Harcourt Butler Technological Institute Kanpur

Course Structure & Syllabus of 1st Year B.Tech.

w.e.f.

Academic Session 2013-14

Year : I Semester : I Branch : Common to all branches

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IMA-101	Mathematics I	3	1	0	30	20	50	100	150	4
2	IPH-101/ICY-101	Physics/Chemistry	3	1	0	30	20	50	100	150	4
3	IEE-101/IET-101	Electrical Engg./Electronics & Instrumentation Engg.	3	1	0	30	20	50	100	150	4
4	IME-101/ICS-101	Engg. Mechanics/ Concepts of Computer and C programming	3	1	0	30	20	50	100	150	4
5	IHU-101/ICE-101	Professional communication/ Engineering Graphics	3	1	0	30	20	50	100	150	4
6	IHU-102/ICE-102	Remedial English/Environment and Ecology	2	0	0				50	50	Audit
Practical/Training/Project											
7	IPH-151/ICY-151	Physics/Chemistry	0	0	3	10	10	20	30	50	1
8	IHU-151/ICS-151	Language Lab/Computer Lab	0	0	3	10	10	20	30	50	1
9	IEE-151/IWS-151	Electrical Engg./Workshop Practice	0	1	3	30	20	50	50	100	2
10	IGP-101	General Proficiency						50		50	

Year : I Semester : II Branch : Common to all branches

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											

1	IMA-201	Mathematics II	3	1	0	30	20	50	100	150	4
2	IPH-201/ICY-201	Physics/Chemistry	3	1	0	30	20	50	100	150	4
3	IEE-201/IET-201	Electrical Engg./Electronics & Instrumentation Engg.	3	1	0	30	20	50	100	150	4
4	IME-201/ICS-201	Engg. Mechanics/ Concepts of Computer and C Programming	3	1	0	30	20	50	100	150	4
5	IHU-201/ICE-201	Professional Communication/ Engineering Graphics	3	1	0	30	20	50	100	150	4
6	IHU-202/ICE-202	Remedial English/Environment and Ecology	2	0	0				50	50	Audit
Practical/Training/Project											
7	IPH-251/ICY-251	Physics/Chemistry	0	0	3	10	10	20	30	50	1
8	IHU-251/ICS-251	Language Lab/Computer Lab	0	0	3	10	10	20	30	50	1
9	IEE-251/IWS-251	Electrical Engg./Workshop Practice	0	1	3	30	20	50	50	100	2
10	IGP-201	General Proficiency						50		50	

Study and Evaluation Scheme

B.Tech. Computer Science & Engineering & B.Tech. Information Technology

[Effective from the session 2009-10]

YEAR - II, SEMESTER - III

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	IET-302	Digital Logic Design	3	1	0	30	20	50	100	150
2	IMA-302	Computer Oriented Numerical & Statistical Technique	3	1	0	30	20	50	100	150
3	ICS-301	Data Structures Using C	3	1	0	30	20	50	100	150
4	IMA-303	Discrete Mathematical Structures	3	1	0	30	20	50	100	150
5	ICS-302	Object Oriented Systems	3	1	0	30	20	50	100	150
PRACTICALS										
6	IET-352	Digital Logic Design Lab	0	0	2	10	10	20	30	50
7	ICS-351	Data Structures Lab	0	0	3	10	15	25	50	75
8	ICS-352	Object Oriented Systems Lab	0	0	3	10	15	25	50	75
9	IGP-301	General Proficiency						50		50
		Total	15	5	8	-	-	-	-	1000

YEAR - II, SEMESTER - IV

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	IEE-402	Network Analysis & Synthesis	3	1	0	30	20	50	100	150
2	ICS-403	Computer Organisation	3	1	0	30	20	50	100	150
3	ICS-401	Data Base Management Systems	3	1	0	30	20	50	100	150
4	ICS-404	Priciples of Programming Languages	3	1	0	30	20	50	100	150
5	ICS-402	Software Engineering	3	1	0	30	20	50	100	150
PRACTICALS										
6	IEE-452	Network Analysis & Synthesis Lab	0	0	2	10	10	20	30	50
7	ICS-451	Data Base Management Systems Lab	0	0	3	10	15	25	50	75
8	ICS-452	Software Engineering Lab	0	0	3	10	15	25	50	75
9	IGP-401	General Proficiency						50		50
		Total	15	5	8	-	-	-	-	1000

B.Tech. Computer Science & Engineering

(Effective from the session 2010-11)

YEAR - III, SEMESTER - V

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	HHU-501	Engineering Economics and Management	3	1	0	30	20	50	100	150
2	HCS-501	Computer Graphics	3	1	0	30	20	50	100	150
3	HCS-502	Operating Systems	3	1	0	30	20	50	100	150
4	HCS-503	Design & Analysis of Algorithm	3	1	0	30	20	50	100	150
5	HCS-504	Theory of Automata & Formal Languages	3	1	0	30	20	50	100	150
PRACTICALS										
6	HCS-551	Computer Graphics Lab	0	0	2	10	10	20	30	50
7	HCS-552	Operating Systems Lab	0	0	3	10	15	25	50	75
8	HCS-553	Design & Analysis of Algorithm Lab	0	0	3	10	15	25	50	75
9	HGP-501	General Proficiency						50		50
		Total	15	5	8	-	-	-	-	1000

YEAR - III, SEMESTER - VI

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	HMA-602	Operational Research	3	1	0	30	20	50	100	150
2	HHU-601	Organizational Behavior	3	1	0	30	20	50	100	150
3	HCS-603	Compiler Design	3	1	0	30	20	50	100	150
4	HCS-604	Computer Networks	3	1	0	30	20	50	100	150
5	HCS-605	Web Technology	3	1	0	30	20	50	100	150
PRACTICALS										
6	HCS-653	Compiler Design Lab	0	0	3	10	15	25	50	75
7	HCS-654	Computer Networks Lab	0	0	3	10	15	25	50	75
8	HCS-655	Web Technology Lab	0	0	2	10	10	20	30	50
9	HGP-601	General Proficiency						50		50
		Total	15	5	8	-	-	-	-	1000

B.Tech. Computer Science & Engineering

(Effective from the session 2011-12)

YEAR - IV, SEMESTER - VII

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	HOE-756	Open Elective	3	1	0	30	20	50	100	150
2	HCS-702	Artificial Intelligence	3	1	0	30	20	50	100	150
3	HCS-701	Advanced Computer Architecture	3	1	0	30	20	50	100	150
4	HCS-703	Elective - I	3	1	0	30	20	50	100	150
5	HCS-706	Elective - II	3	1	0	30	20	50	100	150
PRACTICALS										
6	HCS-751	Industrial / Practical / Training and Report Presentation	0	0	2	10	10	20	30	50
7	HCS-752	Artificial Intelligence Lab	0	0	3	10	10	20	30	50
8	HCS-753	Project	0	0	3	30	20	50	50	100
9	HGP-701	General Proficiency						50		50
		Total	15	5	8	-	-	-	-	1000

YEAR - IV, SEMESTER - VIII

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	HCS-801	Distributed Systems	3	1	0	30	20	50	100	150
2	HCS-802	Digital Image Processing	3	1	0	30	20	50	100	150
3	HCS-803	Elective - III	3	1	0	30	20	50	100	150
4	HCS-806	Elective - IV	3	1	0	30	20	50	100	150
PRACTICALS										
5	HCS-852	Digital Image Processing Lab	0	0	3	10	10	20	30	50
6	HCS-851	Distributed Systems Lab	0	0	3	10	10	20	30	50
7	HCS-853	Project	0	0	6	-	100	100	150	250
8	HGP-801	General Proficiency						50		50
		Total	12	4	12	-	-	-	-	1000

Syllabus of 1st Year B.Tech.

w.e.f.

Academic Session 2013-14

IMA-101

MATHEMATICS-1 **L T P**

(B Tech, Ist Semester) **3 1 0**

Unit I- <u>Functions of One Real Variable:</u>

Successive differentiation, Leibnitz theorem, Mean value theorems, Convergence of series, Expansion of functions, Improper integrals and their convergence.

Unit II- Functions of Several Real Variables:

Limit, Continuity, Partial differentiation, Total differential and approximations, Jacobian, Euler's theorem, Expansion of functions, Beta and Gamma Functions, Multiple integrals, Change of order, Change of variables, Applications to area, volume, mass, surface area etc. Dirichlet's Integral & Applications.

Unit III- Vector Calculus:

Point functions, differentiation, Gradient, Directional derivative, Divergence and Curl of a vector and their physical interpretations, Solenoidal & irrotational fields, Integration, Line, Surface and Volume integrals, Green's, Stoke's and Gauss Divergence theorems (without proof) and applications.

Unit IV – Matrices and Linear Algebra:

Vector space and subspace, linear dependence, dimensions and basis, Linear transformation and its matrix representation, Elementary transformations, Echelon form, rank & nullity, Consistency of linear system of equations and their solutions, characteristic equation, Cayley Hamilton theorem, Real and complex eigenvalues and eigenvectors, diagonalisation, quadratic forms, complex, orthogonal, and unitary matrices, Cryptography, An error correcting code, discrete compartmental models, system stability.

Unit V – Optimization:

Engineering applications of optimization, statement and classification of optimization problems, optimization techniques, single variable optimization, multi variable optimization with no constraint, with equality and inequality constraints, Linear Programming Problems, Graphical method and Simplex method.

