UNIVERSITY OF MUMBAI

COMPUTER ENGINEERING

SCHEME OF INSTRUCTIONS AND EXAMINATION (R-2001) SEMESTER VII to VIII

AND

DETAILED SYLLABUS FOR SEMESTER VII and VIII

FIRST YEAR ENGINEERING

SEMESTER-I

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics-I	5	-	-	3	100	-	-	-	100
2.	Applied Sciences-I	4	-	2	3	100	25	-	-	125
3.	Engineering Mechanics	6	3	-	3	100	25	-	-	125
4.	Basic Electrical and Electronics Engineering	6	3	-	3	100	25	-	-	125
5.	Computer programming-I	4	3	-	3	100	25	-	-	125
6.	Basic Workshop Practice	4	-	-	-	-	-	-	-	-
Total		**25**	**13**	**2**	**-**	**500**	**100**	**-**	**-**	**600**

SEMESTER – II

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics-II	5	-	-	3	100	-	-	-	100
2.	Applied Sciences-II	4	-	1.5	3	100	25	-	-	125
3.	Communication Skills	2	-	1.5	3	100	25	-	-	125
4.	Engineering Drawing	4	6	-	4	100	25	-	-	125
5.	Computer programming-II	4	3	-	3	100	25	-	-	125
6.	Basic Workshop Practice-II	-	4	-	-	-	100	-	-	100
Total		**19**	**13**	**3**	**-**	**500**	**200**	**-**	**-**	**700**

SECOND YEAR ENGINEERING

SEMESTER III

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics III (CE)*	4	-	-	3	100	-	-	-	100
2.	Electronics Devices and Circuits *	3	3	-	3	100	25	-	-	125
3.	Electrical Network *	4	-	2	3	100	25	-	-	125
4.	Data Structures	3	2	-	3	100	25	-	-	125
5.	.Digital Logic Design and Application *	4	2	-	3	100	25	-	-	125
6.	Discrete Structures *	3	-	2	3	100	25	-	-	125
Total		**20**	**7**	**5**	**-**	**600**	**125**	**-**	**-**	**725**

SEMESTER IV

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics IV (CE)*	4	-	-	3	100	-	-	-	100
2.	Principles of Communication Enginjeering*	3	2	-	3	100	25	-	25	150
3.	Computer Organization and Architecure	4	2	-	3	100	25	-	25	150
4.	Database Systems	4	2	-	3	100	25	-	25	150
5.	Analysis of Algorithms	4	2	-	3	100	25	25	-	150
6.	Industrial Economics and Management*	4	-	-	3	100	-	-	-	100
Total		**23**	**8**	**-**	**-**	**600**	**100**	**25**	**75**	**800**

THIRD YEAR ENGINEERING

SEMESTER – V

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics V (CE)*	4	-	-	3	100	-	-	-	100
2.	Principles of Digital Communication	3	2	-	3	100	25	-	-	125
3.	Cmputer Networks*	3	2	-	3	100	25	-	-	125
4.	Microprocessor*	4	2	-	3	100	25	-	-	125
5.	Theoratical Computer Science	3	-	2	3	100	25	-	-	125
6.	Presentation & Communication Techniques$	2	-	2	-	-	25	-	25	50
7.	Computer Programming Laboratory*	-	3	2	-	-	25	-	-	25
Total		**19**	**9**	**6**	**-**	**500**	**150**	**--**	**25**	**675**

SEMESTER – VI

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	System Programming	3	2	-	3	100	25	-	25	150
2.	Operating System with Unix	3	3	-	3	100	25	-	25	150
3.	Web Technology	4	2	-	3	100	25	-	25	150
4.	Object Oriented Analysis and Design*	3	3	-	3	100	25	25	-	150
5.	Computer Graphics	3	3	-	3	100	25	25	-	150
6.	Advanced Databases	3	2	-	3	100	25	-	25	150
Total		**19**	**15**	**-**	**-**	**600**	**150**	**25**	**100**	**900**

* Common with IT , $ Common with all branches

UNIVERSITY OF MUMBAI

B.E, COMPUTER ENGINEERING
SCHEME OF INSTRUCTIONS AND EVALUATION (R-2001)

B.E. SEMESTER VII

Scheme of Instructions					Scheme of Evaluation					
Subjects		Lect/	Pract/	Tuto/	Paper		T/W	Pract	Oral	Total
		Week	Week	Week	Hours	Marks				
1	Advanced Microprocessors	4	2	-	3	100	25	-	25	150
2	Intelligent Systems	4	2	-	3	100	25	-	25	150
3	Digital Signal Processing	4	2	-	3	100	25	-	25	150
4	Software Engineering	4	2	-	3	100	25	-	25	150
5	Elective-I	4	2	-	3	100	25	-	25	150
6	Project-A	-	-	2	-	-	25	-	25	50
		20	10	2	-	500	150	-	150	800

B.E. SEMESTER VIII

Scheme of Instructions					Scheme of Evaluation					
Subjects		Lect/	Pract/	Tuto/	Paper		T/W	Pract	Oral	Total
		Week	Week	Week	Hours	Marks				
1	System Security	4	2	-	3	100	25	-	25	150
2	Distributed Computing	4	2	-	3	100	25	-	25	150
3	Multimedia Systems*	4	2	-	3	100	25	-	25	150
4	Elective-II	4	2	-	3	100	25	-	25	150
5	Project-B	-	-	6	-	-	50	-	50	100
		16	8	6	-	400	150	-	150	700

Elective-I	
1	Image Processing
2	Pattern Recognition*
3	Mobile Computing*
4	Embedded Systems*
5	Computer Simulation and Modeling*
6	Advanced Computer Networks*

Elective-II	
1	Robotics*
2	Computer Vision*
3	Parallel Processing
4	Data Warehousing and Mining*
5	Neural Networks and Fuzzy Systems*
6	Software Testing*

* Common with IT

FE SEMESTER-I

Applied Mathematics – I

Class: F. E. (All Branches)	**Semester: I**
Periods per week: Lectures: 5 Practicals: -- Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: - Practical : - Oral: - Total: 100

Detailed Syllabus		Periods / week
Section I: Applied Mathematics 1		
1	**Complex numbers** • Idea of argand diagram (problem based on geometry are not expected) Cartesian, polar and exponential form of complex number • De'moivre's theorem (without proof), power and roots of exponential and trigonometric functions • Hyperbolic and logarithmic functions, inverse trigonometric functions • Separation of real and imaginary parts of all types of functions	2 6 3 4
2	**Vector algebra and vector calculus** • Vector triple product (proof is not expected), product of four vector • Differentiation of a vector function of a single scalar variable, proofs of theorems on derivatives of sums and product are not expected • Curves in spaces, serrate frenetic formulae (without proof), curvature, torsion, osculating plane, normal plane and rectifying plane.	3 2 5
3	**Mean value theorem** • Rolles theorem, lagrange's and Cauchy's mean value theorem (proofs are not expected but geometrical interpretation are expected) • Taylor's and maclaurian's theorem (without proof), taylor's and maclaurian's series	4 4
4	**Differential calculus** • Successive differentiation of nth derivatives of function	4

	such as (ax+b)^m; (ax+b)^-1, e^ax, sin(ax+b), cos(ax+b), log(ax+b), e^axsin(bx+c), e^axcos(bx+c) • Leibnitz theorem (without proof), expansions of power series, indeterminate forms and L'hospital rule	7

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5	**Partial differentiation** • Partial derivatives of first and higher order, total differentials, composite functions and implicit functions • Euler's theorem on homogeneous functions with two and three independent variables (with proof), deductions from Euler's theorem • Errors and approximations, maxima and minima of a function of two variables	7 4 4
	Recommended Books: • Higher engineering mathematics, Dr B S Grewal, khanna publications • A text book of applied mathematics, P N & J N Wartikar, pune vidyarthi griha • Advanced engineering mathematics, Erurin Kreyszing, Wiley Eastern Limited • Engineering mathematics 1, G V Kumbhojkar, C Jamanadas and Co • Appilied mathematics 1, Dr B V Jungam, K P Patil, Mrs N M Kumthekar,Nandu publication	

Applied Sciences – I

Class: F. E. (All Branches)	Semester: I
Periods per week: Lectures: 4 Practicals: -- Tutorials: 2	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
Section I: Applied Physics		
1	**Solid state physics** • Crystal structure: structure of cubic crystals, special form in cubic crystals, diamond structure, barium titanate Miller indices, planes &directions, Legacy and critical radius ratio in tonic crystals • Formation of energy band and classification of solids, conductors, semiconductors, insulators, physical of semiconductor junctions,(bipolar)photo diode. • C-B characteristics, concept of fermi-level, energy gap, temperature dependence.	9
2	**Sound waves** • Audible, ultrasonic and infrasonic waves propagation, piezo electric effect, principles of ultrasonic transducers and oscillations, production of ultrasonic waves, echo sounding thickness measurement, cavitations and non distructive testing and flow detection	6
3	**Electricity and magnetism** • Motion of charges, particles in electric and magnetic field, magnetic and electrostatic focusing system and its use in CRO, use of CRO for measuring amplitude of DC and AC, voltage and phase diff between 2 sine waves	6
4	**Quantum physics** • Introduction to wave nature of particles, De Broglie waves	3
Section II: Applied Chemistry		
5	**Water and its treatment** • Introduction to hard and soft water	7

	• Hardness: types, units, estimation of EDTA method, numerical, understanding effect of hard water in industries • Softening of water • Lime soda process, zeolite- permutit method, ion exchange method, comparison of methods, numerical problems based on lime soda and zeolite process	

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6	**High polymers and elastomers** • Introduction and definition of elastomers and polymers • Classification of polymers: homopolymer and copolymer, limear, branched and crossed linked, organic and inorganic • Types of polymerization: addition (e.g. polyethelene, polypropelene), condensation 9 e.g. phenol formaldehyde urea formaldehyde) • Plastics: classification (thermoplastic and thermosetting), compounding of plastics, fabrication of plastic-compression, extrusion, transfer, and injection molding industrial applications. • Rubber: structure- cis and trans isomer, properties and drawbacks, Vulcanization- mechanism, agents, advantages, effects on properties, synthetic rubbers-manufacture, properties and uses of polyurethane, silicon rubber	9
7	**Pollution and pollution control** • Definition of pollution and pollutant • Introduction to atmospheric pollution: nature of atmospheric pollutants and their effects, methods of reducing atmospheric pollution in brief • Introduction to water pollution: nature of water pollutants and their effects, methods of reducing water pollution in brief.	5
8	**Introduction to lubricants** • Definition of lubricants, lubrication and purpose of lubrication • Classification of lubricants with examples: solids semisolid, liquids, blended, synthetic. • Mechanism of lubrication- thick film, thin film and extreme lubrication • Properties of ideal lubricant (definition and significance)- viscosity, viscosity index flash fire point, cloud and pom point, saponification value, acid value and numerical problems on saponification value and acid value.	7

	Term Work Each student has to appear for at least one written test during the term. Report on experiments demonstrated (at least five each based on above syllabus of section I & Section II), Assignments consisting of minimum 10 numerical problems covering the syllabus along with the graded answer paper shall be submitted as term work. The distribution of term work marks will be as follows Report on experiments demonstrated, assignments:- 15 Marks Written test: 10 Marks
	Recommended Books: • Concept of modern physics , Arthur Beiser, Tata McGraw Hill • Engineering Physics, R. K. Gaur and S. L. Gupta, Dhanpatrai Publishing Company • Modern Physics, J. B. Rajam, S. Chand and Co. • Engineering Chemistry, Jain and Jain, Dhanpat Rai Publising Co. • A Text Book of Engineering Chemistry, M.M. Uppal, Khanna Publishers • Environmental Chemistry, B.K. Sharma, Goyal Publishing House • Engineering Chemistry, S.S. Dara, S. Chand and Co.

Engineering Mechanics

Class: F. E. (All Branches)	**Semester: I**
Periods per week: Lectures: 6 Practicals: 3 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		**Periods / week**
Section I: Statics		
1	**System of coplanar forces** • Resultant of I) concurrent forces ii) Parallel forces and iii) Non concurrent forces non parallel forces. Moment of forces about any point, couples, Varignon's Theorem, Distributed forces in plane	6
2	**Equilibrium of system of coplanar forces** • Conditions of equilibrium for I) concurrent forces ii) Parallel forces iii) Non concurrent non parallel system of forces and couples • Types of supports, determination of reactions at support for	6

	various types determinants structures (with/without internal hinge) • Centurions of plane areas. Center of Gravity of wires bent into different shapes. • Analysis of determinate pin joined plane frames by method of joint and method of sections.	
3	**Forces in space** • Resultant of I) concurrent forces ii) parallel forces and iii) general force system. Moment of a force about a point, finding scalar and vector components of the force and the moment of force about the axis.	7
4	**Friction** Laws of friction, cone of friction, equilibrium of bodies on inclined plane, application to problems involving wedges and ;ladders, screw and belt friction only simple type involving tension on both side of pulley to be covered	6
5	**Principle of virtual work** Equilibrium of an ideal system, application to link systems with single degree of freedom only	3
	Section II: Dynamics	
6	**Kinematics of particle** • Rectilinear motion, acceleration, time and velocity time graphs and their uses • Velocity and acceleration in terms of rectangular coordinate system. Motion along plane curved path , tangential and normal component of acceleration, projectile motion. Simple harmonic motion	14
7	**Kinematics of rigid bodies** Relative velocity, translation, pure rotation and plane motion of rigid bodies, link mechanism, instantaneous center of rotation for the velocity and velocity diagrams for bodies in plane motion	6

8	**Kinematics of particles and kinematics of rigid bodies** • D'Alemberts principle, equation of dynamic equilibrium, linear motion, curvilinear motion • Area moment of inertia, parallel axis theorem, perpendicular axis theorem, mass moment of inertia about centroidal axis and about any other axis. D'Alemberts principle for bodies under rotational motion about a fix axis and plane motion. Application to motion of bars, cylinders, spheres only. • Linear momentum, impulse momentum, principle of conservation of momentum, impact of solid bodies, elastic impact, semi elastic impact and plastic impact, work done by a force, potential and kinetic energy and power work energy equation, principle of conservation of energy	6 8 8

	Term Work Each student has to appear for at least one written test during the term. At least 6 laboratory experiments from those mentioned below (minimum 2 on dynamics) should be conducted. The List of experiment (Static's & Dynamics) • Polygon law of coplanar forces (Concurrent) • Nonconcurring nonparallel (general) • Simple jip crane • Bell-Crank lever • Support reactions for beam • Link Polygon • Inclined plane or wedge friction or ladder friction (to determine coefficient of friction) • Coil friction • Simple / Compound pendulum (Time period of vibration) • Fly wheel (Mass moment o inertia) • Collision of elastic bodies (Law of conservation of momentum) • Rolling disk on inclined plane (To determine experimental mass moment of inertia of disk) Four problems should be solved graphically along with analytical solutions. Also assignments consisting of minimum 20 (Almost equal numbers on static's and dynamics) numerical problems based on the above syllabus shall be solved during practical periods.. Report on experiments performed, assignments as mentioned above, along with the graded answer paper shall be submitted as term work. The distribution of term work marks will be as follows Report on experiments demonstrated, assignments:- 10 Marks Assignments and solutions to problems: 5 Marks Written test: 10 Marks
	Recommended Books: • R.C. Hibbtlen, Engineering Mechanics, McMillan • B. N. Thadani, Engineering Mechanics, Weinall Book Co. • Beer and Johnson, Engineering Mechanics, Tata McGraw Hill • Kumar Engineering Mechanics, Tata McGraw Hill • S. Junarkar, Engineering Mechanics, Charotar Publishing House • Tayal, Engineering Mechanics, Umesh Publication • Macklin and Nelson, Engineering Mechanics, McGraw Hill • Mariam, Engineering Mechanics, John Willy • S. Rajesekaran & G. Shankarsubramaniam, Fundamentals of Engineering Mechanics, Vikas Publication • F. L. Singer, Engineering Mechanics, Harper & Raw Publishers

Basic Electrical and Electronics Engineering

Class: F. E. (All Branches)	**Semester: I**
Periods per week: Lectures: 6 Practical: 3 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
1	Units of work, power and energy, ohms law, effect of temperature on resistance, series and parallel circuit, lead acid battery construction and charging	3
2	AC fundamentals: Sinusoidal voltage and current waveforms, RMS and average value of various waveforms, form factor, crest factor, frequency, RL,RC and RLC, one phase series circuit (with resonance), parallel circuit (with resonance), statement for relation of line current, phase voltage and power in 3 phase circuits for a balanced 3 phase load	12
3	Elementary network theorems: (For DC circuits only), star delta transformations, superposition theorem, Thevenin's and Norton's theorem, Maximum power transfer theorem	8
4	Principle and working of single phase transformer, EMF equation, voltage and current ration of an ideal transformer, determination of efficiency and regulation by direct loading	5
5	General principles and working of electrical motors and generators: DC series and shut machine, one phase induction motor	4
6	PN junction diode as a rectifier, introduction to filters, light emitting diode	4
7	Principle and working of bipolar junction transistor and FET and its uses as amplifier	8
8	SCR characteristics and its applications for single phase converter and inverter circuits (Numerical problems not expected)	4
9	Transducers: Classification of transducers, study of transducers like displacement, temperature and pressure transducers, flow meters, LVDT, microphone, loudspeakers (numerical problems not expected)	6
10	Basic principles of measurements of electrical quantities.	8

	Voltmeters, Ammeters, Wattmeter, Millimeter, and power supplies (Numerical problems not expected)	

	Term Work Each student has to appear for at least one written test during the term. The List of experiment • RLC series and RLC parallel circuit and study of response • Study of relationship between line current / voltage and phase current / voltage for balanced star load • Study of relationship between the line current line / voltage and phase current / voltage for balance delta load • Verification of Norton's theorem, Thevenin's and superposition theorem • Load test on single phase transformer • Diode rectifier half wave and full wave circuit • Transistor I/O characteristics • Measurement of power using two wattmeter methods • Transistor as an amplifier • SCR as control rectifier • Transducer characteristics Report on experiments performed, assignments consisting of minimum 10 numerical problems based on above syllabus, along with the graded answer paper shall be submitted as term work. The distribution of term work marks will be as follows Report on experiments demonstrated, assignments:- 10 Marks Assignments and solutions to problems: 5 Marks Written test: 10 Marks
	Recommended Books: • Vincent Del-Torro, Principles of Electrical Engineering, Prentice Hall Pvt. Ltd. • R.K. Sugandhi & K.K. Sugandhi, Tyrister Theory and Applications, Wiley Fastern Ltd. • Sawhney A. K., A Course in Electrical & Electronics Measurements & Instrumentation, Dhanpat Rai & Sons • I.J. Nagrath & D.P. Kothari, Electrical Machines, Tata McGraw Hill, Ltd. • Allen Moteorshed, Electronic Devices & Circuits- & Introduction, Prentice Hall (I) Ltd.

