)

- To learn the principal and foundation of distributed database.
- To learn the architecture, design issue and integrity control of distributed database.
- To learn the details of query processing and query optimization technique.
- To learn the concept of transaction management in distributed database.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand distributed database systems architecture and design
CO2	Be able to apply methods and techniques for distributed quey processing and optimisation
CO3	Understand the broad concepts of distributed transaction process
CO4	Understand the basic concepts of Data warehousing and OLAP technology
CO5	Be able to apply methods and techniques for association analysis, data classification and clustering

Syllabus

Module I: [9L]

Introductory concepts and design of (DDBMS)

Data Fragmentation; Replication; and allocation techniques for DDBMS; Methods for designing and implementing DDBMS, designing a distributed relational database; Architectures for DDBMS: cluster federated, parallel databases and client server architecture.

Module II:[9L]

Query Processing[4L]

Overview of Query Processing: Query processing problem; Objectives of Query Processing; Complexity of Relational Algebra operations; characterization of Query processors; Layers of Query Processing;
Translation of global queries.

Transaction Management[5L] Introduction To Transaction Management: Definition of Transaction, Properties of Transaction, types of transaction ; Distributed Concurrency Control: Serializability theory; Taxonomy of concurrency control mechanisms; locking bases concurrency control algorithms.

Module III:[5L]

Partitioned network; check point and cold start; Management of distributed transaction; Architectural aspect; Node and link failure recoveries

Module IV:[6L]

Distributed data dictionary management. Distributed database administration. Heterogeneous databases- federateddatabase, reference architecture, loosely and tightly coupled.

Module V:[6L]

Distributed Object Database Management systems [6L]

Fundamental Object concepts and Object models; Object distribution design; Architectural issues; Object management; Distributed object storage; Object query processing

Module IV:[6L]

Current trends & developments related to Distributed database applications technologies [6L]

Distributed Object/component-based DBMS; Database Interoperability including CORBA; DCOM and Java RMI;Distributed document-based systems; XML and Workflow management.

Text books:

1. Distributed Databases - Principles and Systems; Stefano Ceri; Guiseppe Pelagatti; Tata McGraw Hill; 1985.
2. Fundamental of Database Systems; Elmasri & Navathe; Pearson Education; Asia

Reference books:

1. Database System Concepts; Korth & Sudarshan; TMH
2. Principles of Distributed Database Systems; M. Tamer Özsu; and Patrick Valduriez Prentice Hall

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS605C.1	3	2	2	2								
CS605C.2	3	2	2	3								
CS605C.3	3	3	2	2								
CS605C.4	3	3	2	3								
CS605C.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS605C.1	3	3	3
CS605C.2	3	3	3
CS605C.3	3	3	3
CS605C.4	3	3	3
CS605C.5	3	3	3

Computer Vision
IT(CSE)605(D)
Contact: 3L Credits: 3
Total Lectures: 36L

Course Objective:

Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us. This requires understanding of the fundamental concepts related to multi- dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc. Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision. Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision
CO2	Describe known principles of human visual system
CO3	Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
CO4	Suggest a design of a computer vision system for a specific problem
CO5	Identify, formulate and solve problems in image procecssing and computer vision.

Introduction
[2L]
Impact of Computer Vision, Components and Its Applications.

Digital Image Formation and low-level processing
[5L]
Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

Depth estimation and Multi-camera views
(5L)
Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. apparel

Feature Extraction [7L]
Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian
derivative filters, Gabor Filters and DWT.

Image Segmentation(4L)
Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

Pattern Analysis (7L)
Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

Motion Analysis (3L)
Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Shape from X (3L)
Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

Books:
Textbooks
:
Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

References:
Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

Journals:
IEEE-T-PAMI (IEEE Transactions on Pattern Analysis and Machine Intelligence).
IJCV (International Journal of Computer Vision) - Springer.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS605D.1	3	3	2	2		2						3
CS605D.2	3	2	3	2		2						3
CS605D.3	3	3	2	3		2						3
CS605D.4	3	2	2	2		2						3
CS605D.5	3	3	2	2		2						3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS605D.1	3	3	3
CS605D.2	3	3	3
CS605D.3	3	3	3
CS605D.4	3	3	3
CS605D.5	3	3	3

Name of the Paper: Data Warehousing & Data Mining
Paper Code: IT(CSE)606A
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 36

Prerequisite:

5. Programming and Data Structures
6. Database Systems

Course Objective(s)

1. To understand classical models and algorithms in data warehousing and data mining.
2. To enable students to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
3. To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the functionality of the various data mining and data warehousing component
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models
CO3	Explain the analyzing techniques of various data
CO4	Describe different methodologies used in data mining and data ware housing
CO5	Compare different approaches of data ware housing and data mining with various technologies

Module I: Introduction to Data Warehousing 08L

Data Warehousing: Data warehouse Architecture and Infrastructure , 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.

Module II: Business Analysis05 L

Business Analysis: 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 Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

Module III: Data Mining and Classification12L

Data Mining: Introduction – Data – Types of Data – 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 Preprocessing.

Association Rule Mining and Classification: 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 Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

Module IV: Clustering and Applications 11L

Clustering and Applications and Trends in Data Mining: Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – Kmeans – 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. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", SecondEdition, Elsevier, 2007.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining",Person Education, 2007.

Reference Book

1. Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.
2. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Prentice Hall, 2003.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS606A.1	3	2	2	2								
CS606A.2	3	2	2	2								
CS606A.3	3	3	2	2								
CS606A.4	3	2	2	2								
CS606A.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS606A.1	3	3	3
CS606A.2	3	3	3
CS606A.3	3	3	3
CS606A.4	3	3	3
CS606A.5	3	3	3

Name of the Paper: Digital Image Processing
Paper Code: IT(CSE)606B
Contact (Periods/Week): 3L/Week
Credit Point: 3
No. of Lectures: 35
Prerequisite:

- Fourier analysis

Course Objective(s)

- To learn discrete Fourier transform and its properties
- To study the monochrome and color image fundamentals
- To learn the analytical tools and methods which are currently used in digital image processing as applied to image information for human viewing.
- To learn image compression and segmentation techniques.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic concepts of digital image processing to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of image enhancement strategies and Identify the scope of enhancement where students can Apply the appropriate strategy and Analyze the performance.
CO3	Illustrate the fundamental image restoration strategies and Apply them appropriately to eliminate noise in the image.
CO4	Illustrate various Image Compression Techniques and Apply them to compress the images and Analyze their performances.
CO5	Understand and Develop ideas to Propose solutions to the problems of Morphological Image Processing and Image Segmentation and Analyze the effectiveness as well as limitations of solutions underscoring its utilitarian importance for further explorations leading towards lifelong learning.

Module -1: Introduction:[5L]
Digital Image Fundamentals **:** Overview, Computer imaging systems , Digital Image Representation, Fundamental steps in Image Processing **[1L]**, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display **[1L]**. Digital Image Formation: A Simple Image Model, Use and Analysis of Color Models in Image Processing **[2L]**, Sampling & Quantization - Uniform & Non-uniform **[1L]**.

Module -2: Mathematical Preliminaries : [5L]

Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure **[1L]**; Distance Measures, Arithmetic/Logic Operations, Discrete Signals and Systems **[1L]**- A Review – Fourier Transformation, Properties of The Two Dimensional Fourier Transform **[2L]**, Discrete Fourier Transform, Discrete Cosine & Sine Transform **[1L]**.

Module 3: Image Enhancement : [6L]

Spatial Domain: Gray level transformations – Histogram processing **[2L]** Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain **[2L]**– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters **[2L]**.

Module -4: Image Restoration, Segmentation and Filtering :[14L]

Image Restoration and Segmentation:Image restoration: noise removal: mean & adaptive filters, degradation model, inverse filter **[2L]**. Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained **[1L]**; Constrained Least Square Restoration, Restoration by Homomorphic Filtering **[1L]**, Geometric Transformation - Spatial Transformation, Gray Level Interpolation **[1L]**. Image Segmentation : Point Detection, Line Detection, Edge detection, Combined detection **[2L]**,

Module -5: Edge Linking, Boundary Detection and Image compression : [5L]

Edge Linking & Boundary Detection- Local Processing, Global Processing via The Hough Transform **[2L]**; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding **[2L]**; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging **[2L]**.
Image compression: system model, lossless methods , lossy methods [2L]

Module -6: Image Representation and Recognition :[5L]

Image Representation and Recognition :Boundary representation – Chain Code – Polygonal approximation **[1L]**, signature, boundary segments – Boundary description **[1L]** – Shape number – Fourier Descriptor **[1L]**, moments- Regional Descriptors –Topological feature **[1L]**, Texture – Patterns and Pattern classes – Recognition based on matching **[1L]**.

Text Books:

1. Chanda & Majumder , Digital Image Processing & Analysis, PHI

Reference books:

1.Malay K. Pakhira, Digital Image Processing and Pattern Recognition, First Edition, PHI Learning Pvt. Ltd., 2011.

2. Rafael C. Gonzales and Richard E. Woods, Digital Image Processing, Third Edition, Pearson Education, 2010.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS606B.1	3	2	2	2								
CS606B.2	3	3	2	3								
CS606B.3	3	3	2	2								
CS606B.4	3	2	3	2								
CS606B.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS606B.1	3	3	3
CS606B.2	3	3	3
CS606B.3	3	3	3
CS606B.4	3	3	3
CS606B.5	3	3	3

Name of the Paper: E Commerce &
ERP Paper Code: IT(CSE)**606C**
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 39

Prerequisite: Knowledge of Software Engineering and Networking

Course Objective(s)

- To impart knowledge on E-Commerce & ERP and its various applications.
- To understand E-Commerce framework and business model applications of E-Commerce
- To understand e-payment mechanisms

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic concepts and technologies used in the field of management information systems
CO2	Have the knowledge of the different types of management information systems
CO3	Understand the processes of developing and implementing information systems.
CO4	Be aware of the ethical, social, and security issues of information systems.
CO5	An ability to effectively integrate IT-based solutions into the user environment

Module 1: Overview of E-Commerce[10L]

Introduction to E-Commerce [4L]: 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 [6L]: Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

Module 2: Security Issues in E-Commerce [10L]

Legal issues [4L]: 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 [6L]: 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.

Module 3: Applications [3L]

E-business [3L]: Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Module 4: Overview of ERP (9L)

The evolution of ERP systems: A historical perspective [4L]

Evolution through Payroll system, Inventory Control system, Materials Requirement Planning (MRP I) system, Manufacturing Resource Planning (MRP II) system, their advantages and disadvantages. Definition and Concept of ERP, Business reasons for rise and popularity of ERP system - Benefits of an ERP system

Business processes supported by ERP systems [5L]

Various business functions in an Organization – Purchasing, Materials Management, Manufacturing, Sales & Distribution, Plant Maintenance, Quality Management, Finance & Accounting including Costing, Human Resources etc.

ERP market place – 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 (preferably SAP and Oracle) – Order to Cash, Procure to Pay, Plan to Produce and Despatch.

Module 5 : Emerging Trends and Future of ERP systems (7L)

Emerging Technologies and ERP [5L]

Service-oriented Architecture (SOA): Enterprise SOA layers – Business processes, Business services, Components and Integration services, Advantages and Drawbacks of SOA, When to use 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 (EAI): Basic understanding of the concept, Types of EAI (levels) – User Interface, Method (logic), Application Interface, Data. EAI architecture – Typical framework (Business Processes, Components &Services, Messaging service, and Transport service. Mention of some of the leading EAI vendors – IBM, Microsoft, Oracle, SAP, TIBCO. Radio Frequency Identification (RFID) 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[2L]

Transformation to SOA, more E-Commerce features, Growing mobile applications, Economical and Easy models of ERP deployment etc.

Text books:

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Enterprise Resource Planning – A Managerial Perspective by D P Goyal, Tata McGraw Hill Education

Recommended books:

1. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
2. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press
3. Enterprise Resource Planning by Ashim Raj Singla, Cengage Learning

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS606C.1	3	2	2	2								
CS606C.2	3	2	2	2								
CS606C.3	3	3	2	2								
CS606C.4	3	2	2	2								
CS606C.5	3	2	2	2								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS606C.1	2	2	2
CS606C.2	2	2	2
CS606C.3	2	2	2
CS606C.4	2	2	2
CS606C.5	2	2	2

Practical

Name of the Paper: COMPUTER NETWORKS Lab
Paper Code: CS691
Contact (Periods/Week):=3L/Week
Credit Point: 2
No. of Lectures: 36

Prerequisite:

5. Familiarity and knowledge of Computer Network and Computer Architecture
6. Also require strong knowledge of programming languages like C, Java and UNIX or Linux environment.

