Scheme and Syllabus

For

B. Tech. (CSE)
FOUR YEAR FULL-TIME PROGRAMME

Session-2017-18

MEWAR UNIVERSITY, CHITTORGARH, RAJASTHAN

First Semester (Common to all Disciplines)

Course Code	Course Title	L	T	P	Credit Hours	Assignments / Lab Record	Teachers' Evaluation	External Examination /Viva-voce	Total Marks
		Contact Hours per week				Internal Assessment/Evaluation		External Examination	Total Marks
BS-101	Engineering Physics-I	3	1	-	4.0	35	15	50	100
BS-103	Engineering Mathematics-I	3	1	-	4.0	35	15	50	100
BS-105	Engineering Chemistry	3	1	-	4.0	35	15	50	100
ES-101	Engineering Graphics & Drawing	1	3	-	4.0	35	15	50	100
ES-103	Fundamentals of Computers and Programming	3	1	-	4.0	35	15	50	100
ES-105	Basics of Electrical Engineering	3	1	-	4.0	35	15	50	100
BS-107	Physics Lab-I	-	-	2	1.0	15	10	25	50
BS-109	Chemistry Lab	-	-	2	1.0	15	10	25	50
ES-107	Computer Lab	-	-	2	1.0	15	10	25	50
ES-109	Electrical Engineering Lab	-	-	2	1.0	15	10	25	50
ES-111	Workshop Practice-I	-	-	2	1.0	15	10	25	50
ELGA-101*	English Language and General Awareness-I	2	-	-	-	25	25	-	-
		16	08	10					
Total Semester Credits = 29.0						Total Semester Marks=850			

*Compulsory but not counted towards credit hours

Second Semester (Common to all Disciplines)

Course Code	Course Title	Contact Hours per week	Credit Hours	Internal Assessment/Evaluation	External Examination	Total Marks

		L	T	P		Assignments/ Lab Record	Teachers' Evaluation	/Viva-voce	
BS-102	Engineering Physics-II	3	1	-	4.0	35	15	50	100
BS-104	Engineering Mathematics-II	3	1	-	4.0	35	15	50	100
ES-102	Introduction to Environmental Sciences	3	1	-	4.0	35	15	50	100
ES-104	Introduction to CADD	3	1	-	4.0	35	15	50	100
ES-106	Basics of Electronics Engineering	3	1	-	4.0	35	15	50	100
ES-108	Basics of Mech Engineering	3	1	-	4.0	35	15	50	100
BS-108	Physics Lab-II	-	-	2	1.0	15	10	25	50
ES-110	Electronics Engineering Lab	-	-	2	1.0	15	10	25	50
ES-112	Workshop Practice-II	-	-	2	1.0	15	10	25	50
ES-114	CAD Lab	-	-	2	1.0	15	10	25	50
HS-102	Language Lab	-	-	2	1.0	15	10	25	50
ELGA-102*	English Language and General Awareness-II	2	-	-	-	25	25	-	-
		18	06	10					
Total Semester Credits = 29.0						Total Semester Marks=850			

*Compulsory but not counted towards credit hours

Third Semester

Course Code	Course Title	Contact Hours per week			Credit Hours	Internal Assessment/Evaluation		External Examination /Viva-voce	Total Marks
		L	T	P		Assignments/ Lab Record	Teacher's Evaluation		
CSE-201	Data Structures and Algorithms	3	1	-	4.0	35	15	50	100
CSE-203	Digital and Analog Communication	3	1	-	4.0	35	15	50	100
CSE-205	Digital Electronics	3	1	-	4.0	35	15	50	100
CSE-207	Programming Methodology and File Structures	3	1	-	4.0	35	15	50	100
CSE-209	Operating System Concepts	3	1	-	4.0	35	15	50	100
HS-201	Essentials of Management and Organizational Behavior	3	1	-	4.0	35	15	50	100
CSE-211	Data Structures and Algorithms Lab	-	-	2	1.0	10	15	25	50
CSE-213	Digital Electronics Lab	-	-	2	1.0	10	15	25	50
CSE-215	Programming Methodology and File Structures Lab	-	-	2	1.0	10	15	25	50
CSE-217	Operating System Lab	-	-	2	1.0	10	15	25	50
ELGA-201*	English Language and General Awareness-III	2	-	-	-	25	25	-	-
		18	06	8					
Total Semester Credits = 28.0						**Total Semester Marks=800**			

*Compulsory but not counted towards credit hours

Fourth Semester

Course Code	Course Title	Contact Hours per week			Credit Hours	Internal Assessment/Evaluation		External Examination /Viva-voce	Total Marks
		L	T	P		Assignments/ Lab Record	Teacher's Evaluation		
CSE-202	Computer Organization and Architecture	3	1	-	4.0	35	15	50	100
CSE-204	Object Oriented Programming in C++	3	1	-	4.0	35	15	50	100
CSE-206	Website Design and Applications	3	1	-	4.0	35	15	50	100
CSE-208	Data base Management System	3	1	-	4.0	35	15	50	100
CSE-210	Computer Network	3	1	-	4.0	35	15	50	100
HS-202	Fundamentals of Business & Economics	3	1	-	4.0	35	15	50	100
CSE-212	Object Oriented Programming in C++ Lab	-	-	2	1.0	15	10	25	50
CSE-214	Website Design and Applications Lab	-	-	2	1.0	15	10	25	50
CSE-216	Data base Management System Lab	-	-	2	1.0	15	10	25	50
CSE-218	Computer Network Lab	-	-	2	1.0	15	10	25	50
ELGA-202*	English Language and General Awareness-IV	2	-	-	-	25	25	-	-
		18	06	8					
Total Semester Credits = 28.0						**Total Semester Marks=800**			

*Compulsory but not counted towards credit hours

Fifth Semester

Course Code	Course Title	Contact Hours per week			Credit Hours	Internal Assessment/Evaluation		External Examination /Viva-voce	Total Marks
		L	T	P		Assignments/ Lab Record	Teacher's Evaluation		
CSE-301	Internet technology and Network Programming	3	1	-	4.0	35	15	50	100
CSE-303	Design and Analysis of Algorithms	3	1	-	4.0	35	15	50	100
CSE-305	Programming Language Concepts	3	1	-	4.0	35	15	50	100
CSE-307	Microprocessors and Microcontrollers	3	1	-	4.0	35	15	50	100
CSE-309	Automata Theory	3	1	-	4.0	35	15	50	100
CSE-311	Java Programming	3	1	-	4.0	35	15	50	100
CSE-313	Microprocessors and Microcontrollers Lab	-	-	2	1.0	15	10	25	50
CSE-315	Design and Analysis of Algorithms Lab	-	-	3	1.5	15	10	25	50
CSE-317	Java Programming Lab	-	-	3	1.5	15	10	25	50
ELGA-301*	English Language and General Awareness-V	2	-	-	-	25	25	-	-
		18	06	08					
Total Semester Credits = 28.0						**Total Semester Marks=750**			

*Compulsory but not counted towards credit hours

Sixth Semester

Course Code	Course Title	Contact Hours per week			Credit Hours	Internal Assessment/Evaluation		External Examination /Viva-voce	Total Marks
		L	T	P		Assignments/ Lab Record	Teacher's Evaluation		
CSE-302	Multimedia technologies	3	1	-	4.0	35	15	50	100
CSE-304	Artificial intelligence and Robotics	3	1	-	4.0	35	15	50	100

Course Code	Course Title	L	T	P	Credit Hours	Assignments/Lab Record	Teacher's Evaluation	External Examination/Viva-voce	Total Marks
CSE-306	Compiler design	3	1	-	4.0	35	15	50	100
CSE-308	Software Engineering	3	1	-	4.0	35	15	50	100
CSE-310	Advanced Computer Architecture	3	1	-	4.0	35	15	50	100
CSE-312	Computer Graphics and Image Processing	3	1	-	4.0	35	15	50	100
CSE-314	Compiler Design Lab	-	-	2	1.0	15	10	25	50
CSE-316	Multimedia Technologies Lab	-	-	2	1.0	15	10	25	50
CSE-318	Computer Graphics and Image Processing lab	-	-	2	1.0	15	10	25	50
CSE-320	Seminar	-	-	2	1.0	25	25	-	50
ELGA-302*	English Language and General Awareness-VI	2	-	-	-	25	25	-	-
		18	**06**	**08**					
Total Semester Credits = 28.0						**Total Semester Marks=800**			

*Compulsory but not counted towards credit hours

Seventh/Eighth Semester

Course Code	Course Title	Contact Hours per week			Credit Hours	Internal Assessment/Evaluation		External Examination /Viva-voce	Total Marks
		L	T	P		Assignments/ Lab Record	Teacher's Evaluation		
CSE-421	Departmental Elective-I	3	1	-	4.0	35	15	50	100
CSE-422	Departmental Elective-II	3	1	-	4.0	35	15	50	100

CSE-423	Departmental Elective-III	3	1	-	4.0	35	15	50	100
CSE-424	Departmental Elective-IV	3	1	-	4.0	35	15	50	100
OE-431	Open Elective-I	3	-	-	3.0	25	-	50	75
OE-432	Open Elective-II	3	-	-	3.0	25	-	50	75
		18	04	-					
Total Semester Credits = 22.0						**Total Semester Marks=550**			

Seventh/Eighth Semester

Course Code	Course Title	Contact Hours per week			Credit Hours	Internal Assessment/Evaluation		External Examination /Viva-voce	Total Marks
		L	**T**	**P**		Assignments/ Lab Record	Teacher's Evaluation		
CSE-421/422	Industrial Training/Project	-	-	32	16	100	100	200	400
CSE-450	Comprehensive Academic and General Proficiency Viva-Voce	-	-	-	04	-	-	100	100
		-	**-**	**32**					
Total Semester Credits = 20.0						**Total Semester Marks=500**			

B TECH (1ˢᵗ SEMESTER) COMPUTER SCIENCE AND ENGINEERING
ES-103FUNDAMENTALS OF COMPUTERS AND PROGRAMMING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the components of a Computer System, To understand basic Concepts of Operating System and Computer Networks, To have an overview of different types of operating systems like DOS, UNIX/LINUX Operating System, Windows XP, To have a thorough knowledge of various System Software and Programming languages, To study different kinds of Number system, To know the concepts of Problem Solving, To have a thorough knowledge of C language and its programming

UNIT-I	Brief history of development of Computers, Introduction to Digital System, Von Newman Concept, Hypothetical Decimal Computer, Hardware Organization of Computer System, Input /Output devices, Storage devices, Input /Output Ports and Connectors, Introduction to Operating Systems, Functions of Operating Systems, Classifications of Operating systems, Basic introduction to DOS, UNIX/LINUX Operating System, Windows XP.
	Data Communication, Network Devices-LAN, LAN Topologies, WAN, OSI Reference model, Introduction to internet and Protocols: TCP/IP Reference model, Backbone Network, Network connecting devices, Hypertext documents, HTTP, DNS, Network security.
UNIT-II	System Software, Application Software, Programming languages, Machine language, Assembly language, Low level language, High level language, Types of high level language, Compiler, Interpreter, Assembler, Loader, Linker, Relationship between Compiler, Interpreter, Loader &Linker, Introduction to MS-OFFICE.
	Number System, Binary System, Conversion between Number Bases, Binary Addition, Subtraction of 1's Complement & 2's Complement Method, Octal System, Hexadecimal System, Binary Coded Decimal, ASCII system
UNIT-III	Flowcharts & Algorithms, Problem Definition Phase, General Problem Solving Strategies, Top down, Breaking a Problem into sub Problems, Choice of a Suitable Data Structure, Documentation of Programs, Debugging of Programs.
	Introduction to C, Preprocessor, Directives, Header files, Data Types & Qualifiers, Operators & Expressions, Enumerations Data input & output, Variables and arithmetic Expressions, The for statement, Symbolic Constant, Character Input and output, Arrays, Functions, Arguments- call by value, Character Arrays, External Variables and Scope, Types, Operators and Expressions: Variable Names, Data types and Sizes, Constants, Declarations, Arithmetic operators, Relational and logical operators, Type conversions Bitwise operator, Assignment operators and operators and expressions, Conditional ,expressions, Precedence and order of evaluation, Related exercises in C.
UNIT-IV	Statement and blocks, IF–else, Else–if, Switch,Loops- while and for, Loops –do –while, Break and continue, Goto and labels, Functions and program structure, Basics of functions, External variables, Scope rule, Header file, Static variables, Register variables, Block structure, Initialization, Recursion, Related exercises in C.
	Pointers and addresses, Pointers and function arguments, Pointers and arrays, Address arithmetic, Character pointers and functions, Pointer arrays: pointers to pointers, Multi-dimensional arrays, related exercises in C.
	Basics of structure, Structures and functions, Arrays of structures, Pointers to structure, Table lookup, Unions, related exercises in C.
	Standard input and output, Formatted output-printf, Variable-length arguments list, Formatted input-scanf, File access, Line input and output,related exercises in C.

Recommended Books:
- Rajaraman V, Computer programming in C, PHI
- Sharma A K,Fundamental of Computers & Programming with C, Dhanpat Rai Publications, New Delhi
- KernighanBrian W and Ritchi Dennis,The C Programming Language, 2nd Edition, PHI
- GottfriedBS,Programming in C, SCHAUM SERIES,TMH

Silberschatz Abraham, Baer Peter and Greg Galvin, Operating System Concepts, 7ᵗʰEdition, John Wiley & Sons Inc

B TECH (1st SEMESTER) COMPUTER SCIENCE AND ENGINEERING

ES-103FUNDAMENTALS OF COMPUTERS AND PROGRAMMING LAB

List of Experiments

1. Introduction to MS-DOS and its commands.
2. Introduction to Linux operating system and its commands
3. Introduction to MS-Word.
4. Write a program to print "Hello".
5. Write a program to add 2 constant numbers.
6. Write a program to perform all the arithmetic operations.
7. Write a program to find area of circle.
8. Write a program to find area of triangle.
9. Write a program to calculate simple interest.
10. Write a program to swap two numbers using three variables.
11. Write a program to find largest of two numbers using if-else statement.
12. Write a program to find smallest of two numbers using if-else statement.
13. Write a program to find even/odd number using if-else statement.
14. Write a program to find largest of three numbers using nested if-else statement.
15. Write a program to find whether the character is vowel or consonant using switch-case statement.
16. Write a program to print the series of n-numbers using for loop structure.
17. Write a program to calculate factorial of a given number using for loop.
18. Write a program to print the following with the help of FOR and WHILE loop.
    ```
    *
    **
    ***
    ****
    ```
19. Write a program to print (1 to 10 numbers) using 1-D array.
20. Write a program for Arithmetic operation using Functions.

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-201   DATA STRUCTURES AND ALGORITHMS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of this course is to facilitate the students with the basics of Data structure and different applications. After undergoing this course the students will have the understanding of various data structures either linear or non linear, Their applications, Related algorithms(sorting and searching)

UNIT-I	Introduction, Mathematical notations and functions, Algorithmic notation, Complexity of algorithms, Asymptotic notations for complexity of algorithms, Internal representation, Integers, Floating point numbers, Packed decimal, Characters, Data types and data object, Fundamentals of pointers in C, Pointer declaration, Passing pointer to functions, Pointers and 1-d arrays, Dynamic memory allocation, Operation on pointers, Pointers and 2-d arrays, Files and related operations in C, Implementations in C.
UNIT-II	Linear Data Structures: Definition of array, Representation of array in storage, Address mapping function, Access table method of storage of arrays, Sparse arrays, Manipulation transpose, Addition, Multiplication of sparse matrices, Application of arrays, Stack and Queues, Representation and implementation, Multiple stacks and queues, Implementation of recursion using stack, Linked Lists, Needs for the structure and justification of the study, Representation and Implementation, Doubly linked list, Circular linked list, Linked list application, Memory Management, Static memory management, Dynamic memory management.
UNIT-III	Nonlinear Data Structures: Trees-Definitions, Terminologies and properties, Binary tree representation, Traversals and applications, Threaded binary trees, Binary Search Trees, AVL Trees, M-way Search Trees, B-trees, B*-trees, B+-trees, Optimum binary search trees, Multidimensional binary search trees, Graphs: Definition, Terminologies and properties, Graph representations, Minimum spanning trees, Depth-first search, Breadth-first search, Priority Queues, Heap Structures, Binomial Heaps.
UNIT-IV	Sort and Search Algorithms: Efficiency in terms of time and storage requirements, Bubble sort, Selection sort, Heap sort, Merge sort, Quick-sort, Hashing, General radix sort, Sequential search, Binary search, Searching and data modification.