Computer Programming I

Class: F. E. (All Branches)	**Semester: I**
Periods per week: Lectures: 4 Practical: 3 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
1	Fundamental of UNIX • Multiuse system: logging in and passwords, electronic mail, time for Unix • Unix file system: Files and directories, sub directories and path names, searching the tree for files • File Utilities: Ownership and access to file, simple text files, basic editing techniques, print files • File and data processing utilities: searching for patterns, rearranging file, structures, sorting a file, relational files	2 2 2 4
2	Structured programming • C fundamentals : Character set, identifiers and keywords , data types, constants, variable and arrays , declarations and operators and expressions, library functions, statements, symbolic constants, preprocessor directives • Data input and output: getchar(), scanf(), printf(), gets(), puts(),functions • Control statements: if else, while, do while, goto, for statement, nested control structures, switch, break, continuous statements, operators • Functions: Function prototypes, Passing arguments to a function by a value, recursion, storage classes, automatic, external, static, register variable in single file environment • Arrays: defining-processing array, passing arrays to functions, introduction to multidimensional arrays, arrays and streams • Pointers: Declarations, referencing and dereferencing, passing pointers to functions, pointer to array (no reference to dynamic memory allocation) • Structures and unions: defining and processing a structure	4 1 10 6 6 6 5

	Term Work Each student has to appear for at least one written test (preferably online) during the term. Teamwork shall consist of graded answer paper of the test and 5 assignments covering Unix fundaments, and 10 programs developed under control structures using C , 10 programs under arrays, functions and structures using C programs should be debug (hand written computer printout) and should have suitable comments. Recommended compilers:- Unix Linux, Turbo C / Borland C Report on programs:- 10 Marks Assignments : 5 Marks Written test: 10 Marks
	Recommended Books: • Programming in C, Balaguruswami, Tata McGraw Hill • A Structured Programming Approach using C, Behrouz Forouzan, Thomas Learning • Unix training Guide, Clifford Mould, Wheeler Publications • Programming in C, Schuam Outline Series • Let Us C, Yashwant Kanetkar, B.P.B. Publications • Practical C Programming, O'Reilly • Internet for everyone, A. Leon, Leon Techworld

Basic Workshop Practice I

Class: F. E. (All Branches)	**Semester: I**
Periods per week: Lectures: -- Practical: 4 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): -- Term work: 100 Practical : - - Oral: - - Total: 100

Detailed Syllabus		Periods / week
Note	The syllabus and term work to be done during Semi and Sem2 are given together. Select any four trade topics out of the topics at Sr. No. 3 to 10. Demonstrations and hands on exercise is to be provided during the periods allotted for the same. A report on the demonstration including suitable sketches is also to be included n the term works.	--
1	**Fitting** • Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping • Term work to include one job involving following operations**:** Filing to size, one simple male-female joint, drilling and tapping	24
2	**Carpentry** • Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood turning, modern wood turning methods • Term work to include one job workshop practice carpentry job involving a joint and a report on demonstration of a job involving woodturning.	24
3	**Forging (Smithy)** • At least one workshop practice job (lifting hook and handle) is to be demonstrated.	12
4	Welding • Edge preparations for welding jobs, Arc welding for different jobs like, lap welding of two plates, butt welding of plate's wiyh simple cover, arc welding to join plates at right angles.	12
5	**Machine Shop** • At least one turning job is to be demonstrated.	12
6	**Electrical board wiring** • House wiring, staircases wiring for fluorescent tube light,	12

	go-down wiring and 3-phase wiring for electrical motors.	
7	**PCB Layout exercise** • Layout wiring, +ve and –ve film making, PCB etching and drilling, tinning and soldering techniques	12
8	**Sheet Metal Working and Brazing** • Use of sheet metal, working hand tools, cutting, bending spot welding.	12

9	**Plumbing** • Use of plumbing tool, tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic plumbing line involving fixing of a water tap and use of coupling, elbow, tee, and union etc.	12
10	**Masonry** • Use of Mason's tool like trowel, hammers, sprit level, square, plumb, line, and pins etc, demonstration of motor making, single and one and half brick masonry, English, and Flemish bonds, block masonry, pointing and plastering.	12

FE SEMESTER-II

Applied Mathematics – II

Class: F. E. (All Branches)	**Semester: II**
Periods per week: Lectures: 5 Practical: -- Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: -- Practical : - - Oral: - - Total: 100

Detailed Syllabus		Periods / week
1	Beta and Gamma functions: Beta and Gamma functions with properties Relation between beta and gamma functions. Duplicate formula	7
2	Differentiation under integral sign with constant limits of integration	2
3	Integral calculus: • Rectification of plane curves • Double and triple integration, idea of Jacobin for evaluating integrals with transformation • Geometrical interpretation and evaluation of change by order and change to polar form • Application of double and triple integral to area mass and volume	6 14 3
4	Differential equations: • First order and first degree exact differential equation and those can be reduced to exact by use of integrating factor • Linear differential equations and equations reducible to linear equations • Linear differential equations of higher order with constant coeff. Complementary functions, particular integrals for the equations of the type • Cauchy's lenear homogeneous equation and Leagendre differential equation • Variation of rarameter methods and method of undetermined coeff. • Standard curves: Straight line, circle, parabola, ellipse, hyperbola, rectangular hyperbola, catenary's, semi cubical parabola, cissoids lemniscates, asteroid, hypocoid, cycloid, cardioids and a y 2 = x2 x (a-x), 9ay2, (x-2) (x-2a)2	6 10 4 4

	Recommended Books: • Higher Engineering Mathematic, Dr. B. S. Grewal, Khanna Publications • A text Book of Applied Mathematics, P.N. & J.N. Wartikar, Pune Vidyarthi Gruh • Advanced Engineering Mathematics, Erurin Kreyszing, Wiley Estern Ltd. • Engineering Mathematics I , G.V. Kumbhojkar, C. Jamnadas & Co. • Applied Mathematics I, Dr. B.V. Junjam, K.P. Patil, Mrs. N.M.Kumthekar, Nandu Publications

Applied Sciences – II

Class: F. E. (All Branches)	**Semester: II**
Periods per week: Lectures: 4 Practical: -- Tutorials: 1.5	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
Section I: Applied Physics		
1	**Optics** • Interference: Coherence, interference in thin film, wedge shaped film, Newton's rings, qualitative explanation of Comu's frings for finding strains and stresses in bent bearings	10
2	**X- Rays** • Production of X- rays, origin of X-rays, properties of X-rays, Mosseley's law, x-ray diffraction, Bragg's law, bragg's X-ray spectrometer and determination of crystal structure	6
3	**Laser** • Spontaneous and stimulated emission, population inversion, pumping device and active system • The ruby laser, He-Ne laser, and CO2 laser, semiconductor laser, applications of laser	
4	**Nuclear Physics** • Radiation detectors, ionization chamber, G.M. "Counter", nuclear reactions, fission, fusion, nuclear reactors	4
Section II: Applied Chemistry		
5	**Corrosion and its control** • Introduction and definition of electrochemical theory of corrosion, factors influencing rate of corrosion	8

	• Types of corrosion: galvanic, atmospheric and water line, differential aeration, pitting, soil, microbiological • Corrosion control: by proper selection of material and design, by cathodic protection, by anodic protection, by preventive coating	
6	**Fuels** • Introduction and classification of fuel, characteristics of fuels, calorific value, high and low calorific value, units, Doulong's formulae, numerical problems • Solid fuels: types of coal, selection of coal, analysis of coal, numerical problems • Liquid fuels: Petroleum composition, classification, mining and refining, cracking- thermal, catalytic, reactions, knocking- octane number, Colane number, antiknock agents. • Gaseous Fuels: composition and properties of natural gas, LPG, composition manufacturing and properties of natural gas.	10

7	**Alloys** • Introduction, definition, principle of alloying, purpose of making alloys, classification based on principal constituent • Ferrous alloys: plane carbon steel composition, properties, classification based on carbon content, applications, alloy steels- special effects of alloying elements on the properties, composition, properties and uses of Nichrome, stainless steel. • Non ferrous alloys: Alloys of aluminum, composition, properties and uses of duralumin, magnesium, alloys of copper- brass- general composition, composition, properties and uses of commercial brass and germen silver, bronze, nickel bronze, alloys of lead and tin (solders)- composition, properties and uses of soft solders, Tinman's solders	5
8	**Biotechnology** • Introduction: scope and importance of biotechnology, application of biotechnology, application of biotechnology to energy development and environment • Manufacture of biogas from organic waste	5
	Term Work Each student has to appear for at least one written test during the term. Report on experiments demonstrated (at least five each based on above syllabus of section I & Section II), Assignments consisting of minimum 10 numerical problems covering the syllabus along with the graded answer paper shall be submitted as term work. The distribution of term work marks will be as follows Report on experiments demonstrated, assignments:- 15 Marks Written test: 10 Marks	

	Recommended Books: • Concept of modern physics, Arthur Beiser, Tata McGraw Hill • Engineering Physics, R. K. Gaur and S. L. Gupta, Dhanpatrai Publishing Company • Modern Physics, J. B. Rajam, S. Chand and Co. • Engineering Chemistry, Jain and Jain, Dhanpat Rai Publising Co. • A Text Book of Engineering Chemistry, M.M. Uppal, Khanna Publishers • Environmental Chemistry, B.K. Sharma, Goyal Publishing House • Engineering Chemistry, S.S. Dara, S. Chand and Co.

Communication Skills

Class: F. E. (All Branches)	**Semester: II**
Periods per week: Lectures: 2 Practicals: -- Tutorials: 1.5	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
1	Communication: Concept and meaning and communication, barriers to communication, methods of communication, techniques to improve communication	4
2	Summarization: Techniques to summarize a given passage to test comprehension and ability to present written matter in a brief and concise manner	2 – 3

3	Comprehension and vocabulary: technical, scientific or general text with multiple choice questions to test analytical skills, comprehension, expression, vocabulary and grammar (Synonyms, autonyms, one word substitution, word formation)	2 – 3
4	Basic official correspondence: Principles of correspondence, language and style in official letters, formats of letters, (complete block , modified block, semi block) types of letters, (enquiry, replies to enquiries, claims and adjustments, application letters with biodata	9 – 10
5	Technical quitting: Framing definitions, classification and description of objects, explanation of a process, writing instruction	3 - 4
	Tutorials: Topics to be assigned for speech practice in the form of elocution and debates to test diction, modulation, fluency and nonverbal communication	
	Term Work Each student has to appear for at least on written test during the term. Term work shall consist of graded answer paper of the test and at least 8 hand written assignments (2 on communication, 3 on correspondence, 1 on summarization, 1 on comprehension and vocabulary, 1 on technical writing) The distribution of term work marks will be as follows Report on experiments demonstrated, assignments:- 15 Marks Written test: 10 Marks	

	Recommended Books: • Business Correspondence & Report Writing, R.C. Sharma & Krishna Mohan, Tata McGraw Hill • Business Communication (Revised Edition), Rai & Rai, Himalaya Publication • Lesiker & Petit: Business Communication, Tata Mc Graw Hill • Modern Business Correspondence, Mc Commas and Satterwhite, Sixth edition, McGraw hill • English for Engineers and technologist , A Skill approach (Books I & II) Course Authurs (Humanities & Social Sciences Division, Anna University Madras. Orient Longman (Mainly for Comprehensive) • Technical Writing, Eisenberg, Anne, McGraw Hill Publications (Teacher Reference Only) • Technical Writing And Professional Communication, Huckins, Thomas, McGraw Hill Publications • Written Communication, Freeman, Sarah, Orient Longman

Engineering Drawing

Class: F. E. (All Branches)	**Semester: II**
Periods per week: Lectures: 4 Practical: 6 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
Section I		
1	**Introduction** • Drawing instruments, symbolic lines , lettering, dimensioning system as per LS, conventions, commercial construction and tangential arcs.	2
2	**Engineering Curves** • Parabola, ellipse, hyperbola, cycloid, involutes by various methods.	7
3	**Projections** • Projections of points and lines inclined to both the reference planes • Projections of planes inclined to both reference planes • Projections of right regular solids inclined to both H.P. and V.P.	5 4 5
4	**Sections** • Sections of solids cut by planes perpendicular to at least one reference plane	3
5	**Development** • Development of lateral surfaces of solids cut by plane and curved plane (solid position with axis perpendicular to one of the reference planes)	5
Section II		
6	**Orthographic Projections** • Multi view orthographic projection of simple machine parts by first angle method and third angle method of projection as recommended by Indian standard	5
7	**Sectional views** • Sectional views of simple machine parts (full section, half section, offset section, partial section, revolved and removed sections)	5

8	**Reading of Orthographic Projections**	6
9	**Isometric projections** • Isometric projections / drawings of simple blocks (plain and cylindrical excluding sphere)	4
10	**Free hand sketches of lastners** • Thread profiles- IS convention of external and internal threads, drilled hole, blind hole, tapered hole. • Bolts- Hexagonal head, square head, cylindrical bolt • Nuts- Hexagonal, square wing and capstan • Set screws- heads and ends	3

11	**Introduction to computer 2D drawing**	3
	Term Work Term work shall consist of the following (all drawings to be prepared on A2 or Half imperial drawing sheets) • One drawing sheet on engineering curves (one problem) • One drawing sheet on projection of points and lines (two problems), projections of plane (2 problems) • One drawing sheet on (4 problems) projections of solids, sections of solids and development of lateral surfaces • One drawing sheet on (4 problems) orthographic projections, sectional views and reading of orthographic projections • One drawing sheet on (three problems) isometric projection • One print out of computer aided 2D drawing for missing view The distribution of term work marks will be as follows Report on experiments demonstrated, assignments:- 15 Marks Written test: 10 Marks	
	Recommended Books: • Elementary Engineering Drawing, N. D. Bhatt, Charotar Publishing House • Machine Drawing, N. D. Bhatt, Charotak Publishing House • Engineering Drawing First & Second, M. B. Shah & B.C. Rana	

Computer Programming – II

Class: F. E. (All Branches)	**Semester: II**
Periods per week: Lectures: 4 Practical: 3 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): 100 Term work: 25 Practical : - - Oral: - - Total: 125

Detailed Syllabus		Periods / week
1	C++ fundaments: (moving from c to C++) Data types, operators, processor directives, declarations, input and output, manipulation, control structure, function and arrays	3
2	Objection classes: Data handling and encapsulation, private and public members, member functions, accessing class members, object as function parameters, static data and member functions, friend functions and friend classless	8
3	Object initialization and cleanup: Constructors, parametrical constructors, destructor, constructor overloading, constructors with defaults arguments, constructors with dynamic operators	2
4	Function and operating overloading: function overloading, function with default arguments, inline functions, unary operator overloading, operator returning value, binary operator overloading, overloading arithmetic: collation and assignment operators	5
5	Inheritance: Derived and base class, protected members, over ridding functions, private, protected and public inheritance, derived class constructors, levels of inheritance and multiple inheritance	8
6	Points: void pointers, pointer to functions and objects, this pointer, pointers and memory management, new and delete operators. Dynamic memory allocation. Creating one and two dimensional arrays with dynamic memory allocation	8
7	Virtual functions and polymorphism: need for virtual functions, pointer to derived class objects, pure vital functions, abstract classes, dynamic or late binding	5
8	File handling: Files and structures, opening and closing a file, input and output, classes and files	3
9	Templates (only for concepts): Function templates and class templates	2

	Term Work Each student has to appear for at least one written test (preferably online) during the term. Teamwork shall consist of graded answer paper of the test and 5 assignments covering classes should be developed for manipulation of data stored in single dimensional array, two dimensional array linked lists and strings. Applications on data manipulation, matrix manipulation and statistics. and 10 programs developed under classes, objects and pointers, 10 programs should be developed under inheritance, operator overloading, function overloading. Recommended compilers:- Unix Linux, Turbo C / Borland C Report on programs:- 10 Marks Assignments: 5 Marks Written test: 10 Marks
	Recommended Books: • Programming in C++, Balaguruswami, Tata McGraw Hill • Starting Out with C++, Tony Gaddis, Penran International Publishing, India • Complete Reference by Hurbert Shield, Tata McGraw Hill • Object oriented programming in turbo C++, Bobettbalore, Galgotia • Programming in C, Schuam Outline Series • Let Us C++, Yashwant Kanetkar, B.P.B. Publications • Practical C ++ Programming, O'Reilly • Beginning C++, Ivor Hortou • A Text Book of C++, Garybronson

Basic Workshop Practice – II

Class: F. E. (All Branches)	**Semester: I**
Periods per week: Lectures: -- Practical: 4 Tutorials: --	Evaluation Systems: Theory Paper (3 Hours): -- Term work: 100 Practical : - - Oral: - - Total: 100

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER III

SUBJECT: : APPLIED MATHEMATICS III

Lectures**: 4 per week**	Theory: **100 Marks**

Objectives of the course: This course will prepare the Mathematics base for the students that they require for the rest of the curricula.

Pre-requisites: NIL

DETAILED SYLLABUS

1. **Complex Variables:**
   - Function of complex variable; Continuity (only statement), derivability of a function analytic, regular function; Necessary condition for f (z) to be analytic (statement of sufficient conditions); Cauchy Riemann equation in polar co-ordinates; Harmonic function, orthogonal trajectories; Analytical and Milne Thomson method to find f(z) from its real or imaginary parts.

Mapping: Conformal mapping, linear, bilinear mapping with geometrical interpretations.

2. **Fourier Series and Integrals:**
   - Orthogonal and orthonormal functions expression for a function in a series of orthogonal functions; Sine and cosine function and their orthogonal properties; Fourier series, dirichlet's theorem (only statement); Periodic function with period 2 and 21; Even and odd function; Half range sine and cosine series; Parseval's relations.
   - Complex form of Fourier series: Introduction to Fourier integral; Relation with Laplace transforms.

1. **Laplace Transforms:**

- Function of bounded variation (statement only), Laplace transform of I, t^n, e^{at}, sin(at) , cos(at), sinh(at), cosh(at), crf(t), shifting properties; Expressions (with proofs) for
  i) L{ t^n f(t)} ii) L{ f(t)/ t} iii) L{$\int$ f(u) du} iv) L {f(t)}
  Unit step functions, Heaviside, Dirac functions and their Laplace transformation; Laplace Transform of periodic function.
- Evaluation of inverse Laplace transforms, partial fraction method Heaviside development, convolution theorem.
- Application to solve initial and boundary value problems involving ordinary differential equation with one dependent variable.

4. **Matrices:**

- Types of matrices; Adjoint of a matrix; Inverse of a matrix; Elementary transformations of a matrix; Linear dependent and independent of rows and columns of a matrix over a real field; Reduction to a normal form; Partitioning of a matrices.
  System of homogeneous and non homogeneous equations, their consistency and solution.

BOOKS

TEXT BOOKS

1. P. N. Wartikar and J. N. Wartikar, "Element of applied mathematic", Volume I and Volume II, A. V. Griha, Pune.
2. S. S. Shastri, "Engineering Mathematics", Vol-2, PHI, Second edition , 1994.

3. A. R. Vasistha, “Matrices”, Krishna Prakasan, Meerut, 1988-89.
4. Churchil , “Complex Variable”, McGraw Hill, Tokyo.

References:

1. Shanti narayan, “Matrices”, S. Chand Publishing House, Delhi.
2. Shanti narayan, “Theory of function of complex variable”, S. Chand Publishing House, Delhi.
3. “Laplace transforms”, Schaum's outline series, McGraw Hill.
4. T. Veerarajan, “Engineering mathematics”, TMH.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER III

SUBJECT: : ELECTRONICS DEVICES AND CIRCUITS

Lectures: 3 per week **Practical:** 2 per week	**Theory:** 100 Marks **Term work:** 25 Marks

Objectives of the course: **The course intends to provide an overview of the principles, operation and application of the analog building blocks for performing various functions. This first course relies on elementary treatment and qualitative analysis and makes use of simple models and equations to illustrate the concepts involved. Detailed knowledge of the device structure and imperfections are not to be considered.**

Pre-requisites**: NIL**

DETAILED SYLLABUS

1. Review of transistors (BJT and FET):

- BJT principle, Biasing, Simple remodel, Voltage and Current amplification. CE, CB, CC amplifier configurations, FET principle, Biasing, FET amplifier configurations.

2. Differential Amplifier:

- Introduction, Circuit configurations, DC and AC analysis, FET differential amplifier, Current mirror circuit.

3. Operational Amplifier:

- Block diagram representation, Ideal op-amp, Equivalent circuit, Op-amp with negative feedback, Open-loop configurations, Frequency response, Compensating networks, Popular 741 op-amp specifications and performance characteristics.