Books Recommended:

1. R. K. Jain & S. R. K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
2. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons 8th Edition.
3. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2nd Edition.
4. S. S. Rao; Optimization: Theory & Applications, Wiley Eastern Limited.
5. T. M. Apostol, Calculus, Vol. I, 2nd ed., Wiley 1967.
6. T. M. Apostol, Calculus, Vol. II, 2nd ed., Wiley 1969.
7. Gilbert Strang, Linear Algebra & its applications, Nelson Engineering 2007

IMA-201

MATHEMATICS–II **L T P**

(B. Tech., II Semester) **3 1 0**

(Effective from Session 2013-14)

Unit –I: Ordinary Differential Equations:

First order ordinary differential equations, Existence and uniqueness of solutions of initial value problems, Solution of higher order linear differential equation with constant coefficients, Solution of second order differential equations by changing dependent and independent variables, Cauchy- Euler equations, Methods of diagonalization, undetermined coefficients and variation of parameters, Nonlinear equations, Linear and nonlinear models, Initial value and boundary value problems, Systems of equations, Application of differential equations as mathematical models, Models from population dynamics, Newton's Law of cooling, electric circuit, Oscillation of spring.

Unit –II: Series Solutions of Ordinary Differential Equations

Ordinary and singular points of an equation, Power series solutions, Frobenius method, Bessel's and Legendre's equations and their series solutions, Properties of Legendre's polynomials and Bessel's functions, Generating functions, Fourier-Bessel series and Fourier-Legendre series expansions, Sturm- Liouville Problem and related theorems.

Unit –III: Laplace Transform:

Laplace transform, Existence conditions and ROC, Inverse Laplace transform, Operational properties, Convolution, Unit step function, Dirac-Delta function, Periodic functions, Applications to solve IVP and BVP, Linear ordinary differential equations, Transfer function and control system analysis.

Unit –IV: Fourier Series and Partial Differential Equations:

Orthogonal functions, Fourier series, existence conditions, Fourier series of even and odd functions, Convergence of Fourier series, Fourier half range series, Harmonic analysis, Complex Fourier series and frequency spectrum.

Development of partial differential equations and solutions, Solution of first order partial differential equations, Solutions of linear higher order partial differential equations with constant coefficients, Classification of second order partial differential equations.

Unit –V: Boundary-Value Problems:

Derivation of heat and wave equations, solutions in rectangular coordinates by separation of variable method, solution of Laplace equation, D'Alemberts solution of wave equation, Non-homogeneous equations and boundary conditions, Orthogonal series expansions, Fourier series in two dimensions, Boundary value problems in polar, cylindrical and spherical coordinate systems and their solutions.

Books Recommended:

1. E.A. Coddington, An Introduction to Ordinary Differential Equations, Practice Hall, 1995.
2. I.N. Sneddon, Elements of Partial Differential equations, McGraw-Hill 1957.
3. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2nd Edition.
4. R. K. Jain & S. R. K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
5. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons 8th Edition.

IPH-101 / IPH-201

PHYSICS

Unit -1

Relativistic Mechanics:

Inertial and Non-inertial Frames of reference, Galilean transformation, Michelson-Morley Experiment, Postulates of special theory of relativity, Lorentz Transformation, Length contraction, Evidences of length contraction, Time dilation, Evidences for time dilation, Relativistic velocity transformation, Relativistic variation of mass with velocity, Evidence of mass variation with velocity, Relativistic kinetic energy, Mass energy equivalence, Examples from nuclear physics, Relativistic energy-momentum relation.

Unit-2

Quantum Mechanics:

De Broglie waves and Group velocity concept, Uncertainty principle and its application, Davisson-Germer experiment, Derivation of Schrodinger equation for time independent and time dependent cases. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a free particle

(one dimensional and three dimensional case), Particle in a box (one dimensional and three dimensional), Simple harmonic oscillator (one dimensional and three dimensional).

Unit –3

Electodynamics:

Basic concepts of Gauss's law, Ampere's law and Faraday's law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement cuurent). Maxwell's equations, transformation from integral form to differential form , Physical significance of each equation. Pointing theorem, Maxwell's equations in free space, velocity of electromagnetic wave, Transverse character of the wave and orthogonality of E, H and v vectors, Maxwell 's equation in dielectric medium and velocity of e. m. wave ,Comparison with free space, Maxwell's equations in conducting media, Solution of differential equation in this case and derivation of penetration depth.

Fiber Optics:

Fundamental ideas of optical fiber, types of optical fibers, acceptance angle and cone ,numerical aperture, propagation mechanism and communication in fiber, single mode and multimode fiber, step index and graded index fibers.

Unit-4

Statistical Mechanics:

Phase space, the probability of a distribution, most probable distribution, Maxwell Boltzmann Statistics, Application to find out energy and velocity distribution among the molecules of an ideal gas, derivation of average velocity. R.M.S. velocity, and most probable velocity in the above case. Bose Einstein Statistics, Application to Black body radiation, distribution law of energy, Planck's radiation formula and Stefan's law. Fermi – Dirac statistics, Application to electrons in metals (energy distribution, Fermi energy).

Lasers:

Spontaneous and stimulated emission of radiations, Einstein's coefficient and relation between them, Population inversion, Components of a laser, Ruby laser, He-Ne laser.

Unit-5

Dielectric materials:

Electric field in presence of dielectic medium: Concept of electric polarization, Different types of polarization, Dielectric in a.c. field: concept of dielectric loss and loss of energy.

Semiconducting Materials:

Concept of energy bands in solids, Carrier concentration and conductivity in intrinsic semiconductors and their temperature dependence, carrier concentration and conductivity in extrinsic semiconductors and their temperature dependence. Hall effect in semiconductors, Compound semiconductors.

Nano Materials:

Basic principles of nanoscience and technology, Preparation, structure and properties of fullerene and carbon nanotubes, graphene. Application of nano technology.

IPH 151 /IPH 251

Physics Practical

List of Experiments for I B.Tech (Engg)

Any ten experiments are to be conducted from the following :

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the specific rotation of cane sugar solution using polarimeter.
3. To determine the wavelength of spectral lines using plane transmission grating.
4. To verify Brewster's law using rotating Nicol prism.
5. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
6. To study the variation of magnetic field along the axis of current carrying circular coil.
7. To verify Stefan's law by electrical method.
8. To study the Hall effect and to determine Hall coefficient in n type Germanium.
9. To study the energy band gap of n type Germanium using conductivity method.
10. To study the Ballistic constant of a ballistic galvanometer.
11. To determine e/m of electron using Magnetron valve.
12. To determine the Horizontal component of magnetic field using Tangent Galvanometer.
13. To find out thermoelectric power of copper-constantan thermocouple using potentiometer.
14 To draw hysteresis curve of a given sample of ferromagnetic material.

ICY-101/ICY 201

Chemistry

(Common to All Branches of B.Tech.)

Unit I **(8- 10Pds)**

Bonding : Hydrogen and Metallic bonds, Classification and Applications of Liquid crystals, Band Theory of Solids.

Spectroscopy : Basic Principles and Applications of UV–VIS, IR and NMR spectroscopy

Unit II **(8-10Pds.)**

Chemical Kinetics : Order and molecularity, zero, first and second order reactions. Determination of order, Temperature effect, Concept of Activated Complex/ Transition State: Energy of activation, Potential energy surface,

Theories of reaction rate: Collision and Transition State theories.

Unit III **(8-10 Pds)**

Electrochemistry: EMF of cell and its relation with thermodynamic parameters; K, ΔH, ΔS & ΔG.

Concentration cells and liquid junction potential, Dry and fuel cells.

Corrosion: Concept of Corrosion, Types of corrosion, Electrochemical theory of corrosion and Methods for protection of corrosion.

Unit IV **(8-10 Pds)**

Reaction Mechanism: Inductive, Electomeric and Mesomeric effects. Stability of reaction intermediates for(. carbanion, carbocation and free radicals). Mechanism of SN_1 and SN_2 reactions. Mechanism and application of following reactions:

(I) Aldol Condensation

(II) Beckmann Rearrangement

(III) Hoffmann Rearrangement

(IV) Diels-Alder Reaction

Stereochemistry: E-Z nomenclature, R-S configuration and Optical isomerism

Unit V **(8-10 Pds)**

Polymers: Polymers and their classifications . Free radical, anionic and cationic polymerization, Copolymers, Conducting and Biodegradable polymers, Determination of average mol. weight of polymer.

Water Treatment: Hardness of water, Problems due to use of hard water in boilers, Water softening methods; Zeolites and Ion exchange processes, Reverse osmosis.

Reference Books:

1. Advance Organic Chemistry by Jerry March, Third Edition Wiley Eastern Limited, New Delhi.
2. Organic Chemistry by Morrision & Boyd , Allyn and Bacon , Inc. Boston.
3. Physical Chemistry by P.C. Rakshit .
4. Textbook of Physical Chemistry by S. Glasstone, Macmillan and Co. Ltd., London.
5. Chemical Kinetics and Reaction Dynamics by S.K. Upadhyay, Springer.
6. Principles of Polymerization by George Odian.
7. Polymer Science by V.R. Gowarikar, N.V. Vishwanathan and J. Shridhar, Wiley Eastern Ltd., New Delhi.
8. Principles of Instrumental Analysis by Douglas and Skoog, Saunder College publishing Co., New York.
9. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publication Co., New Delhi.
10. Application of Absorption of Spectroscopy of Organic Compounds by John R. Dyer, Prentice Hall of India Pvt. Ltd. ,New Delhi.

