B.E. II YEAR (COMPUTER SCIENCE & ENGINEERING) 2016-2017
SEMESTER III EXAMINATION SCHEME 2017

Subject Nomenclature			Lecture	Tutorial	Practical	Contact Hrs	Credit	Exam Hrs	Marks		
									Theory	Practical and Sessional	Total
A. THEORY PAPERS											
Ma	201A	Advanced Engineering Mathematics-I (CSE/IT)	3	1	-	4	4	3	100	-	100
CSE	202A	Discrete Structures (CSE/IT)	3	1	-	4	4	3	100	-	100
CSE	203A	Object Oriented Programming (CSE/IT)	2	1	-	3	3	3	100	-	100
CSE	204A	Data Structures and Algorithms (CSE/IT)	3	1	-	4	4	3	100	-	100
CSE	205A	Logic Design (CSE/IT)	2	1	-	3	3	3	100	-	100
CSE	206A	Computer Oriented Statistical Methods (CSE/IT)	2	1	-	3	3	3	100	-	100
TOTAL(A)			**15**	**6**	**-**	**21**	**21**		**600**	**-**	**600**
B. PRACTICALS AND SESSIONALS											
CSE	203B	Object Oriented Programming Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
CSE	204B	Data Structures and Algorithm Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
CSE	205B	Logic Design Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
CSE	206B	Scripting Languages Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
TOTAL(B)			-	-	**8**	**8**	**4**		**-**	**400**	**400**
TOTAL(A+B)			**15**	**6**	8	**29**	**25**		**600**	**400**	**1000**

To pass, a candidate must obtain:

(a) At least P Grade in each written paper.
(b) At least B Grade in each practical & sessional.
(c) At least 5.00 SGPA in a semester.

B.E. II YEAR (COMPUTER SCIENCE & ENGINEERING) 2016-2017
SEMESTER IV EXAMINATION SCHEME 2017

Subject Nomenclature			Lecture	Tutorial	Practical	Contact Hrs	Credit	Exam Hrs	Marks		
									Theory	Practical and Sessional	Total
A. THEORY PAPERS											
Ma	202 A	Advanced Engineering Mathematics-II (CSE/IT)	3	1	-	4	4	3	100	-	100
CSE	251 A	Principles of Programming Languages (CSE/IT)	3	1	-	4	4	3	100	-	100
CSE	252 A	Computer Organization & Architecture (CSE)	3	1	-	4	4	3	100	-	100
CSE	253 A	Database & File Systems (CSE/IT)	2	1	-	3	3	3	100	-	100
CSE	254 A	Communication Engineering (CSE/IT)	3	0	-	3	3	3	100	-	100
		Open Elective-I	3	0	-	3	3	3	100	-	-
TOTAL(A)			**17**	**4**	**-**	**21**	**21**		**600**	**-**	**600**
B. PRACTICALS AND SESSIONALS											
CSE	251 B	Programming Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
CSE	252 B	Computer Organization & Architecture Laboratory (CSE)	-	-	2	2	1	3	-	100	100
CSE	253 B	Database & File Systems Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
CSE	255 B	Unix/Linux Laboratory (CSE/IT)	-	-	2	2	1	3	-	100	100
TOTAL(B)			-	-	**8**	**8**	**4**	**3**	**-**	**400**	**400**
TOTAL(A+B)			**17**	**4**	8	**29**	**25**		**600**	**400**	**1000**
CSE	200 E	Co-curricular Activities	-	-	-	-	0	-	-	-	100

List of Open Electives I: Enclosed with examination scheme of VIII Semester

To pass, a candidate must obtain:

(a) At least P Grade in each written paper.
(b) At least B Grade in each practical & sessional.
(c) At least 5.00 SGPA in a semester.

List of Open Electives Available for BE (CSE) Students	
Name of subject	**Semester**
BCT 291 A Open Elective-I: Sustainable Architecture CE 291A Open Elective-I :Energy Efficient Building Design ChE 291 A Open Elective-I : Renewable Energy Sources EE 291 A Open Elective-I : Industrial Applications of Electrical Drives EE 292 A Open Elective-II: Engineering Economics Ma 291 A Open Elective-I :Mathematical Statistics For Engineers ME 291 A Open Elective-I:Renewable Energy Sources ME 292A Open Elective-I: Automobile Engineering MI 291A Open Elective-I: Tunneling For Engineering Projects PI 291A Open Elective-I: Manufacturing Science	Fourth Semester
BCT 341 A Open Elective-II: Traditional Indian Architecture CE 341A Open Elective-II: Non Urban Public Hygiene & Drinking Water ChE 341 A Open Elective-II : Petroleum Refining Technology EE 341 A Open Elective-II : Optimization Techniques Ma 341 A Open Elective-II :Mathematical Theory of Operations Research ME 341A Open Elective-II : Economics Analysis and Management of Operations ME 342A Open Elective-II: Systems Design And Analysis MI 341A Open Elective-II: Application of GIS & Remote Sensing in Engineering PI 341A Open Elective-II: Principles of Management & Economics SE 341A Open Elective-II :Structural Dynamics	Fifth Semester
BCT 391 A Open Elective-III: Climate Responsive Architecture CE 391A Open Elective-III: Ecosystem & Biodiversity ChE 391 A Open Elective-III : Nanotechnology EC 391 A Open Elective-III: Electronic Instrumentation EE 391 A Open Elective-III: Soft Computing Techniques EE 392 A Open Elective-III: Energy Conservation Ma 391 A Open Elective-III: Advanced Numerical Analysis ME 391A Open Elective-III: Design Planning And Control Of Production System ME 392A Open Elective-III: Finite Elements Method MI 391A Open Elective-III: Project Environment Clearance PI 391A Open Elective-III: Quality Management SE 391A Open Elective-III :Finite Element Method	Sixth Semester
BCT: Building Construction Technology, CE: Civil Engineering, ChE: Chemical Engineering, CSE: Computer Science and Engineering, EC: Electronics & Communication, EE: Electrical Engineering, ME: Mechanical Engineering, MI: Mining Engineering, PI: Production & Industrial Engineering, SE: Structural Engineering, Ma: Mathematics	

THIRD SEMESTER (CSE)

Ma 201 A – ADVANCED ENGINEERING MATHEMATICS – I (CSE/IT)

3L,1T **3 Hours, 100Marks**

Section A

Differential equations : Simultaneous differential equations, Total differential equations, Partial differential equations of first order, Charpit's method, Linear partial differential equations with constant coefficients, Second order partial differential equations, Monge's method for the equation of type $Rr + Ss + Tt = V$

Solution of Wave, Heat and Laplace equations using separation of variables method.

Section B

Complex Analysis : Analytic function, Harmonic function, Construction of an Analytic function, Cauchy-Riemann equations in Cartesian and Polar form.