Recommended Books:
- Tanenbaum A M, Data structures using C, PHI

- Horowitz E and Sahni S, Fundamentals of Data Structures, Galgotia
- Patel R B, Expert Data Structures in C, Khanna Publishers
- Kruse R L, Data Structures & Program Design in C, PHI
- Knuth D F, The art of Computer Programming Vol 1, Narosa Publications

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-203   DIGITAL AND ANALOG COMMUNICATION

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:

The objective of this course is to facilitate the student with the basics concept of digital communication and analog communication. After undergoing this course students will have the knowledge of communication system components, Data transmission system, Standards in data communications, Security in data communications, Different modulation technique and medium of communication.

UNIT-I	Introduction to Communication, Definition & means of communications, Block Diagram of Communication System, Block diagram of Electrical communication system, Radio Communication Digital and analog signals: sign waves, Square waves, Properties of signals: amplitude, Frequency, Phase, Theoretical basis for data communication: Fourier analysis: Fourier series and Fourier Transform (property, ESD, PSD and Raleigh) effect of limited bandwidth on digital signal, Fourier Transform for Various Signals, Analog-to-Digital Conversion
UNIT-II	Physical connections, Modulation, Definition of Modulation, Modulation Technique amplitude-, Frequency-, Phase- modulation, Data encoding: binary encoding (NRZ), Manchester encoding, Differential Manchester encoding, A Base Band Signal Receiver, Probability of Error, The Optimum Filter, Matched Filter, Probability of Error in Matched Filter, Transmission Media: Twisted pair-, Co-axial-, Fiber optic-cables, Wireless media Transmission impairments: attenuation, Limited bandwidth of the channels, Delay distortion, Noise, Data rate of the channels (Nyquist theorem, Shannon limit). Physical layer interfaces: RS 232, X.21 Coherent Reception, Coherent Reception of PSK and FSK, Non-Coherent Reception of FSK, PSK and QPSK, Calculation of Error Probability of BPSK and BFSK, Error Probability for QPSK Bit-by-Bit Encoding versus Symbol-by-Symbol Encoding, Relationship Between Bit Error Rate and Symbol Error Rate and Comparison of Modulation Systems.
UNIT-III	Communication modes: simplex, Half duplex, Full duplex, Transmission modes: serial, Parallel transmission, Synchronizations: Asynchronous, Synchronous transmission, Type of services: connection oriented, Connectionless services, Flow control: unrestricted simplex protocol, Simplex stop and wait protocol, Sliding window protocol, Switching systems: circuit switching, Packet switching: data gram, Virtual circuits, Permanent virtual circuits. Telephone Systems, PSTN, ISDN, Asynchronous Digital Subscriber Line. Multiplexing, Frequency Division, Time, Wave Division Multiplexing, Transmission errors: feedback-, Forward-error control approaches, Error detection, Parity check, Block sum check, Frame check sequences, Error correction: hamming codes, Cyclic redundancy check, Data encryption: secret key cryptography, Public key cryptography, Introduction to Data compression techniques.
UNIT-IV	Definition of Modulation, Analog Modulation, Amplitude, Frequency Modulation and Pulse Amplitude Modulation, Need for Modulation, Phase Modulations, Advantages of FM over AM, Types of AM Methods (AM, DSBSC, SSBSC), Frequency Modulation & Phase Modulation, Linear Modulation, Collector Modulator or Plate Modulator and Base Modulator, Non-linear Modulation, Balanced Modulator & Ring modulator, Generation of Frequency Modulation, Indirect Method of FM, Direct Method of FM, Reactance Modulator, Angle Modulation, And Bandwidth Consideration, Narrow Band and Wide Band FM, Comparison of FM & PM Pulse Modulations, Time division Multiplexing, FDM, Asynchronous Multiplexing, Digital Modulation, Binary Phase-Shift Keying (BPSK), Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), Quadrature Amplitude Shift Keying (QASK), Binary Frequency-Shift Keying (BFSK), Similarity of BPSK and BFSK, M-ary FSK, Minimum Shift Keying (MSK).ASK, FSK, PSK, DPSK, M-ary PSK, ASK, FSK.

Recommended Books:

- Tomasi W, Electronic communications systems, Pearson Education, 2th ed
- Taub H and Schilling D L, Principles of Communication Systems, TMH
- Wayne Tomasi, Electronic communications systems, 5th edition Pearson Education Asia
- Taub and Schilling, Principles of Communication Systems, TMH, IInd Edition
- Hancock J C, An Introduction to the Principles of Communication Theory, McGraw Hill
- Haykins S, Introduction to Analog and Digital Communication, Wiley
- Kennedy G and Davis B, Electronic communication systems, TMH
- Proakis J G, Salehi M, Communications Systems Engineering, PHI, 2nd ed
- Roddy D and Coolen J, Electronic Communications, PHI
- Haykins S, Communication Systems, Wiley

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-205   DIGITAL ELECTRONICS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics knowledge of digital components, Different behaviors of gates, Designing using gates and latches & their applications.

UNIT-I	Digital Electronics, Combinations of logic functions, Logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean function, Derived logic gates: Exclusive-OR, NAND, NOR gates, Their block diagrams and truth tables. Logic diagrams from Boolean expressions and vica-versa. Converting logic diagrams to universal logic. Positive, Negative and mixed logic. Number Systems: Number Systems (binary, Octal, Hexadecimal), Conversion from one system to another, Complements and codes, Arithmetic & Radix representation of different numbers. Sign & magnitude representation, Fixed point representation, Complement notation, Various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, Postulates of Boolean algebra. Theorems of Boolean algebra. Review of Number systems, Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes. Boolean algebra :Basic Definitions, Theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Logic Operations & Gates, Introduction to Boolean algebra, Boolean identities, Basic logic functions, Combinational logic, Standard forms of logic expressions. K-map representation, Simplification of logic expressions, Realization of logic expressions using AOI, NOR, NAND . Logic gate conversion. Map Method and Tabulation Method (2, 3, 4, 5, 6 variables).
UNIT-II	Design using gates, Karnaugh map and Quine Mcluskey methods of simplification. Combinational logic circuit design, Half and full adder, Subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier, Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, Demultiplexer, Encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, Encoders, Decoders and demultiplexers. Combinational Logic Design Using Msi Devices and LSI: Combinational Logic: Design Procedure, Arithmetic and Arithmetic Circuits, ProMultiplexers and Demultiplexers and their use as logic elements, Adders, Parallel Adder / Sub tractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices, Multiplexers, ROMs, PLA's, Arithmetic circuits, Seven-segment and alphanumeric display design
UNIT-III	Latches and application, Flip Flops : S-R, J-K, T, D, Master-slave, Conversions of flip-flops and applications, Triggering, Edge triggered, Analysis, State Reduction & Assignment, FF Excitation Tables, ASM Charts, Design Procedure, Shift registers, Sequence generators, Counters: synchronous and Asynchronous, Synchronous decade counter, Ring counters and Johnson Counter, Modulus counter, Skipping state counter, Design of counter, Design with State Equations, Counter applications, Design of Synchronous and Asynchronous sequential circuits. Registers: buffer register, Shift register. Digital Logic Gate & Families and Characteristic: Switching mode operation and application of p-n junction, Bipolar, MOS, CMOS Devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, CMOS and MOSFET logic families. Tristate logic, Interfacing of CMOS and TTL families. TTL logic gate characteristics, Theory & operation of TTL NAND gate circuitry, Open collector TTL, Three state output logic, TTL subfamilies, Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another.
UNIT-IV	Sample and hold circuit, Weighted resistor and R -2 R ladder D/A Converters, Specifications for D/A converters. A/D converters : Quantization, Parallel -comparator, Successive approximation, Counting type, Dual-slope ADC, Specifications of ADCs.

Recommended Books:

- Jain R P, Modern Digital Electronics(Edition III), TMH
- Mano M M and Ciletti M D, Digital Design, 4th Ed., Prentice Hall
- Balabanian N and Carlson B, Digital Logic Design Principles, John Wiley & Sons
- Malvino and Leach, Digital principles and applications, McGraw-Hill Book Co
- Kumar A A, Pulse and Digital Circuits, 2nd Ed., Prentice-Hall of India
- Floyd T L, Digital Fundamentals, 8th Ed., Pearson Education

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-207   PROGRAMMING METHODOLOGY & FILE STRUCTURE

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics methodology of programming and various file structures. After undergoing this course student will be able to understand various programming concepts, Their applications , File structures and their storage and indexing, Hashing techniques.

UNIT-I	Programming Methodology and Practices: Introduction to software development-Concept of professional programming and software development, Tools for software design and for algorithm specification, Problem Solving Concepts: Steps of developing any program, Problem Definition Phase, General Problem Solving Strategies, Top down.
UNIT-II	Breaking a Problem into sub Problems, Algorithm construction, Patterns of logic, Principles for decomposition, Communication between procedures, Iteration vs. recursion, Flowcharts & Algorithms, Choice of a Suitable Data Structure, Program Documentation-Introduction, Documentation for programmers, Operators, Users, Interactive systems, Debugging of Programs.
UNIT-III	File Structures and Organizations: File organizations, File operations, File systems, File directories, Device control, Channel and buffer management, Sequential File Organization, Sequential files: Organization, Creation, Update and maintenance, Merging, Natural, Balanced, Polyphase, Cascade and their performance relative file organization-definition, Addressing techniques, Hashing techniques :approaches to collision problem, Creation, Retrieval and update, Performance, Indexed sequential file organization, Organization, Creation, Update and maintenance.
UNIT-IV	B+ tree structure, Physical layout indexes, Design, Multi-key file organization-multi-key access, Inverted file organization, Multi-list file organization Tree structured files, B-trees, AVL-trees, Tries, Overview of storage and indexing, Tree structured indexing, Hash based indexing.

Recommended Books:
- Loomis M E, Data Management and File Structures, 2nd Ed. PHI
- Ramakrishnan Raghu and Gehrke Johannes, Database Management Systems, Mc Graw Hill
- Juliff P, Program Design, PHI
- Rajaraman V, Fundamentals of Computers, PHI
- Chauhan S K, P C Organization, Kataria & Sons, Delhi

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-209   OPERATING SYSTEM CONCEPTS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the components of an operating system, An overview of different types of operating systems, A thorough knowledge of process management, Knowledge of storage management and the concepts of I/O and file systems, To know basics of Unix system and Windows NT and get an overview of distributed system, Multiprocessor operating system and database operating system.

UNIT-I	Introduction, Basic concepts, Terminology, Historical perspective, Early systems, Types of operating system: batch operating system, Multiprogramming, Time sharing operating system, Mainframe systems, Desktop Systems, Multiprocessor Systems, Distributed Systems Clustered Systems, Real Time Systems, Handheld Systems, Functions and Components of Operating System, Operating system Services, Multiprocessor distributed system, Architecture, System Calls, System Programs, Information management: File concepts, File system, Directory structure, Gaining access to files, Basic file system calls, Sharing and security, File protection, Allocation methods, Implementation issues.
UNIT-II	Process Concept, operations on process, Process Scheduling, Process scheduling criteria, Process scheduling algorithm: FCFS(first come first serve),SJF(shortest job first),priority scheduling, Round robin scheduling, Multilevel queue scheduling, Multiple-Processor Scheduling-Real Time Scheduling .Threads, Threading issues, Cooperating Processes, Inter-process Communication, The Critical-Section Problem, Semaphores, Classic problems of Synchronization, Critical regions, Monitors.
UNIT-III	Dead locks: Deadlock problem, Characteristics, Prevention, Avoidance, Detection, Recovery from dead lock, Combined approach to dead lock handling., Memory management : Basics, Swapping, Fixed partitions, Variable partitions, Overlay, Paging, Segmentation, Segmented paging, Virtual memory concepts, Demand paging, Page replacement,- space allocation policies, Dynamic linking.
UNIT-IV	Device management : Physical characteristics, Disk scheduling algorithms, Sector queuing, Device drivers, Protection : Goals of protection, Mechanisms and policies, Access matrix and its implementation, Dynamic protection structures, Security, Introduction to Unix system and windows NT, Advanced topics: distributed system, Multiprocessor operating system and database operating system.

Recommended Books:
- Silberschatz Abraham, Galvin Peter Baer and Gagne Greg, Operating System Concepts, Sixth Edition, John Wiley & Sons (ASIA) Pvt. Ltd
- Tanenbaum Andrew S, Modern Operating Systems, Prentice Hall of India Pvt. Ltd
- Stallings William, Operating System, Prentice Hall of India, 4th Edition
- Deitel Harvey M, Operating Systems, Second Edition, Pearson Education Pvt. Ltd
- Chandra Pramod and Bhatt P, An Introduction to Operating Systems, Concepts and Practice, PHI

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
HS-201   ESSENTIALS OF MANGEMENT AND ORGANISATIONAL BEHAVIOUR

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To help the students lay a foundation to an understanding of Management and Organizational behavior which are essential fields of study to make a success of both their professional and personal lives.

UNIT-I	Concept of management, Characteristics and Importance, Management vs Administration, Management as an art a science and as a profession, Levels of Management, Contributions of Henry Fayol, FWTaylor & Elton Mayo, Management Functions: Planning, Organizing, Staffing, Directing and Controlling.
UNIT-II	Concept & significance of Organizational Behavior, Challenges and opportunities in the field of OB, Model of OB. Learning, Attitude, Job Satisfaction, Personality, Perception and Individual Decision-making, Motivation, Theories of Motivation by Maslow, Herzberg and McGregor.
UNIT-III	Classification of Groups, Stages of Group Development, Group Properties, Group Decision-making. Types of Teams, Creation of an Effective Team, Difference between a group and a team. Styles of Leadership, Theories of Leadership by Blake and Mouton, Contingency Theory by Fiedler.
UNIT-IV	Organizational Structure, Common Organizational Design, New Organization Design options, Change, Organizational Change, Planned Change, Resistance to Change, Models of Organizational Change.

Recommended Books:
- Koontz , Essentials of Management, Tata McGraw Hill
- Robbins and Coulter, Management, PHI, 8th Ed.
- Robbins and Judge, Organizational Behavior, Pearson
- Pareek, Understanding Organizational Behavior, Oxford
- Luthans, Organizational Behaviour. McGraw Hill Education

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-211   DATA STRUCTURES AND ALGORITHMS LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	**Note:- Write all programs in C language** • Write a program to search an element in two dimensional array using linear search • Create a file containing 26 alphabets (a to z)in separate lines • write programs for finding the elements an array using binary search • write a program for swapping two numbers using call by value and call by reference strategies • Write a program for implementing the various operations on string such as length of string , Concatenation, Reverse & copy of string to another. • Define a pointer to an integer, Read a list of n numbers using dynamic memory allocation and find average of these numbers. • Create a file containing 26 alphabets(A to Z) in separate lines. • Copy a file to another. Source file name and destination file name are input from the user. • Sort n numbers using quick/merge/selection sort. Also count the number of exchanges in each case. • Write a program for expression evaluation using stacks.. • Write a program which stimulates the various tree traversals algorithm • Write a program for infix to postfix conversion. • Create a singly linked list and reverse it in the same list. • Write a program for a doubly linked list giving following option, Insertion, Deletion, Retrieval, • Write a program to implement queues using linked list with option, List of elements in queue, Insertion, And deletion. • Write a program to implement stacks using linked list with options push and pop. • Write a program to stimulates the various graph traversing algorithms • Write a program for multiplication of two polynomials using linked list. • Implement heap sort. Show the contents of heap after each adjustment of element i.e. n outputs should be printed if list has n elements.