Course Objectives:

1. To provide students with an overview of the concepts and fundamentals of data communication and computer networks
2. To familiarize with the basic taxonomy and terminology of computer networking area. 3
3. To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite

Course Outcomes (COs):

After attending the course students should be able to

CO1	To design and implement small size network and to understand various networking commands.
CO2	To provide the knowledge of various networking tools and their related concepts.
CO3	To understand various application layer protocols for its implementation in client/server environment
CO4	Understand the TCP/IP configuration for Windows and Linux
CO5	Learn the major software and hardware technologies used on computer networks

Syllabus

- Familiarization of UNIX or Linux environment, UNIX or Linux general Commands specially Network Commands. Familiarization of Internetworking - Network Cables - Color coding - Crimping. Internetworking Operating Systems - Configurations. **[6L]**
- Implementation of flow control mechanisms [3L]
- Socket Programming using TCP and UDP **[15L]**

- Implementing routing protocols such as RIP, OSPF. **[2L]**
- Familiarization of advanced simulators like Packet Tracer, NS2/NS3, OMNET++, TinyOS**[4L]**
- Server Configuration: only web server (If time permit..instructor can do more than that) **[6L]**

Text books:

1. **TCP sockets in C programs-Practical guide for Programmers By Micheal J Donahoo and Kenneth L calvert.**
2. **Socket Programming by rajkumar Buyaa.**

Substantial/ High	3
Medium	2
Low	1
No Correlation	

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS691.1	3	3	3	2	3							2
CS691.2	3	3	3	3	3							2
CS691.3	3	3	3	3	3							2
CS691.4	3	3	3	3	3							2
CS691.5	2	3	2	2	3							2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS691.1	3	3	3
CS691.2	3	3	3
CS691.3	3	3	3
CS691.4	3	3	3
CS691.5	3	3	3

Name of the Paper: Microprocessors & Microcontrollers Lab
Paper Code: CS692
Contact (Periods/Week): 3P/Week
Credit Point: 2
No. of Lectures: 30

Prerequisite:

7. Familiarity with the number system
8. A solid background in digital logic and implementation of digital circuit in a bread board.

Course Objective(s)

- To learn the assembly language programming of a microprocessor.
- To learn the assembly language programming of a microcontroller.
- To learn the interfacing of microprocessor.
- To be familiar with microprocessor and microcontroller based projects.

Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand and apply the fundamentals of assembly level programming of microprocessors and Microcontroller.
CO2	To work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters.
CO3	To troubleshoot interactions between software and hardware.
CO4	To analyze abstract problems and apply a combination of hardware and software to address the problem

List of Experiments:

1. Write an assembly language program to transfer a data from one memory location to another memory location.
2. Write an assembly language program to add two numbers stored in memory locations 9140 and 9141. Store the sum at 9142 and carry at 9143.
3. Write an assembly language program to add a series of numbers. The length is given in the location 913F and the series itself starts from 9140. Store the result at 9160.
4. Write an assembly language program to find maximum of a series of numbers. The length is given in the location 913F and the series itself starts from 9140. Store the result at 9160.
5. Write an assembly language program to copy 16 data from 9140-914F to 9148-9157 (overlapping memory locations).
6. A set of eight data bytes is stored in the memory location starting at 9140. Check each data byte for bits D7 and D0. If D7 or D0 is 1, reject the data byte; otherwise, store the data bytes at memory locations starting at 9160.
7. Write an assembly language program to count number of 0's and number of 1's in the string (data byte) stored in the memory location 9140. Store the results in 9141 and 9142, respectively.
8. Write an assembly language program to find HCF of two numbers stored in memory locations 9140 and 9141. Store the result at 9142.
9. Write an assembly language program to convert a BCD number to its equivalent Binary form. The BCD number is within memory location 9140. Store the bits of equivalent binary number from 9141-9148. The LSB should be stored into 9141.

10. Write an assembly language program to find square value of a number using Look Up Table.
11. Write an assembly language program to add two numbers using subroutine.
12. Write an assembly language program to fill flag register by 5D.

Text Books:

1.MICROPROCESSOR architecture, programming and Application with 8085 - R. Gaonkar (Penram international Publishing LTD.)

Recommended books:

1.Fundamentals of Microprocessor and Microcontrollers - B. Ram (Paperback)

2.The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)

CO-PO Mapping

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS692.1	3	3	3	2	3				3			
CS692.2	3	3	3	2	3				3			
CS692.3	3	3	3	2	3				3			
CS692.4	3	3	3	2	3				3			
CS692.5	3	3	3	2	3				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS692.1	3	3	3
CS692.2	2	3	3
CS692.3	3	3	2
CS692.4	3	2	3
CS692.5	3	3	3

Name of the Paper: Software Engineering Lab
Paper Code: CS693
Contact (Periods/Week): 3L
Credit Point: 2

Prerequisite:

For Software Engineering Lab, design a project proposal which will be used throughout the lab for performing different experiments using CASE Tools.

Course Objective(s)

- To learn software development skill through various stages of software life cycle. .
- To ensure the quality of software through software development with various protocol based environment.

Course Outcomes (COs):
After attending the course students should be able to

CO1	Understand the basic knowledge of how to apply Software Engineering and mathematical knowledge and designing solution to software engineering problem including the specification.
CO2	Analyze the cost-benefit trade-off.
CO3	Design solutions to the one or more application domains using software engineering approaches that integrates ethical.
CO4	Develop the code from the design and effectively apply relevant standards and perform testing .
CO5	Identify and use of modern software engineering tools necessary for software project management.

Assignments to be given from the following

1. Preparation of requirement document for standard application problems in standard format. (e.g. Library Management System, Railway Reservation system, Hospital management System, University Admission system) .DFD of standard application problems.

2. Project Schedule preparation. Software Requirement Analysis: Describe the individual Phases/ modules of the project, Identify deliverables.

3. Use Case diagram, Class Diagram, Sequence Diagram, Activity Diagram and prepare Software Design Document using tools like Rational Rose.(For standard application problems)

4. Software Development and Debugging. Estimation of project size using Function Point(FP) for calculation.

5. Design Test Script/Test Plan(both Black box and White Box approach)

6. Compute Process and Product Metrics (e.g Defect Density, Defect Age, Productivity, Cost etc.) Cost Estimation models. COCOMO

Recommended books:

4. SoftwareEngineering:Apractitioner'sapproach–Pressman(TMH)
5. SoftwareEngineering-PankajJalote(Wiley-India)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS693.1	3	3	3	3	3				3			3
CS693.2	3	3	3	3	3				3			3
CS693.3	3	3	3	3	3				3			3
CS693.4	3	3	3	3	3				3			3
CS693.5	3	3	3	3	3				3			3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS693.1	3	3	3
CS693.2	3	3	3
CS693.3	3	3	3
CS693.4	3	3	3
CS693.5	3	3	3

Department of Computer Science and Engineering

Curriculum Structure

&

Syllabus

2016-2017

(Autonomy)

of

7th Semester

			7TH SEMESTER					
SL No	**Type**	**Code**	**A. THEORY**	L	T	P	Total	
1	PC	CS701	Artificial Intelligence	3	0	0	3	3
2	HS	HU702	Values & Ethics in Profession	2	0	0	2	2
3	PE	CS702A	Soft Computing					
		CS702B	Natural Language Processing					
		CS702C	Web technology	3	0	0	3	3
4	PE	CS703A	Cloud Computing					
		CS703B	Data Analytics	3	0	0	3	3
		CS703C	Sensor Network and IOT					
5	PE	CS704A	Distributed Algorithms					
		CS704B	Bio-informatics					
		CS704C	Cryptography and Network Security	3	0	0	3	3
Total Theory							14	14
			B. PRACTICAL					
6	PC	CS791	Artificial Intelligence Lab	0	0	3	3	2
7	PE	CS792A	Soft Computing Lab					
		CS792B	Natural Language Processing Lab					
		CS792C	Web Technology Lab	0	0	3	3	2
8		CS795	Project-1	0	0	3	3	2
Total Practical							9	6
			C. SESSIONAL					
9		CS781	Industrial Training	0	0	0	0	2
Total Sessional								
			D. MANDATORY COURSES					
10	MC	MC781	Technical Skill Development	0	0	3	3	2Unit
Total							26	22

Syllabus

Theory

Name of the Paper: Artificial Intelligence
Paper Code: CS701
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 37

Prerequisite:

9. Basics of Design and Analysis of Algorithm
10. A solid background in mathematics, including probability.

Course Objective(s)

- To learn the overview of artificial intelligence principles and approaches.
- To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
- This course also covers fundamental areas of Local Search Algorithms, Adversarial Searching and Neural Networks.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and explain the fundamental concepts of Knowledge Representation and Inferencing in Artificial Intelligence and its utilitarian importance in current technological context for further exploration leading towards lifelong learning.
CO2	Identify and formulate an engineering problem primarily to fitaState-Space Exploration Framework or an Inferencing Model/Agent Design Framework within the scope of Artificial Intelligence paradigm.
CO3	Explore relevant literature and apply the concept of Heuristic Techniques of Artificial Intelligence to solve problems.
CO4	Develop Inferencing Models for proposing solutions to the problems of Artificial Intelligence.
CO5	Implement Inferencing Models of Artificial Intelligence through developing feasible algorithms and investigate their effectiveness by analyzing their performances in solving the relevant problems.

Module 1: Basics of AI [7L]

Introduction [2]

Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

Intelligent Agents [2]

Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

Learning [3]

Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

Module 2: Different types of searching algorithms [14L]

Problem Solving [3]

Problems, Problem Space & search: Defining the problem as state space search, production system, constraint satisfaction problems, issues in the design of search programs.

Search techniques [4]

Solving problems by searching: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Heuristic search strategies [4]

Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

Adversarial search [3]

Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

Module 3: Knowledge & Reasoning [12L]

Knowledge & Reasoning [3]

Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.

Using predicate logic [4]

Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules [2]

Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Probabilistic reasoning [3]

Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets, and fuzzy logics.

Module 4: Different fields of AI [4L]

Natural Language Processing [2]

Introduction, Syntactic processing, semantic analysis, discourse, and pragmatic processing.

Expert Systems [2]

Representing and using domain knowledge, expert system shells, and knowledge acquisition.
Basic knowledge of programming language like Prolog

Text books:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence, A Modern Approach, Stuart Russel, Peter Norvig ,Pearson

Recommended books:

3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS701.1	3	3	2	2			2					3
CS701.2	3	3	3	3			2					3
CS701.3	3	3	3	3			2					3
CS701.4	3	3	3	3			2					3
CS701.5	3	3	3	3			2					3

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
CS701.1	3	3	3
CS701.2	3	3	3
CS701.3	3	3	3
CS701.4	3	3	3
CS701.5	3	3	3

Paper Name: Values and Ethics in Profession
Paper Code: HU702

Contact: L-T-P= 2-0-0

Credit: 2

Pre requisites: Basic knowledge of management, basics of communication, Knowledge about environment science

Course Objective: To create awareness on professional ethics and Human Values

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO2	Identify the multiple ethical interests at stake in a real-world situation or practice
CO3	Articulate what makes a particular course of action ethically defensible
CO4	Assess their own ethical values and the social context of problems
CO5	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

Course contents:

Module: 1. Introduction: Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Module: 2. **Psycho-social theories of moral development**: View of Kohlberg; Morality and Ideology, Culture and Morality, Morality in everyday Context.