Complex integration, Cauchy's integral theorem, Cauchy's integral formula, Derivative of Cauchy's integral formula.

Taylor's and Laurent's series expansion of complex functions.

Cauchy's residue theorem and its application for evaluation of the contour integrals of f(sinx ,cosx) from 0 to 2π and f(x)from $-\infty$to ∞

Transformations: shifting, rotating, conformal and bilinear transformations.

Section C

Probability and Statistics: Theorems of probability and their application, Binomial, Poisson and Normal probability distribution. Correlation and Regression analysis of two parameters.

Note: Candidates are required to attempt FIVE questions in all, selecting at least one from each Section.

CSE 202 A - DISCRETE STRUCTURES (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

Introduction to Discrete Mathematical Structures, Formal Methods: Induction and Analogy, Abstraction.

Sets, sequences, empty set, power set, operations on sets, Venn diagram, ordered pair, principle of inclusion and exclusion. Counting and Combinatorics.

Introduction to mathematical logic, statements and notations, well-formed formulas, tautologies, tautological implications, normal forms, the theory of Inference for statement calculus, predicate logic.

Graph Terminology, Degrees of Nodes, Isomorphic Graphs, Dijkstra's Shortest Path Algorithm, Planar Graphs, Eulerian Graphs, Hamiltonian Graphs, Traveling Salesman Problem.

Trees, Introduction, Rooted and Other Trees, Representation of Prefix Codes, representation of Arithmetic Expression, Representation of Prefix Codes, Spanning Trees, Traversing Binary Trees, Binary Search Trees.

Relations, matrix and graph representation of relation, properties of relations, partitions. Equivalence Relations, Compatibility Relations, Composition of Binary Relations, Transitive and symmetric closures, partially ordered set, lattices. Recurrence relations.

Functions, Matrix representation of functions, composition of function, inverse function.

Algebraic Structures, General properties of algebraic systems, groupoids, semigroup, monoids, group, rings. Applications of algebra to control structure of a program. Homomorphism, congruences, admissible partitions. Groups and their graphs.

CSE 203 A - OBJECT ORIENTED PROGRAMMING (CSE/IT)

3L,1T **3 Hours, 100 Marks**

A review of C. Concepts of object oriented programming using C++. Data types: elementary and derived data types, literals.

Operators and expressions: operators, association and precedence rules of operators, expressions using unary, binary and ternary operators.

Statements: declarations as statements, selection statements, iteration statements, goto statement, break statement, continue statement, return statement, try-catch block.

Functions: void functions, functions with return value, call by value and call by reference parameter passing, default parameters, recursive functions, inline functions.

Classes: classes, objects, friend functions, classes within a class, local classes, global classes, constructors, destructors.

Derived classes: single and multiple derivation of classes, multilevel and hybrid derivation of classes, constructors, destructors.

Polymorphism: function and operator overloading, virtual functions.

Streams: input and output of built-in data types, manipulators.

File streams: opening a file, accessing a file, closing a file.

Exceptions: catching exceptions, rethrowing the exception, standard exceptions.

Templates: defining a template, template instantiation, function templates, class templates.

Elementary case study of a object oriented database in C++.

CSE 204 A - DATA STRUCTURES AND ALGORITHMS (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

Introduction to data structure, String storage representation and manipulation. Markov algorithm and primitive data structures.

Concepts of non primitive data structures. Linear data structure. Array, stack, queue, their applications and implementations using sequential storage representation and linked representation.

Linear linked list, double linked list, circular linear linked list and generalised lists and applications.

Concept of non-linear data structures, Tree, graph, set and their representation, Binary Tree, Threaded tree, different techniques of tree traversal, breadth first search, depth first search, application of tree and graph such that Polish notation, concepts of heap.

Sorting, searching algorithms and comparative study of different sorting and searching techniques such that selection sort, heap sort, bubble sort, quick sort, merge sort and radix sort. Linear search and binary search, hashing. External sorting.

Time and space complexity of the algorithms – Big-O,θ,Ω, and small-o, Asymptotic complexity, Upper and Lower bound time and space trade offs.

CSE 205 A - LOGIC DESIGN (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

Introduction to number systems, concept of logic gates, boolean algebra and simplification of boolean expressions, K-map, tabular method, combinational circuits, half adder, full adder, flip flops, transfer circuits, clocks, shift registers and binary and BCD counters.

Multiplexer, demultiplexer, encoder, decoder.

Analysis and design of synchronous sequential systems, finite memory and flow chart method of design, State assignment, races and hazards, Introduction to threshold logic & relay circuits, sequential adder.

Introduction to switching devices, positive and negative logic. OR, AND, NOR, NAND, Exclusive OR and Exclusive NOR gates, RTL, DCL, DCTL, TTL, RCTL, ECL, HTL, MOS AND CMOS logic circuit and their realization. Fan-in and Fan-out capacity. Speed and delay in logic circuit.

CSE 206 A - COMPUTER ORIENTED STATISTICAL METHODS (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

Frequency distribution, Class interval, limit, boundaries, class mark, histograms and frequency polygon, relative frequency distribution, cumulative frequency distribution curves, Frequency curves.
Measure of central tendency, mean, arithmetic and weighted arithmetic and their properties, median, mode, the Empirical relation between mean, median and mode, geometric mean, harmonic mean. The root mean square (RSM). Quartiles, Deciles, and Percentiles.
Measures of Dispersions, range, mean deviation, standard deviation. Variance, properties of standard deviation , Empirical relation between measure of dispersions, Absolute and relative dispersion , coefficient of variation.
Moments for grouped data, relations between moments, computations. Skewness, Kurtosis, Population moments.
Probability theory, conditional probability, independent, dependent and mutually exclusive events. Probability distribution . Mathematical expectations. Combinations and permutations.
Sampling theory , random samples, random numbers, sampling distribution of means, preposition, differences and sums, Standard errors.
Decision theory, statistical decision, hypotheses, tests of hypotheses and significance. Decision rules, Type I, II, errors, level of significance. Special tests. Tests involving binomial and normal distribution, two tail and one tail test Curve fitting, equations of approximations curve, free hand method of curve fitting, the straight line.
Subject approach shall be algorithmic.

CSE 206B – SCRIPTING LANGUAGES LABORATORY (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

PEARL, PYTHON, AWK, SHELL. Data types, variables, and control structures. Basic introduction to PEARL, PYTHON, AWK, SHELL, simple application programme, followed by 200-300 LOC application development.

FOURTH SEMESTER

Ma 202 A – ADVANCED ENGINEERING MATHEMATICS – II (CSE/IT)

3L,1T **3 Hours, 100 Marks**

Section A

Transforms: Laplace Transform, Inverse Laplace Transform, Properties of Laplace Transforms, Application of Laplace Transform to solve differential equation with constant coefficients. Z- Transforms. Infinite Fourier Transforms.