4. Operational Amplifier Applications:

- Basic op-amp applications, Instrumentation amplifier, AC amplifier, Analysis of integrator and differentiator circuits.

5. Active Filters:

- First order and second order low pass, high pass Butterworth and band pass filter configurations.

6. Oscillators and Converters:

- Oscillation principle, Phase shift oscillator, Wein-bridge oscillator, Voltage controlled oscillator.

7. Comparators and Converters:

- Op-amp used as basic comparator; Zero crossing detector, Schmitt trigger comparator, Voltage limiter, Comparator specifications and performance characteristics. Analog to digital converter and Digital to analog converter principles, Practical A-D converter with binary weighted resistors, Successive approximation A-D converter, Monolithic A-D converters, AD808 and 809, A-D and D-A converter specifications and performance characteristics.

8. Voltage Regulators:

- Fixed voltage series regulators, Variable voltage regulator using IC 723, Principle of switching regulator. PWM IC voltage regulator specifications and performance characteristics. Practical power supply circuits.

9. Specialized IC applications:

- 555 timer IC and its use as monostable and astable multivibrator, Specifications and performance characteristics.

BOOKS

TEXT BOOKS

1. Ramakant A. Gayakwad, “OP-Amps and Linear Integrated Circuits”, PHI Publishers.
2. D. Roy Choudhary and Shail Jain , “Linear Integrated Circuits”, New Age International Publishers.
3. Robert L. Boylestad and Louis Nashelsky “Electronic Devices and Circuit Theory”, Eighth Edition, Pearson Education Asia.
4. J. M. Fiore, “Op Amps and Linear Integrated Circuits”, Thomson Learning.

References:

1. Sergio Franco, “Operational Amplifiers and Analog Integrated Circuits”, McGraw Hill International Edition.

TERM WORK

1. Term work should consist of at least 10 experiments and two assignments covering all the topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER III

SUBJECT : ELECTRICAL NETWORK

Lectures: 4 per week **Tutorials**: 2 per week	**One paper:** 100 marks. (3 Hrs.) **Term work:** 25 marks

Objectives of the course: Besides learning the specific problems, this course attempts at inculcating analytical insight of the students, which enhances their abilities to solve a large and complex problem.

Pre-requisites: NIL

DETAILED SYLLABUS

1. Solution of Network with Independent Sources.

2. Linear Graphs:

- Introductory definition; The incidence matrix A; The loop matrix B, Relationship between sub matrix of A and B cut sets and cutsets matrix, Fundamental cutsets and Fundamental Tiesets, Planner graphs, A & B matrices, Loop, Node, Node pair equations, Duality.

3. Network Equation in the Time Domain:

- First and second order differential equations initial conditions; Evaluation and analysis of transient and steady state response to step, ramp, impulse and sinusoidal input functions.

4. Laplace Transform:

- Laplace transform and it's application to analysis of network for different input functions described above.

5. Network Functions:

- Driving point and transfer functions; Two port network, Open circuit and short circuit parameter; Transmission parameter, Hybrid parameter, Chain parameter; Interconnection of two port network, Cascade connection, Series and parallel permissibility of connection.

6. Representation of Network Functions:

- Pole zeros and natural frequencies, Location of pole, Even and Odd pairs of a function;

Magnitude and angle of function; The delay function; All pass and minimum phase function,

Net change in angle, Azimuth polynomials, Ladder network, Constant resistance network,

Maximally flat response Chebyshev response; Calculation of a network function form a

given angle and real part Bode method.

7. Fundamentals of Network Synthesis:

- Energy function passive, reciprocal network; The impedance function; Condition on angle ,

Positive real function; Necessary and sufficient conditions; The angle property of a positive

real function; Bounded real function; The real part function; Reactance functions; Realization

of reactance functions; Ladder form of network, Azimuth polynomials and reactance

function ;Impedance and admittance of RC network under network realization; Resistance

inductance networks.

BOOKS

TEXT BOOKS

1. Franklin F. Kuo, “Network analysis and synthesis”, PHI.
2. M. E. Venvalkenberg, “Network analysis”, Prentice Hall (I) Ltd, third edition.
3. Willam Hayt and Jack Kemmerly, “Engineering Circuit analysis”, TMH.

References:

1. Nolman Balbanian, T. A. Bickkart, Sundaram, “Electrical Networks”, John-Wiley & Sons.

Topics of Tutorial

The students should perform the following tutorials:

a) One example indicating the concept of superloop and supermode concepts.

b) One example indicating the application of Thevenin and Norton's theorem in presence of

development sources.

c) The incidence cutset, tieset, Fundamental cutset and fundamental tieset matrices should be

written for one graph.

d) Example of evaluating the transient and steady state condition for an R-L and R-C circuit

for dc conditions.

Example of evaluating the transient and steady state condition for R-C series of parallel connection for different values of resistance. The concept of overdamped critically damped, underdamped, oscillatory and unbounded response should become clear from this problem.

Evaluating the above examples using Laplace transforms

One example on interconnected two port network for any one or more type of parameter.

Analysis of a transfer function using Bode plot along with gain and phase margin calculation.

a. Necessary and sufficient condition for positive real functions and realizations of R- L, R-C, L-C functions.

TERM WORK

1. Term work should consist of at least 10 assignments covering all the topics of the syllabus

A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING
SECOND YEAR SEMESTER III

SUBJECT : DATA STRUCTURES

Lectures : 3 per week **Practicals**: 3 per week	**One paper**:100 marks. (3 Hrs.) **Term work**: 25 marks;

Objectives of the course: Data structures are commonly used in all program designs. The study of data structures, therefore, rightly forms the central course of the curriculum in Computer Engineering. At the end of this course, students are expected to understand the various data structures, a knowledge they will use in every program they write for the rest of their lives.

Pre-requisites: Course in C.

DETAILED SYLLABUS

1. Introduction in C:

- Static and Dynamic Structures Unions ;Strings ; Files :Macros

2. Lists:

- Abstract Data Types; Stacks: ADT; Representation ; Operations ;Example ;Applications;Queues: ADT; Representation ;Operations ;Circular and Priority Queues; Examples; Applications; Other Lists and their Implementations.

3. Linked Lists:

- ADT; Dynamic Memory and Pointers ;Dynamic Representation; Insertion and Deletion of Nodes; Linked Stacks and Queue ;Linked Lists as Data Structures; Array Implementation of Linked List ; Comparison of Dynamic and Array Representations.

4. Recursion:

- Recursive Definition and Processes ;Recursion in C; Writing Recursive Programs; Efficiency in Recursion.

5. Binary Tree:

- Binary Tree Operations and Applications ;Binary Tree Representations ;Node Representation; Array Representation ;Binary Tree Traversals ;Threaded Binary Tree ;The Huffman Algorithm; Representing Lists as Binary Trees; Finding and Deleting Elements ;Tree-Represented Lists; Applications of Trees: Expression Trees; Game Trees.

Topics for Experiment

1. Strings and Files in C.
2. Implementation of Stack and its Operations.
3. Implementation of Queue and its Operations.
4. Implementation of Circular Queue and its Operations.
5. Array and Dynamic Implementation of Linked List and its Operations.
6. Binary Tree: Implementation, Creation of Binary Tree, Insertion and Deletion of Nodes in an Existing Tree.

Algorithms and Flowcharts are to be included for all programs.

BOOKS

TEXT BOOKS

1. Y. Langsam, M. J. Augenstein and A. M. Tannenbaum, “Data Structures Using C and C++", Prentice-Hall India, Second Edition.
2. R. Kruse, “Data Structures and Program Design", Prentice-Hall India, Third Edition.
3. R. F. Gilberg, “Data Structures: A Pseudocode Approach with C”, Thomson Learning

Reference Books:

1. Tremble and Sorenson, “Data Structures and Algorithms", Tata McGraw-Hill.
2. M. A. Weiss, “Data Structures and Algorithm Analysis in C++", Addison Wesley Longman, International Student Edition.
3. A. Aho, J. E. Hopcroft and J. D. Ullman, “Data Structures and Algorithms", Addison Wesley, Low Price Edition.

TERM WORK

1. Term work should consist of at least 12 practical experiments covering all the topics.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER III

SUBJECT : DIGITAL LOGIC DESIGN AND APPLICATIONS

Lectures: 4 per week **Practical:** 2 per week	**One paper:** 100 marks. (3 Hrs.) **Term work:** 25 marks

Objectives of the course: The subject is the first course in Digital logic design and its applications. This subject covers classical topics of logic circuits theory, elementary analysis and its implementation in practical cases. This is followed by the popular logic families and their characteristics.

Pre-requisites: NIL

DETAILED SYLLABUS

1. Number Systems:

- Decimal, Binary, Octal and Hexadecimal number system and conversion, Binary weighted codes, Signed number binary order, 1's and 2's complement codes, Binary arithmetic.

2. Boolean Algebra:

- Binary logic functions, Boolean laws, Truth tables, Associative and distributive properties, DeMorgan's Theorems, Realization of switching functions using logic gates.

3. Combinational Logic:

- Switching equations, Canonical logic forms, Sum of product & Product of sums, Karnaugh maps, Two, three and four variable Karnaugh maps, Simplification of expressions, Quine-McCluskey minimization techniques, Mixed logic combinational circuits, Multiple output functions.

4. Analysis and Design of Combinational Logic:

- Introduction to combinational circuit, Code conversion, Decoder, Encoder, Priority encoder, Multiplexers as function generators, Binary address, Subtractor, BCD adder, Binary comparator, Arithmetic and logic units.

5. Sequential Logic:

- Sequential circuits, Flip-flops, Clocked and edge triggered flip-flops timing specifications counters asynchronous and synchronous, Counter design with state equations registers,

Serial in serial out shift registers, Tristate register, Register transfer timing considerations.

6. Sequential Circuits:

• State diagrams and tables, Transition table, Excitation table and equations. Examples using flip-flops. Simple synchronous and asynchronous sequential circuit analysis, Construction of state diagram and counter design.

7. Programmable Logic:

• Programmable logic devices, Programmable logic arrays and programmable array logic, Design using PAL, Field programmable gate arrays.

8. Digital Integrated Circuits:

• Digital circuit logic levels, Propagation delay times, Power dissipation, Fan-out and fan- in, Noise margin for popular logic families, TTL, LSTTL, CMOS, and ECL integrated circuits and their performance comparison, Open collector and Tri-state gates and buffers.

BOOKS

TEXT BOOKS

1. John M. Yarbrough, “Digital logic”, Thomson Learning.
2. T. C. Bartee, “Digital Computer Fundamentals”, McGraw Hill.
3. D. P. Leach, A. P. Malvino, “Digital Principles and Applications”, TMH.

References:

1. John P. Uyemura, Brookes, “Digital Systems Design”, Cole publishing Co.
2. M. Morris Mano, “Digital Logic and Computer Design”, PHI.
3. A. B. Marcontz, “Introduction to Logic Design”, McGraw Hill.

TERM WORK

1. Term work should consist of at least 10 practical experiments and two assignments covering all the topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER III

SUBJECT: DISCRETE STRUCTURES

Lectures: 3 per week; **Tutorials :** 2 per week;	**One paper:** 100 marks. (3 Hrs.) **Term work:** 25 marks.

Objectives Of The Course: This course aims to build fundamental logical concepts using mathematical tools. It develops an understanding of domains and relationships between elements of same and different domains. The basic understanding of Boolean elements, logical relations, recursion, coding and graphs is built.

Pre-requisites: NIL

DETAILED SYLLABUS

1. **Set Theory:**
   - Sets, Venn diagrams, Set membership of tables ;Laws of set theory; Partitions of sets ;Power set.

2. **Logic:**
   - Propositions and logical operations ;Truth tables, Equivalence, Implications; Laws of logic; Mathematical induction and Quantifiers.

3. **Relations, Digraphs and Lattice:**
   - Relations, paths and digraphs; Properties and types of binary relations ;Manipulation of relations, closures, Warshall's algorithm; Equivalence and Partial ordered relations; Posets and Hasse diagram; Lattice.

4. **Functions and Pigeon Hole Principle:**
   - Definition and types of functions : injective , surjective and bijective ; Composition, identity and inverse ; Pigeon-hole principle.

5. **Graphs:**
   - Definition ;Paths and circuits : Eulerian , Hamiltonian ;Planer graphs.

6. **Groups:**
   - Monoids, Semi groups, Groups ;Product and quotients of algebraic structures ; Isomorphism, homomorphism, automorphism ;Normal subgroup; Codes and group codes.

7. **Rings and Fields:**
   - Rings, integral domains and fields;Ring Homomorphism.

8. **Generating Functions and Recurrence Relations:**
   - Series and Sequences ; Generating functions ;Recurrence relations; Applications: Solving Differential equations, Fibonacci etc.

BOOKS

Text Books :

1. Joe Mott, Abraham Kandel and Theodore Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, Second Edition, PHI.
2. K. D. Joshi, “Foundations of discrete mathematics”, New Age International Publication.

References:

1. Aln Doerr and K. Levasseur , “Applied Discrete structure for computer Science”, Galgotia.
2. Seymour Lipschutz and Marc Lars Lipson, “2000 Solved Problems in Discrete Mathematics”, McGraw Hill, International Edition.
3. C. L. Liu, “Elements of Discrete mathematics”, McGraw Hill.
4. Trembley and Manohar , “Discrete mathematical structures”, McGraw Hill.

TERM WORK

1. Term work should consists of at least 12 problem-based assignments covering all above topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER IV

SUBJECT: APPLIED MATHEMATICS IV

Lectures: 4 per week	**One paper**: 100 marks. (3 Hrs.)

Objectives Of The Course: This course aims to build concepts of Complex Variables, Residue theorem, Matrices and Numerical Methods. These topics are included to provide required mathematical background for subsequent courses**.**

Pre-requisites: NIL

DETAILED SYLLABUS

1. Complex Variables:

- Regions and Paths in Z plane ;Taylor's and Laurent's development t;Singularities, Poles, residue at isolated singularity and its evaluation ;Residue theorem: Application to evaluate real integrals.

2. Matrices:

- Vectors; real field inner products; Norm; Linear independence; orthogonality; Characteristic values and vectors; their properties for Hermitian and real symmetric matrices;Characteristic polynomial; Cayley Hamilton theorem; Functions of square matrix; Minimal polynomial; Diagonalizable matrix.

3. Numerical Methods:

- Errors: Types and Estimation ;Solutions to Transcendental and polynomial equations: Bisection method; Gauss-Jordan method; Newton-Raphson method;Solutions to system of linear algebraic equations: Gauss elimination method; Gauss-Jordan method; Gauss Siedel iteration method;Interpolation: Linear interpolation; High order interpolation using Lagrange and Newtons methods; Finite difference operators and difference tables;Numerical Integration: Trapezoidal rule; Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.Solutions to ordinary differential equations: Taylor's series method; Euler's predictor-corrector method; Rungekutta method of second and fourth order.

BOOKS

TEXT BOOKS

1. P. N. Wartikar and J. N. Wartikar, "Element of applied mathematic", Vol I/Vol II, A. V. Griha, Pune.
2. Shanti Narayan, "Matrices", S. Chand Publishing House, Delhi.
3. Shanti Narayan, "Theory Of Functions Of Complex Variables", S. Chand Publishing House, Delhi.
4. S. S. Shastri, "Introductory Methods of Numerical Analysis" , Vol-2, PHI, Second edition , 1994..

References:

1. John S. Mathews , “Numerical Method for Mathematics, Science and Engineering”.
2. Salvadari and MacCraken, “Numerical Methods”.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER IV

SUBJECT : PRINCIPLES OF COMMUNICATION ENGINEERING.

Lectures: 3 per week **Practical:** 2 per week;	**One paper**: 100 marks. (3 Hrs.) **Term work**:25 marks **Oral Exam**:25 marks

Objectives Of The Course: This course aims to build the basics of communication principles.

Pre-requisites: NIL

DETAILED SYLLABUS

1. Introduction:

- Elements of a communication system, Modulation and demodulation; Noise in Communication systems, Signal-to-Noise ratio, Noise factor and Noise Figure, Equivalent Noise Temperature.

2. Amplitude Modulation:

- DSB Full carrier AM – principles, modulator circuits, transmitters. Different types of AM, Suppressed – carrier AM, SSB, ISB – Principles, transmitters.

3. Angle Modulation:

- Frequency modulation, Phase modulation, Effect of noise, FM modulators, Transmitters.

4. Radio Receivers:

- Receiver characteristics, TRF and Superheterodyne receivers, AM detectors, FM detectors, Receiver circuits

5. Radio Wave Propagation:

- Electromagnetic waves, Properties of radio waves, Propagation of waves, Propagation terms and definitions.

6. Analog Pulse Modulation:

- Sampling Theorem for Low-pass and Band-pass signals - proof with spectrum, Aliasing. Sampling Techniques – principle, generation, demodulation, spectrum. PAM, PWM, PPM – generation and detection.

7. Digital Transmission:

- Quantization , Quantization error, Non-uniform quantizing, Encoding. PCM, PCM, Delta modulation, Adaptive Delta modulation – transmission system, bandwidth.

8. Multiplexing:

- TDM, FDM – Principles, Hierarchy.

BOOKS

TEXT BOOKS

1. Wayne Tomasi, “Electronic Communication Systems”, Pearson Education, Third Edition, 2001.
2. Roy Blake, “Electronic Communication Systems”, Thomson Learning, Second Edition.
3. Kennedy and Davis, “Electronic Communication Systems”, TMH.

References:

1. Leon W Couch, “Digital and Analog Communication Systems”, Pearson Education, Sixth Edition.
2. Taub and Schilling, “Principles of Communication Systems”, Tata McGraw-Hill, Second Edition.

Topics of Experiments

1. AM generation and detection.
2. FM generation and detection.
3. Superheterodyne Receiver.
4. Sampling and reconstruction.
5. PWM generation and detection.
6. PPM generation and detection.
7. PCM generation and detection.
8. Delta modulation generation and detection.
9. Time Division Multiplexing.
10. Frequency Division Multiplexing.

TERM WORK

1. Term work should consist of at least 8 experiments and 5 assignments covering all the topics.
2. A term work test must be conducted with a weightage of 10 marks.

ORAL EXAMINATION

An oral examination based on the above syllabus should be conducted to test the knowledge of the students.

B.E. COMPUTER ENGINEERING
SECOND YEAR SEMESTER IV

SUBJECT : COMPUTER ORGANIZATION AND ARCHITECTURE

Lectures: 4 per week **Practical**: 2 per week	**One paper:** 100 marks. (3 Hrs.) **Term work:** 25 marks **Oral Exam :** 25 marks

Objectives of the course: **Computer Organization and architecture is a subject of increasing relevance with the merging of computer, communication technology and consumer electronics. The purpose of this course is to acquaint budding engineers with the basic principles of organization, operation and performance of modern-day computer systems. It covers all aspects of computer technology, from the underlying integrated circuit technology used to construct computer components, to the use of parallel organization concepts in combining those components.**

Pre-requisites: Digital Logic and Design

DETAILED SYLLABUS

1. Overview:

- General organization and architecture ;Structural/functional view of a computer; Evolution/brief history of computers.

2. System Buses:

- Computer components-memory, cpu , i/o ;Interconnection structures ;Bus interconnection,multiple bus hierarchies, pci bus structure.

3. Memory Organization:

- Internal memory—characteristics, hierarchy; Semiconductor main memory – types of ram, chip logic, memory module organization; Cache memory-- elements of cache design, address mapping and translation, replacement algorithms; advanced dram organization ;Performance characteristics of two-level memories; External memory: magnetic disk, tape, raid, optical memory; High speed memories: associative and interleaved memories.

Data Path Design:

- Fixed point representation; Floating point representation ;Design of basic serial and parallel high speed adders, Subtractor, multipliers, Booth's algorithm ;The arithmetic and logic unit (ALU): Combinational and sequential ALU's

.