ICY-151/ICY-251

Chemistry Lab

List of Experiments:

1. Determination of alkalinity in given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of iron content in given water sample by Mohr's method.
5. Determination of chloride content in water sample by Mohr's method.
6. Determination of strength of supplied ferrous Ammonium Sulphate solution in gm/liter using external, internal and self indicator.

7. Determination of Viscosity of a given liquid by Ostwald Viscometer.
8. Determination of Surface Tension of a given liquid by Stalagamometer.
9. pH determination of given sample.

IEE 101/IEE 201

ELECTRICAL ENGINEERING

L	T	P
3	1	0

Unit I

1. DC Circuit Analysis and DC Network Theorems

Circuit Concepts: Concepts of Network, Active and Passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements. **3**

DC Circuit Analysis and DC Network Theorems: Kirchhoff's Law, Loop and nodal methods of analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Source transformation, Star-delta transformation. (Numerical Problems) **6**

Unit II

2. Steady-State Analysis of Single Phase AC Circuits

AC Fundamentals, R L and C as linear elements, Sinusoidal, Square and Triangular waveforms-average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel, and series – parallel RLC Circuits: Apparent, Active & Reactive Power and Energy, Power factor and its importance, Resonance in Series and Parallel Circuits,

Bandwidth and Quality Factor. (Numerical Problems**)** **8**

Unit III

3. Three-Phase AC Circuits

Introduction to three-phase System, meaning of phase sequence and star and delta connections, balanced supply and balanced load, line and phase voltage / current relations, three phase power and its measurement.

(Numerical Problems) **3**

4. Magnetic Circuit

Magnetic circuit concepts, Analogy between Electric & Magnetic circuits, Magnetic circuits with DC and AC excitations, Magnetic leakage, B-H curve, Hysteresis and Eddy Current looses, Magnetic circuit calculations, Mutual coupling. (Numerical problems) **3**

5. Single Phase Transformer:

Principle of Operation, Construction, e. m. f. equation, equivalent circuit, Power losses, efficiency.(Numerical Problems) **3**

Unit IV

6. DC Machines

Types of dc machines, e. m. f. equation of generator and torque equation of motor, characteristics and applications of dc motors. (Numerical Problems) **3**

7. Three Phase Induction Motor

Construction and Principle of Operation, Slip – torque Characteristics, applications. (Numerical Problems based on slip) **3**

8. Single Phase Induction Motor

Construction and Principle of Operation, Applications. **1**

Unit V

9. Introduction to Power System

Principle of operation of three phase alternator, General layout of Indian electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid, Electrical safety, Equipment

earthing **3**

10. Measuring Instruments

Introduction to analog and digital instruments, Types of instruments, Construction and Working Principles of PMMC and Moving Iron type Voltmeter & Ammeters, Introduction to Single Phase Dynamometer Wattmeter

and Induction Type Energy Meter, Introduction to sensors and transducers (Numerical Problems) **4**

Text Books:

1. V. Del Toro, " Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, " Basic Electrical Engineering" Tata Mc-Graw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc-Graw Hill
4. V. N. Mittle/Arvind Mittal, "Basic Electrical Engineering", Tata Mc-Graw Hill

Reference Books:

1. Edward Hughes, "Electrical Technology" Longman
2. T.K. Nagsarkar & M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
3. H. Cotton, " Advanced Electrical Technology" Wheeler Publishing
4. W.H. Hayt & J.E. Kennely, "Engineering Circuit Analysis" Mc-Graw Hill

IEE 151/ IEE 251

ELECTRICAL ENGINEERING LABORATORY

L T P

0 0 2

Note: A Minimum Eight experiments out of the following list.

1. Verification of Kirchhoff's laws.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's / Norton's Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Measurement and verification of power and power factor in a 1 – Ø ac series / parallel R-L-C circuit.
6. Measurement and verification of relationships between phase and line voltages and currents for star/delta connected balanced load.
7. To measure energy by a 1 – Ø energy meter and determine error.
8. Measurement of power in 3 – Ø circuit by Two Wattmeter method and determination of its power factor.
9. Determination of Voltage Ratio and Efficiency by load test of a 1 – Ø Transformer.
10. Determination of equivalent circuit and efficiency of single transformer by OC and SC test.
11. To obtain load characteristics of DC shunt motor.
12. To study running and speed reversal of a 3 – Ø induction motor and record its speed in both direction.

IME-101/201

ENGINEERING MECHANICS

L :T :P

3 :1 :0

Unit I

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Applications.

Unit II

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams.

Trusses: Introduction, Simple Truss and Solution of Simple truss, Method of Joints and Method of Sections.

Unit III

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

Unit IV

Simple Stress and Strain: Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants, One Dimensional Loading of members of varying cross-sections, Strain energy.

Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr’s stress circle. Theories of Failure

Unit V

Pure Bending of Beams: Introduction, Simple Bending Theory, Stress in beams of different cross sections.

Torsion: Introduction to Torsion of circular shaft, combined bending & torsion of solid & hollow shafts.

Text books:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Materials by E.P.Popov, PHI
3. Engineering Mechanics by R.K.Bansal
4. Strength of Materials by Ryder
5. Mechanics of Material by Gere & Timoshenko
6. Engineering Mechanics by A. Nelson
7. Engineering Mechanics by U.C. Jindal
8. Engineering Mechanics Statics by J.L. Meriam & L.G.Kraige

IWS 151/251

WORKSHOP PRACTICE

L:T:P

0: 1:3

1. **Carpentry Shop :**

Practice (I): To prepare half lap corner joint from given pieces of mango wood.

Practice (II) : To prepare mortise and tenon joint from given pieces of mango wood.

Instructions: Description and demonstration of different tools, joints along with advanced Carpentry joints, classification and definition of timber, wood seasoning, demonstration of wood working lathe and advanced power tools used in carpentry work, safety precaution during actual working .

2. Fitting and Bench working Shop :

Practice (I): To prepare male- female joint from given pieces of mild steel.

Practice (II): To prepare practice work piece involving marking, measuring, sawing, drilling and tapping operations

Instructions: Classification and description of different tools used in fitting shop e.g. marking and measuring tools, holding and supporting tools, striking tools and cutting tools etc , safety precaution during actual working.

3. Black Smithy Shop :

Practice (I): To prepare ‘ L ’ shape job from given piece of mild steel rod by hand forging.

Practice (II): To prepare a ‘ Ring ’ from given piece of mild steel rod by hand forging.

Instructions: Description of various forging processes done in black-smithy work e.g. upsetting, drawing down, punching, bending, fullering etc, classification and description of different tools, equipments used in black-smithy shop, safety precaution during actual working.

4. Welding Shop :

Practice (I): To prepare simple butt joint and lap joint by electric arc welding from given pieces of mild steel

Practice (II): To prepare simple lap joint by oxy-acetylene gas welding and gas flame cutting practice.
Instructions: Concept of welding, classification and explanation of various types of welding with the help of flow

chart, description of different tools. Equipments required for arc welding and gas welding, demonstration of various types of flames in Oxyacetylene gas welding, setting of current and selection of electrodes along with different welding joints, safety precaution during actual working. (As approved in Board of Studies (Mechanical Engg.),

HBTI, Kanpur in its meeting held on 6th July, 2009 Page 4)

5. Sheet Metal Shop :

Practice (I): To prepare a funnel complete with soldering from given G.I. sheet.

Practice (II): To fabricate tray / tool box or electric panel box from given G.I. sheet.

Instructions: Classification and description of different types of tools, equipments used in sheet metal work, different types of metals used in sheet metal shop e.g. Galvanized iron, black iron, copper, aluminum etc, concept of development of surfaces along with different types of joints in sheet metal work, safety precaution during actual working

6. Machine Shop :

Practice (I): To prepare a job by plain turning, facing, step turning and chamfering operation from given mild steel rod.

Practice (II): To prepare a job by taper turning, threading, knurling operations from given mild steel rod.
Instructions: Classification of lathe machines, different parts of lathe machine, tools and equipments used, explanation and demonstration of various operations on lathe machine, tool geometry of single point cutting tool, cutting speed, feed and depth of cut in turning, safety precaution during actual working.

7. Foundry Shop :

Practice (I) : To prepare a simple mould of given pattern in Green Sand.

Practice (II) : To prepare a mould with two step pulley with Runner and Riser.

Instructions : Description and use of various foundry tools, showel, flat rammer, hand rammer, strike off bars, vent wire, trowels, hand riddle etc. Types of various moulding sands, types of patterns, pattern materials, pattern allowances, safety precautions during actual working.

ICS-101/201

CONCEPTS OF COMPUTER & C PROGRAMMING

L T P

3 1 0

Unit – I

Introduction To Computers: Computer hardware Components, peripherals and their functions, Number Systems and conversion methods, Concept of an algorithm; termination and correctness.

Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming Environment, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic.

Unit – II

Basic operating System Concepts: Introduction of MS-DOS, WINDOWS, and LINUX Operating Systems, Functional Knowledge of these operating systems. Introduction of Basic Commands of LINUX and Editors, Managing Files and Directories in LINUX, Programming Environment in LINUX, Writing and executing programs in LINUX.