Module: 3. **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. ***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. **Self Development**: Character strengths and virtues, Emotional Intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module: 6.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 / Reference Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU702.1		2				2	3	3				3
HU702.2		2				2	3	3				3
HU702.3		2				2	3	3				3
HU702.4		2				2	3	3				3
HU702.5		2				2	3	3				3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU702.1	2	2	2
HU702.2	2	2	2
HU702.3	2	2	2
HU702.4	2	2	2
HU702.5	2	2	2

Paper Name: Soft Computing
Code: CS 702A
Contacts: 3L
Credits: 3
Allotted hours: 38L

Prerequisite:

11. A solid background in mathematical and programming Knowledge

Course Objective(s)

- To learn the basics of Soft Computing usage.
- To learn the basics of many optimization algorithm
- To learn to solve and optimize the real world problem using soft computing methodology.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and explain the basic concept of soft computing and hard computing and apply them in designing solution to engineering problem.
CO2	Identify and formulate learning rules for each of the architectures and learn several neural network paradigms and its applications to solving engineering and other problems.
CO3	Explore relevant literature and apply fuzzy logic and reasoning to handle uncertainty and solving interdisciplinary engineering problems
CO4	Use genetic algorithms to combinatorial optimization problems and recognize the feasibility of applying a soft computing methodology for a particular problem.
CO5	Implement the concept and techniques of designing of soft computing methods in real world problem.

Soft Computing: Module-I
[7L]

1. An Overview of Artificial Intelligence
2.Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.
3. Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control

Soft Computing: Module-II
[10L]

1. Introduction to derivative free optimization, GA; biological background, search space of genetic algorithm, genetic algorithm Vs. Traditional algorithm; Simple genetic algorithm, Genetic algorithm Operators: Encoding, selection criteria, Crossover, Mutation, advantages and disadvantages of genetic algorithm, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional method.

Soft Computing: Module-III
[12L]

1. Neural Network : Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, Structure and Function of a single neuron, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow &

Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN.
2. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of EBPA, momentum, heuristic, limitation, characteristics and application of EBPA.
3.Adaptive Resonance Theory: Architecture, classifications, Implementation and training, Associative Memory.

Soft Computing: Module-IV
[11L]

1. Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions,
2. Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

Text Books:

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2.Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

Reference Books:

1. K.H.Lee. First Course on Fuzzy Theory and Applications, Springer-Verlag.
2. J. Yen and R. Langari.. Fuzzy Logic, Intelligence, Control and Information, Pearson Education.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS702A.1	3	3	3	3								3
CS702A.2	3	3	3	3								3
CS702A.3	3	3	3	3								3
CS702A.4	3	3	3	3								3
CS702A.5	3	3	3	3								3

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
CS702A.1	3	3	3
CS702A.2	3	3	3
CS702A.3	3	3	3
CS702A.4	3	3	3
CS702A.5	3	3	3

Name of the Paper: Natural Language Processing
Paper Code: CS702B
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 41

Prerequisite:

12. A solid background in mathematics, including probability, set theory.
13. Determination to learn new and difficult things.

Course Objective(s)

- To learn the basics of NLP.
- To learn the principles and application of different NLP techniques.
- To learn the details of NLP algorithms, different tools and knowing their use.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Analyze and apply the morality and method of Human Languages such as English and other Indian Languages using computers.
CO2	Understand the semantics and pragmatics of English language for text processing
CO3	Create CORPUS linguistics based on digestive approach (Text Corpus method)
CO4	Illustrate, analyze and apply for the modern techniques for statistical approaches to machine translation.
CO5	Analyze and apply the POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language.

<u>Module I:</u> [12L]

Introduction to NLP [2L]

Human languages, models, definition of NLP, text representation in computers, encoding schemes, issues and strategies, application domain, tools for NLP, Linguistic organisation of NLP, phase in natural language processing, applications

.

Regular Expression and Automata [2L]

Finite State Automata. Introduction to CFG and different parsing technniques.

Tokenization [4L]

Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition,Multi Word Extraction, Spell Checking – Bayesian Approach, Minimum Edit Distance

Morphology [4L]
Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer.

Module II: [9L]

Language Modeling [4L]
Introduction to N-grams, Chain Rule, Smoothing – Add-One Smoothing, Witten-Bell Discounting; Backoff, Deleted. Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models. Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model, counting words in Corpora

Hidden Markov Models and POS Tagging [5L]
Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech Tagging – Rule based and Machine Learning based approaches, concept of HMM tagger Evaluation. Handling of unknown words, named entities, multi word expressions.

Module III: [9L]

Text Classification [4L]
Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis – Opinion Mining and Emotion Analysis, Resources and Techniques.

Context Free Grammar [5L]
Context Free Grammar and Constituency, Some common CFG phenomena for English, Top-Down and Bottom-up parsing, Probabilistic Context Free Grammar, Dependency Parsing

Module IV: [11L]

Computational Lexical Semantics [5L]
Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, VerbNet, Computational Lexical Semantics – Thesaurus based and Distributional Word Similarity, Lexemes (homonymy, polysemy, synonymy, hyponymy), word structure, metaphor, metonymy.
Word sense disambiguation, machine learning approaches, dictionary based approaches.

Information Retrieval [6L]
Boolean Retrieval, Term-document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval , Term Frequency and Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking, Combining different features for ranking, Search Engine Evaluation, Relevance Feedback.
Resource management with XML, Management of linguistic data with the help of GATE, NLTK

Text books:

1. D. Jurafsky & J. H. Martin – "Speech and Language Processing – An introduction to Language processing, Computational Linguistics, and Speech Recognition",Pearson Education
2. Chris Manning and Hinrich Schütze, "Foundations of Statistical Natural Language

Processing", MIT Press. Cambridge, MA: May 1999.

Reference books:

1. Allen, James. 1995. – "Natural Language Understanding". Benjamin/Cummings, 2ed.
2. Bharathi, A., Vineet Chaitanya and Rajeev Sangal. 1995. Natural Language Processing- "A Pananian Perspective". Prentice Hll India, Eastern Economy Edition.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS702B.1	3	3	3	3								3
CS702B.2	3	3	3	3								3
CS702B.3	3	3	3	3								3
CS702B.4	3	3	3	3								3
CS702B.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS702B.1	3	3	3
CS702B.2	3	3	3
CS702B.3	3	3	3
CS702B.4	3	3	3
CS702B.5	3	3	3

Name of the Paper: Web Technology
Paper Code: CS702C
Contact (Periods/Week): 3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisites:

1. Fundamentals of Programming
2. Concepts of Networking

Course Objective(s):

- To impart the design, development and implementation of Static and Dynamic Web Pages.
- To develop programs for Web using Scripting Languages and .net framework.
- To give an overview of Server Side Programming in Web

Course Outcomes (COs):

After attending the course students should be able to

CO1	To develop interactive web pages using HTML, DHTML, CSS and image map
CO2	To procure the knowledge of information interchange formats like XML
CO3	To validate fields of web pages using scripting languages like JavaScript
CO4	To develop web applications using PHP and ASP.net
CO5	To acquire the server side programming concepts using servlet, JSP

Module 1: [4L]

Introduction to Web[4L]: Concept of World Wide Web (www), Internet and the relation with www**[1L];**The Internet - Basic Internet Protocols, HTTP Protocol - Request and Response, Web browser **[1L];** Web clients and Web servers, Dynamic IP**[1L];** Clients, Servers, and Communication, Web site design principles, Planning the site and navigation**[1L].**

Module -2: [9L]

HTML, DHTML & CSS [6L]: Introduction, Elements, Attributes, Heading, Paragraph. Formatting**[1L];** Link, Table, List, Block, Layout, Html Forms and input **[1L];** Iframe, Colors, Image Maps and attributes of image area **[2L];**Introduction to CSS, basic syntax and structure of

CSS, different types- internal, external and inline CSS**[1L];**Basic Introduction of DHTML, Difference between HTML and DHTML, Documentary Object Model (DOM) **[1L].**
Extended Markup Language (XML) [3L]: Introduction, Difference between HTML & XML, XML-Tree **[1L];** Syntax, Elements, Attributes, Validation and parsing, DTD**[2L].**

Module 3: [8L]

Java Scripts[3L]: Basic Introduction, Statements, comments, variable, operators, data types**[1L];** condition, switch, loop, break [1L]; Java script functions, objects and events**[1L].**
CGI Scripts [1L]: Introduction, Environment Variable, GET and POST Methods.
PHP Scripting [4L]: Introduction, Syntax, Variables, Output, Data types, String, Constants**[1L];** Operator, Decision Control statements**[1L];** switch-case, Loop, PHP function**[1L];** array, Form Handling**[1L].**

Module-4: [14L]

Java Server Page (JSP) [8L]:
JSP Architecture **[1L];** JSP Servers , JSP Life Cycle **[1L];** Understanding the layout of JSP**,** JSP Scriptlet Tag**[1L];** JSP implicit object (request and response) **[1L];** Variable declaration, methods in JSP **[1L];**JSP directive (Taglib and Include), Javabean- inserting javabean in JSP **[1L];**JSP Action tags (Forward & Include) **[1L];** Creating ODBC data source name, Introduction to JDBC, prepared statement and callable statement **[1L].**

Java Servlet [3L]: Servlet environment and role, Servlet life cycle **[1L];** Servlet methods- Request, Response, Get and post **[1L];**Cookies and Session **[1L].**

.NET Framework [3L]: ASP.Net with MVC introduction, MVC Architecture, MVC routing, controller, Action method, Action Selector and Action verb, Model and View **[1L];**.net framework, C#.net introduction, environment variable, basic syntax of conditional statement, loop and function**[2L].**

Text Books:

1. "Web Technology: A Developer's Perspective", N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. **(Topics covered: html, CSS, imagemap, xml)**
2. "Learning PHP, MySQL & JavaScript", Robin Nixon, O'Reilly Publication.(**Topics covered: PHP, Java Script)**
3. "Head First Servlet's & JSP", Bryan Basham, Kathy Sterra, Bert Bates, O'Reilly Publication.(**Topics covered: Servlet, JSP)**
4. ASP.NET Core 2.0 MVC And Razor Pages For Beginners:", Jonas Frajerberg, O'Reilly Publication.(**Topics covered: MVC, ASP.Net, C#)**

Recommended books:

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

Education, 2007.
2. ”Core Web Programming”- Second Edition-Volume I and II, Marty Hall and Larry Brown, Pearson Education, 2001.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS702C.1	3	3	3	3								3
CS702C.2	3	3	3	3								3
CS702C.3	3	3	3	3								3
CS702C.4	3	3	3	3								3
CS702C.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS702C.1	3	3	3
CS702C.2	3	3	3
CS702C.3	3	3	3
CS702C.4	3	3	3
CS702C.5	3	3	3

Paper Name: Cloud Computing
Code:CS703A
Contacts:3L ;
Credits:3
Allotted hours: 35L

PREREQUISITE

- Should have the basic knowledge of Operating Systems and Virtualization Technologies
- Should aware of the fundamental concepts of Networking
- Should have knowledge of heterogeneous systems and resource management.

COURSE OBJECTIVES

- To learn the work-flow of cloud business model and optimized resource allocation.
- To gain knowledge of cloud service and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.
- To learn virtualization techniques, load balancing, and work strategy of different cloud infrastructure.
- To know the security and privacy issues in cloud infrastructure.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify the appropriate cloud services for a given application
CO2	Assess the comparative advantages and disadvantages of Virtualization technology
CO3	Analyze authentication, confidentiality and privacy issues in cloud computing
CO4	Identify security implications in cloud computing.
CO5	Understand the importance of protocols and standards in management for cloud services.

Module 1: Definition of Cloud Computing and its Basics [8L]

1. Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing **[3]**
2. Cloud Architecture: Cloud Infrastructure, Architecture of each components, Virtualization versus Traditional Approach, Virtualization Model for Cloud Computing. **[2]**
3. Services and Applications by Type**[3]**

IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos
PaaS – Basic concept, tools and development environment with examples
SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform
Identity as a Service (IDaaS) Compliance as a Service (CaaS)

Module 2: Use of Platforms in Cloud Computing [6L]

1. Concepts of Abstraction and Virtualization **[2]**
Virtualization technologies: Types of virtualization, Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing; Classification of Virtualization Environment: Scheduling-based Environment, Load-Distribution-Based Environment, Energy Aware-Based Environment, Operational-Based Environment, Distributed Pattern-Based Environment, Transactional-Based Environment
2. Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine imaging (including mention of Open Virtualization Format – OVF) **[2]**
Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance
3. Concepts of Platform as a Service **[2]**
Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development.Use of PaaS Application frameworks

Module 3 : Cloud Service Models [6L]

1. Use of Google Web Services **[2L]**
Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service.
2. Use of Amazon Web Services **[2L]**
Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service
3. Use of Microsoft Cloud Services **[2L]**
Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

Module 4 : Cloud Infrastructure [10L]

Types of services required in implementation – Consulting, Configuration, Customization and Support
1. Cloud Management **[3L]**
An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle)
2. Live Migration of Virtual Machines: **[2L]**
Need of Live Migration of Virtual Machine, A Designing Process of Live Migration, and Security Issues during live migration
3. Concepts of Cloud Security **[3L]**
Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security, Identity and Access Management
4. Auditing and Compliance in Cloud Environment: **[2L]**

Data Security in Cloud Computing Environment, Need for Auditing in Cloud Computing Environment, Third Party Service Provider, Cloud Auditing Outsourcing Lifecycle Phases, Auditing Classification.