Section B

Numerical Analysis : Interpolation with equal intervals: Newton-Gregory interpolation formulae, Lagrange's interpolation formula for unequal intervals. Central difference interpolation formulae: Gauss' forward and backward formulae, Stirling' s and Bessel's interpolation formulae. Numerical integration : Trapezoidal rule, Simpson' s 1/3 and 3/8 rule. Numerical solution of algebraic and transcendental equations : Bisection, regula falsi

and Newton-Raphson methods. Numerical solution of linear simultaneous equations : Gauss' elimination, Gauss-Jordon, Jacobi and Gauss-Siedal methods. Numerical solution of ordinary differential equations : Euler's, Runge-Kutta Fourth order and Milne's methods.

Section C

Special function : Series solution of Bessel and Legendre's differential equations. Generating function of Bessel and Legendre's Polynomials. Orthogonal Property of
Bessel and Legendre's function. Rodrigue's formula.

Note: Candidates are required to attempt FIVE questions in all, selecting at least one from each Section.

CSE 251 A - PRINCIPLES OF PROGRAMMING LANGUAGES (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

Importance of programming languages, brief history , features of good programming language. Translators, Syntax, semantics, virtual computers. Binding and binding time.

Elementary and structured data types, their specifications and implementation. Type checking and type conversion, vectors arrays, records, character string, variable size data structures. Sets, input and output files.

Evolution of the concept of data type, abstraction, encapsulation and information binding, subprograms, type definition and abstract data types.

Implicit and explicit sequence control, sequence control within expression and between statements. Subprogram sequence control, Recursive subprograms, Exception and exception handlers, Coroutines and scheduled subprograms. Task and concurrency exception.

Names and referencing environments, Static, dynamic and block structure, Local data and local referencing environments.

Dynamic and static scope of shared data, Block structure, parameters and their transmission. Tasks and shared data. Storage requirement for major run-time elements. Program and system controlled storage management. Static and stack-based storage management. Fixed size and variable-size heap storage management.

CSE 252 A –COMPUTER ORGANIZATION AND ARCHITECTURE (CSE)

3L, 1T **3 Hours, 100 Marks**

Organization of computer system, Basic Building blocks of CPU-ALU, Timing and Control Unit, Construction of ALU, integer representation, binary half and full adder. Parallel full adder. Addition and subtraction in a Parallel arithmetic element. BCD adder. Binary multiplication, Booth's algorithm. Binary division. Logical operations, implementation of logical instructions, floating point number system, and arithmetic operations on floating point numbers.

General instruction formats, addressing modes.

Concept of control unit, execution of instructions, Hardwired and Microprogrammed control unit, Microinstructions, Horizontal and vertical format, Microprogramming, Wilkes control .

Memory element , RAM, Static RAM, Dynamic RAM, dimension of memory access, ROM, PROM, EPROM, EEPROM, Magnetic, CCD and cache memories. Hierarchy of memories. Associative memory.

Interconnection of computer components, buses, bus formats and operations, isolated and memory-mapped input-output, interfacing of keyboards and printers. Interrupts in IO systems, DMA. Data transfer, DMA interrupts, polling, masking, nested interrupts. Control of data transfer, handshaking, bus scheduling, standard bus interfaces.
Introduction to printers, magnetic tapes, disks, floppy disks, optical disk.

CSE 253 A - DATABASE AND FILE SYSTEMS (CSE/IT)

3L, 1T **3 Hours, 100 Marks**

Introduction to database systems. A historical prespective, file systems v/s DBMS, advantages of a DBMS, Data abstraction , models, instances and schemes. Data independency. Data definition and manipulation languages. Database manager, administration and users. Overall system structure.

Entities and entity sets. Relationships and relationship sets. Attributes, mapping, keys, E-R diagram and its conversion to tables. Design of an E-R database scheme.

Structure of relational database. The relational algebra. The tuple and domain relational calculus. Modification of databases and views.

Query languages, SQL and query by examples. Security of databases against misuse. Domain

constraints, referential integrity, functional dependencies, assertions and triggers. Pitfall in relational database design. Normalization using functional, multi valued and join dependencies. Domain key normal form. Alternative approaches to database design.

Data storage, Physical storage media, files organization, organisation of records into blocks, sequential files , mapping relational data to files, data dictionary storage, buffer management,

Basic concept of indexing and hashing, properties of indexes, index specification in SQL,. B+ - Tree and B-Tree index files. Hash base indexing, static hash functions, dynamic hash function.

CSE 254 A – COMMUNICATION ENGINEERING (CSE/IT)

3L,1T **3 Hours, 100 Marks**

Introduction to analog and digital techniques for electrical communication. Concept of baseband and carrier transmission. Elementary study of AM, DSBSC SSB, FM and PM.
Sampling theorem and principle of pulse analog modulation. Elements of PCM, fundamentals of digital carrier modulation techniques for data communication.
Concept of FDM and TDM. Meaning of synchronous and asynchronous transmission. Principle of models. Effects of noise in communication systems.

General structure of telecommunication networks. Simplex, duplex and half-duplex lines, concepts of centralized and common control switching in telephone networks.
Qualitative study of radio-wave propagation. Introductory study of microwave LOS tropospheric scatter, satellite and optical communications.

Ma 261 A: Special Mathematics-I

(For Diploma Passed Candidates - common for all branches)

3L,IT **3 Hrs. MM : 100**

Differential Calculus :Asymptotes, curvature, envelops evolutes, and curve tracing

Integral Calculus : Rectification . Volumes and surfaces of solids of revolution, differentiations under sign of integration

Differential Equations : Differential equations with constant coefficients and variable coefficients.