Unit – III

Programming in C: History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

Unit – IV

Operators: Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

Control statements: if-else, switch, break, and continue, the comma operator, goto statement.

Loops: for, while, do-while. **Functions:** built-in and user-defined, function declaration, definition and function call, and parameter passing: call by value, call by reference, recursive functions, Multi file programs. **Arrays:** linear arrays, multidimensional arrays, passing arrays to functions, Arrays and strings.

Unit – V

Structure and Union: definition and differences, self-referential structure. **Pointers:** value at (*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers. **File Handling in C:** opening and closing a data file, creating a data file, read and write functions, unformatted data files.

Text and References Books:

1. Kernighan, Ritchie, “The C Programming Language”, PHI
2. V. Rajaraman, “Fundamentals of Computers”, PHI
3. Peter Norton’s, “Introduction to Computers”, TMH

4. Gottfried, “Programming in C”, Schaum’s Series, Tata McGraw Hill

5. Yashwant Kanitkar, “Working with C”, BPB

6. E. Balagurusamy, “Programming in ANSI C”, TMH

ICS-151/251

COMPUTER LAB

L T P

0 0 3

1. Write C program to find largest of three integers.
2. Write C program to check whether the given string is palindrome or not.
3. Write C program to find whether the given integer is

   (i). a prime number

   (ii). an Armstrong number.

4. Write C program for Pascal triangle.
5. Write C program to find sum and average of n integer using linear array.
6. Write C program to perform addition, multiplication, transpose on matrices.
7. Write C program to find fibbonacci series of iterative method using user-defined function.
8. Write C program to find factorial of n by recursion using user-defined functions.
9. Write C program to perform following operations by using user defined functions:

   (i) Concatenation

   (ii) Reverse

   (iii) String Matching

10. Write C program to find sum of n terms of series:
    n – n*2/2! + n*3/3! - n*4/4! + ...
11. Write C program to interchange two values using

    (i). Call by value.

    (ii). Call by reference.

12. Write C program to sort the list of integers using dynamic memory allocation.
13. Write C program to display the mark sheet of a student using structure.
14. Write C program to perform following operations on data files:
    (i) read from data file.
    (ii) write to data file.
15. Write C program to copy the content of one file to another file using command line argument.

IHU-101/201

Professional Communication

(I B Tech & I MCA)

UNIT I Fundamentals of Technical Communication : process of communication, language as a tool of communication, levels of communication , flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.

UNIT II Elements of Written Communication: words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,

UNIT III Forms of Technical Communication: (A) business letters, job application letter and resume,

business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters,

official letters: D.O. letters, government letters, letters to authorities, etc. ,

(B) Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, complaint report, laboratory report, research papers, dissertations and theses.
Technical Proposals: purpose, characteristics, types, structure.

UNIT IV Presentation Strategies: defining the subject, scope and purpose, analysing audience & locale, collecting materials, preparing outlines, organising the contents, visual aids, nuances of delivery, extemporaneous, manuscripts, impromptu, memorization and non- verbal strategies.

UNIT V Value-based Text Reading:

(A) Study of the following essays from the text book with emphasis on writing skills:

1. Man and Nature by J. Bronowski
2. The Language of Literature and Science by Aldous Huxley
3. The Aims of Science & The Humanities by Moody E Prior
4. Gods in this Godless Universe by Bertrand Russell
5. Science and Survival by Barry Commoner

(B) Readings of selected short stories:

1. The Renunciation by Rabindranath Tagore

2. The Lament by Anton P. Chekhov

3. The Barber's Trade Union by Mulk Raj Anand

4. The Eyes Are Not Here by Ruskin Bond

Text Books:

1. 'Improve Your Writing' ed. By V N Arora and Laxmi Chandra, Oxford University Press, New Delhi
2. 'An Anthology of English Short Stories', edited by R P Singh, Oxford University Press.

3. 'Technical Communication- Principles and Practices' by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, New Delhi.

IHU-151 / 251

Language Lab

(I B Tech. & I MCA)

Interactive practical sessions with emphasis on oral presentations/ spoken communication:

Practical Sessions on:

1. Group Discussions: selected topical issues to be discussed in groups.
2. Mock interviews
3. Communication skills for seminars/conferences/workshops with emphasis on non-verbal skills.
4. Presentation skills for technical papers/project reports/professional reports.
5. Theme presentation/ key note presentation based on correct argumentation methodologies.
6. Argumentative skills
7. Role play
8. Comprehension skills based on reading and listening practice, Asking questions.
9. Introduction to International Phonetics Alphabets
10. Audio Visual demonstration of effective communicative strategies

References:

Reference Books:

1. Effective Technical Communication, by Barun K Mitra, Oxford University Press
2. Business Correspondence & Report Writing by R.C. Sharma & Krishna Mohan, Tata McGraw Hill, N.D.

3. Developing Communication Skills by Krishna Mohan & Meera Benerjee, Macmillan India

4. 'Technical Communication- Principles and Practices' by M R S Sharma, Oxford University Press, New Delhi.

IHU-102/202

Remedial English

(I B. Tech.)

UNIT I Basic Applied Grammar and Usage- Sentence structure-1: constituent of a sentence- noun, verb, adjective, preposition, etc.; use of articles, adjectival forms, prepositions, adverbs; verb forms; finite and non-finite verbs, gerund and participles, auxiliary verbs. Tense and mood. Subject- verb concord, pronoun concord.

UNIT II Sentence Structure-2: (i) adverb clause, adjective clause, noun-clause; (ii) negation and interrogation;

(iii) passive; (iv) exclamatory; (v) transformations; (vi) tense forms; (vii) varieties of sentences; (viii) placement of modifiers.

UNIT III Paragraph Writing: Structure of Paragraph, Topic Sentence, Construction of Paragraph, Technique of Paragraph writing, Unity, Coherence, Emphasis

UNIT IV Comprehension and Précis Writing

Reading and listening comprehension, improving comprehension skills, précis writing,

UNIT V Short Essay Writing

Dimension of essay writing- literary, scientific, sociological, narrative, descriptive, reflective, expository, argumentative and imaginative.

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References:

1. Das, B K and A David, 'A Remedial Course in English for Colleges', (Book -1,2,3) Oxford University Press, New Delhi.

2. Sinha, R P, ‘Current English Grammar and Usage with Composition’, Oxford University Press, New Delhi.

3. Wren, P C & Martin, ‘English Grammar and Composition’, S Chand & Co Ltd. New Delhi.

4. A.S.Horne, Guide to Pattern and usage in English, Oxford University Press, N.D.

5. M.L. Tickoo & A.E.Subramanian, Intermediate Grammar, usage & composition, Orient Longman

6. J.C.Nesfield, English Grammar Composition & usage, Macmillan India

ICE 101/201

ENGINEERING GRAPHICS

L T P

3 1 0

Unit 1

Graphics as a tool to communicate ideas, Lettering and dimensioning,

Plain and Diagonal Scales, Construction of geometrical figUres like pentagon and hexagon.

Unit 2

Principles of orthographic projections, Principal and auxiliary planes, Fi~ and Third angle projections ,Projection of points. Pictorial view.

Unit 3

Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems.

Unit 4

Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other plane, Solids lying on a face or generator on a plane.

Sectioning of solids lying in various positions, True shape of the section.

Unit 5

Development of lateral surfaces, sheet metal drawing.

Principles of isometric projection, Problems using box & offset methods.

ICE 102/202

ENVIRONMENT AND ECOLOGY

L T P

2 0 0

Unit-l

Definition, Scope and Importance, Need for Public awareness, Environment definition, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social Security.

Effects of Human Activities on environment-Agriculture, Housing, Industry, Mining and Transportation Activities, Basic of Environmental Impact Assessment, Sustainable Development.

Unit-2

Natural Resources: Water Resources -Availability and Quality Aspects, Conservation of water, Water Borne Diseases, Water Induced Diseases, Fluoride Problem in Drinking Water; Mineral Resources, Forest Wealth, Material Cycles-Carbon, Nitrogen and Sulphur Cycles.

Energy -Different Types of Energy, Electro-magnetic Radiation, Conventional and Non-Conventional Sources, Hydro Electric Fossil Fuel Based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an Alternative Future Source of energy.

Unit-3

Environmental Pollution and their Effects, Water Pollution, Land Pollution, Noise Pollution, Public Health aspects, Air Pollution, Solid Waste Management.

Current Environmental Issue of Importance: Population Growth, Climate Change and Global Warming-Effects, Urbanization, Automobile Pollution. Acid Rain, Ozone Layer Depletion.

Unit-4

Environmental Protection-Role of Government, Legal Aspects, Initiatives by Non-Governmental Organizations (NGO), Environmental Education, Women Education.

Field Work: Visit to local area to document environmental assets-rivers/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industries/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-ponds, river, hill slopes etc.

IET 101/ IET 201

Electronics and Instrumentation Engineering

P-N Junction Diode, V-I Characteristics, Diode Application as Rectifier (Half Wave & Full Wave), Zener Diode and its Applications.

Introduction of Bipolar Junction Transistor, FET: Applications, demo, explanation,
OPAMP and its Applications

Boolean Algebra, Logic Gates, Concept of Universal Gate.

Basic Combinational Circuits: Adder, Subtractor.

Sequential Circuits: Flip-Flops, Registers.