Recommended books:
- Tanenbaum A M, Data structures using C, PHI
- Horowitz E and Sahni S, Fundamentals of Data Structures, Galgotia
- Patel R B, Expert Data Structures in C, Khanna Publishers
- Kruse R L, Data Structures & Program Design in C, PHI

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-213 DIGITAL ELECTRONICS LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

EXPERIMENTS	• Design ALL Logics gate on Bread Board • Study and verify the Truth table of various logic gates-AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR. • Design & realize a given function using K-maps and verify its performance. • Verify the truth table of 4-bit comparator using IC7485. • To verify the operation of multiplexer & Demultiplexer. • Design and verify a Half Adder • Design and verify a FULL adder • To verify the operation of comparator. • Design a Flip Flops • To verify the truth tables of S-R, J-K, T & D type flip flops. • To verify the operation of bi-directional shift register. • To design & verify the operation of 3-bit synchronous counter. • To design of synchronous UP/DOWN decade counter using J K or any flip-lops. • Design a seven-segment display using the Gates. • To design & realize a sequence generator for a given sequence using J-K flip-flops. • Case Study of CMOS NAND & NOR gates • Design a 4-bit shift-register and verify its operation. • Design a ring counter and a Johnson counter • To verify the operation of a mod-10 counter. • To design and implement a mod-10 counter using JK flip flops and logic gates.

Recommended Books:
- Jain R P, Modern Digital Electronics (Edition III), TMH
- Mano M M and Ciletti M D, Digital Design, 4th Ed., Prentice Hall
- Balabanian N and Carlson B, Digital Logic Design Principles, John Wiley & Sons

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-215   PROGRAMMING METHDOLOGY AND FILE STRUCTURES LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	- Develop modular program of simple text based calculator and implement in C - Develop modular program for scientific calculator and implement in C. - Implement the following programs in C - Mid square hashing - Hashing by folding - Division remainder hashing - Extendible hashing - Static hashing - Linear hashing - B-trees - AVL trees - Tries data structure - Cascade merge - Polyphase merge - Natural merge - Balanced merge - Fibonacci series

Recommended Books:
- Loomis M E, Data Management and File Structures, 2nd Ed. PHI
- Ramakrishnan Raghu and Gehrke Johannes, Database Management Systems, Mc Graw Hill
- Juliff P, Program Design, PHI

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-217   OPERATING SYSTEM LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	• Study of H/W and S/W requirement of different operating system. • Study of system calls and various OS management services in Unix/Linux OS and their implementation • Learn DOS command, Utilities and Tools. • Use DOS command to create a file and folder in system. • File System, Utilities, Editor, Process, Communication, Filters, Shell Programming, System Administration. • Familiarities with SUN-Solaris: Commands and Utilities. • Write a program for round robin scheduling • Write a program for FCFS algorithm • Write a program for banker algorithm. • Write a program for Bernstein condition for concurrency. • Write a program of worst, Best & first fit for contiguous allocation using randomly generated free space list • Implement resource allocation graph. • Implement wait for graph. • Implement the concept of external and internal fragmentation. • Write a program for shortest job first scheduling.

Recommended Books:
- Silberschatz Abraham, Galvin Peter Baer and Gagne Greg, Operating System Concepts, Sixth Edition, John Wiley & Sons (ASIA) Pvt. Ltd
- Tanenbaum Andrew S, Modern Operating Systems, Prentice Hall of India Pvt. Ltd
- Stallings William, Operating System, Prentice Hall of India, 4th Edition
- Deitel Harvey M, Operating Systems, Second Edition, Pearson Education Pvt. Ltd

B TECH (3rd SEMESTER) COMPUTER SCIENCE AND ENGINEERING
ELGA-201   ENGLISH LANGUAGE AND GENERAL AWARENESS-III

L	T	P	Cr
2	-	-	-

Internal Evaluation: 50 Marks

Course Objective:
To help the students acquire the ability to develop a well-structured paragraph and also to provide them basic knowledge of issues relating to poverty in India.

UNIT-I	**Paragraph Development** • Guidelines for effectiveness of a paragraph • Fog Index (an indication of clarity of any text) by Robert Gunning • Expanding an idea into a paragraph

UNIT-II	**General Awareness**
	(a) Poverty in India
	    • The concept of poverty
	    • Various estimates of poverty
	    • Economic reforms and reduction of poverty
	    • Poverty eradication programs: a review
	(b) Biography: Ratan Tata
	(c) Book Review: Ignited Minds by APJ Abdul Kalam
	(d) Industry Overview: Small Scale Industries

Recommended Books:
- Barun K Mitra, Effective Technical Communication, Oxford
- Tyagi Kavita & Misra Padma, Basic Technical Communication, PHI
- Raman Meenakshi & Sharma Sangeeta, Technical Communication, Oxford
- Datt & Sundharam, Indian Economy, S Chand
- Sharma R C, Krishna Mohan, Business Correspondence and Report Writing, TMH

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-202   COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics architecture of Computer Organization and mother board. Study the I/O interaction, ALU, CPU and Interpretation

UNIT-I	Basic Machine Principle, Structure and representation of real world data, Von-Newman Model and stored program concept, Subroutine, Branching & Macro facility, Processor Design: Processor Organization, Information representation and Number format, Instruction cycle and Instruction format, Addressing modes, Arithmetic operation, Timed point addition, Subtraction, Multiplication and division, ALU design and floating point arithmetic, Parallel processing-Performance consideration, Pipeline processor and Multiunit processor.
UNIT-II	Instruction sequencing and Interpretation, Hardware Control design method, Multiplier control unit and CPU control unit, Micro programmed Control, Minimizing Instruction Size, Micro programmed computer.
UNIT-III	Memory device characteristic, Random access and serial access memories, Virtual memory-memory hierarchies, Main Memory allocation & replacement policies, Segments, Pages and file organization, High speed memories-Interlocked, Cache and associative memory
UNIT-IV	Local and long distance communication, Programmed I/O, DMA and interrupts, I/O processors & CPU-I/O interaction, Introduction to Multiprocessor

Recommended Books:
- Hayes J P, Computer Architecture and Organization, 3rd Ed. TMH
- Gear C W, Computer organization and Programming, TMH
- Bartee T C, Digital Computer Fundamental, TMH
- Mano M M, Computer System Architecture, PHI
- Tanenbaum S, Computer System Organization, PHI

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-204 OBJECT ORIENTED PROGRAMMING IN C++

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the knowledge of object oriented system development and programming in C++. After undergoing this course students have basic knowledge of encapsulation, Inheritance and Streams and Formatted I/O.

UNIT-I	Object oriented systems development and designing: Traditional and object oriented software cycles, Objectives of OOP, Object oriented analysis Object Oriented Programming Concepts, Introduction to Objects and object oriented programming, Classes, Methods and Messages, Abstraction and Encapsulation, Inheritance, Abstract Classes, Polymorphism, Arguments, Function Overloading, Friend Functions, Const and Volatile, Functions, Static Members, Objects, Pointers and Objects, Constant Objects, Nested Classes, Local Classes, Reusability.
UNIT-II	Basics of C++, C++ standard library, Basics of C++ Environment preprocessors, Directives, Illustrative simple c++ programs header namespaces library files . Object oriented programming in C++: Concepts of data abstraction, Encapsulation, Introduction to objects, Classes and instances, Static members, Inheritance, Polymorphism, Overloading and information hiding, Function overloading, Operator overloading in C++, Memory management, Constructors, Overloading of constructors, Copy constructors, Destructors, Constructors and information hiding, Concepts of file handling in C++.
UNIT-III	Inheritance and polymorphism in C++,Inheritance, Derived and base classes, Protected member, Overriding member function, Class hierarchies, Multiple inheritance, Containership, Virtual functions, Late binding, Pure virtual functions, Abstract classes, Friend functions, Friend classes, Static functions, Templates, Function templates, Class templates, Exception Handling in c++ Constructors, Default Constructor, Parameterized Constructors, Constructor with Dynamic Allocation, Copy Constructor, Destructors, Operator Overloading, Overloading through Friend Functions, Overloading the Assignment Operator, Type Conversion, Explicit Constructor.
UNIT-IV	Streams and Formatted I/O, I/O Manipulators, File Handling, Random Access, Object Serialization, Namespaces, STD Namespace, ANSI String Objects, Standard Template Library, Templates and exception handling Function and Class Templates, Exception Handling, Try-Catch-Throw Paradigm, Exception Specification.

Recommended Books:
- Trivedi J B, Programming with ANSI C++, Oxford University Press
- Lafore Robert, Object Oriented Programming in C++, Galgotia
- Guruswamy Bala, Object Oriented programs, TMH
- Schildt Herbert, C++: The Complete Reference, TMH
- Deitel H M & Deitel P J, C++ how to program, Prentice Hall

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-206   WEBSITE DESIGN AND APPLICATIONS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics knowledge web sites design and application of website. Study the HTML, DHTML and XML language.

UNIT-I	Overview of Internet, Introduction to Internet, Web and WWW, History of Web Browser, Concept of Networking and Layers of OSI Model, Internet Protocols like TCP/IP and Applications, HTTP, HTTPS, Telnet and FTP, URL, E-mail, Domain Name, History of Search Engines, Working Strategy of SE, Counters, Chat & Bulletin Board Services, Various Internet & Web Technologies, Hardware and Software Requirement for Different Internet Applications, Search Engine Optimization, Google Analytics, Page Rank Algo, Google Add Words.
UNIT-II	Principles of Web Design, Key Issues and Challenges to be Considered in Web Site Design, Structure of a Web Page, Introduction to HTML, Elements of HTML syntax, Head and Body Sections, Building HTML Documents, Inserting Text, Images, Hyperlinks, Backgrounds and Color Control, Ordered and Unordered Lists, Content Layout & Presentation, HTML Tags, Building Web Pages with HTML Tags, Use of Different HTML Tags in Design of Web Pages, Frames, DHTML, Hosting Website & Security, Hosting a Website and it's Security Issues, Cyber Laws.
UNIT-III	Table Handling, Table layout & Presentation, Constructing Tables in a Web Page, Developing a Web Page in a Table, HTML Editors & Tools, Use of different HTML editors and tools like Netscape Communicator and Microsoft Front Page etc, Graphical and Animation Techniques: Use of Different Graphical and Animation Tools like Abode Photoshop, Gif Animator etc, HTML Editors & Tools, Use of Different HTML Editors and Tools like Microsoft Front Page, Dreamweaver etc. Graphical and Animation Tools, Use of Different Graphical and Animation Tools like Abode Photoshop, Gif Animator, Macromedia Fash etc.
UNIT-IV	Frames, Developing Web Pages Using Frames, Interactivity, Client Server Model, Static & Dynamic Web pages, Creating forms, CGI, Role of Databases in web applications, Security, Concept of Various Methods of Internet Security like Firewalls etc, Web Technologies, Overview of Various Web Technologies and their Applications like Java Script, Macromedia Flash, Embedding Java Applets in a Web Page etc, Interactivity, Forms, Creating Interactive & Dynamic Web Pages, Comparison of ASP, PHP and JSP technologies, Active Server Pages, Interactivity with Database Using ASP, ASP Request & Response Objects, ASP Server Objects, Latest Trends & Technologies in Web Industry, Java for Web, Overview of Java Beans, Java Servlets, Java Applets, Java Script, ASP.NET, E-Commerce, Web Engineering, Semantic Web, VB Script, Microsoft Visual Interdev IDE, Overview of Visual Basic & VB.NET.

Recommended Books:
- Xavier C, World Wide Web Design with HTML, Tata McGraw Hill
- Sklar Joel, Principles of Web Design, Web Warrior series
- Godbole Achyut S and Kahate Atul, Web Technologies, Tata McGraw Hill
- Xavier C, Web Technology & Design, Tata McGraw Hill
- Navarro Ann, Effective Web Design, BPB publications
- Kamal Raj, Internet & Web Design, Tata McGraw Hill
- Kamal Raj, Internet and Web Technologies, TMH
- Heith Morneau, Active Server Pages, Vikas Publishing House
- Jain V K, Advanced programming in web design,Cyber tech publications
- Ramachandran T M, Internet & Web development, Dhruv publications

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-208   DATA BASE MANAGEMENT SYSTEM

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics of Database management system. The scope of the subject is to acquire skills in the field of database design and study DML, DDL.

UNIT-I	Fundamental of Database, Need for database, Basic Concepts of Database & Database Users, Characteristics and Application of the Database, Database Systems, Conceptual and External Level in a Database System, Mapping DBA, DBMS, Organization of database, Meaning of Physical, Internal, Concepts and Architecture, Data models, Different Types of Data Models, Schemas & Instances, Introduction to DBMS, Advantages of Database Management, DBMS Architecture & Data Independence, Database Languages & Interfaces, Data Modeling using the Entity-Relationship Approach, Overview of Hierarchical, Network & Relational Data Base Management Systems, Introduction to ER Modeling, Entity, Entity Sets, Relation and Relationship Sets in ER models, ER Diagrams and Reducing ER Diagrams to Tables, Generalization and Aggregation in ER Models.
UNIT-II	Relational Model, Languages & Systems, Relational Data Model, Relational Model Concepts, Relational Model Constraints, Hierarchical Data Model, Network Data Model and their Comparison, Relational Algebra, SQL- a Relational Database Language, Data Definition Language(DDL) in SQL, View and Queries in SQL, Specifying Constraints and Indexes in SQL, DML, Database Manager, DBA, Various Types of Database Users, Oracle Architecture, Logical Data Structures, Physical Data Structure, Table Spaces, Types of Table spaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers, Design Strategies for a Database Scheme, Various Types of Relational Commercial Languages like SQL, QBE, And QUEL etc, Meaning of Integrity constraints, Various types of integrity constraints in relational approach like, Integrity Constraints Revisited, Domain Constraints, Referential Integrity Constraints, Functional Dependency Constraints, Assertions, Triggers etc.
UNIT-III	Introduction to Relational Database Systems and Design of Relational Database, Meaning of Tuples, Attributes, Insertion, Deletion, Updating and Retrieval in Relational Approach, Various Operations in Relational Approach Like Select, Project, Join, Union, Function Dependencies & Rules about Functional Dependencies, Normalization for Relational Database, Normal Forms, Normal Forms Based on Primary Keys, (1NF, 2NF, 3NF & BCNF), Lossless Join and Dependency Preserving Decomposition (4NF, 5NF), Domain Key Normal Form, Extended ER Diagram, Relational Algebra & Calculus, Functional, Multivalve and Join Dependency, Intersection etc, Normalization in Relational approach, Conversion of a Relational to Higher Normal Forms, Normalization Using Functional Dependencies, Join Dependencies etc., Domain Key Normal Form.
UNIT-IV	Recovery Techniques, Concurrency Control Techniques, Locking Techniques, Time Stamp Ordering, Granularity of Data Items, Recovery Techniques, Recovery Concepts, Database Backup and Recovery from Catastrophic Failures, Concepts of Object Oriented Database Management Systems, Distributed Data Base Management Systems, Overview Objected Oriented and Object Relational Databases and Related Concepts, Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases, Object Relational Model, Distributed Database, Parallel Databases, Temporal Databases, Spatial Databases, Web & Multimedia Databases.

Recommended Books:

- Elmsari and Navathe, Fundamentals of database systems, Pearson Education
- Garcia, Ullman, Widom, Database Systems, The complete book, Pearson Education
- Ramakrishnan R, Database Management Systems, McGraw Hill International Editions
- Date C J, An introduction to Database Systems
- Korth H, Silberschatz A, Database System Concepts, McGraw-Hill
- Desai Bipin, An introduction to database Systems, Galgotra Publications
- Rob P & Coronel C, Database Systems: Design Implementation & management, Thomson Learning
- Ullman J D, Principals of database systems, Galgotia publications

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-210   COMPUTER NETWORK

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics knowledge in networking field. Applications of LAN, WAN and MAN. Study the network hardware and application of OSI model.

UNIT-I	Uses of Computer Networks, Network Hardware, Network Software, OSI, TCP/IP and other networks models, Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN, Physical Layer : Transmission media copper, Twisted pair wireless, Switching and encoding asynchronous communications, Narrow band, Broad band ISDN and ATM.
UNIT-II	The Physical Layer, The Theoretical Basis For Data Communication, Guided Transmission Media, Wireless Transmission, Communication Satellites, The Public Switched Telephone Network, The Mobile Telephone System, The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Sliding Window Protocols.
UNIT-III	The Medium Access Control Sublayer, The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless Lan, Broadband Wireless, Bluetooth, Data Link Layer Switching, The Network Layer, Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internetworking, The Network Layer in the Internet, Summary.
UNIT-IV	The Transport Layer: The Transport Service, Elements of Transport Protocols, A Simple Transport Protocol, The Internet Transport Protocols: UDP, The Internet Transport Protocols: TCP, Performance Issues, The Application Layer**:** DNS-Domain Name System, Electronic Mail, The World Wide Web, Multimedia, Introduction to Wireless networks and mobile computing, Network management systems, Security threats and solutions, Multimedia applications and its impact on networking.