Mechanics: Friction , common catenary, kinematics of uniplanar motion, simple harmonic motion

Vector calculus: Gradient , divergence, curl, green's theorem , stoke's theorem, gauss divergence theorem (Verification only)

B.E. III YEAR (COMPUTER SCIENCE & ENGINEERING)
SEMESTER V EXAMINATION SCHEME 2017

A. THEORY PAPER											
Subject Nomenclature	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Contact	Credit	Unit	Exam. Hrs.	Marks		
									Theory	Practicals & Sessionals	Total
CSE 311A	Theory of Computation (CSE/IT)	3	1	-	4	4	½	3	60	--	60
CSE 312A	Database Management System (CSE/IT)	3	1	2	6	5	1	3	60	--	60
CSE 313A	System Programming (CSE/IT)	3	1	2	6	5	1	3	60	--	60
CSE 314A	Microprocessors (CSE)	3	1	2	6	5	1	3	60	--	60
CSE 315A	Java Programming (CSE/IT)	3	1	2	6	5	1	3	60	--	60
CSE 316A	Computer Networks (CSE/IT)	3	1	2	6	5	1	3	60	--	60
	Total (A)	18	6	10	34	29	5½	-	360	--	360
B. PRACTICALS AND SESSIONALS											
CSE 312B	Database Management System Laboratory (CSE/IT)			2					--	60	60
CSE 313B	System Programming Laboratory (CSE/IT)			2					--	60	60
CSE 314B	Microprocessors Laboratory (CSE)			2					--	60	60
CSE 315B	Java Programming Laboratory (CSE/IT)			2					--	60	60
CSE 316B	Computer Networks Laboratory (CSE/IT)			2					--	60	60
	Total (B)			10					--	300	300
	Total of Semester (A+B)	18	6	10	34	29	5½	-	360	300	660

For a pass, a candidate must obtain:

(a) 35 percent in each of the written paper
(b) 50 percent in each of practical and sessionals, and
(c) 45 percent in the Grand Total

FIFTH SEMESTER

CSE 311 A – THEORY OF COMPUTATION (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction to Automata theory, description of finite automata, transition Systems. Properties of transition functions, acceptability of a string by a FA.

Non-deterministic finite state machine. Conversion from NDFA to DFA. The equivalence of DFA and NDFA. Finite automata. Mealy & Moore machine with outputs. Conversion from a Moore machine to Mealy machine and vice-versa. Minimization of finite automata.

Regular set and regular grammar. Regular expression, finite automata and regular expressions, transition system and regular expression. Equivalence of two finite automata. Equivalence of two regular expressions. Kleen's closure theorem. Construction of finite automata equivalence to a regular expression.

Context free languages and derivation trees. Left most and right most derivations. Normal forms of context free grammars (i) Chomsky-normal form (ii) Greibach-normal form.

Push down automata, acceptance by PDA, PDA and context free languages.

Introduction to Linear bounded automata, acceptance by LBA, LBA and context sensitive language.

Turing machine model, representation of TMs, languages acceptability by TMs, design of TMs, universal TMs and other modifications of TM, and Chomsky-Hierarchy grammar.

CSE 312 A – DATABASE MANAGEMENT SYSTEM (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Review of Database Models. Basic concepts of object oriented model, New data base applications, object structure, class hierarchy, Multiple inheritance, object identity, object containment, physical organization, object oriented queries, scheme modification. Comparison between RDBMS and OODBMS, crash recovery. Failure classification, storage hierarchy.

Transaction model , log-based recovery, Buffer Management , check points, shadow paging , failure with loss of non-volatile storage, stable storage implementation, concurrency control schedule, Testing for serializability, lock-based protocols, Time stamp based protocols, validation techniques, multiple Granularity, Multiversion schemes, Insert and Delete operations.

Basics of XML, Schema, Syntax and Sementics, view, manipulation, query, design, constaints, translation from Relational database, application.

Security and Integrity violations, Authorizations and views, security specification in SQL, Encryption, statistical databases. Introduction to distributed databases, Internet data bases. Data base Design case study.

CSE 313 A - SYSTEM PROGRAMMING (CSE/IT)

3L, 1T 3 Hours, 60 Marks

System Software and Machine Architecture, General register level architecture, VAX, Pentium, RISC Machines – Power PC, instruction and data formats.

Assemblers: Basic functions, Algorithm and Data Structures.

Machine dependent assembler features: Instruction formats and addressing modes, program relocation.

Machine Independent features: Literals, symbol definitions.

Program blocks, control sections and Linking.
Assembler design, one pass and multi-pass assemblers, MASM, and SPARC assemblers.

Loaders and Linkers: Loaders functions, absolute loader, boot strap-loader, Machine dependent and independent features, relation and lining. Data structures and algorithm of loader, Library Search, Linkage editors, Dynamic and Static Linking. Specific examples.

Macroprocessors: Functions, algorithms and data astructures, macro-expansion. Macros of HLLs, specific examples and macroprocessors.
Basic idea of compilers, phases of compiler. Interpreters, compiler-compilers. Sun OS complier, lex, yacc, gcc.

Operating System, its functions, types of OS, User interface, run time environment, interrupt processing, process scheduling, memory management, file processing, job scheduling, protection.

CSE 314A - MICROPROCESSORS (CSE)

3L, 1T 3 Hours, 60 Marks

An introduction to 80x86 microprocessor family, Real and Protected mode Operation, S/W model of 80x86 family, processor registers, data organization, Instruction types, addressing modes, interrupts, a comparative study of 8086, 80286, 80386, and Pentium.

Software Architecture, Addressing modes, Flags, Data transfer and string instructions, arithmetic, logical, bit manipulation, program transfer and processor control instructions.

Use of assembler directives, Using macros, instruction execution time, Interrupt Processing, working with interrupt vectors, Use of BIOS and DOS function calls, using disks and files.

Protected mode operation, Segmentation, Paging, Protection, Multitasking, Exceptions, Virtual- 8086 mode, Protected mode applications,

An introduction to supporting chips and interfacing - 8255, 8279,8253, 8259, 8257 (their advanced versions). Interfacing assembly with C- language.

CSE 315 A - JAVA PROGRAMMING (CSE / IT)

3L, IT 3 Hours, 60 Marks

Evolution of programming languages, generation of programming languages, type of programming languages.

Basic feature of Java, flow control, classes, objects, interfaces, exception and packages.

Java classes and object, access control and inheritance, constructions, inheritance and overloading. Extension of classes.

Data type, control-flow, basics of exception handling, operations on data types.

Introductory idea of threads and their applications.

Basic I0 packages and standard utilities. Application of Java for system programming.

Introduction to LINUX shell, variables , condition and control structures.
Introduction to TCL/TK programming language.

CSE 316A- COMPUTER NETWORKS (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction to Computer Networks, advantages, LAN, MAN, WAN, Network topologies. OSI reference model, Basic concepts, services and layers of OSI model. Physical layer protocols- RS 232C,RS-449, X.21, X.24, Ethernet, Data link layer- basic link protocols, character and bit oriented protocols, Flow control, Error detection, Error control, High level Data Link control (HDLC).

Network layer- Virtual circuit, X.25 specification, Data grams, Transport, Session, Presentation and Application layers. Connection less and connection oriented protocols, circuit, message and packet switching.

Introductory study of TCP/IP protocol suit, LAN Topologies and transmission media, twisted pairs, coaxial, optical fibers. LAN access techniques, random access method, ALOHA, CSMA, CSMA/CD, Controlled access schemes.

Introduction to Network interconnections, Bridges and Routers.

INTERNET and WWW. Domain name system, E-mail, HTML, TELNET and file transfer protocol (FTP).

Introduction to Wireless Networks.