Module 5 : Concepts of Services and Applications [5L]

1. Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs **[1]**
2. Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs **[2]**
3. Cloud-based Storage: Cloud storage definition – Manned and Unmanned. **[1]**
4. Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services **[1]**

BooksRecommended:

1.***MasteringCloudComputing***byRajkumarBuyya,ChristianVecchiola,S.ThamaraiSelvi,McGrawHill Education (India)PrivateLimited,2013
2. ***Fundamentals of Cloud Computing*** by P. K. Pattnaik, S. Pal, M. R. Kabat, Vikas Publications, 2014.

References:

1. ***CloudComputingBible***byBarrieSosinsky,WileyIndiaPvt. Ltd,2013
2. ***Cloudcomputing:Apracticalapproach***,AnthonyT.Velte,TataMcgraw-Hill

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS703A.1	3	2	2	2								3
CS703A.2	3	3	3	2								3
CS703A.3	3	3	2	3								3
CS703A.4	2	3	2	2								3
CS703A.5	3	2	2	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS703A.1	3	3	3
CS703A.2	3	3	3
CS703A.3	3	3	3
CS703A.4	3	3	3
CS703A.5	3	3	3

Name of the Paper: Data Analytics
Paper Code: CS703B
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 40

Prerequisite:

14. Familiarity and knowledge of Database Management Systems
15. Familiarity and knowledge of Database Management Systems Laboratory.

Course Objective(s)

1. Conceptualization and summarization of big data and trivial data versus big data
2. Big data computing technologies.
3. Help students learn, understand, and practice big data analytics with distributed approaches.
4. Learn and understand different programming model of big data.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and explain the fundamental concepts of the Big Data Analytics which are primarily explored for making automated decisions using machine learning strategies on analyzing large scale structured as well as unstructured data distributed across multiple locations (Map Reduce, Hadoop and No SQL Framework) underscoring the utilitarian importance in current technological context for further exploration leading towards lifelong learning.
CO2	Identify and formulate an engineering problem of analyzing large scale data distributed across multiple locations to make automated meaningful decisions within the scope of Big Data Analytics Frameworks.
CO3	Explore relevant literature and apply the concepts of Big Data Analytics to solve problems of making automated decisions dealing with large scale structured as well as unstructured data using Map Reduce, Hadoop and advanced SQL Frameworks.
CO4	Excogitate ideas for proposing solutions to the challenging problems of Big Data Analytics.
CO5	Implement ideas of Big Data Analytics through developing feasible algorithms or frameworks and investigate their effectiveness in solving the relevant problems by analyzing the performances using proper techniques.

Module I: DATA AND BIG DATA ANALYTICS

[6L] Introduction (2L):

Types of digital data [1L]: Structured: Sources of structured data and Ease with Structured data Semi-Structured: sources of semi-structured data Unstructured: sources of unstructured data: Issues with terminology, dealing with unstructured data.

Big data analytics-1 [2L]: Characteristics of data-Definition of big data-Challenges of big data Traditional BI vs. Big data-A typical BI environment-A big data environment-Big data stack

Big data analytics-2 [1:]: Classification of analytics-Top challenges facing big data-Data science.

Terminologies used in big data environment [2L]: In memory analytics-In database processing. Massively parallel processing-Parallel vs distributed systems-Shared Memory architecture CAP (Consistency, Availability, Partition Tolerance) theorem explained- BASE (Basically Available Soft State

Eventual Consistency)-Few top Analytics tools.

Module II: BIG DATA TECHNOLOGY AND HADOOP [8L]

The big data technology landscape [1]: NoSQL-Types of NoSQL databases-Why NoSQL -Advantages of NoSQL- What we miss with NoSQL?- NoSQL Vendors SQL Vs. NoSQL. NewSQL - Comparison of SQL, NoSQL and NewSQL.

Hadoop [1] : Features of Hadoop- Key advantages of Hadoop- Versions of Hadoop-Hadoop 1.0 Hadoop 2.0- Overview of Hadoop Ecosystems- Hadoop Vs. SQL- Integrated Hadoop systems offered by leading market vendors-Cloud based Hadoop solutions.

Introducing Hadoop [2]: Why not RDBMS-Distributed Computing Challenges. Hadoop Overview: Hadoop Components-High Level Architecture of Hadoop. Hadoop Distributed File System: HDFS Architecture-Daemons Related to HDFS- Working with HDFS Command-Special Features of Hadoop.

Processing Data With Hadoop [2]: Introduction-How Map Reduce Works-Map Reduce Example. Word Count Example using Java.

Managing Resources and Applications with YARN [2] : Introduction-Limitation of Hadoop 1.0- Hadoop 2: HDFS-Hadoop 2: YARN-Business Intelligence on Hadoop

Module III: NOSQL – MONGODB AND CASSANDRA [9L]

NoSQL – MongoDB [4] : What is MongoDB? - Using JSON-Creating or generating a unique key Support for dynamic queries- Storing binary data-Replication-Sharding-Updating information in-place. Terms used in RDBMS and MongoDB-Data types in Mongodb-MongoDB - CRUD (Insert (), Update (), Save (), Remove (), find ())-MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations.

NoSQL – Cassandra [4] : What is Cassandra?-Why Cassandra?- Peer to peer network-Gossip and Failure detection- Anti-Entropy & Read Repair- Writes in Cassandra- Hinted handoffsTunable consistency. Cassandra- CQLSH - CRUD, Counter, List, Set, Map, Tracing.
NoSQL – MongoDB Vs. NoSQL – Cassandra
[1L]

Module IV: HADOOP HIVE [9L]

Introduction to Hive - The Problem Solution [3]: Hive Use Case- Data Growth- Schema Flexibility and Evolution- Extensibility. What is Hive: History of Hive and Recent Releases of Hive-Hive Features-Hive Integration and Work Flow- Hive Data Units.

Hive Architecture-Hive Primitive Data Types and Collection Types-Hive File Formats-Hive Query Language Statements: DDL-DML. Hive Partitions-Bucketing-Views-Sub Query-Joins Hive User Defined Function-Aggregations in Hive-Group by and Having-Serialization and Deserialization-Hive Analytic Functions**. [6L]**

Module V: HADOOP – PIG [8L]

Hadoop – Pig: Introducing Pig [2L] : History and Anatomy of Pig-Pig on Hadoop-Pig Features-Pig Philosophy-Word count example using Pig-Use Case for Pig-Pig Primitive Data Types , Collection Types and NULL.

Pig Latin Overview [2L]: Pig Latin Grammar - Comments, Keywords, Identifiers-Case sensitivity in Pig- Common Operators in Pig.

Pig Statements [1L]: LOAD-STORE-DUMP-Interactive Shell – GRUNT: FILTER- SORTGROUP BY-ORDER BY- JOIN-LIMIT.
Pig Latin Script [2L]: Local Mode-Map Reduce Mode-Running Pig Script. Working with: Field Tuple-Bag.
User Defined Function-Parameters in Pig.
Jasper Report using Jasper soft studio: Introduction to Jasper Report using Jasper Soft Studio Reporting using MongoDB-Reporting using Cassandra **[1L]**

Text books:

1. Mark Dexter, Louis Landry, "Joomla Programming", 2012 Pearson Education.
2. Seema Acharya and Subhashini C, "Big Data and Analytics", Wiley Publication, 2015

Recommended books:

1. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", Wiley Publication, 2013.
2. Tom White, "Hadoop: The Definitive Guide", O"Rilly Publication, 2015.
3. Chuck Lam, "Hadoop in action", Dreamtech Press, 2011.
4. Dirk Deroos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, "Hadoop for dummies", Wiley publication, 2015.

Other References:

1. https://www.mongodb.org
2. http://cassandra.apache.org
3. http://apache.bytenet.in/hadoop/common/hadoop-2.6.0/
4. http://apache.bytenet.in/hive/
5. http://apache.bytenet.in/pig/
6. https://community.jaspersoft.com

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS703B.1	3	2	2	1								3
CS703B.2	3	3	3	2								3
CS703B.3	3	3	2	3								3
CS703B.4	2	3	2	2								3
CS703B.5	3	2	2	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS703B.1	3	2	2
CS703B.2	3	3	2
CS703B.3	3	2	3
CS703B.4	2	2	3
CS703B.5	2	3	3

Name of the Paper: Sensor Network and IOT
Paper Code: CS703C
Contact (Periods/Week):3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

16. Familiar with basic Computer Networks concepts
17. Basic knowledge of Microcontroller fundamentals

Course Objective(s)

- To explore the interconnection and integration of the physical world and the cyberspace
- To understand building blocks of Internet of Things and characteristics
- To design and develop IoT Device

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and explain the Fundamental Concepts and applications of ad- hoc and wireless sensor networks
CO2	Describe and analyze the MAC protocol issues of ad-hoc networks
CO3	Design and develop routing protocols for ad-hoc wireless networks with respect to TCP design issues
CO4	Explain the concepts of network architecture and MAC layer protocol for WSN
CO5	Develop and analyze the WSN routing issues by considering QoS measurements

Module -1: [11L]
Wireless Sensor Networks Fundamentals
Wireless medium access issues [1L]
MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols(CSMA,PAMAS) [2L]
Schedule based protocols (LEACH, SMACS, TRAMA) Address and Name Management in WSNs, Assignment of MAC Addresses [2L]
Routing Protocols- Energy-Efficient Routing, Geographic Routing, Hierarchical networks by clustering. [2L]
Sensor deployment & Node discovery [2L]
Dataaggregation & dissemination [2L]

Module -2: [6L]
Fundamentals on IoT
Definition of IoT and Characteristics of IoT [1L]
Physical and logical design of IoT [2L]
Functional blocks of IoT [1L]

Communication models &APIs: Internet connectivity, Internet-based communication,IPv4, IPv6,6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS,FTP,TELNET and ports. [2L]

Module 3: [7L]
Message to Message Communication and IoT
M2M communication and Modified OSI Model for the IoT/M2M Systems [1L]
Data enrichment, data consolidation and device management at IoT/M2M Gateway [2L]
Web communication protocols used by connected IoT/M2M devices [2L]
Message communication protocols (CoAP-SMS, CoAP-MQ, MQTT,XMPP) for IoT/M2M devices [2L]

Module -4: [11L]
IoT Prototyping and Security
Introduction to Prototyping Embedded device software [1L]
Programming Embedded Device Arduino Platform using IDE [1L]
Reading data from sensors and devices, Devices, Gateways [2L]
Internet and Web/Cloud services software development [1L]
Programming MQTT clients and MQTT server [2L]
Introduction to IoT privacy and security [2L]
Vulnerabilities, security requirements and threat analysis [1L]
Domain specific applications of IoT [1L]

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach", Orient BlackSwan
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley

Recommended books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, Rowan Trollope, "IoT Fundamentals : Networking Technologies, Protocols and Use Cases for the Internet of Things", Pearson
2. C. Siva Ram Murthy, B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS703C.1	3	2	2	1								3
CS703C.2	3	3	3	2								3
CS703C.3	3	3	2	3								3
CS703C.4	2	3	2	2								3
CS703C.5	3	2	2	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS703C.1	3	2	2
CS703C.2	3	3	3
CS703C.3	3	3	2
CS703C.4	2	3	2
CS703C.5	3	2	2

Name of the Paper: Distributed Algorithms
Paper Code: CS 704(A)
Contact (Periods/Week):=3L/Week
Credit Point: 2
No. of Lectures: 35

Prerequisite:

18. Familiarity with the basic concept of Algorithm and protocols
19. A solid background in mathematics, including probability, connective arithmetic.