5. The Central Processing Unit:

- Basic instruction cycle ;Instructions sets, formats and addressing; Processor organization; Register organization; Instruction pipelining; Co-processors, pipeline processors;RISC Computers, RISC versus CISC characteristics.

6. The Control Unit:

- Micro- operations; Hardwired implementation;Microprogrammed

control;Micro-Instruction format ;Applications of microprograming.

7. **Input and Output Unit:**
   - External devices-: keyboard, monitor, disk drive and device drivers ;I/O modules: programmed I/O, interrupt driven I/O, DMA, I/O channels and I/O processors ;Serial transmission and synchronization.

8. **Multiple Processor Organizations:**
   - Flynn's classification of parallel processing systems ;Pipelining concepts.

BOOKS

TEXT BOOKS

1. William Stallings, "Computer Organization and Architecture", Prentice Hall / Pearson Education Asia, Fifth Edition.
2. John P. Hayes, "Computer Architecture and Organization", Mc-Graw Hill, Third Edition.
3. Tannenbaum, "Computer Organization", PHI.

References:

1. V. Carl Hamacher and Zaky, "Computer Organization", Mc-Graw Hill.
2. Thomas C. Bartee, "Computer Architecture and Logic Design", Tata Mc-Graw Hill.
3. Moris Mano, "Computer System Architecture", Prentice Hall of India, Second Edition.

TERM WORK

1. The term work must consist of at least 6 simulation programs (for example implementation of high speed adders/sub tractors and multipliers, simulation of pipelined multipliers etc.).
2. The term work must also include 4 assignments. The assignments should include case studies of at least two RISC and CISC processors and the corresponding P.C. used in the lab.

   A term work test must be conducted with a weightage of 10 marks.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER IV

SUBJECT : DATABASE SYSTEMS

Lectures: 4 per week **Practicals:** 2 per week;	**One paper:** 100 marks. (3 Hrs.) **Term work:** 25 marks **Oral :**25 marks.

Objectives Of The Course: Database management has evolved from a specialized computer application to becoming the central component of modern computer systems. Therefore knowledge of database systems has become essential for engineers both in the computer and information technology area. This course on database systems helps students learn the concept of relational database systems, their management and implementation.

Pre-requisites: A basic course on data structures and algorithms. Knowledge of any programming language.

DETAILED SYLLABUS

1. Introductory Database Concepts:

- Introduction to data processing; Overview of files and file systems; Drawbacks of file systems; Concept of a database; Database systems versus File systems; Data abstraction and data independence; Data models; Database languages; Database users and administrators; Transaction management; Database system structure.

2. Entity-Relationship Model:

- Basic concepts; Constraints ;Design Issues; Entity-Relationship diagram ;Weak entity sets; Extended E-R features ;Design of an E-R database schema ;Reduction of an E-R schema to tables.

3. Relational Model:

- Concept of a relation ;Notion of primary and secondary keys, foreign keys ;Structure of relational database s;The relational algebra and extended relational-algebra operations; Formation of queries; Modification of the database; views.

4. SQL:

- Background; Basic Structure ;Set Operations; Aggregate functions; Null values ;Nested Queries; Views; Complex queries; Database modification ;DDL; Embedded SQL; Stored procedures and functions; Dynamic SQL; Other SQL features.

5. Integrity and Security:

- Domain Constraints; Referential integrity ;Assertions; Triggers; Triggers and assertions in
- SQL ; Security and authorization; Authorization in SQL; Encryption and authentication.

6. Relational-Database Design:

- First normal form; Pitfalls in relational-database design; Functional dependencies;

Decomposition; Desirable properties of decomposition; Boyce–Codd normal form; 3rd and 4th normal form; Mention of other normal forms; Overall database design process;

7. Storage and File Structure:

- Overview of physical storage media; Magnetic disks; RAID; Tertiary storage; Storage access; File organization; Organization of records in files; Data-dictionary storage

8. Indexing and Hashing:

- Basic Concepts; Ordered Indices ;B+ Tree Index Files; B-Tree Index Files ;Static Hashing; Dynamic Hashing; Index Definition in SQL; Multiple-Key Access;

9.Transactions:

- Transaction concept; Transaction state ;Implementation of atomicity and durability; Concurrent executions; Serializability; Recoverability; Implementation of isolation; Transaction definition in SQL.

10. Concurrency Control:

- Lock-based protocols; Timestamp-based protocols;Validation-based protocols; Multiple granularity;Multiversion schemes; Deadlock handling;Insert and delete operations; Weak levels of consistency ; Concurrency in index structures.

11. Recovery System:

- Failure classification; Storage structure ;Recovery and atomicity; Log-based recovery;Shadow paging; Recovery with concurrent transactions;Buffer management.

BOOKS

Text Books :

1. Korth, Silberchatz, Sudarshan, "Database System Concepts", Fourth Edition, McGraw-Hill .
2. Peter Rob and Carlos Coronel, "Database Systems, Design, Implementation and Management", Thomson Learning, Fifth Edition.

References :

1. Elmasri and Navathe, "Fundamentals of Database Systems", Fourth Edition, Addison-Wesley.
2. C. J. Date, "Introduction To Database Systems", Seventh Edition, Addison Wesley Longman.
3. Mark Whitehorn nad Bill Markyln, "Inside Relational Databases", Springer Verlag.
4. Mark Levene and George Lizou, "Guided Tour Of Relational Databases And Beyond", Springer Verlag.
5. "Structured COBOL", Schuam's series.
6. Raghu Ramkrishnan and Johannes Gehrke, "Data base Management Systems", TMH.

TERM WORK
1. Term work should consist of two programs in COBOL, using file processing and Report Writer facilities. 2. It should include at least 8 practical assignments in SQL, which will include basic SQL, advanced SQL ("Group By", nested queries etc.). Programs must also include use of Embedded SQL, Stored procedures, Triggers and Assertions. 3. A small application to be designed and implemented in SQL. 4. A term work test must be conducted with a weightage of 10 marks.
ORAL EXAM
An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER IV

SUBJECT: ANALYSIS OF ALGORITHMS

Lectures: 4 per week **Practical:** 2 per week;	**One paper:** 100 marks. (3 Hrs.) **Term work:** 25 marks **Practical:** 25 marks;

Objectives of the course: This course deals with the systematic study of the design and analysis of *algorithms*. The aim of this course is to give the students some basic tools needed to develop their own algorithms, whenever necessary.

Pre-requisites: Course in Data Structures.

DETAILED SYLLABUS

1. Algorithm Analysis:

- Mathematical Background; The Model;
- The Time Complexity:
  - How to Analyze and Measure;
  - Big-Oh and Big-Omega Notations;
  - Best Case, Average Case and Worst Case Analyses.

2. Sorting Methods:

- Efficiency Considerations in Sorting;
- Different Sorting Methods :Bubble Sort ;QuickPort ;Straight Selection Sort ;Binary Tree Sort; Heaps and Heap sort ; Heap as Priority Queue; Insertion Sort; Shell Sort; Bucket Sort; Merge Sort; Radix Sort.
- Time Complexity Calculation: Best Case, Worst Case and Average Case Calculations of the Different Sorting Methods.

3. Searching Methods:

- Efficiency Considerations in Searching;

Basic Searching Techniques: Sequential Search; Efficiency Considerations for Sequential Search; Searching Ordered Table; Indexed Sequential Search; Binary Search; Interpolation Search. Binary Search Tree:Implementation;Insertions and Deletions;Efficiency Considerations; General Search Trees:Multiway Search Trees;B-Trees;B+-Trees;Tries;AVL Trees.Hashing:Hash Functions; Resolving Clashes (Open and Closed Hashing);Hashing in External Storage; Dynamic Hashing.

4. Graph:

- Graph Traversal; Application of Graph Structures: Shortest Path Problem; Topological Sorting; Minimum Spanning Tree; Connectivity in a Graph;Euler's

and Hamiltonoan Graph.

5. Algorithms:

- Analysis of all the above Algorithms;Greedy Method ;Divide and Conquer Method; Dynamic Programming; Back-Tracking Method.

Topics for Experiment

1. Various sorting methods.
2. Various searching techniques.
3. Implementation of graph along with applications.

BOOKS

TEXT BOOKS

1. Y. Langsam, M. J. Augenstein and A. M. Tannenbaum, “Data Structures Using C and C++", Prentice-Hall India, Second Edition.
2. G. Brassard and P. Bratley, “Fundamentals of Algorithmics", Prentice-Hall India.
3. R. F. Gilberg, “Data Structure: A Pseudocode Approach with C”, Thomson Learning.

Referrences:

1. A. Aho, J. E. Hopcroft and J. D. Ullman, “Data Structures and Algorithms", Addison Wesley,
Low Price Edition.
2. M. A. Weiss, “Data Structures and Algorithm Analysis in C++", Addison Wesley Longman,
International Student Edition.
3. R. Kruse, “Data Structures and Program Design in C", Prentice-Hall India.
2. Tremble and Sorenson, “Data Structures and Algorithms", Tata McGraw-Hill.

TERM WORK

1. Term work should consist of at least 12 practical experiments covering all the topics.
2. A term work test must be conducted with a weightage of 10 marks.

PRACTICAL EXAMINATION

A practical examination should be conducted to test the work done by the students in the Laboratory.

B.E. COMPUTER ENGINEERING

SECOND YEAR SEMESTER IV

SUBJECT: INDUSTRIAL ECONOMICS AND MANAGEMENT

Lectures: 4 per week;
One paper: 100 marks. (3 Hrs.)

Objectives Of The Course: This course aims making Engineering students familiar with the concepts in Economics and Management. This familiarity will enable them to understand the industrial set-up, which is enhanced by the domain of Economics and Management.

Pre-requisites: NIL

DETAILED SYLLABUS

1. Nature and significance of economics, science, engineering, technology and their relationship with economic development, appropriate technology for developing countries.
2. Demand, supply, elasticity of demand and supply, Competition, monopoly, oligopoly, monopolistic competition, causes creating categories of monopoly organization, price determination under perfect competition and monopoly, Price discrimination, equilibrium of firm under competition and monopoly.

3. Functions of money, supply and demand for money, money price level and inflation, black money, meaning, magnitude and consequences.

4. Functions of commercial banks, multiple credit creation, banking system in India, shortcomings and improvement.

5. Central Banking: Function of central banking illustrated with reference to RBI, Monetary policy – meaning, objectives and features.

6. Sources of public revenue, principles of taxation, direct and indirect taxes, distribution of incidence, tax structure, reform of tax system.

7. Theory of International Trade, balance of trade and payment, theory of protection, tariffs and subsidies, foreign exchange control, Devaluation.

8. New Economic Policy: Liberalization, extending privatization, globalization, market-friendly state, export-led-growth.

9. Causes of underdevelopment, determinants of economic development, economic and non-economic factors, stages of growth, strategy of development—big push, balanced and unbalanced, critical minimum effort strategy.

10. Management functions, responsibilities of management to society,

development of management thought, contribution of F.W. Taylor, Henri Fayol, Elton Ma'o, System contingency approaches to management.

11. Nature of planning, decision-making process, management by objectives.

12. Organization: line and staff authority relationships, decentralization of delegation of authority, span of management, flat organization.

13. Communication process, media channels and barriers to effective communication

14. Maslow, Herzberg and Macgregor's theory of motivation. McClelland's achievement motivation, Blanchard's situational leadership theory.

15. Production management: Production planning and control, Inventory control, Quality control and Total quality management.

16. Project management : Project development like cycle, project feasibility, project planning, organization and control, Tools of project management – CPM, PERT. Project information systems.

17. Need for good cost accounting system, cost control techniques of financial control, financial statements, financial ratios, break-even analysis, budgeting and budgetary control.

18. Marketing functions, managements of sales and advertising, marketing research.

19. Human resource management: Function, Application of industrial psychology for selection, training, machine design and man-machine systems.

20. Engineering economics: Investment decision, present worth, Annual worth and rate of return methods. Payback time.

BOOKS

TEXT BOOKS

1. A. N. Agarwal, "Indian Economy".
2. Koonz and Odonnel, "Essentials of Management".
3. B. K. Chatterji, "Finance for Non-Finance Managers".
4. Prasanna Chandra, "Project Management".

References:

1. Samuelson, "Economics".
2. Dewet and Warma, "Modern Economic Theory".
3. V. S. Ramaswamy, "Marketing Management".
4. Hampton David, "Management".

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: APPLIED MATHEMATICS

Lectures: **4 Hrs per week**	Theory: **100 Marks**

DETAILED SYLLABUS

1. **Random Variables:**
   Discrete and Continuous Random Variables. Probability Mass Function and Density Function. Probability Distribution for Random Variables, Expected Value, Variance, Moment and Moments Generating Function. Relation between Raw Moments and Central Moments.

2. **Bernoull's Trails:**
   Binomial, Poisson, and Normal Distributions for Detailed Study. Central Limit Theorem and Problems Based on this Theorem.

3. **Sampling Theory:**
   Sampling Distribution. Test of Hypothesis. Level of Significance Critical Region. One Tailed and Two Tailed Tests. Interval Estimation of Population Parameters. Large and Small Samples.
   Test of Significance for Large Samples: Test for Significance of the Difference between Sample Mean and Population Means; Test for Significance of the Difference between the Mean of Two Samples.
   Student's' Distribution and its Properties.
   Test of Significance of Small Samples: Test for Significance of the Difference between Sample Means and Population Mean; Test for Significance of the Difference between the Mean of Two Samples; Paired t- tests. Chi-square Distribution and its Properties. Test of the Goodness of Fit and Independence of Attributes Contingency Table Yate's Correction.

4. **Fitting Of Curves Least Square Method:**

   Fitting the Straight Line and Parabolic Trend. Bivariate Frequency Distribution Correlation, Co-variance Karl Pearson Coefficient and Spearman's Rank Co-relation Coefficient (non-repeated ranks and repeated ranks). Regression, coefficients and lines of regression.

5. **Mathematical Programming:**
   Linear Optimization Problem Formulation and Graphical Solution. Standard and Canonical Form. Basic Solution and feasible solution Primal Simplex Method.

6. **Artificial Variables:**
   Big M Method (method of penalty). Dual Simplex Method. Duality. Degeneracy. Alternative Optima. Unbounded Solution and Sensitivity Analysis.

7. **Nonlinear Programming:**
   Unconstrained External Problems. Necessary and Sufficient Conditions for Extreme. Constrained External Problems. Lagrange Multiplier and Kuhn Tucker Method.

BOOKS
TEXT BOOKS
1. S.C. Gupta and U.K. Kapur, “Fundamentals of Mathematical Statistics”, Sultan Chand and sons New Delhi. 2. T.V. Veerrajan, “Probability Statistics and Random Processes”, TMH. 3. Probability and Statistics, Schaum series.
References:
1. M.D.Taha, “Operation Research”. 2. N.D. Vora, “Quantitative Techniques in Management”, TMH. 3. J.K. Sharma, “Operation Research Theory and Application”, Mackmillan. 4. S.S. Rao, “Operation Theory And Applications”,

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: PRINCIPLES OF DIGITAL COMMUNICATION

Lectures: **3 Hrs per week** Practical: **2 Hrs per week**	Theory: **100 Marks** Term work**: 25 Marks**

Objectives of the course: **Digital communication systems are becoming increasingly attractive because of the ever growing demand for data communication and because digital transmission offers data processing options and flexibilities not available with analog communication.**

Pre-requisites: **Principles Of Communication Engineering**

DETAILED SYLLABUS

1. **Random Variables and Processes:**
   Probability, Mutually Exclusive Events, Joint Probability of Related and Independent Events. Random variables, Cumulative Distribution Function, Probability Density Function, Relation between Probability and Probability Density, Joint Cumulative Distribution and Probability Density. A Communication Example, Average value of Random Variable, Variance of Random Variables, The Gaussian Probability Density, The Error Function. Random Processes, Autocorrelation, Power Spectral Density of a sequence of random pulses, Power Spectral Density of digital data.

2. **Baseband Modulation and Demodulation:**
   Pulse Code Modulation, PCM Waveform Types, PCM Word Size, M-ary Pulse-Modulation Waveform, Correlative Coding; A Base Band Signal Receiver, Detection of binary signals in Gaussian Noise, Inter Symbol Interference, Equalization.
3. **Bandpass Modulation and Demodulation:**
   Binary Phase-Shift Keying, Differential Phase Shift Keying, Differentially Encoded PSK, QPSK, M-ary PSK, Quadrature Amplitude Shift Keying(QASK), Binary Frequency Shift Keying, M-ary, FSK, Minimum Shift keying (MSK). Error performance for Binary systems, Probability of Error for coherently detected BPSK, Probability of Error for coherently detected Differentially Encoded BPSK, Probability of Error for coherently detected Binary Orthogonal FSK, Probability of Error for non-coherently detected Binary Orthogonal FSK, Probability of Error for Binary Orthogonal DPSK. Symbol Error Performance for M-ary systems, Probability of Symbol Error for MPSK, Probability of Symbol Error for MFSK, Bit Error Probability Vs. Symbol Error Probability, Effects of Inter Symbol Interference.

4. **Communication Link Analysis:**
   The Channel: Concept of Free Space, Error Performance Degradation, Sources of Signal Loss and noise. Frequency representation of Noise, Spectral component of Noise, Superposition of Noise, Noise Bandwidth, Resister Noise, Multiple Resister Noise Source, Networks with Reactive Elements, Noise Temperature, Effective Input Noise Temperature, Antennas, Sky Noise Temperature.

5. **Information Theory:**
   Discrete Messages, The Concept of amount of Information, Average Information, Entropy, Information Rate, Coding to increase Average Information per bit, Shannon's Theorem, Capacity of Channel, Capacity of a Gaussian Channel, Bandwidth S/N Ratio tradeoff, Use of

Orthogonal signals to attend Shannon's Limit, Efficiency of Orthogonal signal transmission.

6. Channel Coding:

Wave form coding, Types of Error Control, Structured sequences, Linear Block Codes, Error Detection and Correcting capability, Cyclic Codes, Hamming Codes, Extended Goyal Code, BCH Codes, Convolution Encoding, Convolution Encoder Representation, Formulation of the Convolution Decoding Problem, Properties of Convolution Codes, Reed- Solomon Codes, Interleaving and Concatenation Codes, Coding and Interleaving applied to the Compact Disk and Digital Audio System, Turbo Codes.

7. Source Coding:

Sources, Amplitude quantizing, Differential Pulse Code Modulation, Adaptive Prediction, Block Coding, Transform Coding, Source Coding for Digital data, Huffman Codes, Run Length Codes, Examples of Source Coding, Audio Compression, Image Compression.

8. Encryption And Decryption:

Models, Goals and early chipper systems, The Secrecy of Chipper Text, Practical Security, Stream Encryption, Public Key Cryptosystems.

BOOKS

TEXT BOOKS

1. Taub and schilling, "Principles of Communication Systems", TMH, 1991, 2nd Edition.
2. Sklar, "Digital Communications", Pearson Education, 2001, 2nd Edition.

References:

1. Prokies, "Digital Communications", TMH.
2. Haykins, "Digital Communications", John Weily.

TERM WORK

1. Term work should consist of at least 10 practical experiments covering all the topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: THEORETICAL COMPUTER SCIENCE

Lectures: **3 Hrs per week**	Theory: **100 Marks**
Tutorials: **2 Hrs per week**	Term work: **25 Marks**

Objectives of the course: **This course aims to build concepts regarding the fundamental principles of grammars, automata theory and Turing machine.**

DETAILED SYLLABUS

1. Regular Sets And Automata Theory:

Regular Sets, Regular Grammars and Languages; Regular Expressions, Grammars and Languages, Pumping Lemma, Closure properties, Decision problems, Myhill-Nerode theorem. Finite automata and Finite State Machines, NFA, DFA, FSM, Moore and Mealy Machines, Converting NFA to DFA, Minimization of Automata and FSM, Kleene's Theorem.