Recommended Books:
- Tanenbaum Andrew S, Computer Networks (4th Edition), International edition
- Fred Halsall, Data Communications, Computer Networks and Open Systems, (4th edition), Addison Wesley

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
HS-202   FUNDAMENTALS OF BUSINESS & ECONOMICS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To provide the students a basic understanding of Business and Economics which are vital constituents of the overall professional environment of an Engineer.

UNIT-I	Nature and Significance of Human Resource Management, Functions of Human Resource Management, Manpower Planning, Job Analysis, Job Description & Job Specification, Recruitment, Selection, Training & Development, Compensation Management, Performance Appraisal, Employee Welfare, Safety and Health, Human Resource Development.
UNIT-II	Meaning, Scope and Goals of Financial Management, Investment Decision, Nature, Importance, Evaluation Criteria, Financing Decision, Long Term Sources of Funds, Cost of Capital, Capital structure, Leverage, Dividend Decision, Models and determinants of dividend decision, Working Capital Management, Theories and determinants, Forecasting of working capital, Management of Cash.
UNIT-III	Concepts of market, Marketing and marketing management, Marketing Environment-Analyzing needs & trends in macro environment, Economic environment, Technical environment, Political environment, And socio-cultural environment, Market Segmentation, Targeting and positioning strategies, Marketing mix, Product, Meaning, Product mix, Levels of product, Product life cycle, Price, Meaning, Importance, Pricing objectives and strategies, Place, Importance, Functions of distribution channels, Promotional mix-advertising, Sales promotion, Personal selling, Public relations, Direct marketing.
UNIT-IV	Meaning and significance of Economics, Role of economics in engineering and technology, Basic economic terms, Utility, Saving, Investment, Equilibrium, Micro and macro economics, Economic policies, Globalization, Privatization, Liberalization, Demand &Supply Analysis, Meaning of demand and supply, Law of demand and supply, Elasticity of demand and its measurement, Production, Factors of production, Law of variable production, Production function, Cost Analysis, Types of costs and shapes of different cost curves, Theory of Firm and Pricing, Types of markets, Equilibrium of firm and industry under perfect, Monopoly and imperfect competition.

Recommended Books:
- Dessler, Human Resource Management, Pearson
- Rao V S P, Human Resource Management, Excel
- Khan M Y and Jain P K, Financial Management, Tata McGraw Hill
- Pandey I M, Financial Management, Vikas
- Kotler Philip , Marketing Management , Pearson
- Kotler Philip & Armstrong Gary, Principles of Marketing ,Pearson
- Ahuja H L, Micro Economic Theory, S Chand
- Ruder Dutt & Sundharam, Indian Economy, S Chand

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-212   OBJECT ORIENTED PROGRAMMING IN C++ LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	- Model a geometric point to find distance between points. - Write a C++ program to find the sum of individual digits of a positive integer. - Write a C++ program that uses functions
	  a) to swap two integers.
	  b) To swap two characters.
	  c) To swap two reals. Note: Use overloaded functions - Given that an EMPLOYEE class contains following members:
	Data members: Employee_ Number, Employee_ Name, Basic, DA, IT, Net_ Sal Member functions: to read the data, To calculate Net_ Sal and to print data members. - Write a C++ program to read the data of N employees and compute Net _Sal of each employee (DA=79% of Basic and Income Tax (IT) = 30% of the gross salary). - Write a program that creates a binary file by reading the data for students from terminal. the data of each student consist of name, Roll no. class, Section, Marks. - Raising a number n to a power p is the same as multiplying n by itself p times. Write a function called power ( ) that takes a double value for n and an int value for p, And returns the result as double value. Use a default argument of 2 for p, So that if this argument is omitted, The number will be squared. Write a main ( ) function that gets values from the user to test this function. - A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence. - Write a C++ program that uses a recursive function for solving Towers of Hanoi problem. - Write a C++ program that uses a recursive function to find the binary equivalent of a given non- negative integer n. - Consider the following class definition
	class father {protected : int age, Public, Father (int x) {age = x,}
	virtual void iam ( )
	{ cout < < "I AM THE FATHER, My age is : "<< age<< end1:}
	},
	Derive the two classes son and daughter from the above class and for each, Define iam ( ) to write our similar but appropriate messages. You should also define suitable constructors for these classes. Now, Write a main ( ) that creates objects of the three classes and then calls iam ( ) for them. Declare pointer to father. Successively, Assign addresses of objects of the two derived classes to this pointer and in each case, Call iam ( ) through the pointer to demonstrate polymorphism in action. - Write a C++ program to create a class called BIN_TREE (Binary tree) with member functions to perform inorder, Preorder and postorder traversals. Create a BIN_TREE object and demonstrate the traversals. - Write a C++ program to read two numbers a and b, Find a/b and output the result (Use try/throw/catch construct). Assume that the division program is capable of handling only 32 bit numbers. If the input number is larger than 0xFFFF, The program should flag an error, Prompt theuser with an appropriate message and quit gracefully. The program should also flag error when there is divide by zero. - Write a C++ program to find both the largest and smallest number in a list of integers.

- Create some objects of the string class, And put them in a Deque-some at the head of the Deque and some at the tail. Display the contents of the Deque using the forEach ( ) function and a user written display function. Then search the Deque for a particular string, Using the first That ( ) function and display any strings that match. Finally remove all the items from the Deque using the getLeft ( ) function and display each item. Notice the order in which the items are displayed: Using getLeft ( ), Those inserted on the left (head) of the Deque are removed in "last in first out" order while those put on the right side are removed in "first in first out" order. The opposite would be true if getRight ( ) were used.
- Write a program to read a number and display its square, Square root, Cube root and cube .use a virtual function to display any one of above.
  Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are:
    a) Reading a matrix.   c) Addition of matrices.
    b) Printing a matrix.   d) Subtraction of matrices.
    e) Multiplication of matrices.
- Write a C++ program to create two complex numbers, Displays them, And adds the two complex numbers using the overloaded + operator and displays the result.
- Write a C++ program that uses functions to perform the following operations to:
    a) Insert a sub-string in to the given main string from a given position.
    b) Delete n characters from a given position in a given string.
- Write a C++ program to create a class called DLIST (Doubly Linked List) with member functions to insert a node at a specified position and delete a node from a specified position of the list. Demonstrate the operation by displaying the content of the list after every operation.
- Write a C++ program to create a class called STUDENT with data members roll number, Nameand Age. Using inheritance, Create the classes UGSTUDENT and PGSTUDENT having fields as Semester, Fees and Stipend. Enter the data for at least 5 students. Find the semester wise average age for all UG and PG students separately.
- Write a C++ program
    a) To write an object to a file.
    b) To read an object from the file.
- Write C++ programs that illustrate how the following forms of inheritance are supported:
    a) Single inheritance
    b) Multiple inheritance
    c) Multi level inheritance
    d) Hierarchical inheritance
- Write a C++ program to create a class called MATRIX using a two-dimensional array of integers. Implement the following operations by overloading the operator == which checks the compatibility of two matrices to be added and subtracted. Perform the addition and subtraction by Overloading the operators + and-respectively. Display the results by overloading the operator <<. if (m1 ==m2) { m3 = m1 + m2, M4 = m1-m2, } else display error

Recommended Books:
- Trivedi J B, Programming with ANSI C++, Oxford University Press
- Lafore Robert, Object Oriented Programming in C++, Galgotia
- Guruswamy Bala, Object Oriented programs, TMH
- Schildt Herbert, C++: The Complete Reference, TMH
- Deitel H M & Deitel P J, C++ how to program, Prentice Hall

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-214   WEBSITE DESIGN AND APPLICATIONS LAB

L	T	P	Cr
-	-	2	1

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

PRACTICALS	• Create web pages to understand the various server controls and use to validate user inputs. • Create web pages to learn how to navigate between web pages and servers and Programming to learn data binding. • Create login form and validate it username/password stored in database. • Create your own web page with your hobbies. • Create student record and perform following operations: Add record, Delete, And edit, Search record, Navigation between records. • A web application display product names and price in tabular formats. Each row containing product detail should display Know More button. When the button is clicked the description for the selected item should be displayed. • Development of static pages using HTML of an online Departmental Store. The website should be user friendly and should have the following pages: Home page, Registration and user login, User profile page, Items catalog, Shopping cart, Payment by credit card, Order confirmation. • Add validations to the above static pages of registration, User login, User profile and payment by credit card using Java Script. • Create a web page which displays the map of country link, Each city on image using image map such that respective HTML page of city is displayed when user selects an area. • Creation of a XML document of 20 students of III IT. Add their roll numbers, Marks obtained in 5 subjects, Total and percentage and save this XML document at the server. Write a program that takes students' roll number as an input and returns the students marks, Total and percentage by t.aking the students' information from the XML document. • Creation of a Java Bean which gives the converted value of Temperature (in degree celcius) into equivalent Fahrenheit. • Creation of a simple Bean with a label-which is a "count" of number of clicks. Then create a Bean Info class such that only the "count" is visible in the Property Window. • Installation of TOMCAT web server. • Use any web server to create your website. • Create a website of your college.

Recommended Books:
• Xavier C, World Wide Web Design with HTML, Tata McGraw Hill
• Sklar Joel, Principles of Web Design, Web Warrior series
• Godbole Achyut S and Kahate Atul, Web Technologies, Tata McGraw Hill
• Xavier C, Web Technology & Design, Tata McGraw Hill
• Navarro Ann, Effective Web Design, BPB publications
• Kamal Raj, Internet & Web Design, Tata McGraw Hill

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-216   DATA BASE MANAGEMENT SYSTEM LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	Familiarization of creation of databases and SQL commands (DDL, DML and DCL). The Queries to be implemented on DBMS using SQL.

- Create a database and write the programs to carry out the following operation :

  Add a record in the database

  Delete a record in the database

  Modify the record in the database

  Generate queries

  Generate the report

  List all the records of database in ascending order.

- Write SQL procedure for an application which uses exception handling.
- Write SQL procedure for an application with cursors.
- Write a DBMS program to prepare reports for an application using functions.
- Write SQL block containing triggers and stored procedures.
- Develop a menu driven, GUI based user friendly database application in any one of the domains such as Banking, Electricity Billing, Library management, Payroll, Insurance, Inventory, Health care etc. integrating all the features specified in the above exercises.
- Write the queries for Data Definition and Data Manipulation language.
- Write SQL queries using Logical operators (=,<,>,etc.).
- Write SQL queries using SQL operators (Between…. AND, IN(List), Like, ISNULL and also with negating expressions).
- Write SQL query using character, Number, Date and group functions.
- Write SQL queries for Relational Algebra (UNION, INTERSECT, And MINUS, Etc.).
- Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join, Outer Join)
- Write SQL queries for sub queries, Nested queries.
- Write programs by the use of PL/SQL.
- Concepts for ROLL BACK, COMMIT & CHECK POINTS.
- Create VIEWS, CURSORS, And TRIGGRS & write ASSERTIONS.
- Create FORMS and REPORTS.

Recommended Books:
- Elmsari and Navathe, Fundamentals of database systems, Pearson Education
- Garcia, Ullman, Widom, Database Systems, The complete book, Pearson Education
- Ramakrishnan R, Database Management Systems, McGraw Hill International Editions
- Date C J, An introduction to Database Systems
- Korth H, Silberschatz A, Database System Concepts, McGraw-Hill
- Desai Bipin, An introduction to database Systems, Galgotra Publications
- Rob P & Coronel C, Database Systems: Design Implementation & Management, Thomson Learning
- Ullman J D, Principals of database systems, Galgotia Publications

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-218   COMPUTER NETWORK LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1.0

PRACTICALS	- Simulation of ARP / RARP. - Write a program that takes a binary file as input and performs bit stuffing and CRC Computation. - Circuit diagram of terminator. - Circuit diagram of T connector. - Develop an application for transferring files over RS232. - Simulation of Sliding-Window protocol. - Simulation of BGP / OSPF routing protocol. - Develop a Client-Server application for chat. - Develop a Client that contacts a given DNS Server to resolve a given host name - RJ-45 connector and its circuit diagram. - BNC connector and its circuit diagram. - Write a Client to download a file from a HTTP Server. - Study of Network Simulators like NS2/Glomosim / OPNE - Find the IP address of a host or turn an IP address into a name. Connect to an FTP server and get or put files. Automate the one-time transfer of many files to download the file everyday, Which have changed since yesterday. (use Net:FTP). - Write a program to send mail. The programs should monitor system resources like disk space and notify admin by mail when disk space becomes dangerously low. (use Net: mail) - Thick and thin coaxial - Fetch mail from a POP3 server (use Net:pop3) - Write program for TCP Server, TCP Client and create a sample code to show server-client communication over TCP.

Recommended Books:
- Tanenbaum Andrew S, Computer Networks (4th Edition), International edition

B TECH (4th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
ELGA-202   ENGLISH LANGUAGE AND GENERAL AWARENESS-IV

L	T	P	Cr
2	-	-	-

Internal Evaluation: 50 Marks

Course Objective:
To help the students master the art of condensation this is an essential skill in technical communication and, through the General Awareness section, To sensitize the students on Human Development Index.

UNIT-I	**Précis Writing** • Importance of précis in technical communication • Essentials of an effective précis • Steps to effective précis writing • Précis writing exercises

UNIT-II	**General Awareness**
	(a) Human Development in India
	    • The concept of Human Development
	    • Measuring human development
	    • India's position in human development
	    • National Human Development Report
	(b) Biography: Azim Premji
	(c) Book Review: The World is Flat by Thomas L Friedman
	(d) Industry Overview: Iron and steel

Recommended Books:
- Mitra Barun K, Effective Technical Communication, Oxford
- Tyagi Kavita & Misra Padma, Basic Technical Communication, PHI
- Raman Meenakshi & Sharma Sangeeta, Technical Communication, Oxford
- Datt & Sundharam, Indian Economy, S Chand
- Sharma R C, Krishna Mohan, Business Correspondence and Report Writing, TMH

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-301 INTERNET TECHNOLOGY AND NETWORK PROGRAMMING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the paper is to facilitate the student with the basics concept of Internet technology and applications in modern age. Learn about the web pages and e-mail, FTP/IP, Network security and some brief introduction to network programming in java.

UNIT-I	Introduction to networks and internet, Concept and scope of information technology, Applications of computers, History, Working of Internet, Modes of Connecting to Internet, Internet Service Providers(ISPs), Internet address, Standard address, Domain name, DNS, Network Protocols, Protocols- HTTP, FTP, TELNET, SMTP, POP3, IMAP, MIME, WWW, Web Servers, Apache, Web Server, Proxy Server, Search Engines, Content Display, Browsers, Plug-ins, Helper, E-mail addresses, Message components, Message composition, Mailer features, E-mail inner workings, E-mail management, Newsgroups, Mailing lists, Chat rooms, SMTP, PINE, PICO, Library cards.
UNIT-II	History, Evolution and future of the Web, Significance and impact of the Web, Web terminology, Context, Models. Miscellaneous Web Browser details, Web Content Preparation, HTML, Cascading Style Sheets, JavaScript, DHTML, XML, Document Type Definitions and Schema, Document Object Model, DOM Methods, Simple API for XML, Extensible Style sheet Language, Web Services. searching the www: Directories search engines and meta search engines, Search fundamentals, Search strategies, Working of the search engines, Telnet and FTP, Coast-to-coast surfing, Hypertext markup language, Web page installation, Web page setup, Plug-ins. Internet communication protocols and URLs, HTTP, HTML and CGI., Web standards and their evolution., Web Technology
UNIT-III	Introduction to Network programming with java, Multithreading and multiplexing, File handling, Remote method invocation, CORBA, JDBC, Servlets, Java server pages Packages and Interfaces, Exception Handling, Multithreaded Programming, Strings, I/O, Applets, Event Handling, AWT components, Swing components, Network Programming in JAVA, Looking Up Internet Addresses, Sockets for Clients, Sockets for Servers, Non-Blocking I/O, UDP Data grams and Sockets, RMI, Persistence, Java Beans, Introduction to enterprise java beans, Multimedia, Applets, CORBA, IDL.
UNIT-IV	Introduction, Security Policies, Strategies for a Secure Network, The Ethics of Computer Security, Security Threats and levels Software Complexity, Encryption schemes, Secure Web document, Digital Signatures, Firewalls and Proxy Servers, Kinds of Firewalls, Introduction to Basic encryption and Decryption, Concept of Public key and Private key, Digital Signatures.