Course Objective(s)

- To learn the basic concept of different models of distributed algorithm.
- To learn the principles of Analyze of synchronous, asynchronous and shared allocation techniques.
- To build concepts of shared storage, data links and agreement mechanisms for algorithms.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Develop the fundamental knowledge of parallel and distributed models
CO2	Design, development, and performance analysis of parallel and distributed
CO3	Develop and implement parallel and distributed algorithms
CO4	Analyze the performance issues in parallel computing and trade-offs
CO5	Understand the different issues involved in distributed environment

MODULE– I [TOTAL – 7L]

Introduction to Distributed Algorithms, Kinds of Distributed Algorithm (**1L**);
Timing Models (**1L**),
Synchronous Network Algorithms: Synchronous Network Model, (**1L**);
Leader Election in a synchronous Ring (**1L**);
Algorithms in General Synchronous Networks (**1L**);
Distributed Consensus with Link Failures, Distributed Consensus with Process failures (**1L**);
More Consensus problems (**1L**)

MODULE – II [TOTAL – 5L]

Asynchronous System and network Model (2**L**);
Shared Memory Algorithms and Model (**1L**);
Mutual Exclusion, Resource Allocation (**1L**);
Consensus; Atomic Objects (**1L**)

MODULE – III [TOTAL – 5L]

Basic Network Algorithms (**2L**);
Synchronizers, Shared Memory versus Networks (**2L**);
Logical Time, Global Snapshots and Stable properties (**1L**)

MODULE – IV [TOTAL – 11L]

Network Resource Allocation: Mutual Exclusion, General Resource Allocation (**2L**);
Process Failures: Network methodology (**1L**);
Impossibility of Agreement in the presence of Faults, A Randomized Algorithm (**2L**);
Failure Detectors, Approximate Agreement (**2L**);
Data Link Protocols: The Problem, Stenning'sProtocol (**2L**);
Alternating Bit Protocol (**1L**);
Bounded Tag protocols tolerating Reordering, Tolerating Crashes (**1L**)

MODULE – V [TOTAL – 7L]

Partially Synchronous Algorithms: Partially Synchronous System Models: MMT and General Timed Automata (**2L**);
Properties and Proof methods, Modeling Shared Memory and Network Systems (**2L**);
Mutual Exclusion with Partial Synchrony: A single-register algorithm (**1L**);
Resilience to Timing Failures, Consensus with partial Synchrony: An Efficient algorithm (**2L**).

Text Book:

1.Joseph Jaja, "**An Introduction to Parallel Algorithms**", Addison Wesley
2.Nancy A. Lynch, "**Distributed Algorithms**", Morgan Kaufmann Publishers, 2000
3.A.D. Kshemkalyani, M. Singhal, "**Distributed Computing: Principles, Algorithms, and Systems**", Cambridge University Press, March 2011.

References

1.Geral Tel, "**Introduction to Distributed algorithms**", 2nd Edition, Cambridge, 2004
2.Nicola Santoro, "**Design and Analysis of Distributed Algorithms**", Wiley Inter-science, John Wiley & Sons, Inc., Publication, 2007.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS704A.1	3	3	3	3								3
CS704A.2	3	3	2	2								3
CS704A.3	3	2	3	3								3
CS704A.4	3	2	3	3								3
CS704A.5	2	2	2	2								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS704A.1	3	3	3
CS704A.2	2	2	2
CS704A.3	3	3	2
CS704A.4	2	2	3
CS704A.5	3	3	3

Name of the Paper: Bio-informatics
Paper Code: CS704B
Contact (Periods/Week): L-T-P=3-0-0
Credit Point: 3
No. of Lectures: 35

OBJECTIVES: The student should be made to:

- Be familiar with the modeling techniques.
- Learn microarray analysis.
- Exposed to Pattern Matching and Visualization.

OUTCOMES: The students will be able to upon completion of the course,

- Develop models for biological data
- Apply pattern matching techniques to bioinformatics data – protein data genomic data.
- Apply micro array technology for genomic expression study

Course Outcomes (COs):

After attending the course students should be able to

CO1	Acquire the knowledge of Bioinformatics technologies with the related concept of DNA RNA and their implications
CO2	Develop idea in Molecular Biology
CO3	Understand the concept and techniques of different types of Data Organization and Sequence Databases with different types of Analysis Tools for Sequence Data Banks.
CO4	Acquire the knowledge of the DNA Sequence Analysis.
CO5	Analyze the performance of different types of Probabilistic models used in Computational Biology.

Module -1: **[7L]**

INTRODUCTION TO MOLECULAR BIOLOGY:

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 Gene Concept.

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.

Introduction to Bioinformatics. Recent challenges in Bioinformatics.

Module -2: **[10L]**

Introduction to Genomic data, Data Organization and Sequence Databases: Sequence Data Banks - Introduction to sequence data banks - protein sequence data bank. Signal peptide data bank, Nucleic acid sequence data bank - GenBank, AIDS virus sequencedata bank. RRNA data bank, structural data banks - protein Data Bank (PDB), The Cambridge Structural Database (CSD) : Genome data bank - Metabolic pathway data : Microbial and Cellular Data Banks.

Introduction to MSDN (Microbial Strain Data Network):Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line information system; Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed;

Module 3: [8L]

DNA SEQUENCE ANALYSIS
DNA Mapping and Assembly : Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing
Secondary Structure predictions;
prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Networking.
Tertiary Structure predictions;
prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Networking

Module -4: [10L]

Introduction Probabilistic models used in Computational Biology:
Probabilistic Models;
Gene Regulatory Method Application of HMM in Bioinformatics : Genefinding, profile searches, multiple sequence alignment and regulatory site identification.
Applications in Biotechnology
: Protein classifications, Fold libraries, Protein structure prediction: Fold recognition (threading), Protein structure predictions : Comparative modeling (Homology), Advanced topics: Protein folding, Protein-ligand interactions, Molecular Modeling & Dynamics, Drug Designing.

TEXT BOOK:

- Yi-Ping Phoebe Chen (Ed), "BioInformatics Technologies", First Indian Reprint, Springer Verlag, 2007.

REFERENCES:

- Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
- Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS704B.1	3	3	3	2	2							2
CS704B.2	3	2	2	2	2							3
CS704B.3	2	3	2	2	3							2
CS704B.4	2	2	3	2	3							2
CS704B.5	3	2	2	2	2							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS704B.1	3	3	3
CS704B.2	3	2	2
CS704B.3	2	2	2
CS704B.4	3	3	3
CS704B.5	3	3	3

Name of the Paper: Cryptography and Network Security
Paper Code: CS704C
Contact (Periods/Week):3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

20. Knowledge of Computer Networksand Operating Systems fundamentals
21. Understanding of Discreet Mathematics concepts

Course Objective(s)

- To impart concepts on cryptography and Network security
- To gain knowledge ofthe standard algorithms used to provide confidentiality, integrity, and authenticity
- To recognize the various key distribution and management systems for security of a cryptosystem

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand cryptography and network security concepts and application.
CO2	Apply security principles to system design.
CO3	Identify and investigate network security threat
CO4	Analyze and design network security protocols.
CO5	Conduct research in network security.

Module -1: [6L]
INTRODUCTION AND NUMBER THEORY
Introduction - Services, Mechanisms, and Attacks, OSI security architecture, Network security model**[1L]**
Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography)**[1L]**
Finite Fields and Number Theory: Groups, Rings, Fields, Modular arithmetic, Euclid's algorithm**[2L]**
Finite fields, Polynomial Arithmetic, Prime numbers, Fermat‟s and Euler‟s theorem**[1L]**
Testing for primality -The Chinese remainder theorem - Discrete logarithms **[1L]**

Module -2: [8L]
BLOCK CIPHERS AND PUBLIC KEY CRYPTOGRAPHY
Data Encryption Standard- Block cipher principles, block cipher modes of operation**[2L]**
Advanced Encryption Standard (AES), Triple DES, Blowfish, RC5 algorithm**[2L]**
Public key cryptography: Principles of public key cryptosystems, The RSA algorithm**[2L]**
Key management - Diffie Hellman Key exchange, Elliptic curve arithmetic, Elliptic curve

cryptography **[2L]**

Module 3: [6L]
HASH FUNCTIONS AND DIGITAL SIGNATURES
Authentication requirement, Authentication function, MAC, Hash function**[2L]**
Security of hash function and MAC, MD5, SHA, HMAC, CMAC**[2L]**
Digital signature and authentication protocols, DSS, ElGamal, Schnorr **[2L]**

Module -4: [9L]
SECURITY PRACTICE AND SYSTEM SECURITY
Authentication applications, Kerberos, X.509**[1L]**
Authentication services, Internet Firewalls for Trusted System: Roles of Firewalls**[1L]**
Firewall related terminology- Types of Firewalls**[1L]**
Firewall designs principles, SET for E-Commerce Transactions**[2L]**
Intruder, Intrusion detection system**[1L]**
Virus and related threats, Countermeasures**[1L]**
Trusted systems, Practical implementation of cryptography and security **[2L]**

Module -5: **[6L]**
E-MAIL, IP,AND WEB SECURITY
E-mail Security: Security Services for E-mail-attacks possible through E-mail, Establishing keys privacy, authentication of the source [**1L]**
Message Integrity, Non-repudiation, Pretty Good Privacy, S/MIME**[1L]**
IP Security: Overview of IPSec, IPv4 and IPv6-Authentication Header, Encapsulation Security Payload (ESP)**[1L]**
Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding)**[1L]**
Web Security: SSL/TLS Basic Protocol, computing the keys, client authentication**[1L]** PKI as deployed by SSL Attacks fixed in v3, Exportability, Encoding, Secure Electronic Transaction**[1L]**

Text Books:

3. Atul Kahate, “Cryptography and Network Security”, Third edition, McGraw Hill Education

Recommended books:

3. William Stallings, “Cryptography and Network Security: Principles and Practice”, Sixth edition, Pearson
4. Behrouz A. Forouzan, Debdeep Mukhopadhyay, “Cryptography and Network Security”, Second edition, McGraw Hill Education

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS704C.1	3	3	3	2	2							2
CS704C.2	3	2	2	2	2							3
CS704C.3	2	3	2	2	3							2
CS704C.4	2	2	3	2	3							2
CS704C.5	3	2	2	2	2							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS704C.1	3	3	3
CS704C.2	3	2	2
CS704C.3	2	2	2
CS704C.4	3	3	3
CS704C.5	3	3	3

Practical

CourseCode:CS791

Course Name: Artificial Intelligence Lab

Objective(s):

- To learn the fundamentals of PROLOG Programming.
- To impart adequate knowledge on the need of PROLOG programming languages and problem solving techniques.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Acquire foundational knowledge of PROLOG to implement an Artificial Intelligent Agent as an executable computer program for Knowledge Representation and Inferencing and understand the working principle of the agent and assess its utilitarian importance in current technological context leading towards lifelong learning.
CO2	Identify and formulate an engineering problem by analyzing its characteristics to fit a State-Space Exploration Framework or an Inferencing Agent Formulation Framework of Artificial Intelligence.
CO3	Explore relevant literature and apply the concepts of Artificial Intelligence to solve a problem by implementing well-known Artificial Intelligence strategies using proper techniques and tools of PROLOG.
CO4	Develop ideas and propose expert systems offering solutions to the challenging problems of Artificial Intelligence.
CO5	Plan and Implement Artificial Intelligence based ideas as executable PROLOG programs through developing intelligent heuristic strategies or expert systems with adequate documentation in collaborative environment for successfully carrying out projects on Artificial Intelligence Problems and investigate their effectiveness by analyzing the performances using proper techniques and tools.