Functional Elements of Instruments, Classification & Characteristics, Types of Errors,
Active and Passive Transducers and their Characteristics, LVDT

Display Devices: Seven Segment Display, Alphanumeric Display, LCD, Dot Matrix Displays.

Electronic Ammeter and Voltmeter, Digital Multi-meter, Cathode Ray Oscilloscope.

Text Books:

1. Malvino, A.P. / “Electronics Principles” / Tata McGraw-Hill / 6th Ed.
2. Boylestad, Robert & Nashelsky, Louis / “Electronic Devices & Circuit Theory” / Prentice Hall of India / 8th Ed.
3. H.S. Kalsi / “Electronic Instrumentation” / Tata McGraw-Hill
4. Malvino & Leach / “Digital Principles & Applications” / Tata McGraw-Hill / 5th Edition

Reference Books:

1. Sedra, Adel S., Smith, Kenneth C. / “Microelectronic Circuits”/ Oxford University Press / 5th Edition
2. Sawhney AK/ “Electrical and electronic Measurement and Instrumentation”/ Dhanpat Rai & sons.
3. Lectures of NPTEL

IGP - 101/201

General Proficiency

50 Marks of General Proficiency are to be awarded as detailed below:

- 20 Marks based on extracurricular activities in which 5 marks per activity be awarded to those participating in Institute level activity and 10 marks per activity for those representing Institute outside with upper limit of 20 marks. These will be awarded by the Chairman, Council of Student Activities.

- 10 Marks based on participation of student in the department level extracurricular and academic/research activities in which 2 marks per activity shall be awarded for those participating in department level activities with upper limit of 10 marks. These marks will be awarded by the concerned Head of Department.

- 20 Marks based on conduct and discipline of the student to be awarded by Dean of Student Welfare considering the inputs from Chief Proctor.

Harcourt Butler Technological Institute, Kanpur-208002

(An Autonomous Institute Affiliated to U. P. Technical University, Lucknow)

Revised Syllabus

B. Tech. II Year

Computer Science and Engineering

&

Information Technology

(Effective from the session 2009-10)

HCS-301

DATA STRUCTURES USING C

L T P

3 1 0

Unit - I

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack., Applications of recursion in problems like 'Tower of Hanoi'.

UNIT - II

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues**.**

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

UNIT – III

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm**.**

Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

UNIT – IV

Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting**.**

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

UNIT - V

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

Text Books:

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
3. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
4. K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.
6. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd.(Singapore)

HCS-302

OBJECT ORIENTED SYSTEMS

L T P

3 1 0

UNIT – I

Object Oriented Design and Modeling: Object oriented fundamentals, Objects and Classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract Classes, Object-Oriented Design Process, importance of modeling, principles of modeling, OOAD Methods.

Introduction to UML: UML Terminology, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT - II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT- III

Behavioral Modeling: Interactions and Interaction diagrams, Use Cases and Use Case Diagrams, Activity Diagrams. Events and Signals, State Machines, Nested State Diagrams, Processes and Threads, Time and Space, State Chart Diagrams. Advanced Dynamic Modeling Concepts.

UNIT-IV

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Elementary Design Patterns, The MVC Architecture Pattern.

UNIT – V

Object-Oriented Programming Languages, Dominant features of C++, Java and C#. Object Oriented Database design, Modern Object technologies and web services.

Case Study: The Unified Library Application.

Text and Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
2. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
3. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
4. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
5. Mark Priestley: Practical Object-Oriented Design with UML, TATA Mc-GrawHill
6. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

HCS-351

DATA STRUCTURES LAB

L T P

0 0 3

Write Program in C or C++ for following.

1. Array implementation of Stack, Queue, Circular Queue, List.
2. Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
3. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
4. Implementation of Searching and Sorting Algorithms.
5. Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm.

HCS-352

OBJECT ORIENTED SYSTEMS LAB

L T P

0 0 3

Lab exercises are to be carried out using C++, Java, C# and tools like Visio, ARGOUML etc. Design and Implementation of an Object based application using any one of the above languages/tools is desirable

HCS-403

COMPUTER ORGANIZATION

L T P

3 1 0

Unit-I (**Representation of Information and Basic Building Blocks**)

Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry lookahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro-Operation. ALU-Chip, Faster Algorithm and Implementation (multiplication & Division)

Unit-II (Basic Organization)

Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers

Unit-III (Memory Organization)

Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

Unit-IV (I/O Organization)

Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

Unit-V (Process Organization)

Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8085): Addition of two numbers, Subtraction, Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn's and Feng's Classification, Parallel Architectural classification. Concept of Pipelining, Multi-Core Archetecture.

Text and Reference Books:

1. William Stalling, "Computer Organization & Architecture", Pearson education Asia
2. Mano Morris, "Computer System Architecture", PHI
3. Zaky & Hamacher, "Computer Organization", McGraw Hill
4. B. Ram, "Computer Fundamental Architecture & Organization", New Age
5. Tannenbaum, "Structured Computer Organization", PHI.

HCS-401

DATABASE MANAGEMENT SYSTEM

L T P

3 1 0

Unit- I

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and database language and interfaces, Data definitions language, DML, Overall Database Structure.

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Unit- II

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus,

Introduction to SQL: Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL.

Unit- III

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit- IV

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Unit- V

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

Text Books

1. Date C J, “An Introduction To Database System”, Addision Wesley
2. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill
3. Elmasri, Navathe, “Fundamentals Of Database Systems”, Addision Wesley
4. Leon & Leon, “Database Management System”, Vikas Publishing House.
5. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication
6. Majumdar & Bhattacharya, “Database Management System”, TMH
7. Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill
8. Kroenke, “Database Processing: Fundamentals, Design and Implementation”, Pearson Education.
9. Maheshwari Jain, “DBMS: Complete Practical Approach”, Firewall Media, New Delhi.

HCS-404

PRINCIPLES OF PROGRAMMING LANGUAGES

L T P

3 1 0

Unit -I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -II

Elementary and Structured Data Types: Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types.

Unit -III

Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co routines, Scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism.

Unit -IV

Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

Unit -V

Operating and Programming Environment: Batch Processing Environments, Embedded system requirements, Theoretical models, Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language, Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc.

Text and Reference Books:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley
4. "Fundamentals of Programming Languages", Galgotia.

HCS-402

SOFTWARE ENGINEERING

L T P

3 1 0

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management

Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE

Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Text and Reference Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
5. Ian Sommerville, Software Engineering, Addison Wesley.
6. Pankaj Jalote, Software Engineering, Narosa Publication
7. Pfleeger, Software Engineering, Macmillan Publication.
8. A. Leon and M. Leon, Fundamentals of Software Engineering, Vikas Publication.

HCS-451

Database Management System LAB

L T P

0 0 3

The Queries to be implemented on DBMS using SQL.

1. Write the queries for Data Definition and Data Manipulation language.
2. Write SQL queries using Logical operators (=,<,>,etc.).
3. Write SQL queries using SQL operators (Between…. AND, IN(List), Like, ISNULL and also with negating expressions).

4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for Relational Algebra (UNION, INTERSECT, and MINUS, etc.).
6. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join , Outer Join)

7. Write SQL queries for sub queries, nested queries.
8. Write programs by the use of PL/SQL.
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS.
10. Create VIEWS, CURSORS, and TRIGGRS & write ASSERTIONS.
11. Create FORMS and REPORTS.

*Students are advised to use **Developer 2000/Oracle-9i** version or other latest version for above listed experiments. However depending upon the availability of software's, students may use **Power Builder /SQL SERVER**. Mini Project may also be planned & carried out through out the semester to understand the important various concepts of Database.

HCS- 452

SOFTWARE ENGINEERING LAB

L T P

0 0 3

1. Using any development tool like Rational Rose Perform SA/SD for the following types of problems.
   - Hotel Automation System
   - Book Shop Automation Software
   - Word processing Software
   - Software Component Cataloguing Software.
   - Payroll System
   - Banking System
   - Purchase Order System
   - Library Management System
   - Railway Reservation System
   - Bill Tracking System
   - College Admission System
2. Illustration of various activities of Software Project Management using MS Project 2000.

Revised Syllabus

B. Tech. III Year

Computer Science and Engineering

(Effective from the session 2010-11)

COMPUTER GRAPHICS (HCS-501)

L T P

3 1 0

Unit-I

Line generation: Points and Lines, Planes, Pixels and Frame buffers, vector and character generation. Graphics Primitives: Display devices, Primitive devices, Display File Structure, Display control text, Line-drawing Algorithms**:** DDA Algorithm Bresenham's line Algorithm, Circle-generating Algorithm**:** Midpoint Circle of Algorithm, Polygon Filling Algorithm.

Unit-II

2-D Viewing and Clipping: Point Clipping, Line Clipping, Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm, Polygan Clipping: Sutherland Hodgman Algorithm.

Polygon: Polygon Representation, Entering polygons, Filling polygons, Segments: Segments table, Creating deleting and renaming segments, Visibility.

Unit-III

2-D and 3-D Transformations: Basic Transformations: Translation, Rotation, Scaling, Shear, Composite Transformations: Rotations about a point, Reflection about a line, Homogeneous Coordinate Systems, 3-D Transformations, 3-D geometry primitives, Viewing Transformation, Projections: Parallel Projection, Orthographic & Oblique Projections, Perspective Projections. Interaction: Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.