Recommended Books:
- Greenlaw Raymond and Hepp Ellen, Fundamentals of the Internet and the World Wide Web, TMH
- Deitel, Deitel & Nieto, Internet & World Wide Programming, Pearson Education
- Sebesta Robert W, Programming the World Wide Web 2009 (Fifth edition), Pearson education
- Schildt Herbert, Java2-The Complete Reference, Tata McGraw Hill
- Elliotte Rusty Harold, Java Network Programming (Third edition)
- Halsall Fred, Data Communications, Computer Networks and Open Systems, (4th edition), Addison Wesley

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-303   DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the components of a design and analysis of algorithm. An overview of different types of algorithms. A thorough knowledge of different tree and searching.

UNIT-I	Definitions and notations: standard notations, Asymptotic notations, Worst case, Best case and average case analysis, Big oh, Small oh, Omega and theta notations, Recursive algorithms, Analysis of non-recursive and Recursive algorithms, Solving recurrence equations, Analyzing control structures, Analysis of Sorting and Searching methods.
UNIT-II	Advanced Design and Analysis Techniques: Dynamic programming-Elements, Matrix-Chain multiplication, Longest common subsequence, Optimal polygon triangulation, Greedy algorithms-Elements, Activity-section problem, Huffman codes, Task scheduling problem, Advanced Data Structures: Operations in B-trees, Bionomical heaps, Fibonacci heaps, Data structure for disjoint sets, Strings
UNIT-III	Graph Algorithms: Review of graph algorithms, Topological sort, Strongly connected components, Minimum spanning trees-Kruskal and Prim's, Single source shortest paths, Relaxation Dijkstra's algorithm, Bellman-Ford algorithm, Single source shortest path for directed acyclic graphs, Difference constraints and shortest paths, All pairs shortest paths-shortest paths and matrix multiplication, Floyd-Warshall algorithm, Johnson's algorithm.
UNIT-IV	Flow and Sorting Networks : Flow networks, Ford-Fulkerson method, Maximum bipartite matching, Sorting networks, Comparison networks, The zero-one principle Bionic sorting network, Merging network. Branch and Bound Method: Least Cost (LC) search, The 15-puzzle problem, Control abstractions for LC Search, Bounding, FIFO Branch-and-Bound, 0/1 Knapsack problem, Traveling salesman problem, Problem, NP hard & NP complete problem: basic concepts, Cook's theorem, NP hard graph and NP Scheduling problem, Some NP hard problems.

Recommended Books:
- Coremen, Leiserson and Rivest, Introduction to algorithms 2/e PHL
- Horowitz Ellis and Sahni Sartaj, Fundamentals of computer algorithms, Galgotia publications
- Aho Hopcroft and Ullman, The design and analysis of computer algorithms

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-305   PROGRAMMING LANGUAGE CONCEPT

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the components of a programming language and behavior of programming language. Study the elementary data type's and formal syntax and semantic.

UNIT-I	Introduction, Programming Domains, Language evaluation, Characteristics of programming Languages, Factors influencing the evolution of major programming language, Developments in programming methodologies, Desirable features and design issues. Programming language processors, Syntactic and semantic rules of a Programming language, Characteristics of a good programming language, Programming language translators compiler & interpreters, Structure and operations of translators, Software simulated computer, Describing syntax and semantics, Structure, Virtual computers, Binding and binding time, Formal methods of Describing Syntax and semantics, Attribute grammars. Describing semantics, Data types and variables, Names, Variables, Scope and lifetime, Expression and assignment Statements.
UNIT-II	Elementary and Structured Data Types: Data object variables, Constants, Data types, Elementary data types, Declaration, Assignment and initialization, Enumeration, Characters, Strings. Structured data type and objects: Specification of data structured types, Vectors and arrays, Records, Variable size data structure, Pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, Information hiding, Sub programmes, Abstract data types, Implicit & explicit sequence control, Sequence control within expressions, Sequence control within statement, Subprogram sequence control: simple call return, Recursive subprograms, Exception & exception handlers, Co routines, Sequence control.
UNIT-III	Storage Management Major run time elements requiring storage , Programmer and system controlled storage management & phases, Static storage management, Stack based storage management, Heap storage management, Variable & fixed size elements. Syntax and translation: General syntactic criteria, Syntactic element of a language, Stages in translation, Formal syntax and semantics, Operating and Programming Environment: Batch Processing Environments, Embedded system requirements, Theoretical models, Introduction to procedural, Non-procedural, Structured, Functional and object oriented programming language, Comparison of C & C++ programming languages.
UNIT-IV	Data Control: Names & referencing environment, Static & dynamic scope, Block structure, Local data & local referencing environment, Shared data: dynamic & static scope. Parameter & parameter transmission schemes, Functional programming-LISP: data types, Functions, Control flow, Applications, Overview of logical programming, Basic elements in PROLOG, Deficiencies and applications of PROLOG.

Recommended Books:
- Pratt Terence W, Programming Languages, Prentice Hall, Ninth edition
- Sethi Ravi, Programming Languages-concepts and constructs, Addison Wesely, Second Edition
- Sebesta R W, Concept of Programming Language, Addison Wesley
- Horowitz E, Programming Languages, 2nd Edition, Addison Wesley
- Stroustrup Bjarne, Design and Evolution of C++, Addison Wesley
- Gordon Michael J, Programming language Theory and its implementation, Prentice Hall

B TECH (5th SEMESTER) COMPUTER SCIENNCE AND ENGINEERING
CSE-307   MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the components of Microprocessor and microcontroller, Applications of micro controller, Study the architecture 8085/8086 and latest microprocessor.

UNIT-I	Introduction: Microprocessors Evolution and Types (Intel 4004-Pentium IV and Road Maps), Overview of 8085, 8086, 80286, 80386, 80486, Pentium Processors and Microcontrollers and Power PC. Architecture of 8086/85-CPU Architecture, Internal operation, Machine language instruction, Execution time.
UNIT-II	Assembly language programming: assembler, Instruction format, Data transfer instruction, Arithmetic instructions, Branch instructions, NOP & HLT instructions, Flag manipulation instructions, Logical instruction, Shift and rotate instruction, Directions and operators. Modular programming: stacks, Procedures, Interrupt and interrupt routines, Macros-local labels and nested macros.
UNIT-III	String and I/O programming: string instruction, I/O consideration, Programmed I/O block transfer and DMA,I/O interface: serial communication, Asynchronous, Asynchronous, Physical, 8251a:parallel communication:8255 A, DMA controllers: maximum mode, 16 bit bus interface,80286 architecture: features of 80286,internal architecture, Real and protected virtual addressing modes, Protection, 80286 minimum configuration, Instruction set features.
UNIT-IV	Introduction to microcontrollers, General architecture of microcontrollers and microprocessors, Embedded processors, Overview of the 8051 family, 8051 architecture, Memory organization, Registers and I/O ports, Addressing modes, Instruction sets and assembly language programming, C programming in 8051.
	Programming 8051 timer/counter in assembly language and C.8051 Interrupts, Handling and programming., Serial communication using 8051, Interfacing with RS232, Serial port programming., 8051 interfacing-keyboard, LCD, ADC, DAC and stepper motor interface, Interfacing to external memory, Introduction to PIC microcontrollers and ARM processors., Concept of Embedded Systems, Embedded software and hardware development tools.

Recommended Books:
- Hall D V, Microprocessors and Interfacing, TMH, 2nd Ed.
- Liu and Gibson G A, Microprocessor Systems: The 8086/8088 family Architecture, Programming & Design, PHI
- Gaonkar, Gibson Liu, Microprocessor Systems: The 8086/8088 family Architecture, Programming & Design, PHI
- Singh Renu, Singh B P, Microprocessors, Interfacing and Applications, New Age International
- Antonakes J L, An Introduction to the Intel Family of Microprocessors, Published by Addision Wessley
- Ayala K J, The 8086 microprocessor, Thomson
- Ray A K and Bhurchandi K M, Advanced Microprocessors and Peripherals, TMH

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-309   AUTOMATA THEORY

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the basic components of Automata. Application of Turing machine. Method of pushdown automata and context free grammars.

UNIT-I	Introduction to the Theory of Computation: Mathematical Notation, Functions and Relation, Basic concept, Language, Grammars, Automata and application, Finite Automata: DFA, DATG, Languages & DFA, RL, NDFA.
UNIT-II	RL and RG: Regular Expression, Formal Definition of a RE, Language Associated with RE, Connection between RE and RL:RE denote RL,RE for RL,RE for simple patterns, Regular Grammars: Right and left linear Grammar, RLG for generate RL, RLG for RL, Application of Regular Languages, Context Free Languages, Context Free Grammars, Parsing and Ambiguity, CFG and Programming Language.
UNIT-III	Method for Transforming Grammars, Normal Forms, Pushdown Automata, Nondeterministic Pushdown Automata, Theory of Push down Automata, Pushdown Automata and Context Free Language, CFG for Pushdown automata, Deterministic Pushdown Automata and DCFL,DCFL Grammars, CFL Properties, Pumping Lemmas, Two PL,PL for context free language, Pumping Lemma for Linear Languages, Closure Properties.
UNIT-IV	Turing Machines and Standard, Concept of TM,TM & Transducers, TM and Language Accepters, Models For Turing Machines, Nondeterministic TM, UTM, LB automata, Different Model of Computation, Computation Complexity, Unrestricted Grammars, Chomskey Hierarchy, Chomsky hierarchies of grammars, Unrestricted grammars, Context sensitive languages, Relation between languages of classes, Post Correspondence Problem, Computability: Basic concepts, Primitive Recursive Functions.

Recommended Books:
- Linz Peter, An Introduction to Formal Languages and Automata, Third Edition, Narosa Publishing House
- Hopcroaft & Ullman O D, Mothwani R,   Introduction to automata theory, Language & computations, AW
- Mishra K L P & Chandrasekaran N, Theory of Computer Sc. (Automata, Languages and computation), PHI
- Martin John C, Introduction to languages and the Theory of Computation, TMH

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-311   JAVA PROGRAMMING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To know the basic concept of java programming. Abstract class in java and data types. Application of java in website design

UNIT-I	Overview of fundamentals of object oriented programming, Introduction to Java: java history, Evolution of java, Java and internet, Java and world wide web, Java environment, Importance and Features of Java, Keywords, Constants, Variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping, If-else, Switch, Operator, While, Do, For Statements, Labeled Loops, Jump Statements, Break, Continue, Return, Introducing Classes, Objects and Methods, Defining a Class, Adding Variables and Methods, Creating Objects, Constructors, Class Inheritance, Arrays and Strings: Creating an Array, One and Two Dimensional Arrays, String Array and Methods, String and String Buffer, Classes, Wrapper classes
UNIT-II	Inheritance, Basics Types, Using Super, Multilevel Hierarchy Abstract and Final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, Packages, Exception Handling, Fundamentals Exception Types, Uncaught Exceptions, Throw, Throw, Final, Built in Exception, Creating your own Exceptions, Multithreaded Programming: Fundamentals, Java Thread Model, Priorities, Synchronization, Messaging, Thread Class, Runnable Interface, Inter thread Communication, Suspending, Resuming and Stopping Threads, Hibernate, Principles of Object Relational Mapping, Hibernate configuration, HQL Making Objects Persistent, Hibernate Semantics, Session Management, Flushing, Concurrency and Hibernate, Optimistic and Pessimistic Locking.
UNIT-III	Input/ Output, Basics, Streams, Byte and Character Stream, Predefined Streams, Reading and Writing From Console and Files, Using Standard Java Packages (Lang, Util, Jo, Net), Networking, Basics, Networking Classes and Interfaces, Using java.net Package, Doing TCP/IP and Datagram Programming, Programming with Java, J2ME architecture, Bluetooth Package Interface, Classes, Exceptions, Event Handling: Different mechanism, The Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and text, Using AWT controls, Layout managers and menus, Handling Image, Animation, Sound and video, Java Applet, Spring, Introduction of Spring Framework, Spring Architecture, Spring Framework Definition, Spring & MVC, Factory Pattern, Bean Factory, Spring Context Definition, Inversion of Control (IoC).
UNIT-IV	J2EE: Introduction to J2EE, Building J2EE Applications, JDBC, Servlets and Web Applications, Java Server Pages and Model/View/Controller, J2EE Web Services Overview, Introduction to EJB, Session EJBs, Entity EJBs, JMS and message driven Beans, Transactions and Security, Application Servers, Web Services, Introduction to XML, Service-Oriented Architectures SOAP, SOAP Message Structure, Handling Errors WSDL, UDDI, Java Web Service Implementations JAX-RPC, Web Service Clients in Java, Object Mapping, Mapping simple properties, Single and multi valued associations, Bi-directional associations, Indexed collections, Using Hibernate Template, Querying, Session management, Transaction integration and demarcation, Spring AOP, Application Context and Bean Factory, Spring ORM, Mapping API for JDO, Hibernate, Hibernate Mapping, JDO Mapping, IBATIS, Spring Abstract Transaction layer, Employing Spring transaction, Using EJB declarative transactions, Integration process, Integrating Spring MVC in web application, MVC in web application.

Recommended Books:
- Farley Jim, Crawford William, Java Enterprise in a Nutshell
- Balaguruswamy E, Programming with java, 2nd edition, Tata Mc Graw Hill

- Naughton Patrick and Schildt Herbertz, Java-2 The complete Reference, TMH
- Harold Eliott Rusty and Scott Means W, O'Reilly, XML in a Nutshell
- Cooper James, Java Design Patterns: A Tutorial, Addison Wesley
- Sesadri Govind, Enterprise java Computing: Application and Architectures, Cambridge University Publications
- Horstmann, Computing Concepts with Java 2 Essentials, John Wiley.
- Decker & Hirshfield, Programming Java, Vikas Publication

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-313   MICROPROCESSORS AND MICROCONTROLLERS LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	- Study of 8085 Microprocessor kit. Programming with 8085 - 8-bit / 16-bit multiplication/division using repeated addition/subtraction - Programming with 8085-code conversion, Decimal arithmetic, Bit manipulations. - Write a program to print alphabets - Programming with 8085-matrix multiplication, Floating point operations - Write a program to read a integer number of max(16) bit, Store that number in a register and display it digit by digit. - Programming with 8086 - String manipulation, Search, Find and replace, Copy operations, Sorting. (PC Required) - Using BIOS/DOS calls: Keyboard control, Display, File manipulation. (PC Required) - Using BIOS/DOS calls: Disk operations. (PC Required) - Interfacing with 8085/8086 - 8255, 8253 - Interfacing with 8085/8086 - 8279,8251 8051 Microcontroller based experiments - Simple assembly language programs (cross assembler required). - Sort n numbers using modular program 8051 Microcontroller based experiments - Simple control applications (cross assembler required). - Write a program using 8086 for division of a defined double word (stored in a data segment) by another double Word division and verify. - Write a program using 8086 for finding the square root of a given number and verify. - Write a program using 8086 for copying 12 bytes of data from source to destination and verify. - Write a program using 8086 for arranging an array of numbers in descending order and verify. - Reverse an input string - Write a program for finding square of a number using look-up table and verify.