Syllabus:

Programming Languages such as PROLOG or LISP covering the sample following topics (but
not limited to):-

1. Basic computational related programs, e.g., factorial, Fibonacci, GCD etc.
2. Mini program to express the flavour of intelligence, e.g. if any symptoms are given, the disease should be identified using the program
3. Family tree related problem to understand how to apply logic to solve complex problems
4. Programs related to list/array

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS791.1	3	3	2	2	3				3	-		3
CS791.2	3	2	2	3	3				3	-		3
CS791.3	3	3	2	2	3				3	-		3
CS791.4	3	3	3	3	3				3	-		3
CS791.5	3	3	3	3	3				3	-		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS791.1	3	2	2
CS791.2	3	3	3
CS791.3	3	3	3
CS791.4	3	2	3
CS791.5	3	3	3

Paper Name: Soft Computing Lab
Code: CS
792A
Contacts:
3P
Credits: 2

Prerequisite:

22. Familiarity with the Matlab command
23. A solid background in mathematical and programming Knowledge

Course Objective(s)

- To learn the to implement soft computing methods.
- To learn to solve the real world problem through program of Matlab/Python
- To learn to solve and optimize the real world problem using Matlab/Python

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and explain the basic concept of soft computing and hard computing and apply them in designing solution to engineering problem.
CO2	Identify and formulate learning rules for each of the architectures and learn several neural network paradigms and its applications to solving engineering and other problems.
CO3	Explore relevant literature and apply fuzzy logic and reasoning to handle uncertainty and solving interdisciplinary engineering problems
CO4	Use genetic algorithms to combinatorial optimization problems and recognize the feasibility of applying a soft computing methodology for a particular problem.
CO5	Implement the concept and techniques of designing of soft computing methods in real world problem.

Lab

1.Python/Matlabprogrammingintroduction.
2.Matlabprogrammingfundamental./Pythonprogrammingfundamental.
3. Matlab tool box implementation. / Python introduction to numerical calculation programming(scitificpython,Numericalpython,Imageprocessing).
4.Python/Matlabprogrammingtosimulateasinglelayerneuralnetworkdesigns.
5.Python/Matlabprogrammingtosimulatemultiplelayerneuralnetworkdesigns.
6.Python/Matlabprogrammingtoobservetheperceptronlearningalgorithmperformances forasinglelayernetwork.Inthis experimentconsidertheXOR dataset.
7.WriteaMatlab/pythoncodeformaximizingF(x)=x2,,wherexrangesfromsay0to31 usingGeneticAlgorithm.
8. Use of Genetic Algorithm toolbox in matlab for optimization problem solving. ImplantationSimpleGeneticAlgorithminpythonforsolvingoptimizationproblem.
9.WriteaMatlab/pythonprogramtoimplementthedifferentFuzzyMembershipfunctions.
10.WriteaMatlab/pythonprogramtoimplementFuzzysetoperations andits properties.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS792A.1	3	3	3	3	3	2	2		2			3
CS792A.2	3	3	3	3	3	2	2		2			3
CS792A.3	3	3	3	3	3	2	2		2			3
CS792A.4	3	3	3	3	3	2	2		2			3
CS792A.5	3	3	3	3	3	2	2		2			3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS792A.1	3	3	3
CS792A.2	3	3	3
CS792A.3	3	3	3
CS792A.4	3	3	3
CS792A.5	3	3	3

Name of the Paper: Natural Language Processing Lab
Paper Code: CS792B
Contact (Periods/Week):=3L/Week
Credit Point: 2

Prerequisite:

24. Familiarity with the programming concepts in any language
25. A solid background in mathematics, including probability, statistics.

Course Objective(s)

- To learn the basics of NLTK toolkit.
- To learn the principles of NLP through programming.
- To build an application using different algorithms and natural language processing techniques.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Analyze and apply the morality and method of Human Languages such as English and other Indian Languages using computers.
CO2	Understand the semantics and pragmatics of English language for text processing
CO3	Create CORPUS linguistics based on digestive approach (Text Corpus method)
CO4	Illustrate, analyze and apply for the modern techniques for statistical approaches to machine translation.
CO5	Analyze and apply the POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language.

Module I:
Fundamentals of Python languages, introduction to list, dictionaries etc., input and output handling, saving data to files, retrieving data from files. Writing functions and code reusing. Introduction to working knowledge of matplotlib, SciKit, NumPy and other necessary tools and libraries as per the need.

Module II:
Language processing with python. Manipulating texts and words by writing programs programs. Accessing text corpora, lexical resources,using WordNet through NLTK tool kit. Processing raw text, normalizing, segmenting, applying regular expressions.

Module III:
Writing programs to categorize texts, words, tagging words using tagger, generating tagged tokens, N-Gram tagging, text classification. Writing programs to extract information from texts.

Module IV:
Writing programs to analyze sentence, its meaning etc. Managing linguistic data through programs.

Text books:

1. Steven Bird, Ewan Klein, and Edward Loper. "Natural Language Processing– Analyzing Text with the Natural Language Toolkit". 2009, O'Reilly, 1ed.

Reference books:

1. Learning Python: Powerful Object-Oriented Programming: 5th Edition by Mark Lutz, 2013, O'Reilly.
2. Natural Language Toolkit documentation (https://www.nltk.org/)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS792B.1	3	3	3	3	3	3	2		3			3
CS792B.2	3	3	3	3	3	3	2		3			3
CS792B.3	3	3	3	3	3	3	2		3			3
CS792B.4	3	3	3	3	3	3	2		3			3
CS792B.5	3	3	3	3	3	3	2		3			3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS792B.1	3	3	3
CS792B.2	3	3	3
CS792B.3	3	3	3
CS792B.4	3	3	3
CS792B.5	3	3	3

Name of the Paper: Web Technology Lab

Paper Code: CS792C

Contact (Periods/Week): 3P/Week

Credit Point: 2

No. of Lectures: 30

Prerequisite:

1. Fundamentals of Programming.

Course Objective(s)

- To impart the design, development and implementation of Static and Dynamic Web Pages.
- To develop programs for Web using Scripting Languages as well as .net framework.
- To give an overview of Server Side Programming in Web

Course Outcomes (COs):

After attending the course students should be able to

CO1	To develop interactive web pages using HTML, DHTML, CSS and image map
CO2	To procure the knowledge of information interchange formats like XML
CO3	To validate fields of web pages using scripting languages like JavaScript
CO4	To develop web applications using PHP and ASP.net
CO5	To acquire the server side programming concepts using servlet, JSP

List of Experiments:

1. Write a single html program through which you can explain a) anchor tag, b)'img' tag with 'src' attribute, c)paragraph d) heading.

2. Write a single html program through which you can draw a table which consists of 3 row and

4 columns where 1st row contains 4 different column fields of a student's information with red text color and Calibri font style with font 12. Rest cells of whole table contain values with blue text colors and Times new roman font style with font 10.

3. Write a single html program where 1st paragraph can collect its specified style from internal stylesheet describes inside that html program and 2nd paragraph can collect its specified style from another file (external stylesheet).

4. Write a single html program which implements image map concept using 'usemap' and
<map>.**5.** Write a html program to find out Celsius temperature of a given Fahrenheit temperature using
JavaScript.
6. Write a html program to find out m to the power n (m, n valid integer no) using a function using javascript.
7. Write a xml parsing technique through which parse a text string into an XML DOM object, and extracts the info from it with JavaScript.
8. Write a simple php program through which you can find out maximum and minimum among
three no's specified by the user.
9. Write a simple php program through which you can implement the concept of GET & POST
method w.r.t PHP Form handling.
10. Write a simple program in ASP.net through which you can create a login page of your own website.
11. Write a simple JSP program through which you can print even and odd no separately within a given range.
12. Create a Online Registration form for individual user of an website using Servlet.

Text Books:

1."Web Technology: A Developer's Perspective", N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. **(Topics covered: html, CSS, imagemap, xml)**
2."Learning PHP, MySQL & JavaScript", Robin Nixon, O'Reilly Publication.(**Topics covered:**
PHP, Java Script)
3."Head First Servlet's & JSP", Bryan Basham, Kathy Sterra, Bert Bates, O'Reilly
Publication.(**Topics covered: Servlet, JSP)**
4.ASP.NET Core 2.0 MVC And Razor Pages For Beginners:", Jonas Frajerberg, O'Reilly
Publication.(**Topics covered:**

ASP.Net, C#) Recommended books:

1. "Web Technologies", Black Book, Dreamtech Press
"Core Web Programming" Second Edition, Marty Hall and Larry Brown,"Volume Iand II, Pearson Education, 2001.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS792C.1	3	3	3	3	3				2			3
CS792C.2	3	3	3	3	3				2			3
CS792C.3	3	3	3	3	3				2			3
CS792C.4	3	3	3	3	3				2			3
CS792C.5	3	3	3	3	3				2			3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS792C.1	3	3	3
CS792C.2	3	3	3
CS792C.3	3	3	3
CS792C.4	3	3	3
CS792C.5	3	3	3

Department of Computer Science and Engineering

Curriculum Structure

&

Syllabus

2016-2017

(Autonomy)

of

8th Semester

			8TH SEMESTER					
				Contact hours				Cr. Points
			8th Semester	L	T	P	Total	
SL No	**Type**	**Code**	**A. THEORY**					
1	HS	HU805	Principle of Management	2	0	0	2	2
2	PE	CS801A	Mobile Computing	3	0	0	3	3
		CS801B	Human computer Interaction					
		CS801C	Cyber Law and Security Policy					
		CS801D	VLSI Design					
3	PE	CS802A	Parallel Computing	3	0	0	3	3
		CS802B	Machine Learning					
		CS802C	Real Time Operating System and Embedded System					
		CS802D	Advanced Computer Architecture					
Total Theory							8	8
			B. PRACTICAL					
4	PC	CS891	Design lab	0	0	3	3	2
5		CS892	Project 2	0	0	12	9	6
6		CS893	Seminar Presentation	0	0	3	3	2
Total Practical							15	10
			C. SESSIONAL					
7		CS881	Grand Viva	0	0	0	0	4
Total							26	22
Grand Total								198

Syllabus

Theory

Paper Name: Principles of Management
Paper Code: HU 804

Contact: L-T-P= 2-1-0
Credits: 3
Course Objectives:

1. To develop ability to critically analyze and evaluate a variety of management practices in the contemporary context
2. To understand and apply a variety of management and organizational theories in practice
3. To be able to mirror existing practices or to generate their own innovative management competencies required for today's complex and global workplace
4. To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organizations

Course Content:

Unit	Details	Hour
01	Introduction to Management: definitions, managerial roles and functions; Science or Art perspectives- External environment-global, innovative and entrepreneurial perspectives of Management (3 Hrs.)– Managing people and organizations in the context of New Era- Managing for competitive advantage - the Challenges of Management	**4**
02	Early Contributions and Ethics in Management: Scientific Management- contributions of Taylor, Gilbreths, Human Relations approach-contributions of Mayo, McGregor's Theory, Ouchi's Theory Z .Systems Approach, the Contingency Approach, the Mckinsey 7-S Framework Corporate Social responsibility- Managerial Ethics.	**6**
03	Planning: Nature and importance of planning, -types of plans (3 Hrs.)- Steps in planning, Levels of planning - The Planning Process. – MBO Organising for decision making: Nature of organizing, organization levels and span of control in management Organisational design and structure –departmentation, line and staff concepts Leading and Controlling: Leading Vs Managing – Trait approach and Contingency approaches to leadership - Dimensions of Leadership (3 Hrs.) - Leadership Behavior and styles – Transactional and Transformational Leadership Basic control processcontrol as a feedback system – Feed Forward Control – Requirements for effective control – control techniques – Overall controls and preventive controls – Global controlling	**6**
3	Management of Physical Resources Plant: site selection procedures, factors affecting selection. Layout-types and relative merits and demerits,	**6**

	Maintenance-Objectives, different types of associated decisions, strategies for effective maintenance, computer applications. Material : Functions, objectives, planning and control including inventory models with or without storage costs, price break (excluding dynamic and probabilistic considerations). Different classes of inventory. Material Requirement Planning (MRP)	
4	Quality management: Quality definition, quality planning, quality control and quality management, Total quality management, ISO 9000 systems, simple quality control techniques like control charts and acceptance sampling, Kaizen & Six Sigma	**4**
5.	Marketing management consumer behavior, market research, product design and development pricing and promotion.	**4**
	References 1. Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill. 2. L.M. Prasad, Principles of Management , Sultan Chand & sons, New Delhi. 3. Sherlekar & sherlekar, Principles of Management, Himalaya Publishing House, New Delhi. 4. Stephen Robbins, Organizational Behavior, Pearson Education, New Delhi **5.** Production And Operations Management--K. ASWATHAPPA K. Shridhara Bhat ,Himalayan publishing House	

CO-PO mapping for HU 804

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	_	_	_	_	_	**1**	**1**	**1**	**1**	**2**	_	_
CO-2	_	_	_	_	_	**1**	**1**	**3**	**1**	**2**	_	_
CO-3	_	_	_	_	_	**3**	**2**	**-**	_	**1**	_	**3**
CO-4	_	_	_	_	_		**2**	**1**	**3**	_	_	_

Name of the Paper: Mobile Computing
Paper Code: CS801A
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

1.Basic concept of computer network and communication engineering
2.Basic programming knowledge

Course Objective(s)

- Describe the basic concepts and principles in mobile computing
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
- Understand positioning techniques and location-based services and security issues

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate the concepts and working of modern communication technologies.
CO2	Demonstrate the various routing algorithms for both infrastructure based and ad hoc networks.
CO3	Develop mobility and bandwidth management in cellular network
CO4	Design and build an energy efficient and secure mobile computing environment using heterogeneous wireless technologies
CO5	Predict the technical issues related to recent mobile computing environment.