2. Context Free Grammars And Push Down Automata:

Context Free Grammars and Languages, Parse Trees, CNF and GNF, Pumping Lemma, Closure properties; Push Down Automata, Concept of Stack, PDA for CFG.

3. Turing Machine:

Construction of Turing Machine for problem solving, TM as Acceptors and Generators, Variations and Equivalence of TM, TM Languages, Post Machine, Universal Turing Machine, Church's Hypothesis.

4. Undecideability:

Undecideability and Halting problem, Rice's Theorem, Post Correspondence Problem; Unsolvable problems using TM, Unsolvable problems using CFG, Greibach Theorem; Enumerable and Recursively Enumerable Languages.

BOOKS

TEXT BOOKS

1. J.C. Martin, "Introduction To Languages and the Theory of Computation", TMH, 2003,3rd Edition.
2.Peter Linz, "Introduction Formal Languages and Automata", Narosa.
3.Michael Sipser, "Introduction to the Theory of Computation", Thompson Learning, 1997.

References:

1. J.E .Hopcroft, J.D. Ullman, "Introduction To Automata Theory, Languages And Computation", Addison-Wesley.

TERM WORK

1.Term work should consist of at least 10 experiments/assignments covering all the topics.
2.A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: COMPUTER NETWORKS

Lectures: **3 Hrs per week**	Theory: **100 Marks**
Practical**: 2 Hrs per week**	Term work: **25 Marks**

Objectives of the course: **This is first course in computer networks. Students should able to identify networking layers properly. (For example where are the boundaries of system network programmers and network application developers). Subject can be studied in different ways like top down, bottom up, concept wise, programming wise. This subject reasonably creates base for further studies of high performance networks, network design and analysis, Network system and application programming.**

Pre-requisites: **Course in Data Structures and computer organization, C/C++.**

DETAILED SYLLABUS

1. **Introduction:**

   Network Applications. Network Hardware. Network Software. Reference Models.

2. **The Physical Layer**

   Guided Transmission Media. Wireless Transmission. Communication Satellites. The Public Switched Telephone Network. The Mobile Telephone System. Cable Television.

3. **The Data Dink Layer:**

   Data Link Layer Design Issues. Elementary Data Link Protocols. Sliding Window Protocols. Example of Data Link Protocols: HDLC: High-Level Data Link Control, The Data Link Layer In The Internet.

4. **The Medium Access Sub-layer:**

   The Channel Allocation Problem. Multiple Access Protocols. Ethernet. Wireless LANS. Broadband Wireless. Blue Tooth. Data Link Layer Switching.

5. **The Network Layer:**

   Network Layer Design Issues. Routing Algorithms. Congestion Control Algorithms. Quality Of Service. Internetworking. The Network Layer In The Internet: The IP Protocol, IP Addresses, Internet Control Protocols, The Interior Gateway Routing Protocol: OSPF. The Exterior Gateway Routing Protocol: BGP, Internet Multicasting, Mobile IP, Ipv6.

6. **The Transport Layer:**

   The Transport Service. Elements Of Transport Protocols. A Simple Transport Protocol. The Internet Transport Protocols: UDP; TCP: Introduction To TCP, The TCP Service Model, The TCP Protocol The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management, Wireless TCP And UDP, Transactional TCP. Performance Issues: Measuring Network Performance,

System Design For Better PERFORMANCE, FAST TPDU Processing, Protocols For Gigabit Networks.

7. The Application Layer:

DNS: The Domain name system; Electronic Mail; SNMP.

8. ATM Network

ATM Layer. ATM Application Layer. ATM Signaling. PNNI Routing.

9. Case study with Window2000/Linux

TOPICS FOR EXPERIMENT

1. PC-to-PC file transfer using serial ports.
2. Network OS installation and configuration.
3. Networking Hardware and software components.
4. Network Routing.
5. Network Socket programming.
6. Shortest path routing.
7. Modem commands study.
8. Use network simulators like NS2, DLL simulators.
9. Implement multithreaded client- server application.
10. Assignment: prepare short note on any one advanced topic (not from above syllabus)

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: MICROPROCESSORS

Lectures: **4 Hrs per week** Practical: **2 Hrs per week**	Theory: **100 Marks** Term work: **25 Marks**

Objectives of the course: **This course deals with the systematic study of the Architecture and programming issues of 8086/88-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it.**

Pre-requisites: **Digital Logic Design**

DETAILED SYLLABUS

1. **Introduction to Microcomputer Systems:**
   Introduction to Microprocessors & its evolution, Overview of 8086 Family, Case study of PC System

2. **Architecture of 8086/88 Family:**
   Memory organization & Architecture of 8086 family, 8086 Hardware Design, System clock

   (8284) & reset signal, buffering & latching circuits, Minimum mode & Maximum mode

   Operation, Study of bus controller 8288 & its use in maximum mode Connection, System Timing diagrams for 8086.

3. **8086 Instruction Set & Programming:**
   Addressing modes, Instruction Set in detail, ALP, Mixed language programming, Stacks, Strings, Procedures, Macros, Timers, Counters & delay. Programming examples using DOS And BIOS Interrupts, Device Drivers Programming.

4. **8086 Interrupt System:**
   8086 Interrupt structure, types and applications: Study of Programmable Interrupt Controller 8259A & Interrupt Priority Management using 8259A,

5. **Memory System Design & I/O Interfacing:**
   Interfacing SRAM, ROM and DRAM to 8086, Address decoding & Timing Considerations. I/O interfacing in 8086: Serial communication interface includes Synchronous & Asynchronous Protocols, parallel communication Interface includes I/O Mapped I/O, Memory Mapped I/O, Handshaking Signals.

6. **I/O Controllers for 8086 and Data communication:**
   Study of 8255AH Programmable Peripheral Interface & its modes; Study of 8250 UART, DMA Concepts & transfer types: Study of DMA controller 8237, Study of Programmable Timer 8254 & its modes. Data communication includes EIA RS-232C Standard, IEEE 488 GPIB.

7. **8087 Numeric Co-processor:**
   8087 NDP Architecture, Data types & formats, Numeric Instruction Set, Stacks in 8087, Interface of Coprocessor (8087) to Host (8086), ALP for 8086-8087 systems; Study of IOP

8089, its interaction with 8086.

8. **Multiprocessor Systems**:
   8086/88 based Multiprocessor systems, Study of Multiprocessor configurations, Study of Bus Arbiter 8289, Bus arbitration & control using 8289.

BOOKS

TEXT BOOKS

1. Douglas Hall, "Microprocessors and Interfacing, Programming and Hardware", Tata McGraw-Hill.1999, Second Edition.
2. John Uffenback, "8086/8088 Interfacing, Programming and Design", 1987,PHI.
3. Yu-Cheng Liu, Glenn A. Gibson, "The 8086/8088 Family Architecture, Programming and Design", PHI. 1986, Second Edition.
4. Peter Able, "IBM PC, Assembler Language Programming ", PHI.

References:

1. **A. K. Ray, K. M. Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill, 2000.**
2. **B. B. Brey, "The Intel Microprocessors", PHI, 2003, Sixth Edition.**
3. Peter Norton, "IBM PC, Assembly Language programming", BPB publication.
4. Manuals from Intel.

TERM WORK

1. Term work should consist of at least 12 practical experiments covering all the topics.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: PRESENTATION AND COMMUNICATION TECHNIQUES

Lectures: **2 Hrs per week**	Term work: **25 Marks**
Tutorials: **2 Hrs per week**	Oral Exam.: **25 Marks**

DETAILED SYLLABUS

1. COMMUNICATION IN A BUSINESS ORGANISATION

   Internal (Upward, Downward, Horizontal, Grapevine, Problems, Solutions) External Communication, Strategies for conducting successful business meetings, documentation (notice, agenda, minutes) of meetings, Introduction to modern communication techniques (for e.g. e-mail, internet, video conferencing etc), Legal & ethical issues in communication (intellectual property rights, patents)

   6 – 7 Lectures

2. ADVANCED TECHNICAL WRITING

REPORT – WRITING AND PRESENTATION: Definition and importance of reports. Qualities of Reports, language and style in reports, type of reports, formats (letter, memo, project – reports), methods of compiling data. A computer-aided presentation of a project report based on technical, survey-based, reference based or campus related topic. Topics to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages.

9 – 10 Lectures

3. TECHNICAL PAPER-WRITING

4. WRITING PROPOSALS

5. INTERPERSONAL SKILLS

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution, Assertiveness, Leadership, Term-building, Decision-making, Time-management

9-10 lectures

6. INTERVIEW TECHNIQUES

Preparing for job interviews, verbal and non-verbal communication during interviews. Observation sessions and role-play techniques may be used to demonstrate interview strategies.

1 – 2 lectures

7. GROUP DISCUSSION

Dynamics of Group Behavior, Techniques for effective participation.

1 – 2 lectures

BOOKS

TEXT BOOKS

1. Fred Luthans, 'Organizational Behavior' McGraw Hill International Edition
2. Lesiker and Petit 'Report writing For Business' McGraw Hill International Edition

3. Huckin and Olsen 'Technical Writing and Professional Communication' - McGraw Hill International Edition
4. Wallace and Masters 'Personal Development for Life and Work' (workbook) Thomson Learning
5. Herta Murphy 'Effective Business Communication' Hearta Murphy Herburtwhildebraudt - McGraw Hill

References:

1. Lewicki, Saunders, Minton 'Essential of Negotiation' McGraw Hill International Edition
2. Hartman Lemay 'Presentation Success' Thomson learning.
3. Kitty O Locker & Kaczmark - 'Business Communication Building Critical Skills' McGraw Hill
4. Vikas Gupta: Comdex Computer Course Kit, IDG Books Pvt. Ltd.
5. Heller & Handle : The Essential Manager's Manual – Dorleen Kindercey
6. The Sunday Times 'Creating Success Series'
    1. Develop your Assertiveness
    2. Make every Minute Count
    3. Successful Presentation Skills
    4. How to motivate people
    5. Team building

TERM WORK

1. **2 assignments on Communication topics**
2. **3 assignments on Report writing**
3. **3 assignments on Interpersonal Skills**
4. **1 class test**

Oral:

Practical sessions on Group-discussion / Interview Skills / Project Presentation / Power point Presentation.

5. BREAK UP OF TERM WORK MARKS (External Exam)

Assignment	15 marks
Test	10 marks
Total	25 marks

6. BREAK UP OF ORAL EXAMINATION (Internal Exam)

Project Report Presentation	20 marks
Group Discussion	5 marks
Total	25 marks

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER V

SUBJECT: COMPUTER PROGRAMMING LABORATORY

Practical: **3 Hrs per week** Tutorials: **2 Hrs per week**	Term work: **25 Marks**

Objectives of the course: **This course aims at giving students rigger for programming independent of any particular language and develop a strong problem solving skill.**

Pre-requisites: One programming course, Course in Data Structures.

DETAILED SYLLABUS

1. **Programming Assignments:**
   Students will implement programs adhering to good programming practices. Problems selected should be able to use the selected programming style and language appropriately. Suggested programming style is object-oriented programming and languages may be C++, java, VC++. The assignments should be approximately 10 in number and to be completed in about 5 weeks.

2. **Problem solving assignment:**
   This will be a mini group project to be completed within the Institute in a span of about 10 weeks. Student group should select any one stream area like database programming, network programming, multimedia programming, system programming etc. and use the appropriate skill set to design and implement the mini project.

References:

A.D.Smith and P.D. Smith , “Graded Problems in Computer science “,Addison-Wesley.

TERM WORK

1. Term work should consist of at least 10 programs covering all the topics.
2. A mini project.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER VI

SUBJECT: SYSTEMS PROGRAMMING

Lectures: 3 Hrs per week **Practical:** 2 Hrs per week	Theory: **100 Marks** Term work: **25 Marks** Oral Examination: **25 Marks**

Objectives of the course: **This course is an introduction to the design and implementation of various types of system software. It is intended that the student should be able to design a working assembler, loader and macro-processor on completion of this course.**

Pre-requisites: Course in computer organization, data structures and C/C++.

DETAILED SYLLABUS

1. **Language Processors:**

   Fundamentals of Language Processing and Language Specification. Classification of Programming Language Grammars. Static and Dynamic Binding. Language Processor Development Tools.

2. **System Software And Machine Architecture:**

   Introduction to Systems Programs. Introduction to Data Formats. Registers and Addressing Modes for Traditional CISC Machines and RISC Machines.

3. **Assemblers:**

   Basic Assembler Functions. Assembler Algorithm and Data Structures. Design of Single Pass Assembler. Design of Multi-pass Assemblers. Implementation Examples: MASM Assembler and SPARC Assembler.

4. **Macros And Macro Processors:**

   Macro Definition and Expansion. Conditional Macro Expansion. Macro Parameters. Recursive Macro Expansion. Nested Macro Calls. Design of Macro Preprocessors. Implementation Examples: MASM Macro Processor; ANSI C Macro Language.

5. **Loaders And Linkers:**

   Basic Loader Functions. Design of an Absolute Loader. Relocation and Linking Concepts. Linkage Editors. Dynamic Linking. Bootstrap Loaders. Design of a Linker. Implementation Examples: A Linker for MS-DOS.

6. **Scanning And Parsing:**

   Introduction to Regular Expressions and Finite State Automata. Optimization of DFA Based Pattern Matchers. Top-down and Bottom-up Parsing Techniques. Recursive Descent Parsing.
   LL (1) Parsing. LALR Parsing and Operator Precedence Parsing. LEX and YACC. Syntax Directed Translation.

7. Compilers And Interpreters:

Aspects of Compilation. Memory Allocation: Run time storage organization, Static, Dynamic, Heap Storage and Garbage Compaction. Phases of Compilation: Lexical Analysis; Syntax Analysis; Intermediate Code Generation; Machine Independent and Machine Independent Code Optimization. Compilation of Expressions and Control Structures. Interpreters. Java Compiler and Environment. YACC Compiler-Compiler.

8. Software Tools:

Software Tools for Program Development. Editors. Debug Monitors. Programming Environments. User Interfaces.

BOOKS

TEXT BOOKS

1. D.M. Dhamdhere “Systems Programming And Operating Systems”, Tata McGraw Hill, 2nd Revised Edition, 2002.
2. Leland L. Beck, “Systems Software”, Addison Wesley.
3. A.V. Aho, Ravi Sethi & J.D. Ullman, “Compilers Principles and Techniques”, Pearson Education.

References:

1. J.J Donovan, “Systems Programming”, TMH

TERM WORK

1. Term work should be based on above listed practical
2. **A term work test of 10 marks must be conducted.**

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER VI

SUBJECT: OPERATING SYSTEMS WITH UNIX

Lectures: **3 Hrs per week**	Theory: **100 Marks**
Practical: **3 Hrs per week**	Term work: **25 Marks**
	Oral Exam.: **25 Marks**

DETAILED SYLLABUS

1. Operating System Overview.

Operating System Objectives and Functions. The history and evolution of Operating Systems; Characteristics of Modern Operating Systems; Windows 2000 Overview; Traditional UNIX Systems; Modern UNIX Systems.

Basic concepts. Processes; files; system calls; shell;, layered structure v/s monolithic structure of O.S.

2. **Processes:**

Process Model; Process states; Process Description; Process Control; PCB; creation of processes; context switching; exit of processes; UNIX SVR4 Process Management.

Threads, SMP. Processes and Threads; Symmetric Multiprocessing; Windows 2000 Thread and SMP Management; Linux Process and Thread Management.

3. Process Scheduling:

Objectives; preemptive v/s non-preemptive scheduling; Multiprocessor Scheduling; Real-Time Scheduling; Linux Scheduling; UNIX SVR4 Scheduling; Windows 2000 Scheduling; comparative assessment of different scheduling algorithms. Concurrency. Mutual Exclusion and Synchronization; Principles of Concurrency; Mutual Exclusion; Software Approaches; Mutual Exclusion; Hardware Support; Semaphores; Monitors; Message Passing; Readers/Writers Problem. Concurrency. Deadlock and Starvation; Principles of Deadlock; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; An Integrated Deadlock Strategy; Dining Philosophers Problem; UNIX Concurrency Mechanisms; Windows 2000 Concurrency Mechanisms.

4. Memory

Memory Management Requirements. Memory Partitioning; Virtual memory; Paging; Segmentation; Design and implementation issues in paging and segmentation; page replacement algorithms; page fault handling; working set model; UNIX and. Linux Memory Management; Windows 2000 Memory Management.

5. I/O Management and Disk Scheduling.

I/O Devices. Organization of the I/O Function; Operating System Design Issues; I/O Buffering; Disk Scheduling; RAID; Disk Cache; UNIX SVR4 I/O; Windows 2000 I/O;

6. File Management.

Overview; File Organization; File Directories; File Sharing; Record Blocking; Secondary Storage Management; UNIX File Management; Windows 2000 File System.

7. Case Studies:

Unix. Internal representation of files; system calls for the file system; implementation of

processes; process scheduling; memory management policies .Windows NT; Layered structure; interpretability

BOOKS

TEXT BOOKS

1.William Stallings, “Operating Systems”
2.Silbershatz, A., Peterson, J., Galvin, P., “Operating System Concepts”, Addison Wesley.
3.Maurice J Bach, “The Design of the Unix Operating system”, Prentice Hall.