Unit-IV

Hidden Line and Surface: Back face removal algorithms, hidden line methods. Rendering and Illumination: Introduction to curve and Surfaces generation, Bezier, Hermite and B-spline algorithms and their comparisons.

Unit-V

Multimedia and Animation: Basic of Animation, Types of Animation, Simulating, Accelerations, Computer Animation Tools, Multimedia Applications, Concepts of Hypertext/Hypermedia, Images, Audio and Video**,** Multimedia Tools.

Text and References Books:

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Baker and Hearn, "Computer Graphics", PHI Publication.
3. Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
4. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
5. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

OPERATING SYSTEMS (HCS-502)

L T P

3 1 0

Unit -I

Introduction: Operating System and its functions, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time Operating System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.

Unit-II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling, Threads.

Unit-III

CPU Scheduling: Scheduling Concept, Scheduling Techniques, Performance Criteria for Scheduling Algorithm, Evolution, Multiprocessor Scheduling. Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery From Deadlock Combined Approach.

Unit-IV

Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit-V

I/O Management & Disk Scheduling: I/O Devices and The Organization of I/O Function, I/O Buffering, Disk I/O, Operating System Design Issues. File System: File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues.

Text & Reference Books:

1. Milenekovik, "Operating System Concept", McGraw Hill.
2. Petersons, "Operating Systems", Addison Wesley.
3. Dietal, "An Introduction to Operating System", Addison Wesley.

4. Tannenbaum, "Operating System Design and Implementation", PHI.
5. Gary Nutt, "Operating System, A Modern Perspective", Addison Wesley.
6. Stalling, Williums, "Operating System", Maxwell Macmillan
7. Silveschatz, Peterson J., "Operating System Concepts", Willey.
8. Crowley, "Operating System", TMH.

DESIGN & ANALYSIS OF ALGORITHMS (HCS-503)

L T P

3 1 0

Unit -I

Introduction: Algorithms, Analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms, Divide and Conquer: Merge Sort and Quick Sort, Sorting and order Statistics: Heap sort, Sorting in linear time, Medians and Order Statistics.

Unit -II

Advanced Data Structures: Red-Black Trees, Augmenting Data Structure, B-Trees, Binomial Heaps, Fibonacci Heaps, Data Structure for Disjoint Sets, Amortized Analysis.

Unit -III

Advanced Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Back Tracking, Branch and Bound.

Unit -IV

Graph Algorithms: Elementary Graphs Algorithms, Minimum Spanning Trees, Single-source Shortest Paths, All-Pairs Shortest Paths, Maximum Flow, and Traveling Salesman Problem.

Unit -V

Selected Topics: Randomized Algorithms, String Matching, NP Completeness, Non deterministic Algorithms, Approximation Algorithms, PRAM Algorithms.

Text & Reference Books:

1. Coreman, Rivest, Lisserson: “Algorithm", PHI.

2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley.

3. Horowitz & Sahni, "Fundamental of Computer Algorithm", Universities Press.

THEORY OF AUTOMATA & FORMAL LANGUAGES (HCS-504)

L T P

3 1 0

Unit – I

Defining Languages and Grammars, Chomsky hierarchy, Kleene closures, Regular Expressions, Finite Automata (FA), Transition graph, Generalized Transition Graph.

Unit – II

Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA), Construction of DFA from NFA and optimization, Partitioning Algorithm, FA with output: Moore machine, Mealy machine and their Equivalence, Applications and Limitation of FA

Unit – III

Arden Theorem, Pumping Lemma for regular expressions, Myhill-Nerode theorem, Context free grammar: Ambiguous Grammars and Simplification, Normal forms for CFGs, Pumping lemma for CFLs, Decidability of CFGs, Ambiguous to Unambiguous CFG.

Unit – IV

Push Down Automata (PDA): Description and definition, Working of PDA, Acceptance of a string by PDA, Equivalence of PDA and CFG, Introduction to auxiliary PDA and Two stack PDA.

Unit – V

Turing machines (TM): Basic model, definition and representation, Language acceptance by TM, TM and Type – 0 grammar, Halting problem of TM, Modifications in TM, Universal TM, Properties of recursive and recursively enumerable languages, unsolvable decision problem, Undecidability of Post Correspondence Problem, Church's Thesis, Recursive function theory, Godel Numbering.

Text & Reference Books:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Language and Computation", Nerosa Publishing House
2. K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation)", PHI.
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of theory of Computations", PHI
5. Cohen D. I. A., "Introduction to Computer theory", John Wiley & Sons

6. Kumar Rajendra, “Theory of Automata (Languages and Computation)”, PPM

COMPUTER GRAPHICS LAB (HCS-551)

L T P

0 0 2

Write Program in C or C++ for following.

1. Implementation of line generation using slope’s method, DDA and Bresenham’s algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham’s algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scaling and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms: Depth-Buffer algorithm, Painter’s algorithm, Warnock’s algorithm, Scan-line algorithm.

OPERATING SYSTEMS LAB (HCS-552)

L T P

0 0 3

1. Simulation of the CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority Simulation of MUTEX and SEMAPHORES.
2. Simulation of Bankers Deadlock Avoidance and Prevention algorithms.
3. Implementation of Process Synchronization (Reader-Writer, Sleeping Barber and Dining Philosopher’s Problem)
4. Simulation of page Replacement Algorithms a) FIFO b) LRU c) LFU
5. Simulation of paging techniques of memory management.
6. Simulation of file allocation Strategies a) Sequential b) Indexed c) Linked
7. Simulation of file organization techniques a) Single Level Directory b) Two Level c) Hierarchical d) DAG

DESIGN AND ANALYSIS OF ALGORITHMS LAB (HCS-553)

L T P

0 0 3

Programming assignments on each of the following algorithmic strategy:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication).
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem).
4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).
5. Sorting: Insertion sort, Heap sort, Bubble sort.
6. Searching: Sequential and Binary Search.
7. Selection: Minimum/ Maximum, K_{th} smallest element.

COMPILER DESIGN (HCS-603)

L T P

3 1 0

Unit-I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit-II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, constructing LALR sets of items.

Unit-III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations, case statements.

Unit-IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit-V

Introduction to code optimization: Loop optimization, the DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Text and Reference Books:

1. Aho, Sethi & Ullman, "Compiler Design", Addition Wesley.
2. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thomson Brooks Publication.
3. Allen I. Holub, “Compiler Design in C”, PHI Publications.

COMPUTER NETWORKS (HCS-604)

L T P

3 1 0

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP - IP packet, IP address, IPv6. '

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.

Text and Reference Books:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, “Computer Networks”, 3rd Edition, Prentice Hall India, 1997.
3. S. Keshav, “An Engineering Approach on Computer Networking”, Addison Wesley, 1997
4. W. Stallings, “Data and Computer Communication”, Macmillan Press, 1989.

WEB TECHNOLOGY (HCS-605)

L T P

3 1 0

Unit-I

History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics.

Unit-II

Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

Unit-III

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML. JavaScript: Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

Unit-IV

XML: Introduction, Displaying an XML Document, Data Interchange with an XML document, Document type definitions, Parsers using XML, Client-side usage, Server Side usage.

Unit-V

Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, Active-X Control, VBScript, Active Server Pages (ASP), Web Server Installation & Administration.

Text and Reference Books:

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Sharma &Sharma, "Developing E-Commerce Sites", Addison Wesley
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.
4. Shishir Gundavarma, "CGI Programming on the World Wide Web", O'Reilly & Associate.
5. DON Box, "Essential COM", Addison Wesley.
6. Greg Buczek, "ASP Developer's Guide", TMH.

COMPILER DESIGN LAB (HCS-653)

L T P

0 0 3

1. Simulation of a Finite state Automata to recognize the tokens of various control statements.
2. Simulation of a Finite state machine to distinguish among Integers, Real Numbers & Numbers with Exponents.
3. Program in LEX tool to recognize the tokens and to return the token found for a C like Language.
4. Parsing of arithmetic and algebraic expressions and equations.
8. Use of YACC tool to parse the statements of C like Language.

COMPUTER NETWORKS LAB (HCS-654)

L T P

0 0 3

1. Implementation of the Data Link Layer framing method such as character stuffing and bit stuffing in C.
2. Implementation of CRC algorithm in C.
3. Implementation of a Hamming (7,4) code to limit the noise. We have to code the 4 bit data in to 7 bit data by adding 3 parity bits. Implementation will be in C.
4. Implementation of LZW compression algorithm in C.
5. Write a socket program in C to implement a listener and a talker.
6. Simulation of a network of 3 nodes and measure the performance on the same network.
7. Write a program in C to encrypt 64-bit text using DES algorithm.

WEB TECHNOLOGY LAB (HCS-655)

L T P

0 0 2

1. Design a HTML page to display your CV.
2. Design a HTML form to reserve a railway ticket.
3. Write a Java Script program that finds the greatest common divisor of two numbers.
4. In the form mentioned in problem 2 to reserve a railway ticket add the following validations using java Script.
   - From city and to city are two different cities.
   - Age of passengers should not be greater than 150.
   - Name of the passenger should be a string of a maximum length
5. Write a program for illustrating client/server side scripting with help of ASP.
6. Write a piece of code in XML for creating DTD, which specifies set of rules.
7. Create style sheet in CSS/XSL and display the document in Internet Explorer.