Basic idea of information and Network Security – Encryption, Decryption, DES, RSA, Digital Signatures, Firewalls, BGP.

B.E. III YEAR (COMPUTER SCIENCE & ENGINEERING)
SEMESTER VI EXAMINATION SCHEME 2017

A. THEORY PAPER											
Subject Nomenclature	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Contact	Credit	Unit	Exam. Hrs.	Marks		
									Theory	Practicals & sessionals	Total
CSE 321A	Computer Graphics & Visual Computing (CSE)	3	1	2	6	5	1	3	60	--	60
CSE 322A	Operating System Design (CSE/IT)	3	1	2	6	5	1	3	60	--	60
CSE 323A	Engineering Management & Economics (CSE/IT)	3	1	-	4	4	1	3	60	--	60
CSE 325A	Artificial Intelligence (CSE/IT)	3	1	2	6	5	1	3	60	--	60
CSE 328A	Robotics (CSE/IT)	3	1	2	.6	5.	1	3	60	--	60
	Total (A)	15	5	8	28	24	5	-	300	--	300
B. PRACTICALS AND SESSIONALS											
CSE 321B	Computer Graphics & Visual Computing Laboratory (CSE)			2					--	60	60
CSE 322B	Operating System Design Laboratory (CSE/IT)			2					--	60	60
CSE 325B	Artificial Intelligence Laboratory (CSE/IT)			2					--	60	60
CSE 328B	Robotics Laboratory (CSE/IT)			2					--	60	60
	Total (B)			8					--	240	240
	Total of Semester (A+B)	15	5	8	28	24	5	-	300	240	540
	Total of year								660	540	1200
Joint award for V& VI Semesters (Marks not counted for award of division / degree)											
FE 223E	Co-curricular Activities	-	2	2	2	1	½	-	-	-	100

For a pass, a candidate must obtain:

(a) 35 percent in each of the written paper
(b) 50 percent in each of practical and sessionals, and
(c) 45 percent in the Grand Total

SIXTH SEMESTER

CSE 321A COMPUTER GRAPHICS & VISUAL COMPUTING (CSE)

3L,1T 3 Hours, 60 Marks

Introduction to computer graphics. Application areas, Display devices, raster scan, random scan, color monitor, display file, frame buffer, 3-D display techniques, Input devices, Hardcopy devices.

Points, line, plane and coordinates. Character, vector, circle generation algorithms, antialiasing techniques. Representation of polygons. Interfacing and filling polygon.2-D Transformations, translation, rotation, scaling, shearing, reflection, composite transformations, raster transformations.

Windows, multiple windowing, view-port, viewing transformation. Clipping algorithm for point, line using Sutherland and Cohen, polygon, text clipping. Segment and segment operation.

Interactive graphics, user dialogue, Input modes, Interactive picture construction technique, Curves and curved surface, interpolation and approximation curve, continuity of curve.

Concept of 3-D, representation of 3-D object, 3-D transformation, translation, rotation, reflection, scaling. Parallel, perspective, isometric projections. 3-D clipping Sutherland and Cohen algorithm. Hidden lines and surfaces removal technique. Back face, Z-buffer, painter algorithm.

Basic illumination models, halftone, dithering, color model RGB & CMY, Visualization of data set, representation, scalar, vector, tensor, multivariate data fields.
Introduction to Open GL.

CSE 322A – OPERATING SYSTEM DESIGN (CSE/IT)

3L,1T 3 Hours, 60 Marks

Introduction to operating system, operating system functions, batch processing systems, multiprogramming systems, time sharing systems, real time operating systems.

Process management, process concept, process scheduling, operation on processes, cooperating processes, interprocess communication.

CPU scheduling, scheduling algorithms – first come first served, shortest job first, priority based, round robin, multilevel queue, multilevel feedback queue.

Process synchronization, critical section problem, semaphores, monitors. Deadlocks, deadlock prevention, deadlock avoidance, deadlock detection.

Memory management, contiguous allocation, paging, segmentation, virtual memory, demand paging, page replacement, page replacement algorithms – first in first out algorithm, optimal algorithm, least recently used algorithm.

File concepts, directory structure, file protection, allocation of disk space.

I/O systems, I/O hardware – polling, interrupts, direct memory access. Disk scheduling, disk scheduling algorithms – first come first served algorithm, shortest seek time first algorithm, SCAN algorithm, C-SCAN algorithm, C-LOOK algorithm.

Protection and security in an operating system, access matrix, capabilities.

Case studies of Windows / LINUX operating System.

CSE 323A – ENGINEERING MANAGEMENT AND ECONOMICS (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Principle and Techniques of Management: Management function, theories of management and their application to Indian and International conditions. Responsibility, authority, leadership, motivation, co-ordination and co-operation. Change agent. Importance of organization charts and their application to Computer Industries.

Forms of Business: Proprietorship, partnership, joint stock companies, joint sectors and co-operative movements.

Financial Management: Objectives, functions and importance of financial management, Book-keeping, journals and ledgers, Balance sheet, profit and loss accounts, fund flows and financial ratios, sources of finance and Financial Institutions Interest and depreciation, Salvage value.

Cost Accountancy: Various types of costs, profit, volume ratio, Break even analysis and marginal costing.

Marketing Management: Concept of marketing and its various components.

Stores and Purchase Management: Function of store and purchase management. Economic order quantity, A-B-C analysis. Inventory control and management. Purchase procedure in Government, Public and Private undertakings. Floating of tenders. Contracts.

Production Planning and Control: Job, Batch and Mass production, Production efficiency, productivity. Site selection, Production planning, Routing, scheduling and follow up. Elements of time and motion study. Quality control and quality assurance.

Nature and Scope of Economics: Basic concepts of managerial economics. Supply and demand, free competition, monopoly and oligopoly. Health of Indian Economics and factors affecting it.

Feasibility Reports: Preparation of feasibility, techno-economic and project reports.

Government Organizations: Department of Electronics, NASSCOM , STPI, Free trade zones for Electronics and computer industries, ministry of IT and its role.

CSE 325A – ARTIFICIAL INTELLIGENCE (CSE/IT)

3L, IT 3 Hours, 60 Marks

Defining artificial intelligence (AI), historical foundations, development of logic, turing test, AI application areas.

Prepositional calculus, syntax and semantics, Predicate calculus syntax and semantics. Inferencing and unification.

Searching structures and strategies for state space search, using the state space to represent reasoning with the predicate calculus. Heuristic searches and algorithms and use of heuristics in games. Control and implementations of state space search, recursion-based search, pattern directed search and Production systems.

Languages for AI, problem solving, introduction to Prolog, its syntax, abstract data types, production system and designing of alternative search strategies.