References:

1. Tannenbaum, “Modern Operating Systems”
2. Milan Milenkovic, “Operating System”, Mc Graw Hill
3. Tannenbaum, A., “Operating Systems: Design and Implentation”, Prentice Hall

TERM WORK

1. Term work shall consist of at least 9 programs based on the above topics.
2. It should also include Small routines, involving implantation of small utilities in shell programming for Unix system administration.
3. Programs that would give good exposure to Unix system calls for process control, memory management and file management.
4. Test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER VI

SUBJECT: WEB TECHNOLOGY

Lectures**: 4 Hrs per week**	Theory**: 100 Marks**
Practical**: 2 Hrs per week**	Term work**: 25 Marks**
	Oral Examination**: 25 Marks**

Objectives of the course: **The objective of the course is to provide an understanding of technology used for building WEB. This course gives knowledge right from building of Web to making business on Web. It also gives a comprehensive coverage of HTML, JavaScript, CGI/Perl, Java Servlets, ASP for Building Secure E-commerce applications.**

DETAILED SYLLABUS

1. **Introduction:**
   Introduction to WEB Technology, TCP/IP, Protocols, Telnet, Electronic Mail (Email) File Transfer Protocol (FTP), Word Wide Web, Domain Name System (DNS), Uniform Resource Locator (URL),
2. **HTML:**
   Introduction to Hypertext Markup Language, Tags, Anchors, Backgrounds, Images, Web page structure, Hyper linking, Lists, Character Formatting, Color Control, Images, Tables, Frames, Multimedia, Cascading style sheet, Application with layers.
3. **Dynamic Web Pages:**
   HTML/DHTML**:** Introduction to DHTML, Forms, Client-side Forms, JavaScript, Incorporating JavaScript in HTML, JavaScript expressions, Control flow and functions, String and Arrays, JavaScript objects. JavaScript Forms, Cookies, history, location. XML, CGI Scripting with Perl.
4. **Active Server Pages & Servlets:**
   ASP Objects: Application, Request, Response, Server, Session, Forms, Query Strings, Cookies, Connectivity with databases, Using ActiveX Objects, JSP, Java Servlets.
5. **Applications:**
   Electronics Commerce: An Introduction, Types, Solution, e-shop, Online Payment , Internet Banking

TEXT BOOKS

1. Kriss Jamsa, Konrad King,"HTML & Web Design", TMH
2. **Achyut Godbole ,"Web Technologies", TMH**

References

1. Box ,"Essential XML"
2. David Whiteley,"E-Commerce", TMH .
3. Douglas E Comer,"Internetworking with TCP/IP", Volume I, Pearson education
4. Steven Holzner, "HTML Black Book", Dreamtech.
5. Vivek Sharma, Rajiv Sharma,"Developing e-commerce Site",Addison Wesley.
6. Microsoft Commerce Solutions ,Web technology, PHI
7. Jason Hunter & William Crawford,"Java Servlet Programming",O'REILY.
8. Tom Negrino and Dori Smith,"JavaScript for The World Wide Web",3rd Edition,

TERM WORK

1. At least 10 Programs based on above syllabus
2. Build an e-commerce site

3. Study of ISP, Installation of WEB Server
4. A test must be conducted with a weightage of 10 Marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER VI

SUBJECT: OBJECT ORIENTED ANALYSIS & DESIGN

Lectures: **3 Hrs per week**	Theory**: 100 Marks**
Practical: **3 Hrs per week**	Term work: **25 Marks**
	Practical Exam: **25 Marks**

DETAILED SYLLABUS

1. **Introduction:**
   Overview Of OOL; Object Classes; Meta Types. Object Oriented Methodologies; The Unified Approach Modeling; Why Modeling? Static And Dynamic Models; Functional Models.
2. **Object Modeling:**
   Object. Links. Association. Inheritance. Grouping Constructs; Problems On Object Modeling; Advantages Of Object Modeling.
3. **Analysis:**

   Problem Analysis. Problem Domain Classes. Identify Classes And Objects Of Real World Problems. Using Use Case Analysis; Recording Analysis.
4. **Basic Object Modeling:**
   Multiplicity. Constraints. Aggregation. Component.
5. **Sequence Diagram:**
   Modeling Scenarios. Mapping Events To Object. Interfaces. Discovering Attributes. Modeling Simple Collaboration Modeling. Logical Database Schema. Activity Diagram. Modeling Workflow.
6. **Class Diagram:**
   Test Scenarios. Interfaces. Classes. Methods. Stress Testing. System Testing. Scalability Testing. Regression Testing. Behavioral Modeling. State Chart Diagram.
7. **Design:**
   Architectural Design. Refining The Model. Refactoring. Coupling And Cohesion .Who Should Own The Attribute? Who Should Own The Operations? Process And Threads.
8. **Design Classes:**
   Classes Visibility; User Interface. Subsystem Interface.
9. **Deponent Diagram:**
   Modeling Source Codes. Physical Databases.
10. **Deployment Diagram:**
    Modeling In A C/S System. Distributed System And Embedded Systems.

TOPICS FOR EXPERIMENT

Use any UML/OOAD tool and do the following:

1. Use case diagram.
2. Sequence diagram.
3. Collaboration diagram.
4. Activity diagram.
5. Use case realization.
6. Class diagram.
7. Testing, Debugging, Porting.
8. Component diagram.
9. Change management using MAKE/SCCS utility.

BOOKS

TEXT BOOKS

1. Ali Bahrami, "Object Oriented System Development ", McGraw Hill.
2. Grady Booch, J. Rambaugh, Ivar Jacobson, "The UML Users guide", Pearson Education.
3. J. Rambaugh, *eta*l,, "Object Oriented Modeling and Design"
4. Andrew Haigh, "Object Oriented Analysis and Design", Tata McGrawHill

References:

1. Simon Benett, Steve McRobb, Ray Farmer, "Object Oriented System Analysis and Design Using UML" McGrawHill.
2. Timothy C. Lethbridge, Robert Laganiere, "Object Oriented Software Engineering" McGrawHill.
3. Stephen R. Schach, "Object Oriented and Classical Software Engineering"

TERM WORK

3. Term work should consist of at least 8 experiments covering all the topics.
4. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER VI

SUBJECT: COMPUTER GRAPHICS

Lectures: **3 Hrs per week**	Theory: **100 Marks**
Practical: **3 Hrs per week**	Term work: **25 Marks**
	Practical Exam: **25 Marks**

Pre-requisites: **Knowledge of C language is needed.**

DETAILED SYLLABUS

1. **Introduction:**
   Application Areas. Input and Output Devices. Video Display Devices: Refresh CRT; Raster scan display; Color CRT monitor; Flat panel display; Co-ordinate representation.
2. **Basic Raster Graphics Algorithm for drawing 2-D primitives:**
   Output Characteristics: Aspect ratio; Aliasing and Anti-Aliasing. Line Drawing Algorithms: DDA algorithm; Bresenham's algorithm. Circle Generation Algorithm: Midpoint circle algorithm.
   Ellipse Generation Algorithm: Mid-point ellipse algorithm. Area filling: Scan line polygon filling algorithm; Inside-outside test; Boundary fill algorithm; Flood-fill algorithm.
3. **2-D Geometric Transformation:**
   Window and View port: Window and View port relationship; World co-ordinates; Normalized device co-ordinates and Homogenous co-ordinates. Basic Transformations: Translation; Rotation and Scaling. Other Transformation: Reflection and Shear. Composite Transformation.
4. **2-D Viewing and Clipping:**
   Window to Viewport Co-ordinate Transformation. Clipping: Point clipping; Line: Cohen-Sutherland algorithm, Liang Barsky clipping, Mid-point Subdivision; Polygon: Sutherland Hodgman algorithm.
5. **3-D Concepts:**
   3-D Display Methods: Parallel and Perspective projections; Depth Cueing. 3-D Transformation: Basic Transformations: translation, rotation and scaling; Other Transformation: reflection and shear; Composite Transformation. 3-D Viewing and Clipping.
6. **Hidden Surface Elimination Methods:**
   Backface Detection, Depth or Z-buffer Method, Scan Line Method, Area Subdivision Method.
7. **Curves:**
   Spline Representation, Bezier Curves, B-spline.
8. **Light Shading:**
   Illumination Model. Shading: Constant Intensity shading; Gouraud shading; Phong shading. Half toning. Ray Tracing.

BOOKS

TEXT BOOKS

1. Donald Hearn and M. Pauline Baker, “Computer Graphics with C version “, Low Price Edition, 2nd Edition, 2002.
2. **Newman and Sproll, “Principles of Interactive Computer Graphics”, Tata McGraw Hill, 2nd Edition, 2002.**

References:

1. Rogers and Adams, “Mathematical Elements for Computer Graphics “, TMH
3. Xiang and Plastok, “Schaum’s Outlines Computer Graphics”, TMH, 2nd Edition, 2002.
4. Harrington, “Computer Graphics”, McGraw Hill
5. Rogers, “Procedural Elements for Computer Graphics“, TMH

TERM WORK

1. Term work should consist of at least 10 practical experiments covering all the topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks.

B.E. COMPUTER ENGINEERING

THIRD YEAR SEMESTER VI

SUBJECT: ADVANCED DATABASES

Lectures: **3 Hrs per week**	Theory: **100 Marks**
Practical: **2 Hrs per week**	Term work: **25 Marks**
	Oral Exam.: **25 Marks**

Objectives of the course: **To study the further database techniques beyond which covered in the second year, and thus to acquaint the students with some relatively advanced issues. At the end of the course students should be able to: gain an awareness of the basic issues in objected oriented data models, learn about the Web-DBMS integration technology and XML for Internet database applications, familiarize with the data-warehousing and data-mining techniques and other advanced topics, apply the knowledge acquired to solve simple problems**

Pre-requisites: **A basic course in "Database Systems" and knowledge of OOAD.**

DETAILED SYLLABUS

1. The Extended Entity Relationship Model And Object Model:

The ER model revisited, Motivation for complex data types, User Defined Abstract Data Types And Structured Types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization.
Relationship Types of Degree Higher Than Two.

2. Object-Oriented Databases:

Overview of Object-Oriented Concepts. Object Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods, and Persistence, Type Hierarchies and Inheritance, Type extents and Queries, Complex Objects; Database Schema Design for OODBMS; OQL, Persistent Programming Languages; OODBMS Architecture And Storage Issues; Transactions and Concurrency control
Example of ODBMSs, - O2

3. Object Relational and Extended Relational Databases:

Database Design For An ORDBMS - Nested Relations and Collections; Storage And Access methods, Query processing and Optimization; An Overview of SQL3, Implementation Issues for Extended Type ;Systems. Comparison Of RDBMS, OODBMS, ORDBMS

4. Parallel and Distributed Databases and Client-Server Architecture:

Architectures For Parallel Databases, Parallel Query Evaluation; Parallelizing Individual Operations, Sorting, Joins; Distributed Database Concepts, Data Fragmentation, Replication, and Allocation techniques for Distributed Database Design; Query Processing in Distributed Databases; Concurrency Control and Recovery in Distributed Databases.
An Overview of Client-Server Architecture

5. Databases On The Web And Semi structured Data

Web Interfaces To The Web, Overview Of XML; Structure Of XML Data, Document Schema, Querying XML Data; Storage Of XML Data, XML Applications; The Semi structured Data Model, Implementation Issues, Indexes For Text Data

6. Data Warehousing and Data Mining.

Introduction To Data Warehousing, Star Schemas; Multidimensional Data Model and OLAP,

Introduction To Data Mining; Mining For Rules, Tree Methods, Clustering Approaches To Data Mining; Applications Of Data Warehousing and Data Mining

7. Enhanced Data Models for Advanced Applications.

Active Database Concepts. Temporal Database Concepts.; Spatial Databases, Concepts and architecture; Deductive Databases and Query processing; Mobile Databases, Geographic Information Systems.

BOOKS

TEXT BOOKS

1. Elmasri and Navathe, "fundamentals of database systems " , 4th Edition , Pearson Education
2. Raghu Ramakrishnan, Johannes Gehrke ," database management systems", Second Edition, McGraw-Hill

References:

1. Korth, Silberchatz, Sudarshan ,"Database System Concepts", 4th Edition, McGraw-Hill.
2. Peter Rob and Coronel,"Database systems, Design, Implementation and Management, Fifth Edition,Thomson Learning.
3. C.J.Date, Longman, "Introduction To Database Systems", 7th Edition, Addison Wesley

TERM WORK

1. The term work should include 6 small projects that would cover the different data models dealt with in the subject.
2. Two Assignments on current topics should also be included.
3. A Term Work test must be conducted with a weightage of 10 Marks.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: ADVANCED MICROPROCESSORS

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: To study microprocessor basics and the fundamental principles of architecture related to advanced microprocessors.

Pre-requisite: Microprocessors

DETAILED SYLLABUS

1. **Overview of new generation of modern microprocessors.**

2. **Advanced Intel Microprocessors:** Protected Mode operation of x86 Intel Family; Study of Pentium: Super-Scalar architecture & Pipelining, Register Set & special Instructions, Memory Management, Cache Organizations, Bus operation, Branch Prediction Logic.

3. **Study of Pentium Family of Processors:** Pentium I, Pentium II, Pentium III, Pentium IV, Pentium V: Architectural features, Comparative study.

4. **Advanced RISC Microprocessors:** Overview of RISC Development and current systems, Alpha AXP Architecture, Alpha AXP Implementations & Applications.

5. **Study of Sun SPARC Family**: SPARC Architecture, The Super SPARC, SPARC Implementations & Applications.

6. **Standard for Bus Architecture and Ports:** EISA, VESA, PCI, SCSI, PCMCIA Cards & Slots, ATA, ATAPI, LPT, USB, AGP, RAID

7. **System Architectures for Desktop and Server based systems**: Study of memory subsystems and I/O subsystems. Integration issues

BOOKS

Text Books:

4. Daniel Tabak, "*Advanced Microprocessors*", McGraw-Hill.
5. Barry Brey , "*The Intel Microprocessors, Architecture, Programming and Interfacing*"
6. Tom Shanley, "*Pentium Processor System Architecture*", Addison Wesley Press.

References:

4. Ray and Bhurchandi, "*Advanced Microprocessors and Peripherals*", TMH
5. James Antonakos, "*The Pentium Microprocessor*", Pearson Education.
6. Badri Ram, "*Advanced Microprocessors and Interfacing*", TMH Publication.
7. Intel Manuals.

TERM WORK

1. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: INTELLIGENT SYSTEMS

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objectives: To understand and apply principles, methodologies and techniques in design and implementation of intelligent system.

Prerequisite: Data Structures, Programming Languages, and Algorithms

DETAILED SYLLABUS

1. **Artificial Intelligence**: An overview, Intelligent Systems: Evolution of the concept.
2. **Intelligent Agents**: How agent should act, Structure of intelligent agents, Environments
3. **Problem Solving:** Solving problems by searching, Informed search methods, Game playing
4. **Knowledge and Reasoning:** A knowledge based agent, The wumpus world environment, Representation, Reasoning, Logic, Proportional logic, First order logic: Syntax and Semantics, Extensions and Notational variation, Using first order logic
5. **Building a Knowledge Base:** Properties of good and bad knowledge base, Knowledge engineering, General ontology
6. **Interfacing First Order Logic:** Interface rules involving quantifiers, An example proof, Forward and backward chaining, Completeness
7. **Acting Logically:** Planning, Practical planning: Practical planners, Hierarchical decomposition, Conditional planning
8. **Uncertain Knowledge and Reasoning:** Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief networks, Inference in belief networks
9. **Learning:** Learning from observations: General model of learning agents, Inductive learning, learning decision trees, Learning in neural and belief networks: Introduction to neural networks, Perceptrons, Multilayer feed-forward network, Application of ANN, Reinforcement learning: Passive learning in a known environment, Generalization in reinforcement learning, Genetic algorithms
10. **Agents that Communicate:** Communication as action, Types of communicating agents, A formal grammar for a subset of English
11. **Expert system:** Introduction to expert system, Representing and using domain knowledge, Expert system shells, Explanation, Knowledge acquisition
12. **Applications:** Natural language processing, Perception, Robotics

BOOKS

Text Books:

1. Struart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach*"
2. George F.Luger, *"Artificial Intelligence: Structures and Strategies for Complex*

Problem Solving", Pearson Education

References:

1. Nils J. Nillson, *"Artificial Intelligence: A New Synthesis"*, Harcourt Asia
2. Elaine Rich and Kevin Knight, "*Artificial Intelligence"*, TMH
3. Patrick Winston, "*Artificial Intelligence"*, Pearson Education
4. Ivan Brakto, "*Prolog Programming for Artificial Intelligence*", Pearson Education
5. Efraim Turban Jay E.Aronson, "*Decision Support Systems and Intelligent Systems*"
6. Ed. M. Sasikumar and Others, *"Artificial Intelligence : Theory and Practice"* Proceedings of the International Conference KBCS-2002, Vikas Publishing House

TERM WORK

2. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: DIGITAL SIGNAL PROCESSING

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objective: Digital Signal Processing continues to play an increasingly important role in the fields that range literally from A (astronomy) to Z (zeugmatography, or magnetic resonance imaging) and encompass applications such as Compact Disc player, Speech Recognition, echo cancellations in communication systems, image Enhancement, geophysical exploration, and noninvasive medical imaging. This course aims to build concepts regarding the fundamental principles and applications of Signals, System Transforms and Filters.

Pre-requisites: Nil

DETAILED SYLLABUS

1. **Discrete Time Signals & System:** Discrete–time signals, Discrete–time systems, Analysis of discrete-time LTI systems, Discrete-time systems described by differential equations, Implementation of discrete-time systems, Correlation of discrete-time systems
2. **Z-Transform:** Definition and Properties of Z-transform, Rational Z-transforms, Inverse Z-transform, one-sided Z-transform, Analysis of LTI systems in Z-domain
3. **Frequency Analysis of Signals and Systems:** Frequency analysis: Continuous time signals and Discrete-time signals, Properties of the Fourier transform for discrete-time signals, Frequency domain characteristics of LTI systems, LTI system as a frequency selective filter, Inverse systems and deconvolution
4. **Discrete Fourier Transform:** Frequency domain sampling, Properties of DFT, Linear filtering method based on DFT, Frequency analysis of signals using DFT, FFT algorithm, Applications of FFT, Goertzel algorithm, Quantisation effects in the computation of DFT
5. **Implementation of Discrete Time Systems:** Structure of FIR systems, Structure of IIR systems, quantization of filter coefficients, round-off effects in digital filters
6. **Design of Digital Filters:** Design of FIR filters, Design of IIR filters from analog filters, frequency transformations, Design of digital filters based on least-squares method digital filters from analogue filters, Properties of FIR digital filters, Design of FIR filters using windows, Comparison of IIR and FIR filters, and Linear phase filters.
7. **Introduction to DSP co-**processors: TMS 320C40/50, Analog Devices.
8. **Applications :** Image processing, Control, Speech, Audio, Telecommunication

BOOKS

Text Books:

1. J.G. Proakis, "*Introduction to Digital Signal Processing*", PHI
2. Oppenhiem and Schaffer, "*Discrete Time Signal Processing*"

References:

1. S.K. Mitra, "*Digital Signal Processing*", TMH.
2. T.J. Cavicchi, "*Digital Signal Processing*", John Wiley.
3. L.C. Ludeman," *Fundamentals Of Digital Signal Processing*", John Wiley.
4. E.C. Ifeachor, B.W. Jervis, "*Digital Signal Processing*", Pearson Education.
5. S Sallivahanan, "*Digital Signal Processing*", TMH.
6. Ashok Ambardar, "*Analog and Digital Signal Processing*", Thompson Learning.

TERM WORK

3. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: SOFTWARE ENGINEERING

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objectives: Apply various software Engineering principles and methodologies while dealing with the various phases of software development.

Pre-requisite: Programming concepts.

DETAILED SYLLABUS

1. **Product:** Evolving role of software, Software Characteristics, Software Applications, Software myths.
2. **Process:** Software Process, Process Models, Linear sequential model, Prototyping model, RAD model, Evolutionary software models, Component-based development, Formal methods model, Fourth generation techniques, Process technology, Product and process.
3. **Project Management:** Management spectrum, People, Product, Process, Project, W^5HH principle.
4. **Software Process and Project Metrics:** Measures-Metrics-Indicators, Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software engineering process, Statistical quality control, Metrics for small organizations, Establishing a software metrics program.
5. **Software Project Planning:** Objectives, Software scope, Resources, Software project estimation, Decomposition techniques, Empirical estimation models, Make/Buy decision, Automated estimation tools.
6. **Risk Analysis and Management:** Reactive versus proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, Risk mitigation-monitoring-management, Safety risks and hazards, RMMM plan.
7. **Project Scheduling and Tracking:** Basic concepts, Relationship between people and effort, Defining a task set for the software project, Selecting software Engineering tasks, Refinement of major tasks, Defining a task network, Scheduling, Earned value network, Error tracking, Project plan.
8. **Software Quality Assurance:** Quality concepts, Quality Movement, Software quality assurance, Software reviews, Formal technical reviews, Formal approaches to SQA, Statistical software quality assurance, Software reliability, Mistake-proofing for software, ISO 9000 quality standards, SQA plan.
9. **Software Configuration Management:** Introduction, SCM process, Identification of objects in the software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards.
10. **System Engineering:** Computer-based systems, System engineering hierarchy, Business process engineering, product engineering, Requirements engineering, System modeling.
11. **Analysis Concepts and Principles:** Requirement Analysis, Requirement elicitation for

software, Analysis principles, Software prototyping, Specification.

12. **Analysis Modeling:** Introduction, Elements of analysis model, Data modeling, Functional modeling and information flow, Behavioral modeling, Mechanics of structured analysis, Data dictionary, Other classical analysis methods.
13. **Design Concepts and Principles:** Software design and software engineering, Design process, Design principles, Design concepts, Effective modular design, Design heuristics for effective modularity, Design model, Design documentation.
14. **Architectural Design:** Software architecture, Data design, Architectural styles, Analyzing alternative architectural designs, Mapping requirements into a software architecture, Transform mapping, Transaction mapping, Refining architectural design.
15. **User Interface Design:** The golden rules, User interface design, Task analysis and modeling, Interface design activities, Implementation tools, Design evaluation.
16. **Component-Level Design:** Structured programming, Comparison of design notation.
17. **Software Testing Techniques:** Software testing fundamentals, Test case design, White-box testing, Basis path testing, Control structure testing, Black-box testing, Testing for specialized environments, architectures and applications.
18. **Software Testing Strategies:** Strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing, Art of debugging.
19. **Technical Metrics for Software:** Software quality, framework for technical software metrics, Metrics for the analysis model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance.