Recommended books:
- Hall D V, Microprocessors and Interfacing, TMH, 2nd Ed.
- Liu Y C and Gibson G A, Microprocessor Systems: The 8086/8088 family Architecture, Programming & Design, PHI
- Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085- New Age International

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-315   DESIGN AND ANALYSIS OF ALGORITHMS LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	3	1

PRACTICALS	- Write a program to implement Heap sort with analysis of time and space complexity - Write a program to implement Insertion sort with analysis of time and space complexity - Write a program to implement bubble sort with analysis of time and space complexity - Write a program to implement Sequential search with analysis of time and space complexity - Write a program to implement Binary Search with analysis of time and space complexity - Write a program to implement Divide and conquer method - Write a program to implement Dynamic programming - Write a program to implement Back tracking (Hamiltonian cycles) - Write a program to implement traversal techniques. - Write a program to implement branch and bound technique - Write a program to implement Greedy method (Knapsack problem) - Write a program to implement Greedy method (Job sequencing) - Write a program to implement Greedy method (minimal spanning trees) - Write a program to implement Selection : Minimum/ Maximum, Kth smallest element

Recommended Books:
- Coremen, Leiserson and Rivest, Introduction to algorithms 2/e PHL
- Horowitz Ellis and Sahni Sartaj, Fundamentals of computer algorithms, Galgotia publications
- Hopcroft Aho and Ullman, The design and analysis of computer algorithms

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-317 JAVA PROGRAMMING LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	3	1

PRACTICALS	- Write a Java Program find the Area of circle. - Write a Java Program that will display Factorial of the given number. - Write a Java Program that will display the sum of 1+1/2+1/3…..+1/n. - The class nesting defines one constructor and two methods namely largest() and display(),the method display() calls the method largest() to determine the largest of two numbers and then display the result. - Write a Java Program that will display 25 Prime nos. - Write a Java Program that will accept command-line arguments and display the same. - Write a Java Program to sort the elements of an array in ascending order. - Create an applet with a button and a text field. Write a handle event()so that if the button has the focus character typed into it will appear in text field. - Write a Java Program which will read a text and count all occurrences of a particular word. - Write a Java Program which will read a string and rewrite it in the alphabetical order eg. The word "STRING" should be written a "GINRST". - Make an Applet that create two buttons named "Red" and "Blue" when a button is pressed the background color of the applets is set to the color named by the button's label. - Write a Java Applet that create some text fields and text areas to demonstrate features of each.. - Use a Grid layout class to arrange a few instance of circle canvas. - Write any Java Program using new operator. - Write a Program to create a List Box and a Text Area. Fill up the List Box with some file names. When user double clicks on any filename of the list box, The file should be opened and its contents should be displayed in the text Area. - Create an applet with three text Fields and two buttons add and subtract. User will enter two values in the Text Fields. When the button add is pressed, The addition of the two values should be displayed in the third Text Fields. Same the Subtract button should perform the subtraction operation. - Create an applet to display the scrolling text. The text should move from right to left. When it reaches to start of the applet border, It should stop moving and restart from the left. When the applet is deactivated, It should stop moving. It should restart moving from the previous location when again activated.

Recommended Books:
- Farley Jim, Crawford William, Java Enterprise in a Nutshell
- Balaguruswamy E, Programming with java, 2nd edition, Tata Mc Graw Hill
- Naughton Patrick and Schildt Herbertz, Java-2 The complete Reference, TMH

B TECH (5th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
ELGA-301   ENGLISH LANGUAGE AND GENERAL AWARENESS-V

L	T	P	Cr
2	-	-	-

Internal Evaluation: 50 Marks

Course Objective:
To facilitate the learning of the principles of writing effective formal and business letters and also to help them develop an understanding of the infrastructure development initiatives in the country.

UNIT-I	**Formal Correspondence** • Parts of a letter • Format of a formal/business letter • Formal letters • Business Letters • Job application letters (covering letter & resume/CV)
UNIT-II	**II GENERAL AWARENESS** (a) Infrastructure Development • Infrastructure and economic development • Energy • Power • Transport • Roads and highways • Communication system (b) Biography: L N Mittal (c) Book Review: Imagining India by Nandan Nilekani (d) Industry Overview: Civil Aviation

Recommended Books:
- Mitra Barun K, Effective Technical Communication, Oxford
- Tyagi Kavita & Misra Padma, Basic Technical Communication, PHI
- Raman Meenakshi & Sharma Sangeeta,Professional Communication, Oxford
- Datt & Sundharam, Indian Economy, S Chand
- Sharma R C, Krishna Mohan, Business Correspondence and Report Writing, TMH

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-302   MULTIMEDIA TECHNOLOGIES

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To expose students to the concepts and issues of multimedia data acquisition, Communication and presentation technologies. The objective of the course is to facilitate the student with the idea of how multimedia content is processed the issues in transportation and the use of compression techniques needed wireless free space communications

UNIT-I	Computers, Communication and entertainment, Multimedia, Framework for multimedia systems, Multimedia devices, CD- Audio, CD-ROM, CD-I, Presentation devices and the user interface, Multimedia presentation and authoring, Professional development tools, LANs and multimedia, Internet, World Wide Web & multimedia distribution network-ATM & ADSL, Multimedia servers & databases, Vector graphics, 3D graphics programs, Animation techniques, Shading, Anti aliasing, Morphing, Video on demand.
UNIT-II	Making still images, Editing and capturing images, Scanning images, Computer color models, Color palettes, Vector drawing, 3D drawing and rendering, JPEG-objectives and architecture, JPEG-DCT encoding and quantization, JPEG statistical coding, JPEG predictive lossless coding, JPEG performance, Overview of other image file formats as GIF, TIFF, BMP, PNG etc.
	Digital representation of sound, Time domain sampled representation, Method of encoding the analog signals, Subband coding, Fourier method, Transmission of digital sound, Digital audio signal processing, Stereophonic & quadraphonic signal processing, Editing sampled sound, MPEG Audio, Audio compression & decompression, Brief survey of speech recognition and generation, Audio synthesis, Musical instrument digital interface, Digital video and image compression, MPEG motion video compression standard, DVI technology, Time base media representation and delivery.
UNIT-III	Introduction to Compression techniques, Lossless and Lossy compression, Entropy coding, Source Encoding. Text Compression-Static Huffman coding, Arithmetic Coding, LZ Coding, LZW Coding, Tools and multimedia building blocks: multimedia building blocks, Working exposure on tools like dream weaver,3D effects, Flash.
	Introduction to multimedia operating systems, Media server networks, Communications, Group communication, Synchronization in multimedia systems.
UNIT-IV	Multimedia and internet: history, Internet working, Connections, Internet services the world wide web, Tools for WWW, Plug-Ins and delivery vehicles, HTML, VRML, Designing for WWW, Multimedia applications, Media consumption, Digital communication and new media, Interactive television, Digital broadcasting, Digital radio, Multimedia conferencing, CD-ROM technology, Introduction to MAYA.

Recommended Books:
- Health Steve, Multimedia &communication systems, Focal press, UK
- Vaughan Tay, Multimedia: making it work, TMH
- Villamil & Molina, Multimedia :an introduction, PHI
- Lozano, Multimedia: Sound & Video, 1997, PHI, (Que)
- Drew M S, Fundamentals of Multimedia, Pearson Education
- Hillman D, Multimedia Technology and Application, Galgotia Publication
- Steinmetz R, Multimedia Computing, Communication and Applications, Pearson Education

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-304   ARTIFICIAL INTELLIGENCE AND ROBOTICS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To expose students to the concepts and issues of Artificial intelligence. The objective of the course is to facilitate the student with the idea of how AI work and role of human interaction.

UNIT-I	Meaning and definition of artificial intelligence, Foundation and history of AI, Architecture of AI, Logic family, Classification of logic, Various types of Production systems, Characteristics of production systems, Production rules, The working memory, Recognize act cycle, Conflict resolution strategies, Refractoriness, Recency, Specificity, Alternative approach for conflict resolution by meta rules architecture of production system.
UNIT-II	Ai problems and techniques-AI programming languages, Introduction to LISP - problem spaces and searches, Heuristic function, AND OR graph, OR graph, Heuristic search, Blind search strategies, Breadth first- Depth first- heuristic search techniques Hill climbing: best first- A * algorithm AO* algorithm examples- game tree, Min max algorithms, Game playing- alpha beta pruning, Knowledge representation, Knowledge representation issues, Problems in representing knowledge, Knowledge representation using propositional and predicate logic, Logic programming, Semantic nets- frames and inheritance, Constraint propagation, Resolution and refutation, Deduction, Theorem proving.
UNIT-III	Introduction to reasoning, Reasoning under uncertainty, Review of probability, Baye's probabilistic interferences and Dempster shafer theory, Heuristic methods, Symbolic reasoning under uncertainty, Statistical reasoning, Fuzzy reasoning, Temporal reasoning, Non monotonic reasoning, Various types of slot and filler structures like semantic networks, Frames, Conceptual dependency, Scripts etc. Planning, Planning in situational calculus, Representation for planning, Partial order planning algorithm, Learning from examples, Discovery as learning, I earning by analogy, Explanation based learning, Neural nets, Genetic algorithms.
UNIT-IV	Principles of Natural language processing, Rule based systems architecture, Expert systems, Knowledge acquisition concepts, AI application to robotics, And current trends in intelligent systems. logic programming with prolog: logic program, Horn clause, Program for scene interpretation, Unification of goals SLD resolution, SLD tree, Flow of satisfaction, Controlling backtracking using CUT, Common use of CUT, Implementation of backtracking, Fail predicate, Application of cut fail combination.

Recommended Books:
- Rich Elaine and Knight Kevin, Artificial Intelligence, Tata McGraw Hill Edition
- Russell & Norvig, Artificial Intelligence: A Modern Approach, 1995, Prentice Hall
- Charniak Eugene and McDermott Drew, Introduction to Artificial Intelligence, Addison Wesley
- Konar A, Artificial intelligence and Soft Computing-behavioral and cognitive modeling of human brain, CRC press, USA
- Nilson Nils J, Principles of Artificial Intelligence

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-306   COMPILER DESIGN

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To expose students to the concepts and issues of compiler design in computer science. Application of Compiler tools, Concepts of languages and grammar.

UNIT-I	Introduction to compilers, Types of assemblers, Linkers, Loaders, Compilers and translators, Translators and Interpreters, Overview of compilation, Issues in compilation, Structure of a compiler, Compiler writing tools, Bootstrapping, Notations and concepts for languages and grammars, Regular expressions, Context free grammar, Derivations and parse trees, BNF notations. Context of a lexical analyzer, Construction of lexical analyzer, Deterministic and non-deterministic finite automata, Compiler Structure: Analysis-synthesis model of compilation, Various phases of a compiler, Tool based approach to compiler construction, Lexical analysis: Interface with input parser and symbol table, Token, Lexeme and patterns, Difficulties in lexical analysis, Error reporting and implementation. Regular grammar & language definition, Transition diagrams, Design of a typical scanner using LEX of Flex, Syntax Analysis.
UNIT-II	Syntax Analysis: Context free grammars, Ambiguity, Associability, Precedence, Basic parsing Techniques, Top down parsing, Top down parsing, Recursive descent parsing, Transformation on the grammars, Predictive parsing LL(1) grammar, Nor LL(1) grammar, Bottom up parsing, Operator precedence grammars, LR parsers (SLR, LALR, LR), Design of a typical parser using YACC or Bison, Compile time error handling, Error detection, Reporting, Recovery and repair, Syntax directed translation schemes, Intermediate codes, Translation of assignments, Translation of array reference, Boolean expressions, Case statements, Back patching, Code optimization, Loop, Optimization and global optimization, Sources of sample code generation.
UNIT-III	Syntax directed definitions: Inherited and synthesized attributes, Dependency graph, Evaluation order, Bottom up and top down evaluation of attributes, L- and S- attributed definitions. Type checking: type: type system, Type expressions, Structural and name equivalence of types, Type conversion, Overloaded function and operators, Polymorphic function. Run time system: storage organization, Activation tree, Activation record, Parameter passing symbol table, Dynamic storage allocation. Intermediate code generation: intermediate representation, Translation of declarations, Assignments, Intermediate Code generation for control flow, Boolean expressions and procedure calls, Implementation issues, Assembler, Machine Structure, Machine Languages, Elements of Assembly language Programming, Machine Independent features: Instructions, Program location, Command to Loader, Machine Dependent features: Literals, Symbol defining statements, Expressions, Program Block, Control section and program linking, Design of Two-Pass Assembler, Data Structures Format of Databases, Algorithm
UNIT-IV	A Single-Pass Assembler IBM PC, Loaders Object Code, Function to be performed by Object Code, Machine dependent Features: Location, Linking, Machine Independent features: Automatic Library Search, Loader options, Overlay program, Loader Schemes: Compile and go Loaders, Absolute Loaders, Relocatability: Non-Relocating Program, Relocatable Program, Self-Relocating Programs, Algorithms for Relocating Loaders Using Relocation bit, Algorithm for Relocating loader Using Relocatable Location table, Design of BSS Loader, Linking Schemes, Code generation : object programs, Problems in code generation, A machine model, A simple code generator, Register allocation and assignment, Code generation from DAGs, Peephole optimization.

Recommended Books:

- Louden K C, Compiler Construction, Principle and Practice, Thomson Books
- Aho Alfred V, Sethi Ravi & Ullman Jeffrey D, Principles of Compiler Design, Addison Wesley
- Donovan John J, System Programming, TMH
- Dhamdhere D M, Compiler construction-principles and practice, McMillan india
- Chattopadyaya Shantanu, Compiler Design, PHI

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-308   SOFTWARE ENGINEERING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To expose students to the concepts and issues of software engineering and application of software design. The objective of the course is to facilitate the student with the idea of SDLC cycle models, Requirement analysis, Software project planning, Software design, Software reliability and testing.

UNIT-I	Introduction, Software Development Life Cycle models, System Concept: Definitions, Role of Software Engineer / Analysts / Users in the various phases of Systems Development Life Cycle, Integrated Systems, Sub-systems, Requirements Analysis, Software Design, Coding, Testing, Maintenance, Introduction to software processes and crises, Software life cycle models: build and fix, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Spiral Model, Unified process, Requirement engineering, Types of requirements, Feasibility study, Requirement elicitation analysis, Documentation, Validation, Management.
UNIT-II	Software project planning, Cost estimation, COCOMO, COCOMO-II, Putnam model, Risk management, Software design, Modularity, Strategies, Function oriented design, Object oriented design, Software metrics, Introduction to metrics, Token count, Data structure metrics, If metrics, O-O metrics, Size metrics, Information flow metrics, Entropy based measures, Metric analysis
UNIT-III	Software reliability , Importance of software reliability, S/W reliability & H/w reliability, Failures and faults, Software quality, Reliability models: macro, Basic, Logarithmic, Poisson, Calendar time component, Micro models: estimating number of residual errors, Reliability allocation, CMM,ISO 9000. Testing, Levels of Testing- Functional Testing, Structural Testing, Activities during testing, Test Plan, Test Cases Specification, Reliability assessment, Debugging, Testing tools.
UNIT-IV	Software maintenance, Types of maintenance, Maintenance models, Reverse engineering, Re-engineering, Introduction to Computer Aided Software Engineering (CASE) Types of Data Processing, Multimedia software engineering, Perspectives in multimedia software engineering, Syntax and semantics, Tools for multimedia development environment, Pragmatics, Multimedia software engineering applications.
	Agile software engineering: introduction to agile software development, Time measures, Quality, Learning, Globalization, Reflection, Delivery and cyclicality

Recommended Books:
- Aggarwal K K, Singh Yogesh, Software Engineering, New Age International
- Pressman R, Software Engineering- A Practitioners Approach, McGraw Hill
- Jalote Pankaj, An Integrated Approach to Software Engineering, Narosa Publishing
- Sommerville Ian, Software Engineering,4th edition, Addison Wesley

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-310   ADVANCED COMPUTER ARCHITECTURE

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To expose students to the concepts and issues of advanced computer architecture and application of design. The objective of the course is to facilitate the student with the idea of pipelining computer and array processor.

UNIT-I	Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multivector and SIMD computers, Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Role of computers Program partitioning and scheduling, Grain Size and latency, Grain packing and scheduling, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms, System interconnect architecture.
UNIT-II	Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, Branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines, Arithmetic for computers.
UNIT-III	Memory Hierarchy: Introduction, Multiprocessor system interconnects, The basics of Cache, Measuring and Improving of Cache Performance, Cache coherence problem, Snoopy bus protocol, Directory based protocols, Hardware synchronization mechanisms Virtual Memory, Message passing schemes
UNIT-IV	Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures. Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists, Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms, Parallel Quicksort, Hyper Quick sort, Introduction to parallel program, Scalable point-point interfaces: alpha 364 and HT protocols, High performance signaling layer.