Module I: Introduction [6L]:
Evolution of different types of wireless communication devices; Effects of mobility of devices; Cellular mobile networks – mobility management (call setup, handoff, interoperability and internetworking), bandwidth management, energy management, security; Brief introduction about different generations of wireless communication technology – 1G, 2G, 3G, 4G, 5G.

Module II: Mobile Data Communication [5L]

Mobile Data Communication, WLANs (Wireless LANs) IEEE 802.11 standard, Bluetooth technology, Bluetooth Protocols, Ad hoc networks initialization, leader election, location identification, communication protocols, energy and security.

Module III: Mobility Management in Cellular Networks [4L]
Call setup in PLMN (location update, paging), GPRS, Call setup in mobile IP networks; Handoff management; Mobility models- random walk, random waypoint, map-based, group-based.

Module IV: Bandwidth Management in Cellular Mobile networks [3L]

Mathematical formulation of the channel assignment problem (CAP); CAP and generalized graph coloring; Benchmark instances; Lower bound on bandwidth.

Module V: Localization of Nodes in a Mobile Network [4L]

Different approaches, Indoor and outdoor localizations, LOS and NLOS signals, Outdoor localization techniques – triangulation (TOA-based, AOA- based), errors due to inaccuracies in coordinates of beacon nodes and in measurements.

Module VI: Message Communication in Ad Hoc Networks [6L]

Collision avoidance mechanism (different schemes for a deterministic transmission schedule), collision resolution mechanism – successive partitioning approach; Time slot assignment based on location information, Point-to-point routing in ad hoc networks – proactive, reactive and hybrid approaches, different protocols - DSDV, DSR, AODV, TORA, ZRP

Module VII: Energy-efficient Communication [3L]

Energy efficiency at various layers - Physical layer, MAC layer, Network layer, Application layer, performance analysis in noisy channel environment.

Module VIII: Secure Wireless Communication [4L]

Introduction-different types of attacks, internal attacks, external attacks; measures against attacks (authentication, intrusion detection, encryption); RC4 algorithm

Text books:

1) K. Sinha, S.Ghosh and B. P. Sinha, Wireless Networks and Mobile Computing. CRC Press : New York, 2015.

Recommended books:

1) Research articles published on secure wireless communication (authentication, mitigation of DoS, DDoS, eavesdropping) published in leading journals.
2) Mark Ciampa, Guide to Designing and Implementing wireless LANs, Thomson learning, Vikas Publishing House, 2001.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS801A.1	3	3	3	3								3
CS801A.2	3	3	3	3								3
CS801A.3	3	3	3	3								3
CS801A.4	3	3	3	3								3
CS801A.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS801A.1	3	3	3
CS801A.2	3	3	3
CS801A.3	2	3	3
CS801A.4	3	3	2
CS801A.5	3	3	3

Name of the Paper: Human computer Interaction
Paper Code: CS801B
Contact (Periods/Week):3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

- Basic understanding of relevant psychological theories and approaches

Course Objective(s): The Student Should Be Made To:

- Learn The Foundations Of Human Computer Interaction
- Be Familiar With The Design Technologies For Individuals And Persons With Disabilities
- Be Aware Of Mobile HCI
- Learn The Guidelines For User Interface

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the fundamental concepts of Human Computer Interaction to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of Interactive Design so that they can Design user interface as per specification and Validate it.
CO3	Understand and Explain the fundamental concepts of HCI Models and Analyse their effectiveness and limitations.
CO4	Explain or Illustrate the fundamental design principles of HCI for mobile platforms and Use it appropriately to Design user interface as per specification.
CO5	Understand the fundamental design principles of Web-interface and Design web-interface as per specification and analyse the effectiveness as well as limitations of them making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

Module I : FOUNDATIONS OF HCI [7L]
The Human: I/O Channels – Memory – Reasoning And Problem Solving; The Computer: Devices – Memory – Processing And Networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity- Paradigms.
Module II : DESIGN & SOFTWARE PROCESS [7L]
Interactive Design Basics – Process – Scenarios – Navigation – Screen Design – Iteration And Prototyping. HCI In Software Process – Software Life Cycle – Usability Engineering – Prototyping In Practice – Design Rationale. Design Rules – Principles, Standards, Guidelines, Rules.

Evaluation Techniques – Universal Design.

Module III : MODELS AND THEORIES [7L]

Cognitive Models –Socio-Organizational Issues And Stake Holder Requirements – Communication And Collaboration Models-Hypertext, Multimedia And WWW.

Module IV : MOBILE HCI [7L]

Mobile Ecosystem: Platforms, Application Frameworks- Types Of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements Of Mobile Design, Tools.

Module V : WEB INTERFACE DESIGN [7L]

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays And Virtual Pages, Process Flow. Case Studies.

Text Books:

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (Module I , II & III)
- Brian Fling, "Mobile Design And Development", First Edition , O'Reilly Media Inc., 2009 (Module – IV)

Recommended books:

1. Preece J , Rogers Y, Sharp H, Baniyon D., Holland S. and Carey T. Human Computer Interaction, Addison-Wesley, 1994.
2. B. Shneiderman ; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS801B.1	3	3	3	3								3
CS801B.2	3	3	3	3								3
CS801B.3	3	3	3	3								3
CS801B.4	3	3	3	3								3
CS801B.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS801B.1	3	3	3
CS801B.2	3	3	3
CS801B.3	2	3	3
CS801B.4	3	3	3
CS801B.5	3	3	3

Name of the Paper: Cyber law and Security Policy
Paper Code: CS801C
Contact (Periods/Week): 3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

26. Familiarity in computer Networking.
27. Basic concepts about network security.

Course Objective(s)

- To Enable Learner To Understand, Explore, And Acquire A Critical Understanding Cyber Law.
- To learn the basics of a Cyber security.
- To Develop Competencies For Dealing With Frauds And Deceptions (Confidence Tricks, Scams)

Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
CO2	To acquire in depth knowledge of information technology act, security policies, and legal framework of right to privacy, data security and data protection.
CO3	To develop the understanding of relationship between commerce and cyberspace
CO4	To be familiar with network security threats and countermeasures

Module – 1A: Introduction of Cybercrime: [7]
Cybercrime, Forgery, Hacking, Software Piracy, Computer Network intrusion
Jurisdiction to prescribe/Legislative Jurisdiction; Jurisdiction to adjudicate to enforce; Cyber Jurisdiction in Civil, Criminal & International Cases.

Module – 1B: Category of Cybercrime: [5]
Criminals plan attacks, passive attack, Active attacks, cyberstalking. Unicitral Model Law, Information Technology Act.

Module – 2: Cybercrime Mobile & Wireless devices: [8]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cell phones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Module -3: Tools and Methods used in Cyber crime: [8]

Proxy servers, panword checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection: buffer over flow.Most Common Attacks, Scripts Kiddies and Packaged Defense.

Module – 4A: Phishing & Identity Theft: [4]

Phising methods, ID Theft; Online identity method.

Module – 4B: Cybercrime & Cyber security: [3]

Legal aspects, Indian laws, IT act, Public key certificate

Text Books:

4. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.
5. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
6. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
7. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)

Recommended books:

1. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.

28. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springerverlag, 1997
29. Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York,
30. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi, (2003)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS801C.1	3	3	3	3								3
CS801C.2	3	3	3	3								3
CS801C.3	3	3	3	3								3
CS801C.4	3	3	3	3								3
CS801C.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS801C.1	3	3	3
CS801C.2	3	3	3
CS801C.3	2	3	3
CS801C.4	3	3	2
CS801C.5	3	3	3

Name of the Paper: Parallel Computing
Paper Code: CS802A
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

31. Familiarity with Operating Systems
32. A solid background in Computer Organization and Architecture & Algorithm

Course Objective(s)

The objectives of this course are:

- To learn the basics of parallel system and how parallel computers work.
- To learn how to analyze the correct designs of parallel architectures, especially within the technological constraints.
- To prepare students for a career in designing the computer systems of the future.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the evolution of High Performance Computing (HPC) with respect to laws and the contemporary notion that involves mobility for data, hardware devices and software agents.
CO2	Understand, appreciate and apply parallel and distributed algorithms in problem Solving.
CO3	Evaluate the impact of network topology on parallel/distributed algorithm formulations and traffic their performance.
CO4	Gain hand-on experience with the agent-based and Internet-based parallel and distributed programming techniques.
CO5	Master skills to measure the performance of parallel and distributed programs.

Module I (Introduction) (7L)
Concepts of pipelining and parallelism, Temporal vs. spatial parallelism, differences between distributed computing and parallel computing, loosely coupled vs. tightly coupled systems, Types of parallel architectures – Instruction vs. data (SIMD, MISD, MIMD) (Flynn's classification), Series vs. parallel (Feng's classification), Pipelining vs. parallelism (Haendler's classification). Performance measures – Speed-up factor, AT and AT^2 measures, Amdahl's law,. Models of parallel computation – Parallel RAM (PRAM) model, (EREW, CREW, CRCW models), Interconnection network based model, Interrelationship among the performances under EREW, CREW and CRCW models.

Memory interleaving - S-access and C-access organization.
Concept of reservation table in multifunction static pipeline and minimum average latency.
Elementary concepts of data low architecture.

Module II (Interconnection Networks) (9L)
Static interconnection networks – concept of network graph and the desirable features of a network graph in terms of node degree, diameter, fault-tolerance and bisection width, Different types of interconnection network - Crossbar, Clos, loop, star, wheel, double-loop, tree, mesh, torus, multi-mesh, mesh of trees, multi-mesh of trees, shuffle-exchange, pyramid, hypercube, butterfly, cube-connected cycles, Moebius network, De Bruijn network, OTIS architecture.
Dynamic interconnection networks – concept of blocking, non-blocking and re-arrangeable networks, Baseline, Omega and Benes networks.

Module III (Parallel Arithmetic) (10L)
Addition/Subtraction - Addition of two n-bit numbers in O(log n) time with O(n log n) logic gates using precarry addition, carry-propagation free addition in redundant binary number system.
Multiplication – Dadda's generalized multiplier, column compression technique, parallel algorithm for multiplying two n-bit signed integers in O(log n) time, parallel multiplication in redundant binary and quarternary number systems.
Division : O($\log^2 n$) division algorithm using repeated multiplications and additions.
Parallel algorithm for prefix sum computation on different architectures.
Matrix transpose : O(n) algorithm on a mesh architecture, O(log n) algorithm on a shuffle-exchange network.
Matrix multiplication : parallel algorithms for multiplying two n x n matrices in O(n2), time, O(n log n) time, O(n) time, O(log n) time and O(1) time on appropriate parallel architectures, matrix by vector computation.

Module IV (Numerical Problems) (4L)
Solution of simultaneous linear equations: parallel algorithm based on Gauss-Jordan elimination, parallel algorithm based on Gauss-Seidel iteration.
Finding roots of a polynomial equation : parallel algorithms based on bisection method and Newton-Raphson method.

Module V (Sorting and Searching) (5L)
Odd-even transposition sort, sorting networks, 0-1 principle, Batcher's odd-even merge sort, Batcher's bitonic sort, sorting n^2 elements in O(n) time on a 2-D mesh, brief discussion on sorting n^4 elements in O(n) time a on a multi-mesh. Parallel algorithms for searching.

Text books:

1. Design and Analysis of Parallel Algorithms- Selim G. Akl, Prentice Hall.
2. Computer Architecture and Parallel Processing – Kai Hwang and F. A. Briggs, McGraw-Hill.