BOOKS

Text Books:

1. Roger Pressman, "*Software Engineering*", McGraw Hill, Fifth Edition.
2. James Peter, "*Software Engineering An Engineering Approach*", John Wiley
3. Ian Sommerville, "*Software Engineering*", Pearson Education.

References:

1. W.S. Jawadekar, "Software *Engineering*", TMH.
2. Pankaj Jalote, "*An Integrated Approach To Software Engineering* ", Narosa.
3. R. Mall, "*Fundamentals of Software Engineering"*, Prentice Hall of India
4. A. Behferooz & F. J. Hudson, "*Software Engineering Fundamentals"*, Oxford University Press
5. S. L. Pfleeger, "*Software Engineering Theory and Practice*", Pearson Education

TERM WORK

4. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: IMAGE PROCESSING
(ELECTIVE-I)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. Image processing holds the possibility of developing the ultimate machine that could perform the visual functions of all living beings. There is an abundance of image processing applications that can serve mankind with the available and anticipated technology in the near future.

Pre-requisites: Digital Signal Processing, & Computer Graphics

DETAILED SYLLABUS

1. **Digital Image Processing Systems:** Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels
2. **Image Transforms (Implementation):** Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.
3. **Image Enhancement in the Spatial Domain:** Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters
4. **Image Enhancement in the Frequency Domain:** Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering
5. **Wavelets and Multiresolution Processing:** Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions
6. **Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.
7. **Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images
8. **Image Segmentation:** Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation
9. **Image Representation and Description:** Representation schemes, Boundary descriptors, Regional descriptors

BOOKS

Text Books:

1. R.C.Gonsales R.E.Woods**, "***Digital Image Processing*", Second Edition, Pearson Education

2. Anil K.Jain, "*Fundamentals of Image Processing*", PHI

References:

1. William Pratt, "*Digital Image Processing*", John Wiley
3. Milan Sonka,Vaclav Hlavac, Roger Boyle, "*Image Processing, Analysis, and Machine Vision*" Thomson Learning
2. N Ahmed & K.R. Rao, "*Orthogonal Transforms for Digital Signal Processing*" Springer
3. B. Chanda, D. Dutta Majumder, "*Digital Image Processing and Analysis*", PHI.

TERM WORK

5. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: PATTERN RECOGNITION
(ELECTIVE-I)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: This course teaches the fundamentals of techniques for classifying multi-dimensional data, to be utilized for problem-solving in a wide variety of applications, such as engineering system design, manufacturing, technical and medical diagnostics, image processing, economics, psychology.

Pre-requisite: Linear Algebra, Probability and Statistics

DETAILED SYLLABUS

1. **Introduction:** Machine perception, Pattern recognition systems, Design cycle, Learning and Adaptation
2. **Bayesian Decision Theory:** Bayesian decision theory: Continuous features, Minimum-error rate classification, classification, Classifiers, Discriminant functions and Decision surfaces, Normal density, Discriminant functions for normal density, Bayes Decision theory: discrete features
3. **Maximum-Likelihood and Bayesian Parameter Estimation:** Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian caseand General theory, Prolems of dimentionality, Hidden Markov Model
4. **Nonparametric Techniques:** Density estimation, Parzen windows, k_n-Nearest-Neighbor estimation, Nearest-Neighbor rule, Matrics and Nearest-Neighbor classification
5. **Linear Discriminants Functions:** Linear discriminant functions and decision surfaces, Generalised linear discriminant functions, 2-Category linearly separable case, Minimising the Perceptron criterion function, Relaxation procedure, Non-separable behavior, Minimum squared error procedure, Ho-Kashyap procedures, Multicategory generalizations
6. **Nonmetric Methods:** Decision tree, CART, ID3, C4.5, Gramatical methods, Gramatical interfaces
7. **Algorithm Independent Machine Learning:** Lack of inherent superiority of any classifier, Bias and Variance, Resampling for estimating statistic, Resampling for classifier design, Estimating and comparing classifiers, Combining classifiers
8. **Unsupervised Learning and Clustering:** Mixture densities and Identifiability, Maximum-Likelihood estimations, Application to normal mixtures, Unsupervised Bayesian learning, Data description and clustering criterion function for clustering, Hierarchical clustering
9. **Applications of Pattern Recognition**

BOOKS

Text Books:

1. Duda, Hart, and Stock, "*Pattern Classification*", John Wiley and Sons.
2. Gose, Johnsonbaugh and Jost, "*Pattern Recognition and Image analysis*", PHI

TERM WORK

6. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: MOBILE COMPUTING
(ELECTIVE-I)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 Marks**

Objective: Recent developments in portable devices and high-bandwidth, ubiquitous wireless networks has made mobile computing a reality. Indeed, it is widely predicted that within the next few years' access to Internet services will be primarily from wireless devices, with desktop browsing the exception. Such predictions are based on the huge growth in the wireless phone market and the success of wireless data services.This course will help in understanding fundamental concepts, current developments in mobile communication systems and wireless computer networks.

Pre-requisites: Computer Networks.

DETAILED SYLLABUS

1. **Introduction:** Applications, A short history of wireless communication
2. **Wireless Transmission:** Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.
3. **Medium Access Control:** Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.
4. **Telecommunication Systems**: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, Security, New data services; DECT: System architecture, Protocol architecture; TETRA, UMTS and IMT-2000: UMTS Basic architecture, UTRA FDD mode, UTRA TDD mode
5. **Satellite Systems**: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover, Examples
6. **Broadcast Systems**: Overview, Cyclic repetition of data, Digital audio broadcasting: Multimedia object transfer protocol; Digital video broadcasting
7. **Wireless LAN**: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control. Sublayer, Medium access control Sublayer, Information bases And Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management.
8. **Wireless ATM**: Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover

requirements, Types of handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures and Entities; Addressing, Mobile quality of service, Access point control protocol

9. **Mobile Network Layer**: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation , Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics
10. **Mobile Transport Layer**: Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP
11. **Support for Mobility**: File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language, WML script, Wireless telephony application, Examples Stacks with Wap, Mobile databases, Mobile agents

BOOKS

Text Books:

1. Jochen Schiller, "*Mobile communications"*, Addison wisely , Pearson Education
2. Wiiliam Stallings, "*Wireless Communications and Networks*"

References :

1. Rappaort, "*Wireless Communications* P*rincipals and Practices*"
2. YI Bing Lin , "*Wireless and Mobile Network Architectures*", John Wiley
3. P. Nicopolitidis , "*Wireless Networks*", John Wiley
4. K Pahlavan, P. Krishnamurthy , "*Principles of Wireless Networks*"
5. M. Richharia , "*Mobile Satellite Communication: Principles and Trends*", Pearson Education

TERM WORK

7. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: EMBEDDED SYSTEMS
(ELECTIVE-I)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objective: Embedded system tools and products are evolving rapidly. This course deals with various approaches to building embedded systems. It introduces unified view of hardware and software. The aim of this course is to make the students aware of the various applications of embedded systems.

Pre-requisites: Microprocessors and C Programming

DETAILED SYLLABUS

1. **An overview of embedded systems:** Introduction to embedded systems, Categories and requirements of embedded systems, Challenges and issues related to embedded software development, Hardware/Software co-design, Introduction to IC technology, Introduction to design technology
2. **Embedded Software development:** Concepts of concurrency, processes, threads, mutual exclusion and inter-process communication, Models and languages for embedded software, Synchronous approach to embedded system design, Scheduling paradigms, Scheduling algorithms, Introduction to RTOS, Basic design using RTOS
3. **Embedded C Language:** Real time methods, Mixing C and Assembly, Standard I/O functions, Preprocessor directives, Study of C compilers and IDE, Programming the target device
4. **Hardware for embedded systems:** Various interface standards, Various methods of interfacing, Parallel I/O interface, Blind counting synchronization and Gadfly Busy waiting, Parallel port interfacing with switches, keypads and display units, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above concepts using C language
5. **Study of ATMEL RISC Processor:** Architecture, Memory, Reset and interrupt , functions, Parallel I/O ports, Timers/Counters, Serial communication, Analog interfaces, Implementation of above concepts using C language, Implementation of above concepts using C language
6. **Case studies and Applications of embedded systems:** Applications to: Communication, Networking, Database, Process Control, Case Studies of: Digital Camera, Network Router, RTLinux

BOOKS

Text Books:

1. Raj Kamal, "*Embedded Systems*", TMH
2. David E. Simon, "*An Embedded Software Primer* ", Pearson Education

3. Muhammad Ali Mazidi and Janice Gillispie Mazidi, *"The 8051Microcontroller and Embedded Systems"*, Pearson Education

References:

1. Frank Vahid, Tony Givargis, "*Embedded System Design: A Unified Hardware/Software Introduction*", John Wiley
2. Craig Hollabaugh, "*Embedded Linux*", Pearson Education
3. Daniel Lewis, "*Fundamentals of Embedded Software*", Pearson Education.
4. Barnett, Cox, O'Cull, "*Embedded C Programming and the Atmel AVR* ", Thomson Learning
5. Myke Predko, "*Programming and Customizing the 8051 Microcontroller*", TMH

TERM WORK

8. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
   - Four experiments on micro controller based systems.
   - Four experiments using cross C compiler and Linux.
   - Two experiments using developments tools like logic analyzer, emulator and simulator.
   - Two experiments on case study of advanced embedded systems

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: COMPUTER SIMULATION AND MODELING
(ELECTIVE-I)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral Exam: 25 Marks

Objective: In the last five decades digital computer simulation has developed from infancy to a full-fledged discipline. The field of modeling and simulation is as diverse as of man. The application of simulation continues to expand, both in terms of extent to which simulation is used and the range of applications. This course gives a comprehensive and state of art treatment of all the important aspects of a simulation study, including modeling, simulation software, model verification and validation, input modeling.

Pre-Requisite: Probability and Statistics

DETAILED SYLLABUS

1. **Introduction to Simulation:** System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation.
2. **Simulation Examples:** Simulation of Queueing systems, Other examples of simulation.
3. **General Principles:** Concepts of discrete event simulation, List processing,
4. **Simulation Software:** History of simulation software, Desirable software features, General-purpose simulation packages, Object oriented simulation, Trends in simulation software.
5. **Statistical Models in Simulation:** Useful statistical model, Discrete distribution, Continuous distribution, Poisson process, Empirical distribution.
6. **Queueing Models:** Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Steady state behavior of infinite population Markovian models, Steady state behavior finite population model, Network of Queues.
7. **Random Number Generation:** Properties of random numbers, Generation of pseudo random numbers, Techniques for generating random numbers, Tests for random numbers.
8. **Random Variate Generation:** Inverse transform technique, Convolution method, Acceptance rejection techniques
9. **Input Modeling:** Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models.
10. **Verification and Validation of Simulation Model:** Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.
11. **Output Analysis for a Single Model:** Types of simulations with respect to output analysis, Stochastic nature of output data, Measure of performance and their estimation, Output analysis of terminating simulators, Output analysis for steady state

simulation

12. **Comparison and Evaluation of Alternative System Design:** Comparison of two system design, Comparison of several system design, Meta modeling, Optimization via simulation.
13. **Case Studies:** Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network

BOOKS

Text Books:

1. Jerry Banks, John Carson, Barry Nelson, David Nicol, "*Discrete Event System Simulation*"
2. Averill Law, W. David Kelton, "*Simulation Modeling and Analysis"*, McGRAW-HILL

References:

1. Geffery Gordon, *"System Simulation"*, PHI
2. Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, "*Theory of Modeling and Simulation*", Academic Press
3. Narsing Deo, *"System Simulation with Digital Computer"*, PHI
4. Donald W. Body, "*System Analysis and Modeling*", Academic Press Harcourt India
5. W David Kelton, Randall Sadowski, Deborah Sadowski, "*Simulation with Arena*", McGRAW-HILL.

TERM WORK

9. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: ADVANCED COMPUTER NETWORKS
(ELECTIVE-I)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral Examination: 25 Marks**

Objectives: In first part, Advanced technologies like High speed Devices etc. are to be considered. Second part Network programming is to be studied. Not just SOCKETS but also protocols, Drivers, Simulation Programming. In third part we should study Network Design, Protocols designs and analysis considering deterministic and non-deterministic approach. We expect natural thinking from student. For example he should able to consider different constraints and assume suitable data and solve the problems.

Pre-requisites: Computer networks

DETAILED SYLLABUS

1. **Data Communications:** Business Drivers and Networking Directions : Data communication Past and future.
2. **Understanding the standards and their maker:** Creating standards: players and Process, Current forums, Standard protocols, Layered reference models: The OSIRM, Standard computer architectures.
3. **Introduction to Transmission Technologies:** Hardware selection in the design process.
4. **Optical Networking:** SONET/SDH standards, Dense wavelength division multiplexing (DWDM), Performance and Design considerations.
5. **Physical Layer Protocols and Access Technologies:** Physical Layer Protocols and Interfaces, Accessing the Network, Copper access technologies, Cable Access Technologies, Fiber Access Technologies, Air Access Technologies.
6. **Common Protocols and Interfaces in the LAN environment:** Data link layers protocols, LLC and MAC sub layer protocol, Ethernet, Token Ring, Token Bus and FDDI, Bridge protocols, Switching in the LAN environment.
7. **Frame Relay:** FR specification and design, VoFR: Performance and Design considerations, Advantages and disadvantages of FR.
8. **Common WAN Protocol:** ATM: Many faces of ATM, ATM protocol operation (ATM cell and Transmission), ATM networking basics, Theory of operations, B-ISDN protocol reference model, PHY layer, ATM layer (Protocol model), ATM layer and cell (Definition), Traffic descriptors and parameters, Traffic and Congestion control defined, AAL Protocol model, Traffic contract and QoS, User plane overview, Control plane AAL, Management plane, Sub-DS3 ATM, ATM public services.
9. **Common Protocols and Interfaces in the Upper Layers(TCP/IP):** Background (Routing protocols), TCP/IP suite, Network layer (Internetwork layer), Transport layer, Application layer, Addressing and routing design.
10. **Mature Packet Switched Protocol:** ITU Recommendation X.25, User connectivity, Theory of Operation, Network layer functions, X.75 Internetworking protocol,

switched multimegabit data service (SMDS), SMDS and IEEE 802.6, Subscriber Interface and Access protocol, Addressing and Traffic control.

11. **Requirements Definition:** User requirements, Traffic sizing, Traffic characteristics, Protocols, Time and Delay considerations, Connectivity, Availability, Reliability and Maintainability, Service aspects, Budget constraints,.
12. **Traffic Engineering and Capacity planning:** Background (Throughput calculations) , Traffic engineering basics (Traffic characteristics), Traditional Traffic engineering, Queued data and packet switched traffic modeling, Designing for peaks, Delay or Latency, Availability and reliability, Network performance modeling, Creating the traffic matrix, Capacity planning and Network vision, Design tool, Categories of tools, Classes of design tool, Components of design projects, Types of design projects.
13. **Technology Comparisons:** Circuits-message-packet and cell switching methods, Packet switching service aspects, Generic packet switching network characteristics, Private verses public networking, Public network service selection, Business aspects of Packet-Frame and cell switching services, High speed LAN protocols comparisons, Application performance needs.
14. **Access Network Design:** Network design layers, Access layer design, Access network capacity, network topology and hardware, completing the access network design.
15. **Backbone Network Design:** Backbone requirements, Network capacities, Topologies, Topologies strategies, Tuning the network.

BOOKS

Text Books:

1. Darren L Spohn, “Data Network Design”, TMH
2. D. Bertsekas, R. Gallager, “*Data Networks*”, PHI

References:

1. W.R. Stevens, “*Unix Network Programming*”, Vol.1, Pearson Education
2. J.Walrand, P. Varaiya, “High Performance Communication Networks”, Morgan Kaufmann
3. Y. Zheng, S. Akhtar, “Networks for Computer Scientists and Engineers”, Oxford
4. A.S. Tanenbaum, “Computer Networks”
5. Peterson & Davie, “Computer Networks”, Harcourt Asia.
6. James D. McCabe , “Practical Computer Analysis and Design”, Harcourt Asia.

TERM WORK

10. Term work should consist of at least 10 practical experiments and two assignments covering all the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: PROJECT-A

Tutorial: 2 Hrs per week	**Term Work: 25 Marks** **Oral: 25 Marks**

GUIDELINES

1. Project-A exam be conducted by two examiners appointed by university. Students have to give seminar on the project-A for the term work marks. All the students of the class must attend all the seminars. Seminars should be conducted continuously for couple of days.
2. Project-A should preferably contain abstract, existing system, problem definition, scope, proposed system, its design, introduction to programming tools, hardware and software platforms requirements etc.
3. Out of the total projects 35 percent may be allowed as to be industry projects. 65 percent projects must be in-house. Head of dept and senior staff in the department will take decision regarding projects.
4. Every student must prepare hand written synopsis in the normal journal format.
5. Internal guide has to interact at least once in fortnight and maintain the progress and attendance report during both the terms.
6. Two research projects may be allowed only for outstanding students with research aptitude.
7. In case of industry projects, visit by internal guide will be preferred. Industry project will attract demos either at site or in college.
8. Make sure that external project guides are BE graduates.
9. Number of students for a project should be preferably 2 to 4. Only one student should be avoided and up to 6 may be allowed only for exceptional and complex projects.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: SYSTEM SECURITY

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 Marks**

Objectives of the course: Learn about the threats in computer security. Understand what puts you at a risk and how to control it. Controlling a risk is not eliminating the risk but to bring it to a tolerable level.

Pre-requisites: Computer Networks, Operating system.

DETAILED SYLLABUS

1. **Introduction:** Security, Attacks, Computer criminals, Method of defense
2. **Cryptography:** Basic Cryptography: Classical Cryptosystems, Public key Cryptography, Cryptographic checksum, Key Management: Key exchange, Key generation, Cryptographic key infrastructure, Storing and revoking keys, Hash algorithm, Digital signature, Cipher Techniques: Problems, Stream and block ciphers: AES, DES, RC4.
3. **Program Security:** Secure programs, Non-malicious program errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats
4. **Operating System Security:** Protected objects and methods of protection, Memory address protection, Control of access to general objects, File protection mechanism, Authentication: Authentication basics, Password, Challenge-response, Biometrics.
5. **Database Security:** Security requirements, Reliability and integrity, Sensitive data, Interface, Multilevel database, Proposals for multilevel security
6. **Security in Networks:** Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec
7. **Administrating Security:** Security planning, Risk analysis, Organizational security policies, Physical security.
8. **Legal, Privacy, and Ethical Issues in Computer Security: P**rotecting programs and data, Information and law, Rights of employees and employers, Software failures, Computer crime, Privacy, Ethical issues in computer society, Case studies of ethics

Books

Text Books:

1. Stallings**, "***Cryptography And Network Security: Principles and practice*"
2. C. P. Pfleeger, and S. L. Pfleeger, "*Security in Computing*", Pearson Education.
3. Matt Bishop, "*Computer Security: Art and Science*", Pearson Education.