Recommended Books:
- Hwang Kai, Advanced computer architecture, TMH
- Patterson D A and Hennessey J L, Computer organization and design, Morgan Kaufmann, 2nd Ed.
- Culler David E, Singh J P, Gupta Anoop, Parallel computer architecture, Harcoustasis and Morgan Kaufmann
- Hayes J P, Computer Architecture and organization, MGH
- Cragon Harvey G, Memory System and Pipelined processors, Narosa Publication
- Rajaranam V & Murthy C S R, Parallel computer, PHI
- Ghose R K, Moona Rajan & Gupta Phalguni, Foundation of Parallel Processing, Narosa Publications
- Hwang Kai and Zu, Scalable Parallel Computers Architecture, MGH
- Stalling W, Computer Organisation & Architecture, PHI
- Sima D, Fountain T, Kasuk P, Advanced Computer Architecture-A Design space Approach, Addison Wesley
- Flynn M J, Computer Architecture, Pipelined and Parallel Processor Design, Narosa Publishing
- Patterson D A, Hennessy J L and Kauffmann Morgan, Computer Architecture: A quantitative approach
- Hwan and Briggs, Computer Architecture and Parallel Processing, MGH

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-312   COMPUTER GRAPHICS AND IMAGE PROCESSING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To expose students to the concepts and issues of computer graphics, Its basics, Graphic algorithms, Digital image fundamentals, Techniques for digital image processing, Compression techniques -lossy as well as lossy, Morphology.

UNIT-I	Introduction to computer graphics, Point plotting technique, Basic raster graphics algorithms for drawing 2 D Primitives liner, Circles, Ellipses, Arcs, Clipping, Clipping circles, Ellipses & polygon, Polygon Meshes in 3D, Curves, Cubic & surfaces, Solid modeling, Geometric Transformation: 2D, 3D transformations, Window to viewport transformations, Acromatic and color models, Graphics Hardware: Hardcopy & display techniques, Input devices, Image scanners, Shading Tech: Transparency, Shadows, Object reflection, Gouraud & Phong shading techniques. Visible surface determination techniques for visible line determination, Z-buffer algorithm, Algorithm for oct-tres, Algorithm for curve surfaces, Visible surfaces ray-tracing, Radio-city methods.
UNIT-II	Elementary filtering tech, Elementary Image Processing techniques, Geometric & multi-pass transformation mechanisms for image storage & retrieval. Procedural models, Fractals, Grammar-based models, Multi-particle system, Volume rendering, Projection, Parallel projection, Perspective projection, Computation of vanishing point, Visible surface determination, Scan line algorithm, Area subdivision algorithm, Ray tracing algorithm, Shading, Illumination mode, Specular reflection model, Shading models for curve surfaces, Rendering, Recursive ray tracing, Texture mapping, Advanced Modeling Techniques, Procedural Models, Fractal Models, Grammar based models, Particle systems, Animation, 3D animation, Morphing, Simulation of key frames.
UNIT-III	Introduction and Digital Image Fundamentals, The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations, Image Enhancement in the Spatial Domain, Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Image Enhancement in the Frequency Domain, Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering. Image Restoration A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.
UNIT-IV	Image Compression Coding, Inter pixel and Psycho visual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. Image Segmentation, Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation, Representation and Description, Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. Object Recognition Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods, Introduction to parallel image processing, Point operators, Local operators edge detection, Morphological operators, Segmentation, Stereo image processing, Analysis of image sequences.

Recommended Books:
- Folay, Fundamentals of interactive computer graphics, Addison Wesley
- Hearn & Baker, Computer Graphics, 2nd ed. Pearson Education
- Conzalez Rafael C & Woods Richard E, Digital Image Processing, 2nd edition, Pearson Education
- Jain A K, Fundamental of Digital Image Processing, PHI
- Bartels R H, Beatty J C and Barsky B A, An Introduction to Splines for use in Computer Graphics and Geometric Modeling, Morgan Kaufmann Publishers Inc
- Newman W and Sproull R, Introduction to interactive computer graphics
- Preparata F P and Shamos M I, Computational Geometry: An Introduction, Springer-Verlag New York Inc
- Rogers D and Adams J, Mathematical Elements for Computer Graphics, McGraw-Hill International Edition
- Pratt W K, Digital Image Processing

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-314   COMPILER DESIGN LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	- Write a program to check whether a string belong to grammar or not - Implement a lexical analyzer in "C" - Use LEX tool to implement a lexical analyzer - Write a program to find whether a grammar is operator precedent - Write a program to compute FIRST and FOLLOW of non terminals - Write a program to generate a parse tree - Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and * - Write a program to find leading terminals - Write a program to find trailing terminals - Write a program to show all operations of stack - Write a program to remove left factoring - Implement a calculator that takes an expression with digits, + and * and computes and prints its value - Implement the front end of a compiler that generates the three address code for a simple language with: one data type integer, Arithmetic operators, Relational operators, Variable declaration statement, One conditional construct, One iterative construct and assignment statement - Write a program to show various(read, Write and modify) in a text file - Write a program to check whether a grammar is left recursion or not

Recommended Books:
- Louden K C, Compiler Construction, Principle and Practice Thomson Books
- Aho Alfred V, Sethi Ravi & Ullman Jeffrey D, Compilers Principles, Techniques & Tools, Pearson
- Levine Mason and Brown, Lex & Yacc, O' Reilly
- Aho Alferd V and Ullman J D, Principles of Compiler Design, Narosa Publishing House

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-316   MULTIMEDIA TECHNOLOGIES LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	• Write a program to justify a text entered by the user on both the left and right hand side. For example, The test "An architect may have a graphics program to draw an entire building but be interested in only ground floor", Can be justified in 30 columns as shown below. An architect may have a Graphics programs draw an Entric building but be interested in only ground floor. • Study the notes of a piano and stimulate them using the key board and store them in a file. • Write a program to read a paragraph and store it to a file name suggested by the author. • Devise a routine to produce the animation effect of a square transforming to a triangle and then to a circle. • Write a program to show a bitmap image on your computer screen. • Create a web page for a clothing company which contains all the details of that company and at-least five links to other web pages. • Write a program by which we can split mpeg video into smaller pieces for the purpose of sending it over the web or by small capacity floppy diskettes and then joining them at the destination. • Write a program to simulate the game of pool table. • Write a program to simulate the game Mine Sweeper. • Write a program to play "wave" or "midi" format sound files.

Recommended books:
- Li Z N and Drew M S, Fundamentals of Multimedia, Pearson Education
- Hillman D, Multimedia Technology and Application, Galgotia Publication
- Steinmetz R, Multimedia Computing, Communication and Applications, Pearson Education
- Buford J, Multimedia Systems, Addison Wesley
- Hillman David, Multimedia Technology & Applications, Galgotia Publications
- Steinmetz, Multimedia Computing Communication and Application, Pearson Edn.
- Andleigh and Thakarar, Multimedia System Design, PHI
- Rao, Bojkovic, Milovanovic, Multimedia Communication Systems, PHI
- Andleigh, Thakrar, Multimedia System Design, PHI

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-318   COMPUTER GRAPHICS AND IMAGE PROCESSING LAB

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

PRACTICALS	• To produce a single pixel and pre specified pattern on screen • To implement features like changing background color, Foreground color, Resizing of window, Repositioning of window • To implement mid point algorithm to draw circle and ellipse • Use the line drawing & circle drawing programs to draw composite objects containing only circle & lines. You can take shapes like a cart, Car etc. • Write a program for rotation of a 3D object about arbitrary axis. • To Implement Clipping (various algorithms). • Input a polygon by drawing lines, Use appropriate methods for filling and filling convex & concave polygons. • Programs to produce a single pixel produce a pre specified pattern with features like changing background color, Foreground color, Resizing of window, Repositioning of window must be demonstrated. • Write a program for 2D line drawing as Raster Graphics Display. • Use Mid Point algorithm to draw ellipse. Implement circle drawing as a special case of ellipse. Extend this to draw arcs between points. • Write a program for displaying 3D objects as 2D display using perspective transformation. • Programs to draw composite objects containing circles & lines, Drawing lines thicker than one pixel, You can take shapes like a cart, Car etc. • Write a program for Hidden surface removal from a 3D object. • Programs to demonstrate text generation e.g. simple fonts, Graphical fonts, And scalable fonts. • Programs to demonstrate filling algorithms eg. filling convex & concave polynomials. The program must be able to (i) input a polynomial by drawing lines (ii) determine whether convex or concave (iii) use appropriate methods for filling.

Recommended Books:
- Foley et. al., Computer Graphics Principles & Practice, AWL
- Hearn & Baker - Computer Graphics C version, 2nd ed. Pearson Education
- Conzalez Rafael C & Woods Richard E, Digital Image Processing, 2nd edition, Pearson Education
- Jain A K, Fundamental of Digital Image Processing, PHI

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-320   SEMINAR

Internal Evaluation: 25 Marks
External Examination: 25 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
-	-	2	1

SEMINAR	The student is required to deliver an independent seminar on any of emerging areas/ application of Computer Science and Engineering courses. Senior faculty will supervise the students in selecting and preparation of the same. The student will submit two copies of seminar report (at least one week prior to the presentation) and shall make oral presentation as per time schedule decided by the faculty concerned. Internal Evaluation will be made on the basis of report, presentation and the discussion during the presentation.

B TECH (6th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
ELGA-302   ENGLISH LANGUAGE AND GENERAL AWARENESS-VI

L	T	P	Cr
2	-	-	-

Internal Evaluation: 50 Marks

Course Objective:
To help the students understand the nuances of technical writing that would enable them to communicate effectively and efficiently at their workplace, And, Through the General Awareness section, An overview of economic planning in India.

UNIT-I	**Technical Writing**
	
	• Guidelines for technical writing
	
	• Effective use of charts, Graphs, Tables etc.
	
	• Technical reports
	    o Types of reports
	    o Steps in writing a report
	    o Guidelines for writing a report

UNIT-II	**General Awareness** (a) Economic Planning in India • Objectives of economic planning in India • Review of 60 years of planning in India • 11th Plan (2007-12): achievements and failures • 12th Plan (2012-17): objectives, Targets & strategy (b) Biography: Bill Gates (c) Book Review: A Better India; A Better World by N R Narayana Murthy (d) Industry Overview: Renewable Energy

Recommended Books:
- Barun K Mitra, Effective Technical Communication, Oxford
- Tyagi Kavita & Misra Padma, Basic Technical Communication, PHI
- Raman Meenakshi & Sharma Sangeeta, Technical Communication, Oxford
- Datt & Sundharam, Indian Economy, S Chand
- Sharma R C, Krishna Mohan, Business Correspondence and Report Writing, TMH

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   MOBILE COMPUTING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics problem in Wireless network. The scope of the course is to acquire skills in fields of Mobile Technology and apply its application.

UNIT-I	Introduction to Mobile Computing, Challenges in Mobile Computing, Wireless Transmission, Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread spectrum. Medium Access, Control-SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks, Telecommunication Systems-GSM & Architecture, GPRS, DECT, TETRA, UMTS and IMT-2000, Coping with Uncertainties, Resource Poorness, Bandwidth, Etc, Cellular Architecture, Co-Channel Interference, Frequency Reuse, Capacity Increase by Cell Splitting, Device-Independent View Component, Location Management Techniques, Mobility Pattern, Mobility Management, Network Signaling, Performance Analysis, Admission Control and Handoffs, Call Arrival Pattern, Introduction to Personal Communications Services (PCS), PCS Architecture
UNIT-II	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(MACA), Polling, Inhibit Sense Multiple Access, CDMA, Spread Aloha Multiple Access, 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, 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.
UNIT-III	Mobile Network Layer, Mobile IP, Dynamic Host Configuration Protocol, Mobile Ad-Hoc Networks, Goals, Assumptions and Requirements, Introduction to Wireless Sensor Networks Entities and Terminology, IP Packet Delivery, Agent Advertisement and Discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse Tunneling, Ipv6, Routing, Mobile Transport Layer-Congestion control, Slow Start, Fast Retransmit/Fast Recovery, Implications on mobility, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Traditional TCP, Classical TCP improvements, TCP over 2.5/3G Wireless Networks, Support for Mobility-File Systems, WWW, WAP, I-mode, WAP 2.0, Transmission/Timeout Freezing, Selective Retransmission.
UNIT-IV	Data Dissemination and Management, Challenges, Data Dissemination, Mobile Data Replication, Mobile Data Caching, Mobile Cache Maintenance, Mobile Web Caching, Caching in Ad Hoc Networks, Context Aware Computing, Ubiquitous Computing, Concept of Context, Context Aware Computing and Applications, Middleware Support, Mobile Middleware, Service discovery, Adaptation, Mobile agents, Wireless Application Protocol (WAP), The Mobile Internet standard, WAP Gateway and Protocols, Wireless Mark up Languages (WML), Wireless Local Loop(WLL), Introduction to WLL Architecture, Wireless Local Loop Technologies, Global Mobile Satellite Systems, Case Studies of the IRIDIUM and GLOBALSTAR Systems, Wireless security, Traditional Security Issues, Mobile and Wireless Security Issues, Problems in Ad Hoc Networks, File System Support for Mobility, Distributed File Sharing for Mobility Support, Coda

	and other Storage Manager for Mobility Support, Mobile Transaction and Commerce, Models for Mobile Transaction, Kangaroo and Joey Transactions, Team Transaction, Recovery Model for Mobile Transactions, Consistency and Concurrency Model.

Recommended Books:
- Adelstein Frank, Gupta S K S, Richard III Golden G and Schwiebert Loren, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill Professional
- Agrawal D P and Zeng Q A, Introduction to Wireless and Mobile Systems, Thomson Brooks/Cole
- Rappaport Theodore S, Wireless Communications: Principles and Practice, Second Edition, Prentice Hall
- Stojmenovic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley & Sons
- Ilyas Mohd. & Mahgoub Imad, Mobile Computing Handbook, CRC Press/Aurbach Publications, ISBN 0-8493-1971-4, Boca Raton USA
- Schiller Jochen, Mobile Communications, Second Edition, Pearson Education
- Stallings William, Wireless Communications and Networks, Pearson Education
- Yi-Bing and Chlamtac Imrich, Wireless and Mobile Networks Architectures, John Wiley & Sons
- Pandya Raj, Mobile and Personal Communication Systems and Services, PHI
- Schwartz Mischa, Mobile Wireless Communications, Cambridge University Press, UK

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   CRYPTOGRAPHY AND SECURITY IN NETWORKS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the understanding of various cryptographic techniques for secure data transfer. The prerequisites are to have basic understanding of network security, Probability and stochastic processes.

UNIT-I	Introduction, Review of OSI architecture, Security attacks, Services, Mechanisms, Symmetric Cipher Models, Substitution techniques, Transposition techniques, Rotor machines, Steganography, DES: Simplified DES- Block Cipher principals, The Data Encryption Standard, The Strength of DES, Differential and linear Cryptanalysis, Block Cipher Design principles, Modular arithmetic, The Euclidean algorithm, Block Cipher modes of operations, Stream ciphers and RC4, IDEA: Primitive operations, Key expansions, One round, Odd round, Even Round- Inverse keys for description. AES: Basic Structure, Primitive operation, Inverse Cipher, Key Expansion, Rounds, Inverse Rounds.
UNIT-II	Public key Cryptography: Principles of Public key Cryptography Systems, Number theory, Modular arithmetic, Prime numbers. RSA algorithms, Key Management, Diffie-Hellman Key Exchange, Elliptic curve cryptography, Authentication requirements, Authentication functions, Message authentication codes, Hash functions- SHA, MD5, Security of Hash functions and MACS, Digital signatures, Authentication protocols, Digital signature standards.
UNIT-III	Network security: Electronic Mail Security: Pretty good privacy, S/MIME IP Security: Architecture, Authentication Header, Encapsulating Security payload, Combining Security associations, Key management. Web Security: Web Security considerations, Secure Socket Layer and Transport layer Security, Secure electronic transaction. Firewalls-Packet filters, Application Level Gateway, Encrypted tunnels.
UNIT-IV	System security: intruders, Intrusion detection, Password management, Viruses and related threat, Distributed denial of service attacks, Secure socket layer and transport layer security, Secure electronic transaction (SET), Firewall design principals, Trusted systems.