Revised Syllabus

B. Tech. IV Year

Computer Science and Engineering

(Effective from the session 2011-12)

ARTIFICIAL INTELLIGENCE (HCS-702)

L T P

3 1 0

UNIT-I: Introduction

Introduction to Artificial Intelligence, Brief history, Various approaches to AI, Areas of application, Simulation of sophisticated & Intelligent Behavior in different area, Problem solving in games, natural language processing, automated reasoning, and visual perception, Knowledge and its role in AI, Heuristic algorithm versus solution guaranteed algorithms, Introduction to soft computing.

UNIT-II: Searching in State Space

Representing problems in state space, Informed versus uninformed search, Production System Model, Evaluation of the Production System, Depth First Search and Breadth First Search, Heuristics, Heuristic Search Techniques: Hill Climbing, Best First search, A* Algorithm, Branch and Bound, Cryptarithmatic Problem, Means End Analysis, AO* Algorithm, Game Playing: MINMAX Search, Alpha-Beta Pruning, Heuristic Estimation.

UNIT-III: Knowledge Representation and Reasoning

Propositional Logic, First Order Predicate Logic, Graphs, Associative Network, Semantic Networks, Conceptual Dependencies, Frames, Scripts, Horn Clauses, Introductory Examples from PROLOG, Case Grammar Theory, Production Rules Knowledge Base, The Interface System, Forward & Backward Deduction, Inference System in Propositional and Predicate Logic, Reasoning under Uncertainty.

UNIT-IV: Understanding Natural Languages.

Various Approaches of NLP, Parsing techniques, Context free and transformational grammars, Transition nets, Augmented transition nets, Fillmore's grammars, Grammar free analyzers, Sentence generation, and translation, Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine Perception, Object Identification, Speech Recognition.

UNIT-V: Expert Systems

Architecture of Expert System, Representing and using domain knowledge, Expert System Shell, Explanation System, Knowledge Acquisition System, Case study of Existing Expert Systems like DENDRAL, MYCIN, Development of a small Expert System using programming Languages and tools like LISP, PROLOG, JESS.

Text and Reference Books:

1. N. J. Nilsson, “Artificial Intelligence: A New Synthesis”, Elsevier Publications.

2. Charnick, “Introduction to A.I.”, Addison Wesley.
3. Rich & Knight, “Artificial Intelligence”, McGraw-Hill Publication.
4. Winston, “LISP”, Addison Wesley
5. Marcellous, “Expert System Programming”, PHI
6. Elamie, “Artificial Intelligence”, Academic Press
7. Lioyed, “Foundation of Logic Processing”, Springer Verlag
8. D. W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI.

ADVANCE COMPUTER ARCHITECTURE (HCS-701)

L T P

3 1 0

Unit-I: Introduction

Introduction to parallel computing, need for parallel computing, parallel architectural classification schemes, Flynn’s, Feng’s classification, performance of parallel processors, distributed processing, processor and memory hierarchy, bus, cache & shared memory, introduction to super scalar architectures, quantitative evaluation of performance gain using memory, cache miss/hits.

Unit-II: Multi-core Architectures

Introduction to multi-core architectures, issues involved into writing code for multi-core architectures, development of programs for these architectures, program optimizations techniques, building of some of these techniques in compilers, OpenMP and other message passing libraries, threads, mutex etc.

Unit-III: Multi-threaded Architectures

Parallel computers, Instruction level parallelism (ILP) vs. thread level parallelism (TLP), Performance issues: Brief introduction to cache hierarchy and communication latency, Shared memory multiprocessors, General architectures and the problem of cache coherence, Synchronization primitives: Atomic primitives; locks: TTS, ticket, array; barriers: central and tree; performance implications in shared memory programs; Chip multiprocessors: Why CMP (Moore's law, wire delay); shared L2 vs. tiled CMP; core complexity; power/performance; Snoopy coherence: invalidate vs. update, MSI, MESI, MOESI, MOSI; performance trade-offs; pipelined snoopy bus design; Memory consistency models: SC, PC, TSO, PSO, WO/WC, RC; Chip multiprocessor case studies: Intel Montecito and dual-core, Pentium4, IBM Power4, Sun Niagara

Unit-IV: Compiler Optimization Issues

Introduction to optimization, overview of parallelization; Shared memory programming, introduction to OpenMP; Dataflow analysis, pointer analysis, alias analysis; Data dependence analysis, solving data dependence equations (integer linear programming problem); Loop optimizations; Memory hierarchy issues in code optimization.

Unit-V: Operating System Issues and Applications

Operating System issues for multiprocessing Need for pre-emptive OS; Scheduling Techniques, Usual OS scheduling techniques, Threads, Distributed scheduler, Multiprocessor scheduling, Gang scheduling; Communication between processes, Message boxes, Shared memory; Sharing issues and Synchronization, Sharing memory and other structures, Sharing I/O devices, Distributed Semaphores, monitors, spin-locks, Implementation techniques on multi-cores; OpenMP, MPI and case studies Case studies from Applications: Digital Signal Processing, Image processing, Speech processing.

Text and Reference Books:

1. Kai Hwang," Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX
3. Hennessy and Patterson," Computer Architecture: A Quantitative Approach", Elsevier
4. Dezso and Sima, "Advanced Computer Architecture", Pearson
5. Quinn, "Parallel Computing: Theory & Practice", TMH
6. Quinn, "Parallel Programming in C with MPI and Open MP", TMH
7. Open MP Specification and Usage (www.openmp.org)

DATA MINING AND DATA WAREHOUSING (HCS-703)

L T P

3 1 0

Unit-I

Overview, Motivation (for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. **Data Reduction**:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases–Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3-Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools, OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

Text and Reference Books:

1. M. H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques", Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems, 1/e " Pearson Education
4. Mallach, "Data Warehousing System", McGraw –Hill

DISTRIBUTED DATABASE MANAGEMENT SYSTEM (HCS-704)

L T P

3 1 0

Unit-I: Introduction

Architecture of distributed systems: A detailed review of distributed system architecture (network operating system, distributed operating systems, etc.) will be presented leading to distributed database systems. This will then be categorized into (a) federated database systems, (b) Multi-database systems, and (c) Client/Server systems. **Advanced transaction model**: For managing data processing on distributed platform the conventional transaction model needs some improvements. Discussion of some advanced transaction models suitable for different types of distributed database systems.

Unit-II: Workflow

It is a unit of business processing. From conventional viewpoint it is a set of tightly linked atomic processing units which requires special concurrency control and commit protocols, Discussion of existing ways of handling workflows.

Unit-III: Query processing and Optimization: On distributed systems a query may be fragmented for processing on multiple nodes, This give rise to the problem of query fragmentation and distribution which must be addressed for improving performance.

Unit-IV: Application distribution: To support parallel and concurrent processing of transactions processing application have to be distributed. This gives rise to application recovery problem. This course will explore new ways of managing application recovery which is more complex than database recovery.

Unit-V: Transaction management, commit protocol and database recovery: These are system related issues. We will discuss commonly used schemes and advanced protocols for managing these activities.

Buffer management: Database maintains their own buffer for processing transactions. We will discuss the buffer architecture and buffer management schemes (replacement, allocation, etc.)

Text and Reference Books:

1. Distributed Systems: Concept and Design. Coulouris, Dollimore, and Kindberg, AW.
2. Distributed Database Principles and Systems. Ceri and Pelagatti. McGraw Hill.
3. Recovery Mechanisms in Database Systems. Kumar and Hsu, Prentice Hall.
4. Concurrency Control and Recovery in Database Systems. Bernstein, Hadzilacos and Goodman, AW.

SERVICE ORIENTED ARCHITECTURE (HCS-705)

L T P

3 1 0

UNIT-I: SOA Fundamentals

Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment

UNIT-II: SOA Planning and Analysis

Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution

assets(ESA).

UNIT-III: SOA Design

Service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing.

UNIT-IV: SOA Implementation

Implementing SOA, security implementation, implementation of integration patterns, services enablement, Quality assurance, A brief overview of tools available for SOA Implementation.

UNIT-V: Managing SOA Environment

Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle.

Text and Reference Books:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Prentice Hall Publication, 2005.
2. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah, "Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap", IBM Press Publication, 2005.
3. Sandy Carter, "The New Language of Business: SOA & Web 2.0", IBM Press, 2007.
4. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall Publication, 2004.
5. Dave Chappell, "Enterprise Service Bus",O'Reilly Publications, 2004.
6. Sanjiva Weerawarana, Francisco Curbera, Frank Leymann, Tony Storey, Donald F. Ferguson, "Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WS- Addressing, WS-BPEL, WS-Reliable Messaging, and More", Prentice Hall Publication, 2005.
7. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Addison Wesley Publication, 2004.

CRYPTOGRAPHY AND NETWORK SECURITY (HCS-706)

L T P

3 1 0

Unit-I

Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt

analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Unit-II

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

Unit-III

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit-IV

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text and Reference Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.
2. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
3. Bruce Schiener, "Applied Cryptography".