References :

1. Kaufman, Perlman, Speciner, "*Network Security*"
2. Eric Maiwald, "*Network Security : A Beginner's Guide*", TMH

3. Bruce Schneier, "*Applied Cryptography*", John Wiley.
4. Macro Pistoia, "*Java network security* ", Pearson Education
5. Whitman, Mattord, "*Principles of information security"*, Thomson

TERM WORK

11. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: DISTRIBUTED COMPUTING

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 marks**

Objective: This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Pre-requisites: Operating Systems and Computer Networks

DETAILED SYLLABUS

1. **Introduction to Distributed System:** Goals, Hardware concepts, Software concepts, and Client-Server model. Examples of distributed systems.
2. **Communication:** Layered protocols, Remote procedures call, Remote object invocation, Message-oriented communication, Stream-oriented communication.
3. **Processes:** Threads, Clients, Servers, Code Migration, Software agent.
4. **Naming:** Naming entities, Locating mobile entities, Removing un-referenced entities.
5. **Synchronization:** Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions.
6. **Consistency and Replication:** Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols.
7. **Fault Tolerance:** Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery.
8. **Security:** Introduction, Secure channels, Access control, Security management.
9. **Distributed File System:** Sun network file system, CODA files system.
10. **Case Study:** CORBA, Distributed COM, Globe, Comparison of CORBA, DCOM, and Globe.

BOOKS

Text Books:

1. A. Taunenbaum, **"***Distributed Systems: Principles and Paradigms***"**
2. G. Coulouris, J. Dollimore, and T. Kindberg, "*Distributed Systems: Concepts and Design*", Pearson Education

References:

1. M. Singhal, N. Shivaratri, "*Advanced Concepts in Operating Systems*", TMH

TERM WORK

12. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION
An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: MULTIMEDIA SYSTEMS

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 marks**

Objectives of the course: This course teaches students to collect, and intelligently integrate multiple media on computers. Students learn the issues involved in capturing, compressing, processing, manipulating, searching, indexing, storing, and retrieving various kinds of continuous media in the text section.

Pre-requisites: Operating Systems, Computer Networks

DETAILED SYLLABUS

1. Multimedia Systems Introduction: Multimedia application, Multimedia system architecture, Evolving technologies for multimedia systems, defining objects for multimedia systems, Multimedia data interface standards
2. Compression and Decompression: Types of compression, Binary image compression schemes, Color, Gray scale, Still video image compression, Video image compression, Audio compression, Fractal compression, Data and File Format Standards: Rich text format, TIFF, RIFF, MIDI, JPEG, AVI, MPEG
3. Multimedia Input/Output Technologies: Key technologies issues, Pen input, Video and Image display system, Printout technology, Image scanners, Digital Voice and Audio, Full motion video
4. Storage and Retrieval Technologies: Magnetic media technology, Optical media, Hierarchical storage management, Cache management for storage system, Image and video databases: Indexing and Retrieval
5. Architectural and Telecommunications Considerations: Specialized computational processors, Memory systems, Multimedia board solutions, LAN/WAN connectivity, Multimedia transport across ATM networks, Multimedia across wireless, Distributed object models
6. Multimedia Networking: Multimedia networking applications, Streaming stored audio and video, RTP, Scheduling and policing mechanisms, Integrated services, RSVP
7. Multimedia Application Design: Multimedia application classes, Types of multimedia systems, Virtual reality design, Components of multimedia systems, Organizing multimedia databases, application workflow design issues, Distributed application design issues, Applications like Interactive, Television, Video Conferencing, Video-on-demand, Educational applications and authoring, Industrial applications, Multimedia archives and digital libraries
8. Multimedia Authoring and User Interface: Multimedia authoring systems, Hyper media application design considerations, User interface design, information access, Object display/playback issues
9. Hyper Media Messaging: Mobile messaging, Hyper media message components, Hypermedia linking and embedding, Creating hypermedia messages, integrated multimedia message standards, Integrated document management, The world-wide

web, Open hypermedia systems, Content based navigation.

10. Distributed Multimedia Systems: Components of distributed multimedia systems, Distributed client server operations, Multimedia object servers, Multi-server network topologies, Distributed multimedia database, Managing distributed objects

11. Multimedia System Design: Methodology and considerations, Multimedia systems design examples.

Books

Text Books:

1. Prabhat K. Andheigh, Kiran Thakrar, "*Multimedia Systems Design*", PHI John F,
2. Koegel Buford, "*Multimedia Systems*", Pearson Education.

References :

1. Free Halshall, "*Multimedia Communications*", Pearson Education.
2. R. Steimnetz, K. Nahrstedt, "*Multimedia Computing, Communications and Applications*", Pearson Education
3. K.R. Rao, D. Milovanovic, "*Multimedia Communication Systems: Techniques, Standards, and Networks*"
4. Subrahmanian, "*Multimedia Database Systems*", M. Kaufman
5. J. D. Gibson, "*Multimedia Communications: Directions and Innovations*", Academic Press, Hardcourt India
6. J.F. Kurose, K.W. Ross, "*Computer Networking*", Pearson Education

TERM WORK

13. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: ROBOTICS
(ELECTIVE-II)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objective: The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

Pre-requisite: Exposure to linear algebra and matrix operations. Exposure to programming in a high level language

DETAILED SYLLABUS

1. **Robotic Manipulation**: Automation and Robots, Classification, Application, Specification, Notations.
2. **Direct Kinematics**: Dot and cross products, Co-ordinate frames, Rotations, Homogeneous, Co-ordinates, Link co-ordination arm equation, (Five-axis robot, Four axis robot, Six axis robot).
3. **Inverse Kinematics**: General properties of solutions tool configuration Five axis robots, Three-Four axis, Six axis robot (Inverse kinematics).
4. Workspace analysis and trajectory planning work envelop and examples, workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.
5. **Robot Vision:** Image representation, Template matching, Polyhedral objects, Shane analysis, Segmentation (Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured Illumination, Camera calibration).
6. **Task Planning:** Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion Planning, Simulation of Planer motion, Source and goal scenes, Task planner simulation.
7. **Moments of Inertia.**
8. **Principles of NC and CNC Machines.**

BOOKS

Text Books:

1. Robert Shilling, "*Fundamentals of Robotics-Analysis and control"*, PHI.
2. Fu, Gonzales and Lee, "*Robotics"*, McGraw Hill
3. J.J, Craig, "*Introduction to Robotics"*, Pearson Education

References:

1. Staughard, "*Robotics and AI"*, PHI.
2. Grover, Wiess, Nagel, Oderey, "Industrial Robotics", McGraw Hill

3. Walfram Stdder, *"Robotics and Mecatronics"*, TMH.
4. Niku, "*Introduction to Robotics*", Pearson Education
5. Klafter, Chmielewski, Negin, "*Robot Engineering*", PHI
6. Mittal, Nagrath, "*Robotics and Control*", TMH

TERM WORK

14. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: COMPUTER VISION
(ELECTIVE-II)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: To introduce the student to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving

Pre-requisite: Introduction to Image Processing.

DETAILED SYLLABUS

9. **Recognition Methodology:** Conditioning, Labeling, Grouping, Extracting, Matching. Edge detection, Gradient based operators, Morphological operators, Spatial operators for edge detection. Thinning, Region growing, region shrinking, Labeling of connected components.
10. **Binary Machine Vision:** Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation.
11. **Area Extraction:** Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).
12. **Region Analysis:** Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.
13. **Facet Model Recognition:** Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consisting labeling problem, Back-tracking, Perspective Projective geometry, Inverse perspective Projection, Photogrammetry – from 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.
14. **Object Models And Matching:** 2D representation, Global vs. Local features.
15. **General Frame Works For Matching:** Distance relational approach, Ordered-structural matching, View class matching, Models database organization.
16. **General Frame Works:** Distance –relational approach, Ordered –Structural matching, View class matching, Models database organization.
17. **Knowledge Based Vision:** Knowledge representation, Control-strategies, Information integration.

BOOKS

Text Books:

1. David A. Forsyth, Jean Ponce, *"Computer Vision: A Modern Approach"*
2. R. Jain, R. Kasturi, and B. G. Schunk, *"Machine Vision"*, McGraw-Hill.

References:

1. Milan Sonka,Vaclav Hlavac, Roger Boyle, "*Image Processing, Analysis, and Machine Vision*" Thomson Learning
2. Robert Haralick and Linda Shapiro, "*Computer and Robot Vision"*, Vol I, II, Addison-Wesley, 1993.

TERM WORK

15. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: PARALLEL PROCESSING
(ELECTIVE-II)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: Upon completion of this course students will be able to understand and employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms, recognize problems and limitations to parallel systems, as well as possible solutions

Pre-requisite: Computer architecture, Data structures

DETAILED SYLLABUS

1. **Introduction:** Parallel Processing Architectures: Parallelism in sequential machines, Abstract model of parallel computer, Multiprocessor architecture, Pipelining, Array processors.
2. **Programmability Issues:** An overview, Operating system support, Types of operating systems, Parallel programming models, Software tools
3. **Data Dependency Analysis:** Types of dependencies loop and array dependences, Loop dependence analysis, Solving diophantine equations, Program transformations
4. **Shared Memory Programming:** General model of shared memory programming, Process model under UNIX
5. **Algorithms for Parallel Machines:** Speedup, Complexity and cost, Histogram computation, Parallel reduction, Quadrature problem, Matrix multiplication, Parallel sorting algorithms, Solving linear systems, Probabilistic algorithms
6. **Message Passing Programming:** Introduction, Model, Interface, Circuit satisfiability, Introducing collective, Benchmarking parallel performance
7. **Parallel Programming languages:** Fortran90, nCUBE C, Occam, C-Linda
8. **Debugging Parallel Programs:** Debugging techniques, Debugging message passing parallel programs, Debugging shared memory parallel programs
9. **Memory and I/O Subsystems:** Hierarchical memory structure, Virtual memory system, Memory allocation and management, Cache allocation and management, Cache memories and management, Input output subsystems
10. **Other Parallelism Paradigms:** Data flow computing, Systolic architectures, Functional and logic paradigms, Distributed shared memory
11. **Performance of Parallel Processors:** Speedup and efficiency, Amdahl's law, Gustafson-Barsis's law, Karf-Flatt metric, Isoefficiency metric

BOOKS

Text Books:

1. Hawang Kai and Briggs F. A., "*Computer Architecture and Parallel Processing*", McGraw Hill

2. Jorden H. F. and Alaghaband G., "*Fundamentals of Parallel Processing*"
3. M.J. Quinn, "*Parallel Programming*", TMH

References:

1. Shasikumar M., "*Introduction to Parallel Processing"*, PHI
2. Wilson G.V., "*Practical Parallel Programming*", PHI
3. D. E. Culler, J.P. Singh, A. Gupta, "*Parallel Computer Architecture*", Morgan Kaufman

TERM WORK

16. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: DATA WAREHOUSING AND MINING
(ELECTIVE-II)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term work: 25 Marks**
	Oral Exam: 25 Marks

Objectives of the course: The data warehousing part of module aims to give students a good overview of the ideas and techniques which are behind recent development in the data warehousing and online analytical processing (OLAP) fields, in terms of data models, query language, conceptual design methodologies, and storage techniques. Data mining part of the model aims to motivate, define and characterize data mining as process; to motivate, define and characterize data mining applications.

Pre-requisites: DBMS

DETAILED SYLLABUS

Data Warehousing:

1. **Overview And Concepts:** Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.
2. **Planning And Requirements:** Project planning and management, Collecting the requirements.
3. **Architecture And Infrastructure:** Architectural components, Infrastructure and metadata.
4. **Data Design And Data Representation:** Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data quality.
5. **Information Access And Delivery:** Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web.
6. **Implementation And Maintenance:** Physical design process, data warehouse deployment, growth and maintenance.

Data Mining:

1. **Introduction:** Basics of data mining, related concepts, Data mining techniques.
2. **Data Mining Algorithms:** Classification, Clustering, Association rules.
3. **Knowledge Discovery :** KDD Process
4. **Web Mining:** Web Content Mining, Web Structure Mining, Web Usage mining.
5. **Advanced Topics:** Spatial mining, Temporal mining.
6. **Visualisation :** Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining descriptive statistical measures in large databases
7. **Data Mining Primitives, Languages, and System Architectures:** Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems
8. **Application and Trends in Data Mining:** Applications, Systems products and

research prototypes, Additional themes in data mining, Trends in data mining

BOOKS

Text Books:

1. Paulraj Ponnian, "*Data Warehousing Fundamentals*", John Wiley.
2. M.H. Dunham, "*Data Mining Introductory and Advanced Topics*", Pearson Education.
3. Han, Kamber, "*Data Mining Concepts and Techniques*", Morgan Kaufmann

References:

1. Ralph Kimball, "*The Data Warehouse Lifecycle toolkit*", John Wiley.
2. M Berry and G. Linoff, "*Mastering Data Mining*", John Wiley.
3. W.H. Inmon, "*Building the Data Warehouses*", Wiley Dreamtech.
4. R. Kimpall, "*The Data Warehouse Toolkit*", John Wiley.
5. E.G. Mallach, "*Decision Support and Data Warehouse systems*", TMH.

TERM WORK

17. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: NEURAL NETWORKS & FUZZY SYSTEMS
(ELECTIVE-II)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: This course covers basic concepts of artificial neural networks, fuzzy logic systems and their applications. Its focus will be on the introduction of basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.

Pre-requisite: Knowledge of calculus, and basic probability and statistics are required. Background in the following subjects desirable: numerical analysis (including optimization). Programming skills in one of the following would be desirable: Matlab, MathCad, C, Java, C++

DETAILED SYLLABUS

1. **Introduction:** Biological neurons, McCulloch and Pitts models of neuron, Types of activation function, Network architectures, Knowledge representation. Learning process: Error-correction learning, Supervised learning, Unsupervised learning, Learning Rules.
2. **Single Layer Perceptron:** Perceptron convergence theorem, Method of steepest descent - least mean square algorithms.
3. **Multilayer Perceptron**: Derivation of the back-propagation algorithm, Learning Factors.
4. **Radial Basis and Recurrent Neural Networks:** RBF network structure, theorem and the reparability of patterns, RBF learning strategies, K-means and LMS algorithms, comparison of RBF and MLP networks, Hopfield networks: energy function, spurious states, error performance .
5. **Simulated Annealing**: The Boltzmann machine, Boltzmann learning rule, Bidirectional Associative Memory.
6. **Fuzzy logic:** Fuzzy sets, Properties, Operations on fuzzy sets, Fuzzy relations, Operations on fuzzy relations, The extension principle, Fuzzy measures, Membership functions, Fuzzification and defuzzification methods, Fuzzy controllers.

BOOKS

Text Books:

1. Simon Haykin, "*Neural Network a - Comprehensive Foundation"*, Pearson Education
2. Zurada J.M., "*Introduction to Artificial Neural Systems*, Jaico publishers
3. Thimothy J. Ross, "*Fuzzy Logic with Engineering Applications"*, McGraw Hill
4. Ahmad Ibrahim, "*Introduction to Applied Fuzzy Electronics*", PHI

References:

1. Yegnanarayana B., "*Artificial Neural Networks"*, PHI

2. Driankov D., Hellendoorn H. & Reinfrank M., "*An Introduction to Fuzzy Control*", Norosa Publishing House
3. Berkan R.C., and Trubatch S.L., "*Fuzzy Systems Design Principles*", IEEE Press

TERM WORK

18. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: SOFTWARE ENGINEERING

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objectives: Apply various software Engineering principles and methodologies while dealing with the various phases of software development.

Pre-requisite: Programming concepts.

DETAILED SYLLABUS

20. **Product:** Evolving role of software, Software Characteristics, Software Applications, Software myths.
21. **Process:** Software Process, Process Models, Linear sequential model, Prototyping model, RAD model, Evolutionary software models, Component-based development, Formal methods model, Fourth generation techniques, Process technology, Product and process.
22. **Project Management:** Management spectrum, People, Product, Process, Project, W^5HH principle.
23. **Software Process and Project Metrics:** Measures-Metrics-Indicators, Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software engineering process, Statistical quality control, Metrics for small organizations, Establishing a software metrics program.
24. **Software Project Planning:** Objectives, Software scope, Resources, Software project estimation, Decomposition techniques, Empirical estimation models, Make/Buy decision, Automated estimation tools.
25. **Risk Analysis and Management:** Reactive versus proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, Risk mitigation-monitoring-management, Safety risks and hazards, RMMM plan.
26. **Project Scheduling and Tracking:** Basic concepts, Relationship between people and effort, Defining a task set for the software project, Selecting software Engineering tasks, Refinement of major tasks, Defining a task network, Scheduling, Earned value network, Error tracking, Project plan.
27. **Software Quality Assurance:** Quality concepts, Quality Movement, Software quality assurance, Software reviews, Formal technical reviews, Formal approaches to SQA, Statistical software quality assurance, Software reliability, Mistake-proofing for software, ISO 9000 quality standards, SQA plan.
28. **Software Configuration Management:** Introduction, SCM process, Identification of objects in the software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards.
29. **System Engineering:** Computer-based systems, System engineering hierarchy, Business process engineering, product engineering, Requirements engineering, System modeling.
30. **Analysis Concepts and Principles:** Requirement Analysis, Requirement elicitation for

software, Analysis principles, Software prototyping, Specification.

31. **Analysis Modeling:** Introduction, Elements of analysis model, Data modeling, Functional modeling and information flow, Behavioral modeling, Mechanics of structured analysis, Data dictionary, Other classical analysis methods.
32. **Design Concepts and Principles:** Software design and software engineering, Design process, Design principles, Design concepts, Effective modular design, Design heuristics for effective modularity, Design model, Design documentation.
33. **Architectural Design:** Software architecture, Data design, Architectural styles, Analyzing alternative architectural designs, Mapping requirements into a software architecture, Transform mapping, Transaction mapping, Refining architectural design.
34. **User Interface Design:** The golden rules, User interface design, Task analysis and modeling, Interface design activities, Implementation tools, Design evaluation.
35. **Component-Level Design:** Structured programming, Comparison of design notation.
36. **Software Testing Techniques:** Software testing fundamentals, Test case design, White-box testing, Basis path testing, Control structure testing, Black-box testing, Testing for specialized environments, architectures and applications.
37. **Software Testing Strategies:** Strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing, Art of debugging.
38. **Technical Metrics for Software:** Software quality, framework for technical software metrics, Metrics for the analysis model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance.

BOOKS

Text Books:

4. Roger Pressman, "*Software Engineering*", McGraw Hill, Fifth Edition.
5. James Peter, "*Software Engineering An Engineering Approach*", John Wiley
6. Ian Sommerville, "*Software Engineering*", Pearson Education.

References:

6. W.S. Jawadekar, "Software *Engineering*", TMH.
7. Pankaj Jalote, "*An Integrated Approach To Software Engineering* ", Narosa.
8. R. Mall, "*Fundamentals of Software Engineering"*, Prentice Hall of India
9. A. Behferooz & F. J. Hudson, "*Software Engineering Fundamentals"*, Oxford University Press
10. S. L. Pfleeger, "*Software Engineering Theory and Practice*", Pearson Education

TERM WORK

19. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: PROJECT-B

Tutorial: 6 Hrs per week	**Term Work: 50 Marks** **Oral: 50 Marks**

GUIDELINES

1. Project-B exam be conducted by two examiners appointed by university. Students have to give demonstration and seminar on the project-B for the term work marks. All the students of the class must attend all the seminars. Seminars should be conducted continuously for couple of days.
2. Project –B should contain:
   - Introduction and motivation, Problem statement, Requirement analysis, Project design, Implementation details, Technologies used, Test cases, Project time line, Task distribution, References, and Appendix consisting of users manual, technical reference manual.
   - CD containing: Project documentation, Implementation code, Required utilities, Software's and Manuals.
   - Every student must prepare well formatted, printed and hard bound report.
3. Internal guide has to interact at least once in fortnight and maintain the progress and attendance report during the term.
4. Make sure that external project guides are BE graduates.
5. Convener should make sure that external examiners are appointed from the list as per appropriate technical area.