Overview of expert system, knowledge engineering process, conceptual models. Framework of organization and applying human knowledge. Managing uncertainty in expert system—concepts of Bayesion probability theory, non-monotonic logic and reasoning with belief, fuzzy logic and Dempster/Shafer approaches to uncertainty. Case studies of typical expert system.

Knowledge representation and its issues, network representation, conceptual graphs and structured representation.

Automated reasoning, resolution theorem proving issues and design of automated reasoning programs.

CSE 328A- ROBOTICS (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction: Automation and Robotics, CAD/CAM for Robotics – An overview of Robotics and applications – classification by coordinate system and control system.

Components of the Industrial Robotics: Functional diagram, representation of robot arms, common types of arms. Components, Architecture, degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

Motion Analysis: Homogeneous transformations as applicable to rotation and translation, numerical problems. Manipulator Kinematics: Specifications of matrices, D-H notation, joint coordinates and world coordinates. Forward and inverse kinematics numerical problems.

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages.

Robot actuators and Feed back components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

Introduction to Microcontroller Families, Introduction to AVR microcontrollers, Basic Idea of Interfacing of: LEDs, Switches, Relays, LCD, 7 Segment Display, ADC, Stepper Motors, DC Motors, IR Sensors, Serial Communication, GSM module, GPS module, I2C devices, PWM Techniques

Software tools for robot programming, Cross Compilers. Machine vision and image processing
Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Mini software simulation project.

B.E. FINAL YEAR (COMPUTER SCIENCE & ENGINEERING)
SEMESTER VII EXAMINATION SCHEME 2017

A. THEORY PAPER											
Subject Nomenclature	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Contact	Credit	Unit	Exam. Hrs.	Marks		
									Theory	Practicals & sessionals	Total
CSE 411A	Design & Analysis of Algorithms (CSE/IT)	3	1	-	4	4	1	3	60	--	60
CSE 412A	Net Centric Computing (CSE)	3	1	2	6	5	1	3	60	--	60
CSE 413A	Software Engineering (CSE/IT)	3	1	2	6	5	1	3	60	--	60
CSE 414A	Principles of Compiler Design (CSE)	3	1	2	6	5	1	3	60	--	60
CSE A	Elective – I	3	1	2	6	5	1	3	60	--	60
	Total (A)	15	5	8	28	24	5	-	300	--	300
B. PRACTICALS AND SESSIONALS											
CSE 412B	Net Centric Computing Laboratory (CSE)			2					--	60	60
CSE 413B	Software Engineering Laboratory (CSE/IT)			2					--	60	60
CSE 414B	Compiler Design Laboratory (CSE)			2					--	60	60
CSE B	Elective – I Laboratory			2					--	60	60
CSE 415 D	Seminar (CSE)			2	2	1	½	-	--	60	60
	Total (B+D)	-	-	8	-	-	-	-	--	300	300
	Total of Semester (A+B+D)	15	5	8	28	24	5	-	300	300	600

For a pass, a candidate must obtain:
(a) 35 percent in each of the written paper, (b) 50 percent in each of practical and sessionals, and (c) 45 percent in the Grand Total

List of Elective –I:
CSE 451A – Soft Computing (CSE)
CSE 452A – Image Processing (CSE/IT)
CSE 453A – Client-Server Technology (CSE/IT)
CSE 454A – Multimedia Technology (CSE/IT)
CSE 455A – Computer Vision & Robotics (CSE)
CSE 456A – Web Technology (CSE/IT)
CSE 457A – Digital Signal Processing (CSE/IT)

SEVENTH SEMESTER

CSE 411A - DESIGN AND ANALYSIS OF ALGORITHMS (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction: Algorithm and its specification, performance analysis and Randomized Algorithms. Random access machines (RAM), computational complexity of RAM program. Time and Space complexity, Asymptotic notations (Big-O,θ,Ω, and small-o).

Design of Efficient Algorithms: Designing Methods. *Divide and conquer*: Binary Search, finding maximum and minimum, Merge Sort, Quick Sort. *Greedy methods*: Knapsack problem, tree vertex splitting, minimum cost spanning tree. *Dynamic programming:* Matrix Chain Multiplication, Longest Common Subsequence, Multi Stage Graph and 0/1 Knapsack Problem. *Branch and Bound:* Traveling Salesman Problem and Lower Bound Theory.

Sorting and Comparative study**:** Algorithms and comparisons of Radix sort, Heap sort, Merge sort and Quick sort. Order statistics and expected time for order statistics.

Matrix multiplication and related operations: Strassen's Matrix Multiplication Algorithm, inversion of matrices, LUP decomposition of matrices and its applications.

Advanced Trees: Definitions Operations on Weight Balanced Trees (Huffman Trees), 2-3 Trees and Red- Black Trees. Augmenting Red-Black Trees to Dynamic Order Statistics and Interval Tree Applications.

Graph Theory Algorithms: Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing, Breadth First and Depth First Search, Vertex cover problem.

Problem Classes: NP, NP-Hard and NP-Complete. Decision Problems. Polynominal reductions. Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem.

Randomized Algorithms: Randomized Turing machine and its complexity. Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT.

CSE 412 A – NET-CENTRIC COMPUTING (CSE)

3L, 1T 3 Hours, 60 Marks

Net-centric distributed computing approach: Introduction to net-centric distributed system model.

Inter-process communication: API for internet protocols (socket programming in UNIX and JAVA), external data representation and marshalling, client-server and group communication.

Distributed objects and remote invocation: Communication among distributed objects, RPC, RMI, event and notifications, Java RMI case study.

Name services: Name service and domain name systems (DNS), directory and discovery services.

Distributed file system: File service architecture, file sharing, caching, scalability, case study of distributed file systems like NFS and Andrew file system.

Distributed shared memory: Design and implementation issues, sequential and release consistency, case study of java spaces.

Time and global system: Clocks, events and process state, synchronizing physical clocks in distributed environment, logical time and logical clocks, global states.

Coordination and agreement: Distributed mutual exclusion, election multicast communication.

Replication: Architecture of replication, consistency and request ordering, gossip architecture, introduction to process groups.

CSE 413A- SOFTWARE ENGINEERING (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction, software characteristics and software crisis. The software engineering approach; software process & process maturity. Various software development models. Software life cycle concept.

The software project management concepts and team organization. Software process and project metrics. Software measurement. Metrics for software quality and its integration with the software process.

Software scope/project estimation – the COCOMO model and the Function Point approach.

Software quality assurance. Software reviews, cost impact and software defects. Formal Technical Reviews, software reliability.

Conventional methods for software engineering. Analysis concepts and principles. The software requirements specifications. Software prototyping.

Software design and software engineering, software architecture. Effective modular design – functional independence, cohesion and coupling concepts. Component level/procedural design.

Software testing techniques and strategies.