MOBILE COMPUTING (HCS-707)

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3 1 0

UNIT - I

Introduction to Network Technologies and Cellular Communications: HIPERLAN: Protocol architecture, physical layer, Channel access control sub-layer, MAC sub-layer, Information bases and networking WLAN: Infrared vs. radio transmission, Infrastructure and ad hoc networks, IEEE 802.11. Bluetooth: User scenarios, Physical layer, MAC layer, Networking, Security, Link management GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture

UNIT - II

(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT - III

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT – IV

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues. Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT – V

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs. Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME**.**

Text and Reference Book:

1. Jochen Schiller, “Mobile Communications", Addison-Wesley. (Chapters 4, 7, 9, 10, 11), second edition, 2004.
2. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028. (Chapters 11, 15, 17, 26 and 27)
3. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004

BIOINFORMATICS (HCS-704)

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3 1 0

Unit-I: Introduction

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools, Metadata: Summary & reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, Overview of the bioinformatics applications.

Unit-II: The Information Molecules and Information Flow

Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA, DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit-III: Perl

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, Understanding and Using Biological Databases, Java clients, CORBA, Introduction to biostatics.

Unit-IV: Nucleotide sequence data Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit-V: Biological data types and their special requirements: sequences, macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: alignments, regular expressions, hierarchies and graphical models.

Text and Reference Books:

1. O'Reilly, " Developing Bio informatics computer skills", Indian Edition's publication
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics concepts, skills & Applications", CBS Publishers
3. Rashidi, Hooman and Lukas K. Buehler, "Bioinformatics Basic Applications" CRC Press.
4. "Bioinformatics" , Addison Wesley
5. Stephen Misner & Stephen Krawetz, " Bioinformatics- Methods & Protocols"

ARTIFICIAL INTELLIGENCE LAB (HCS-752)

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1. Write a LISP Program to solve the water-jug problem using heuristic function.
2. Create a compound object using Turbo Prolog.
3. Write a Prolog Program to show the advantage and disadvantage of green and red cuts.
4. Write a prolog program to use of BEST-FIRST SEARCH applied to the eight puzzle problem.
5. Implementation of the problem solving strategies: Forward Chaining, Backward Chaining, Problem Reduction.
6. Write a Lisp Program to implement the STEEPEST-ASCENT HILL CLIMBING.

7. Write a Prolog Program to implement COUNTE PROPAGATION NETWORK.
8. Development of a small Expert System using PROLOG/JESS.

DISTRIBUTED SYSTEMS (HCS-801)

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3 1 0

Unit–I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges.

System Models: Architectural models, Fundamental Models

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, Requirement of mutual exclusion theorem, Token based and non token based algorithms, Performance metric for distributed mutual exclusion algorithms.

Unit–II

Distributed Deadlock Detection: System model, resource vs communication deadlocks, deadlock prevention, avoidance, Detection & resolution, centralized dead lock detection, distributed dead lock detection, Path pushing algorithms, Edge chasing algorithms.

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Unit–III

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.

Security: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent.

Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit–IV

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Unit –V

Distributed Algorithms: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm.

CORBA Case Study: CORBA RMI, CORBA services.

Text and Reference Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.
3. Gerald Tel, "Distributed Algorithms", Cambridge University Press
4. Nancy A. Lynch, "Distributed Algorithms", Elsevier Publication.

DIGITAL IMAGE PROCESSING (HCS-802)

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3 1 0

UNIT-I:

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-II

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-III

Color Image Processing

Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-IV

Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

UNIT-V

Feature Extraction

Representation, Topological Attributes, Geometric Attributes

Description

Boundary-based Description, Region-based Description, Relationship.

Object Recognition

Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

Text and Reference Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

MULTI CORE ARCHITECTURE (HCS-803)

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3 1 0

Unit-I: Multi-core Architectures

Introduction to multi-core architectures, issues involved into writing code for multi-core architectures, Virtual Memory, VM addressing, VA to PA translation, Page fault, TLB- Parallel computers, Instruction level parallelism (ILP) vs. thread level parallelism (TLP), Performance issues, OpenMP and other message passing libraries, threads, mutex etc.

Unit-II: Multi-threaded Architectures

Brief introduction to cache hierarchy - Caches: Addressing a Cache, Cache Hierarchy, States of Cache line, Inclusion policy, TLB access, Memory Op latency, MLP, Memory Wall, communication latency, Shared memory multiprocessors, General architectures and the problem of cache coherence, Synchronization primitives: Atomic primitives; locks: TTS, ticket, array; barriers: central and tree; performance implications in shared memory programs; Chip multiprocessors: Why CMP (Moore's law, wire delay); shared L2 vs. tiled CMP; core complexity; power/performance; Snoopy coherence: invalidate vs. update, MSI, MESI, MOESI, MOSI; performance trade-offs; pipelined snoopy bus design; Memory consistency models: SC, PC, TSO, PSO, WO/WC, RC;

Chip multiprocessor case studies: Intel Montecito and dual-core, Pentium4, IBM Power4, Sun Niagara

Unit-III: Compiler Optimization Issues

Code optimizations: Copy Propagation, dead Code elimination , Loop Optimizations-Loop Unrolling, Induction variable Simplification, Loop Jamming, Loop Unswitching, Techniques to improve detection of parallelism: Scalar Processors, Special locality, Temporal locality, Vector machine, Strip mining, Shared memory model, SIMD architecture, Dopar loop, Dosingle loop.

Unit-IV: Control Flow analysis

Control flow analysis, Flow graph, Loops in Flow graphs, Loop Detection, Approaches to Control Flow Analysis, Reducible Flow Graphs, Node Splitting. Dataflow analysis: Analysis of Structured programs, Reaching definition Analysis, Control Tree based.

Unit-V: Data-Flow Analysis

Data Flow analysis, Interval Analysis, Backward Analysis, Available Expression, Live variable Analysis, Very busy Expression, pointer analysis, alias analysis; Data Dependence Analysis : data Dependence, solving data dependence

equations (integer linear programming problem); Data Dependency graph, Basic Block dependence, Data Dependence in loops, iteration space, iteration Vector, Data dependency in parallel loops, Loop optimizations.

Text and Reference Books:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques & Tools", 2nd Ed, 2006
2. Shameem Akhter and Jason Roberts, Multi-Core Programming, Intel Press, 2006
3. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence-based Approach", Morgan Kaufmann publishers, 2002

EMBEDDED SYSTEMS (HCS-804)

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3 1 0

UNIT-I: Introduction to Embedded Systems

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

UNIT-II: Devices and Buses for Devices Network

I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

UNIT-III: Programming Concepts and Embedded Programming in C

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of 'C' Program compilers – Cross compiler – Optimization of memory codes.

UNIT-IV: Real Time Operating Systems

Timing and clocks in embedded system, Task modeling and management: RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics – Co-operative Round Robin Scheduling – Cyclic Scheduling with Time Slicing (Rate Monotonics Co-operative Scheduling) – Preemptive Scheduling Model strategy by a Scheduler – Critical Section Service by a Preemptive Scheduler – Fixed (Static) Real time scheduling of tasks

UNIT-V: Embedded Control

Embedded control and control hierarchy, communication strategies for embedded system: encoding and flow chart. Fault tolerance and formal verification.

Text and Reference Books:

1. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes.
2. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
3. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001.
4. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware Software Introduction, John Wiley, 2002.
5. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003.
6. H.Kopetz, "Real-Time Systems", Kluwer, 1997.
7. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer 1995.

REAL TIME SYSTEMS (HCS-805)

L T P

3 1 0

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Access Control

Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic nPriority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Multiprocessor System Environment

Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

UNIT-V: Real Time Communication

Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

Text and Reference Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Real-Time Systems: Scheduling, Analysis, and Verification by Prof. Albert M. K. Cheng, John Wiley and Sons Publications.

SOFTWARE PROJECT MANAGEMENT (HCS-806)

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3 1 0

UNIT-I: Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

Text and Reference Books:

1. Software Project Management, M. Cotterell, Tata McGraw-Hill Publication.
2. Information Technology Project Management, Kathy Schwalbe, Vikas Pub. House.
3. Software Project Management, S. A. Kelkar, PHI Publication.

SOFTWARE QUALITY ENGINEERING (HCS-807)

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3 1 0

UNIT-I: Introduction

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

Text and Reference Books:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Interscience, 2005; ISBN 0-471-71345-7.
2. Metrics and Models in Software Quality Engineering, Stephen H. Kan, Addison-Wesley (2002), ISBN: 0201729156

SOFTWARE TESTING (HCS-808)

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3 1 0

Unit-I: Introduction

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing

White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing

Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

Text and Reference Books:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. K. K. Aggarwal and Yogesh Singh, "Software Engineering", 3rd Edition, New Age International Publication.

DIGITAL IMAGE PROCESSING LAB (HCS-852)

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The following programs should be developed in '**C**' language preferably on '**UNIX'** platform. The graphical development environment can be created using some appropriate library like 'OpenGL':

1. Implement the spatial image enhancement functions on a bitmap image –
   a) Mirroring (Inversion) (b) Rotation (Clockwise) (c) Enlargement (Double Size)
2. Implement (a) Low Pass Filter (b) High Pass Filter.
3. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter.
4. Implement Smoothing and Sharpening of an eight bit color image.
5. Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm
6. Implement (a) Edge Detection (b) Line Detection.

DISTRIBUTED SYSTEMS LAB (HCS-851)

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The following programs should be developed preferably on '**UNIX'** platform:-

1. Simulate the functioning of Lamport's Logical Clock in 'C'.
2. Simulate the Distributed Mutual Exclusion in 'C'.
3. Implement a Distributed Chat Server using TCP Sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'
5. Implement 'Java RMI' mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in 'C'.
7. Implement CORBA mechanism by using 'C++' program at one end and 'Java' program on the other.