Recommended books:

1. Parallel Computing –Theory and Practice -Michael J. Quinn. McGraw-Hill.
2. The Art of Computer Programming Vol. 3 (Sorting and Searching) – Donald E. Knuth, Addison-Wesley.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS802A.1	3	3	3	3	2							3
CS802A.2	3	3	3	3	2							3
CS802A.3	3	3	3	3	2							3
CS802A.4	3	3	3	3	2							3
CS802A.5	3	3	3	3	2							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS802A.1	3	3	3
CS802A.2	3	3	3
CS802A.3	3	3	3
CS802A.4	3	3	3
CS802A.5	3	3	3

Name of the Paper: Machine Learning
Paper Code: CS802B
Contact (Periods/Week): 3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

1. Basic programming skills, Algorithm design.
2. Probability, Axioms of Probability, Conditional Probability, Bernoulli Distribution, Binomial Distribution, Multinomial Distribution, Uniform Distribution, Normal (Gaussian) Distribution, Chi-Square Distribution, t Distribution, F Distribution. Probability Distribution and Density Functions, Joint Distribution and Density Functions, Conditional Distributions, Bayes' Rule, Expectation, Variance, Weak Law of Large Numbers.
3. Linear Algebra; Convex Optimization ; Statistics; Calculus.

Course Objective(s)

CS802B.1 Be able to formulate machine learning problems corresponding to different applications.
CS802B.1 Understand a range of machine learning algorithms along with their strengths and weaknesses.
CS802B.1 Understand the basic theory underlying machine learning.
CS802B.1 Be able to apply machine learning algorithms to solve problems of moderate complexity.
CS802B.1 Be able to read current research papers and understand the issues raised by current research.

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand the fundamental concepts of basics of machine learning to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of regression problems so that they can propose models for predicting values based on exemplary data and Analyze their performances.
CO3	Explain or Illustrate the fundamental strategies of unsupervised machine learning paradigm to solve clustering problems and Analyze their performances.
CO4	Explain or Illustrate the concepts of Mining Frequent Patterns, Associations and Data Streams and Apply them to solve the relevant problems and Analyse their performances.

CO5	Develop ideas to Propose solutions to the problems of supervised learning and Identify problems where students can Apply the concept appropriately and Analyze the effectiveness as well as limitations of solutions making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

Module – 1: Introduction
[3L]

Applications and problems, learning scenarios, concepts of tasks (problems to be solved by machine learning), models (output of machine learning) and features (workhorses of machine learning). geometric models, probabilistic models, logical models. [3L]

Module – 2 Classification Schemes
[5L]

Binary classification, assessing and visualizing performance of classification, scoring and ranking, turning rankers into classifiers, class probability estimation. [3L]

Multiclass classification, multiclass scores and probabilities, regression, unsupervised and descriptive learning, predictive and descriptive clustering. [2L]

Module - 3: Various Models[15L]

Tree Models [3L]

Decision trees, ranking and probability estimation trees, tree learning as variance reduction, regression trees. [3L]

Rule Models [2L]

Learning ordered rule lists, learning unordered rule sets, descriptive rule learning, rule learning for subgroup discovery, association rule mining, first-order rule learning. [2L]

Linear Models [4L]

Least squares method, multivariate linear regression, regularized regression. [1L]

Perceptron, support vector machine, soft margin SVM, probabilities from linear classifiers, beyond linearity with kernel methods. [3L]

Distance-based Models [3L]

Nearest neighbour classification, distance[-based clustering, K-means algorithm, clustering around medoids. Hierarchical clustering.
[3L]

Probabilistic Models [3L]

Normal distribution, probabilistic models for categorical data, naïve Bayes model for classification, probabilistic models with hidden variables, Gaussian mixture model, compression-based model.

[3L]

Module - 4 : Features [4L]

Types of features, calculation on features, categorical, ordinal and quantitative features, structured features, thresholding and discretization, normalization and calibration, incomplete features, feature selection - matrix transformations and decompositions. [4L]

Module - 5 : Model Ensembles and Machine Learning Experiments [4L]

Model Ensembles [2L]

Bagging and random forests, boosted rule learning, mapping the ensemble landscape – bias, variance and margins, meta learning. [2L]

Machine Learning Experiments [2L]

What to measure, how to measure, how to interpret, interpretation of results over multiple data sets.
[2L]

Module - 6 : More Selected Topics in Machine Learning [4L]

Support vector machines – separable and unseparable cases, primal optimization and dual optimization problems, kernel methods – positive definite symmetric kernels and negative definite symmetric kernels, kernel-based algorithms. [4L]

Text Book

- Peter Flach, Machine Learning. Cambridge University Press, 2012.

Reference Books

- M. Mohri, A. Rostamizadeh and A. Talwalkar, Foundations of Machine Learning, MIT Press, 2012.

- Kevin P. Murphy, Machine Learning : A Probabilistic Perspective. MIT Press, 2012.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS802B.1	3	3	3	3								3
CS802B.2	3	3	3	3								3
CS802B.3	3	3	3	3								3
CS802B.4	3	3	3	3								3
CS802B.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS802B.1	3	3	3
CS802B.2	3	3	3
CS802B.3	3	3	3
CS802B.4	3	3	3
CS802B.5	3	3	3

Name of the Paper: Real Time Operating System
Paper Code: CS802C
Contact (Periods/Week):=3L/Week
Credit Point: 3
No. of Lectures: 36

Prerequisite:

7. Programming and Data Structures
8. Operating Systems
9. Computer Architecture and Organization
10. Computer Communication
11. Database Systems

Course Objective(s)

1. Syllabus deals with issues in real time operating systems, importance of deadlines and concept of task scheduling.

2. Student will be able to understand and design real time operating systems which are backbone of embedded industry.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the architecture and classifications of different embedded systems and the related programming knowledge.
CO2	Identify and understand the concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices
CO3	Choose case-specific debugging technique for an embedded system.
CO4	Design various real time systems using embedded systems.
CO5	Understand the working principles of microcontroller and apply this knowledge for developing an approach by means of existing and new methods as a team work.

Module I: Introduction to Real time systems 08L

Issues in real time computing (1L)
Structure of real time system (1L)
Need for RTOS (1L)
Task classes, Performance measures for real time system: Properties, traditional performance measures, performability, cost functions and hard deadlines, and Estimating program run times. (2L)
Introduction LINUX/ UNIX OS.(1L)

Module II: Embedded software and Task Scheduling 12L

Examples of embedded system (1L)
Characteristics and their typical hardware components, embedded software architectures (1L)
Scheduling algorithms: round robin, round robin with interrupts, function queue scheduling real time operating system selection (3L)
CPU scheduling algorithms: Rate monotonic, EDF, MLF.(2L)
Priority Scheduling, Priority Ceiling and Priority inheritance (2L)
Real time operating system: Tasks and task states, shared data and reentrancy semaphores and shared data, use of semaphores (2L)
Protecting shared data. (1L)

Module III: Features of Real Time Operating System 5L

Messages, queues , mailboxes , pipes , timer function , events, memory management
Interrupt basic system design using an RT (OS design principles, interrupt routines, task structures and priority.) (4L)
Case Studies: Vx Works and Micro OS-II.(1L)

Module IV: Real Time Databases 6L

Real time v/s general purpose databases, main memory databases, transaction priorities transaction aborts, concurrency control issues: pessimistic concurrency control and optimistic concurrency control, Disk scheduling algorithms.(6L)

Module V: Fault Tolerance Techniques 5 L

Causes of failure, Fault types(1L)

Fault detection , Fault and error containment (1L)

Redundancy: hardware redundancy, software redundancy, Time redundancy, information redundancy (1L)

Data diversity (1L)

Integrated failure handling (1L).

Text Books

3. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.
4. Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.

References

3. Alan C. Shaw, Real-Time Systems and Software, Wiley, 2001.
4. Philip Laplante, Real-TIme Systems Design and Analysis, 2nd Edition, Prentice Hall of India.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS802C.1	3	3	3	3	2							3
CS802C.2	3	3	3	3	2							3
CS802C.3	3	3	3	3	2							3
CS802C.4	3	3	3	3	2							3
CS802C.5	3	3	3	3	2							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS802C.1	3	3	3
CS802C.2	3	3	3
CS802C.3	3	3	3
CS802C.4	3	3	3
CS802C.5	3	3	3

Name of the Paper: Advanced Computer Architecture
Paper Code: CS802D
Contact (Periods/Week):3L/Week
Credit Point: 3
No. of Lectures: 35

Prerequisite:

33. Familiarity with the functionalities of basic digital computer system
34. Fundamentals of Computer Architecture

Course Objective(s)

CS802D.1 To acquire the knowledge of parallelism and pipelining

CS802D.2 To develop knowledge of parallel processing

CS802D.3 To combine the concept and design techniques of interconnection network

CS802D.4 To acquire the knowledge of shared memory architecture

CS802D.5 To describe the fundamentals of embedded system architecture

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate the basic concept of computer architecture and its performance measurement, parallel processing, Flynn's classification and Amdahl's law and apply this knowledge in designing solution for real life engineering problem.
CO2	Summarize the basic concept of pipeline, instruction pipeline, arithmetic pipeline, hazards detection and prevention and use this knowledge for designing and implementing mathematical and engineering problem leading to lifelong learning.
CO3	Identify the concept of Instruction-Level Parallelism to solve engineering problem.
CO4	Illustrate and Compare concept of Multiprocessor architecture and parallel architecture and apply this knowledge for developing an approach by means of existing and new methods as a team work.
CO5	Understand the concept of message passing architecture and interconnection network and design an optimized model for building a new solution as a professional engineering practice as a team.

Total :35 Lectures

Module – 1: Introduction to Advanced Computer Architectures [5L]

Different types of architectural classifications – instruction vs. data (SISD, SIMD, MISD, MIMD), serial vs. parallel, pipelining vs. parallelism; Pipelining: Definition, different types of pipelining, hazards in pipelining. Concept of reservation tables, issue of multiple instructions with minimum average latency (MAL).

Module –2: Parallel Processing & ILP[8L]

RISC architecture, characteristics of RISC instruction set & RISC pipeline, its comparisons with CISC,necessity of using optimizing compilers with RISC architecture, Review of instruction-level parallelism-Super pipelining, Superscalar architecture, Diversified pipelines and out of order execution, VLIW architecture, Dataflow and Control Flow Architectures, Loop Parallelization

Module – 3: Interconnection Networks[13L]

Desirable properties of interconnection networks, static interconnection networks – path, cycle, double- loop, star, wheel, 2D mesh and its variants, multi-mesh, tree, shuffle-exchange, cube, cube-connected cycles

Dynamic interconnection networks: concepts of blocking, rearrangeable and blocking but rearrangeable networks, various types of multistage interconnection networks (MIN)- crossbar, clos, baseline, omega, Benes.

Module -4: Shared Memory Architecture [4L]

Fundamentals of UMA, NUMA, NORMA,COMA architectures, Performance measurement for parallel architectures –Amadahl's law, Gustafson's law

Module – 5: Embedded System Architecture [5L]

Definition, Example, Classification ofEmbedded system, Embedded System Design Issues: Hardware issues (Processor, Memory, Peripherals) ,Softwareissues (Programming Languages, Time Criticality, RTOS)

Recommended Books

Text Books

- J. L. Hennessey and D. A. Patterson: Computer Architecture: A Quantitative Approach, 5th edition, Morgan Kaufmann, 2012.
- K. Hwang and F. A. Briggs: Computer Architecture and Parallel Processing, Tata McGraw Hill, New Delhi.

Reference Books

- Tse-yun Feng, A Survey of Interconnection Networks, IEEE, 1981.
- Selim G. Akl, The Design and Analysis of Parallel Algorithms, Prentice-Hall, 1989.
- Raj Kamal, Embedded Systems Architectures Programming and Design, Second Edition The MacGraw-Hill(for Embedded System)

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS802D.1	3	3	3	3	2							3
CS802D.2	3	3	3	3	2							3
CS802D.3	3	3	3	3	2							3
CS802D.4	3	3	3	3	2							3
CS802D.5	3	3	3	3	2							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS802D.1	3	3	3
CS802D.2	3	3	3
CS802D.3	3	3	3
CS802D.4	3	3	3
CS802D.5	3	3	3