CSE 414 A - PRINCIPLES OF COMPILER DESIGN (CSE)

3L, 1T 3 Hours, 60 Marks

Introduction to translators , compilers, interpreters, compilation process.

Lexical analyzer, input buffering, specification and recognition of tokens, regular expressions to NFA, minimization of DFA, keywords and reserve word policies, LEX - the lexical analyzer generator.

Syntax analyzer, context free grammars, top down parsing, Brute force parser, recursive descent parser, LL (1) parser. Bottom up parsing, operator precedence parsing, LR parser, LALR parser, YACC - the parser generator.

Syntax directed translation schemes, implementation of syntax directed translators, synthesized attributes, inherited attributes, construction of syntax trees, bottom up evaluation of S- attributed definitions, L- attributed definitions, top down translation of L - attributed definitions.

Errors, lexical phase errors, syntactic phase errors.

Intermediate languages, postfix notation, syntax trees, parse trees, three address code- quadruples, triples and indirect triples.

Translation of assignment statements, boolean expressions, statements that alter flow of control, array references, procedure calls, declarations, case statement, record structures.

Symbol tables, operation on symbol tables, symbol table organization for non-block structured languages, symbol table organization for block-structured languages.

Run time storage management, storage allocation and referencing data in block structured languages, storage allocation in FORTRAN.

Code optimization, sources of optimization, loop optimization, DAG and optimization of basic blocks.

Code generation, a machine model, next use information, register allocation and assignment, a simple code generator, code generation from DAG's, peephole optimization.

ELECTIVE-I

CSE 453A – CLIENT-SERVER TECHNOLOGY (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction: Client/Server architecture, Benefits, application, centralize multiuser, Distributed single user architecture, distributed computing environment.

Approach to Distribution: Distributed models, multi tiered environment, cooperative processing, application components, and distribution points. Presentation distribution, distributed processing, distributed function and transaction processing, data distribution.

Client technologies: Function, Application and tools, operating system, hardware plate forms, database access, interprocess communication tools.

Server technologies: Function, server operating system, hardware plate forms, data access, distributed data access, database engines.

System networks Architectures: Components, layers, pear-to-pear communication between SNA layers.

Data Management: Distributed data management, method of the distribution, distributed data access. Database transaction management.

Distributed DBMS: Architecture, storing data in a distributed DBMS, Distributed catalog, management, Distributed query processing, Update distributed data. Introduction to distributed transactions, distributed concurrency control, and distributed recovery.

CSE 454 A – MULTIMEDIA TECHNOLOGY (CSE/IT)

3L, 1T 3 Hours, 60 Marks

Introduction to multimedia and its applications, Basic requirements for multimedia, Multimedia building blocks - Text, Sound, Images, Animation, Video and related tools.

Multimedia Hardware: SCSI, MCI, Memory and storage devices, Output Hardware, Communication devices.

Multimedia Software: Basic tools - Painting and drawing tools, 3-D modelling and animation tools, Images and editing tools, OCR software, Sound Editing programs, Animation, Video and Digital Movies, Video Formats, Compressing movie files.

Multimedia Authoring tools: Selecting a right tool based on various features, card and page based authoring tools, Icon based authoring tools, Time based authoring tools, Object - Oriented Tools.

Assembling and delivering a project: The multimedia team, Planning and costing, designing and producing.

Multimedia and the internet: working of internet, Tools for www - web page makers and editors, HTML and Multimedia, Video on demand, Images, sound and animation for the web.

B.E. FINAL YEAR (COMPUTER SCIENCE & ENGINEERING)
SEMESTER VIII EXAMINATION SCHEME 2017

Subject Nomenclature	Subject	Lecture (L)	Tutorial (T)	Practical (P)	Contact	Credit	Unit	Exam. Hrs.	Marks		
									Theory	Practicals & Sessionals	Total
A. THEORY PAPER											
CSE 421A	Advanced Computer Architecture (CSE)	3	1	-	4	4	½	3	50	--	50
CSE 422A	Embedded Systems (CSE)	3	1	2	6	5	1	3	50	--	50
CSE A	Elective – II	3	1	2	6	5	1	3	50	--	50
CSE A	Elective III	3	1	2	6	5	1	3	50	--	50
	Total (A)	12	4	6	22	19	3½	-	200	--	200
B. PRACTICALS AND SESSIONALS											
CSE 422B	Embedded Systems Laboratory (CSE)			2					--	50	50
CSE B	Elective –II Laboratory			2					--	50	50
CSE B	Elective –III Laboratory			2					--	50	50
CSE 429D	Project (CSE)			6	6	3	½		--	100	100
CSE 435C	Practical Training (CSE)						1½		--	75	75
CSE 436C	Educational Tour (CSE)						½		--	25	25
	Total (B+C+D)			14						400	350
	Total of Semester (A+B+C+D)	12	4	14	30	23	6½		200	400	600
	Total of year								600	600	1150
Joint award for VII & VIII Semesters (Marks not counted for award of division / degree)											
FE 223E	Co-curricular Activities	-	2	2	2	1	½	-			100

For a pass, a candidate must obtain:
(a) 35 percent in each of the written paper,(b)50 percent in each of practical and sessionals, and (c)45 percent in the Grand Total

List of Elective – II

CSE 461A – Intelligence Database System (CSE/IT)
CSE 462A – Object Oriented DBMS (CSE/IT)
CSE 463A – Object Oriented Software Engineering (CSE/IT)
CSE 464A – Real Time Systems (CSE)
CSE 466A – Graph Theory (CSE/IT)
CSE 470A – Computational Science (CSE/IT)

List of Elective – III

CSE 465A – Information Theory & Coding (CSE/IT)
CSE 467A – Simulation and Modeling (CSE)
CSE 468A – Mobile Computing (CSE/IT)
CSE 469A - Bioinformatics (CSE/IT)

EIGHTH SEMESTER

CSE 421 A - ADVANCED COMPUTER ARCHITECTURE (CSE)

3L, 1T 3 Hours, 50 Marks

Introduction to parallel processing and trends: parallelism in uni-processor system, parallel computer structure, architectural classification schemes for parallel computers, multiplicity of instruction – data streams, serial versus parallel computers, parallelism versus pipelining.

Memory hierarchy: hierarchical memory structures, virtual memory system, memory allocation and management.

Principles of pipelining: pipelining principles and classifications, general pipelines and reservation tables, interleaved memory organization, instruction pre-fetch and branch handling, data buffering and busing structures, internal forwarding and register tagging, hazard detection and resolution, job sequencing and collision prevention, dynamic pipelines and reconfigurability.

Structure for array processors: SIMD computer organization, masking and data routing mechanism Inter PE communication, introduction to associative array processing.

Multiprocessor architecture: loosely coupled and tightly coupled multiprocessors, processor characteristics for multiprocessing, interconnection networks, cache coherence protocols.

Introduction to advance processors: Data flow computers, the VLIW architecture, fault tolerant architecture and study of TANDEM HIMALAYAN K2 system architecture.

CSE 422 A - EMBEDDED SYSTEMS (CSE)

3L, 1T 3 Hours, 50 Marks

Introduction to Embedded Systems and their basics, Real time systems, Multitasking. Use of programming languages, Real time kernel, size of embedded programs.

Data Representation – Fixed Precision Binary numbers, binary representation of Integers and Real numbers, ASCII and BCD.

Hardware requirements and time constraints, reliability and cost, design decisions.

Selection of microprocessor/microcontroller for embedded systems, computing the size of memory required RAM and ROM.

S/W tools for embedded system development- High level languages support, Use of cross compilers, Use of tools sets in Embedded Linux , GNU Tool chain for cross compiling.

Concurrent Software, Scheduling, Memory Management, Shared Memory, System Initialization.

Mixing C and assembly, C-Run time environment, Costing of an Object, Using Unions.

Case Study: Use of tool-sets in Embedded Linux, GNU Tool Chain for cross compiling.

ELECTIVE-II

CSE 462A–OBJECT ORIENTED SOFTWARE ENGINEERING (CSE/IT)

3L, 1T 3 Hours, 50 Marks

Object-oriented concepts and principles. Identifying the elements of an object model. Object oriented projects metrics and estimation.

Object-oriented analysis: Domain analysis, the OOA process, the object-relationship model.

Design for object- oriented systems. The system design process.

Object-oriented testing - testing OOA and OOD models. The object-oriented testing strategies. Inter class testing.

Technical metrics for O-O systems. Class-oriented metrics & metrics for O-O projects.

Advanced topics in software engineering. Component-based software engineering and development. Classifying and retrieving components.

Review of CASE tools.

CSE 464A – REAL TIME SYSTEMS (CSE)

3L, 1T 3 Hours, 50 Marks

Introduction to real-time computing: Characteristics of real-time system & tasks, performance measurement of real-time systems, estimation of program runtime.

Real-time system design: hardware requirements, systems development cycle, data-transfer techniques, synchronous and asynchronous data-transfer techniques, standard interfaces.

Task assignment and scheduling: priority scheduling, dynamic scheduling, buses in dynamic scheduling, dynamic priority assignment. Real-time programming languages and tools. Desired language characteristics, data typing. Control structure, run-time error handling, over-loading and generics, run-time support, real-time databases.

Real-time communication, fault-tolerance techniques, cause of failure, fault types, fault detection, redundancy, integrated failure handling.

Reliability evaluation techniques; parameter values, reliability model for hardware redundancy, software error model, clock synchronization.

CSE 466 A - GRAPH THEORY (CSE/IT)

3L, 1T 3 Hours, 50 Marks

Introduction to graphs, applications, representation of graphs. Walk, Paths and circuits. Isomorphism, connectedness, Euler graph, subgraph, operations on graph, Hamiltonian Paths and Circuits, Traveling Salesman problem, algorithm of graph traversals, connectedness.

Tree, Spanning tree, Fundamental Circuits, Cut-sets, Connectivity and Separability, 1-isomorphism, 2-Isomorphism, Network flow, Algorithm for spanning tree, cut vertex.

Planar and Dual graphs, Kuratowski's two graph, representations of planar graph, algorithm for detection of planarity, geometric and combinatorial dual graph, thickness and crossings.

Matrix representation of graphs, incident matrix circuit matrix, cutset matrix, path matrix, adjacency matrix. Coloring, covering and partitioning, chromatic number, chromatic polynomial, matching, bipartite graph, four color problem.

Directed graphs, types, binary relations, connectedness, Euler digraph, tree, fundamental circuits, adjacency matrix, tournaments, acyclic digraph, decyclization, algorithm for finding directed circuits.

CSE 470A – COMPUTATIONAL SCIENCE (CSE/IT)

3L, 1T 3 Hours, 50 Marks

Modeling and Simulation: Definition of simulation and modeling; relationship between simulation and modeling, Purpose including benefits and limitations: role – addressing performance, optimization; supporting decision, making, forecasting, safety considerations.

Application areas: healthcare (including assisting with diagnostics); economics and finance; city and urban simulations; simulation in science and in engineering.

Types of simulations – physical, human in the loop, interaction, computer, virtual reality. The simulation process. simplifying, assumptions; validation of outcomes.

Model building: use of mathematical formula or equation, graphs, constraints. Methodologies and techniques. Use of time stepping for dynamic systems.

Theoretical considerations; Monte Carlo methods, stochastic processes, queuing theory. Software in support of simulation and modeling; packages, languages.

Operations Research: Linear programming: Integer programming, The Simplex method, Probabilistic modeling, Queuing theory, Markov models and chains, Prediction and estimation, Decision analysis, Forecasting, Risk management.

Software tools for Simulations and Modeling.

ELECTIVE-III

CSE 465 A - INFORMATION THEORY AND CODING (CSE/IT)

3L, 1T 3 Hours, 50 Marks

Uncertainty, information, measure of information, average information, entropy, property of entropy, information rate. Discrete memoryless source, Source coding theorem,

Discrete memoryless channel, self and Mutual information, properties, channel capacity, channel coding theorem, Shannon – Hartley theorem, Information capacity theorem.

Data compaction, prefix coding, Huffman coding, Lempal-Ziv coding. Compression of information.

Type of errors, codes, error control coding, linear block code, error detection and correction codes, syndrome decoding, cyclic codes, hamming code, BCH, convolution codes, encoders and decoders, performance of codes.

CSE 469A-BIOINFORMATICS (CSE/IT)

3L, 1T 3 Hours, 50 Marks

Introduction to Molecular Biology and Biological chemistry: Genetic material, Gene structure and information content, protein structure and functions, nature of chemical bonds, molecular biology tools, genomic information content.

Data Searches and pair-wise alignments: Dot plots, Gaps, Dynamic Programming, database searches and family of algorithms –BLAST and FASTA.

Substitution patterns: Pattern substitution with in genes, estimating substitution numbers, variation of evolutionary rates between genes, molecular clocks.

Phylogenetics: Its history, phylogentic trees, distance matrix methods. Character-based methods – parsimony, ancestral sequences. Strategies for faster searches – branch and bound, heuristic. Consensus trees, parametric tests. The tree of life.

Genomics and gene Recognition: prokaryotic and eukaryotic genomes and their structures, open reading frames, gene expression.

Protein and RNA structure prediction: Amino-acids, polypeptide composition, structure. Algorithms for modeling protein folding, and reverse protein folding.

Information integration for life science discovery: Nature of biological data, data sources, challenges in information integration.