Recommended Books:
- Stallings William, Cryptography and Network Security: Principles and Practice, Third Edition, Pearson Education, New Delhi
- Forouzan B A, Cryptography and Network Security, TMH
- Kaufman C, Perlman R and Spenser M, Network Security, Second Edition, Prentice-Hall, Englewood Cliffs
- Bellovin S and Chesvick , Internet Security and Firewalls, Second Edition, Addison-Wesley, Reading
- Delfs H and Knebl H, Introduction to Cryptography, Springer
- Schneier B, Applied Cryptography, Wiley
- Talukder Asoke, Yavagal, Mobile Computing, TMH
- Maiwald Eric, Fundamentals of Network Security, Dreamtech Press
- Koblitz N, A course in number theory and cryptography, Springer-Verlag
- Stinson D R, Cryptography: Theory and Practice, CRC

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   EMBEDDED SYSTEM DESIGN

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics of Embedded systems, Development process, Emphasizing various mobile application development environments. The prerequisites are to have basic understanding of Computer architecture, Programming languages and operation systems

UNIT-I	Introduction to Embedded Systems, Classification of Embedded Systems, Issues in ESD and Co-design, Development phase of an embedded systems, Languages for embedded systems development, Processors for ES, Tools for an ES development, Hardware fundamentals: Gates, Timing diagram, Memory, Microprocessor, Buses, DMA, Interrupts: Microprocessor architecture, Interrupt basics, Interrupt latency, Shared data problem, System partitioning, Building the architectural model, Input and output processing, Hardware and software partitioning, Timing requirements, Special Challenges with Embedded Systems, Introduction to the 68HC12 and HCS12 Microcontrollers, HCS12 Family, Advantages of programming in assembly Language and HLL, Choosing the best HLL available for Embedded Systems, Structured Programming and Design, Programming & Debugging Procedures, Emulators and Logic analyzers, Cross compiler.
UNIT-II	Architecture of 68HC12/HCS12 System, Modes of Operations: Normal operating Modes, B32 EVB Modes of Operation, Register Block Relocation, Port System, B32 Memory System, B32 Memory Map, Memory Resource Remapping, HCS12 DP256 Memory System, Exception processing, 68HC12 Interrupt Response, The Timing System-the standard timer module, Component of timer module, Free running counter and its associated register, I/O channel, Real-time Interrupt, The Enhanced Capture Timer: MC68HC12BE32, Serial Communications, 68HC12 Serial Communication Interface, Serial Peripheral Interface, Input/output interfacing concepts, RS-232 Interface, I2C interfacing, USB Interfacing.
UNIT-III	Real-Time Operating Systems: Review of Concepts, Basic Concepts, Types of RTOS, RTOS Issues, Implementing of RTOS, Distributed Processing Systes-Networking with msCAN: Design Approaches, CAN protocol, The controller Unit for the 68HC12 msCAN12, Timing issue, Development tools and debugging, Host and target machines, Linker/locators, Target system, Testing, Instruction set, Assert macro. Establishing a software development environment C runtime, Environments Embedded debuggers Cross-development methods embedded file formats, Readers, Creating object files - the build process loading software into remote targets, A case study of Windows CE RTOS for mobile applications, Introduction to windows mobile PC and development environment.
UNIT-IV	Examples of embedded systems, Characteristics and requirements Sensors and devices, Theory of sampling, Analog-to-digital and digital-to-analog conversions, Data encoding, Data communications in embedded environments, Bus structures and protocols, Access control methods, Data communications in embedded environments: bus structures and protocols, Access control methods, I/O organizations: device interfaces, Processor interfaces, Time-critical I/O handling, Structures of embedded operating systems cross development and debugging techniques and tools, Codesign Overview, Models and Methodology of Embedded System codesign, Hardware Software partitioning and Scheduling, Cosimulation, High level Synthesis (HW) and functional verification.

Recommended Books:
- Barrett Steven F and Pack Daniel J, Embedded Systems: Design and Applications with 68HC12 and HCS12, Pearson Education

- Ganssle Jack G, The Art of Programming Embedded Systems, Academic press
- Odette Louis L, Intelligent Embedded Systems, Addison-Wesley
- Staunstrup J and Wolf W, Editors, Hardware/Software Co-Design: Principles and Practice, Kluwer Academic Publishers
- Boling Douglas, Programming Microsoft windows CE, .Net, WP publishers & Distributors
- Simon David E, An Embedded Software Primer, Pearson Education, 2001
- Berger Arnold S, Embedded Systems Design ISBN 1-57820-073-3
- Kamal Raj, Embedded System Design, THM
- Jonathan W. Valvano, Embedded Microcomputer Systems, Cenage Learning
- Krishna C M, Real Time System, MGH
- Levi and Agarwal, Real Time System, MGH
- Joseph Mati, Real Time System: Specification, Validation & Analysis, PHI
- Liu Jane W S, Real Time System, Pearson Education

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   NATURAL LANGUAGE PROCESSINGAND INFORMATION RETRIEVAL

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics Operation of NLP. Research area in Speech Recognition. Application of NLP and Machine Translation.

UNIT-I	Introduction to Natural Language Understanding, The study of Language, Achievement and brief history, Challenges of NLP, Applications of NLP, Language and grammar, Evaluating Language, Open problems, Major goal, Characteristic of Language, Understanding Systems, Different levels of Language Analysis, Information retrieval, Language modeling, Introduction, Various based language models, Statistical language model.
UNIT-II	Word level analysis, Regular expressions, Finite state machines, Morphological parsing, Spelling error detection and correction, Parts of speech tagging, Syntactic analysis, CFG, Parsing, Probabilistic parsing, Semantic analysis, Meaning representation, Lexical semantics, Ambiguity, Word sense disambiguation.
UNIT-III	Introduction to discourse parsing, Natural language generation, Architecture of NLG systems, Generation tasks and representations, Applications of NLG.
	Machine translation, Problems, Machine translation approaches, Direct machine translation, Rule based machine translation, Corpus based machine translation, Semantic and knowledge based machine translation
UNIT-IV	Information retrieval, Design features of information retrieval, Information retrieval models, Classical information retrieval models, Non classical models of IR, Alternative models of IR, Natural language processing in IR, Relation matching, Knowledge approaches, Conceptual graphs in IR, Cross lingual information retrieval, Introduction to lexical resources. Application of NLP, Intelligent work processors, Machine translation, User interfaces, Man-Machine interfaces, Natural language querying, Tutoring and authoring systems, Speech recognition, Commercial use of NLP.

Recommended Books:
- Siddiqui Tanveer, Tiwary U S, Natural language processing and information retrieval, Oxford University
- Syal P and Jindal D V, An introduction to Linguistics, Language rammer and semantics, Eastern Economy Edition
- Bharati Akshar, Chaitanya Vineet and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
- Winograd T, Language as a cognitive Process, Addison-Wesley
- Allen James, Natural Language Understanding, Benjamin-1995, Cummings Pub. Comp. Ltd.
- Winograd Terry, Language as a cognitive process, AW
- Gazder G, Natural Language processing in prolog, Addison Wesley

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   MOBILE AD HOC AND WIRELESS SENSOR NETWORKS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To provide basic for various techniques in mobile networks/Adhoc networks and sensor based networks. The objective of the course is to facilitate the student with the understanding of Infrastructure less networks and their importance in the future directions for wireless communications. The prerequisites are to have basic understanding of infrastructured networks, Basic protocols used on computer networking.

UNIT-I	Introduction Mobile Ad hoc Networks (MANET), Technologies for Ad Hoc Network, Issues in Ad hoc wireless Networks, IEEE 802.11 Architecture and protocols, Protocol for AD HOC Wireless Networks, Issues and classification of MAC protocol, Other MAC protocols, Dynamic Source Routing (DBR), Adhoc Distance Vector (AoDV) routing, Routing Protocols, Multicasting Routing issues, Mobility Management, Modeling distributed applications for MANET, MAC mechanisms and protocols, MANET.
UNIT-II	Ad hoc network security-Link layer, Network layer, Trust and key management, Self policing MANET-Node Misbehavior, Secure routing, Reputation systems, Transport layer & Security protocols, Issues in designing transport layer protocols, TCP over Ad Hoc Wireless Networks, Network Security Attacks, And Key management.
UNIT-III	Routing Protocols: Ad hoc network routing protocols, Destination sequenced distance vector algorithm, Cluster based gateway switch routing, Global state routing, Fish-eye state routing, Dynamic source routing, Ad hoc on-demand routing, OLSR & TORA routing, Location aided routing, Zonal routing algorithm.
UNIT-IV	Communication Protocols Physical Layer and Transceiver design considerations in WSNs, Wireless Sensor Networks (WSN)-Design Issues, Clustering, Applications of WSN, MAC layer and routing protocols in WSN Data Retrieval Techniques in WSN-Sensor databases, Distributed query processing, Data dissemination and aggregation schemes, Operating Systems for WSN, Security issues in WSN, QoS in wireless sensor networks, Coverage and deployment, Localization and positioning.

Recommended Books:
- Murthy C Siva Ram & Manoj B S, Mobile Ad hoc Networks-Architectures & Protocols, Pearson Education, New Delhi
- Cordeiro C M & Agrawal D P, Adhoc & Sensor Networks-Theory and Applications, ISBN 981-256-682-1, World Scientific Singapore
- Raghvendra C S, Wireless Sensor Networks, Springer-Verlag
- Adleshein & Gupta, Fundamentals of Mobile and Pervasive Computing, TMH
- Illayas Mohamed, Handbook of Ad Hoc wireless network, CRC press
- Karl Holger, Protocols and Architectures for Wireless Sensor Networks, John Wiley & Sons

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   ADVANCED DATABASE SYSTEMS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics Concept and applications of database systems, Its architecture, Concurrency, Parallel database, Advanced transaction processing.

UNIT-I	Architecture Advantages, Disadvantages, Data models, Relational algebra, SQL Normal forms, General strategies for query processing, Transformations, Expected size, Statistics in estimation, Query improvement, View processing, Query processor, Reliability, Transactions, Recovery in centralized DBMS, Reflecting updates, Buffer management, Logging schemes, Disaster recovery.
UNIT-II	Introduction, Serializability, Concurrency control, Locking schemes, And timestamp based order, Optimistic scheduling, Multi version techniques, And deadlocks, Introduction, Object Definition language, Creating object instances, Object query language.
	Basic concepts of distributed database, Distributed DBMS architecture, Storing distributed data, Introduction to distributed transactions, Distributed concurrency control, Recovery, Options for distributing a database.
UNIT-III	Data warehousing: Introduction Basic concepts, Data warehouse architecture, Data characteristics, Reconciled data layer data transformations, Derived data layer user interface.
	Object Relational Databases: Basic concepts, Enhanced SQL, Advantages of object relational approach.
UNIT-IV	Parallel database: architecture for parallel database parallel query evaluation , Parallel zing individual operations, Parallel query optimization.
	Advanced transaction processing, Integrated access to multiple data source, Mobile database, Memory database, Multimedia database, GIS, Temporal and sequence database.

Recommended Books:
- Desai Bipin C, An Introduction to database systems, Galgotia Publications
- Ramakrishna R & Gehrks J, Database management systems, MGH, International Ed.
- Date C J, Database systems,7th Ed., Addison Wesley, Pearson education
- Tamer M & Valduricz, Principles of distributed database systems, 2nd edition, LPE Pearson Edition
- Korth, Database System

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   SOFTWARE PROJECT MANAGEMENT

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
3	1	-	4

Course Objective:

The objective of the course is to facilitate the student with the basics Operation of Software Project Management and role of software engineering. The scope of the subject is to acquire skills and understand different types of model

UNIT-I	Fundamentals of Software Project Management Need Identification, Project Management Cycle, Objectives, Processes and Project Management, Project Management and the CMM, Overview of the CMM, KPAs for Project Management, Management Spectrum, Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process. Project organization and Scheduling: Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.
	Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Estimating Defects for Other Stages, Quality Process Planning, Defect Prevention Planning, Concepts of Software Quality, Quality Attributes, Software Quality Control and Software Quality Assurance, Evolution of SQA, Major SQA activities, Major SQA issues, Zero defect Software.
UNIT-II	Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management, Process: Risk identification, Risk analysis, Risk planning, Risk Prioritization, Risk Control, Risk Management Planning, Risk Monitoring and Tracking, Measurement and Tracking Planning: Concepts in Measurement, Metrics and Measurements, Process Monitoring through Statistical Process Control, Measurements, Collecting Effort Data, Logging and Tracking Defects, Measuring Schedule, Measuring Size, Project Tracking, The Project Management Plan: Team Management, Team Structure, Communication, Team development, Customer Communication and Issue Resolution, The Structure of the project management plan, Configuration Management: Concepts in Configuration Management, The configuration management Process, Planning and Setting Up Configuration Management, Perform Configuration Control, Status Monitoring and Audits.
UNIT-III	Reviews: The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One person Review, Guidelines for Reviews in Projects, Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Status Reports, Milestone analysis, Project Closure: Project Closure Analysis, The Role of Closure Analysis, Performing Closure Analysis, Closure Analysis Report.
UNIT-IV	Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Managing the Project: Managing the Task, Project Control, Managing to the Plan, Reviews, Feedback and Reporting Mechanisms, Configuration Management, Quality Control and Quality Assurance, Managing Change, Readjusting Goals and Milestones, Risk Management, Testing Phases, Formalized Support Activities, Managing the Team, Team Organizations, Recruiting and Staffing-picking the right people, Technical leadership, Avoiding obsolescence-training, Etc.) Managing the Context, Communication Skill, Decision Theory, Business Management, Assessing the Organization's ability to perform the process, Probability and Statistics, Managing Product Support and Maintenance, Evaluating the Project. Software Project

	Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

Recommended Books:
- Jalote Pankaj, Software Project Management in Practice, Addison Wesley Professional
- Gilb Tom, Susannah Finzi, Principles of Software Engineering Management, Addison-Wesley, England
- Cotterell M, Software Project Management, Tata McGraw-Hill Publication
- Royce, Software Project Management, Pearson Education
- Conway Kieron, Software Project Management, Dreamtech Press
- Dunn Robert, Software Quality Concepts and Plans, Prentice-Hall
- Gillies Alan, Software Quality, Theory and Management, Chapman and Hall

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424 DISTRIBUTED OPERATING SYSTEM

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics Operation of distributed operating system. After undergoing this course the students have the knowledge of goals, Working, Synchronization, Scheduling memory management and MACH .

UNIT-I	Introduction to Distributed System, Motivation, Goals of Distributed system, System architecture type, Hardware and Software concepts, Design issues. Communication in distributed system: Layered protocols, ATM networks, Client-Server model, Remote Procedure Calls and Group Communication. Middleware and Distributed Operating Systems.
UNIT-II	clock synchronization, Mutual Exclusion, Election algorithm, The Bully algorithm, A Ring algorithm, Atomic Transactions, Deadlock in Distributed Systems, Distributed Deadlock Prevention, Distributed Deadlock Detection, Control organization, Centralized, Distributed and hierarchical detection algorithm.
UNIT-III	Threads, System models, Processors Allocation, Scheduling in Distributed System, Real Time Distributed Systems, Distributed file system Design, Architecture mechanism for building, Design issues, Distributed file system Implementation, Log structured file system, Trends in Distributed file systems.
UNIT-IV	Introduction to shared memory, Consistency models, Page based distributed shared memory, Shared variables distributed shared memory, Introduction to MACH, Process management in MACH, Communication in MACH, UNIX emulation in MACH.

Recommended Books:
- Tanenbaum Andrew S, Distributed Operating System, PHI
- Singhal Mukesh & Shivarrati N G, Advanced concepts in operating systems, TMH
- Silberschatz S, Galvin P, Gagne G, Applied operating system concepts, Wiley

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   DISTRIBUTED SYSTEMS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics Concept and applications of Distributed System. Study architecture and basic techniques of Faults in distributed system

UNIT-I	Introduction, Fundamental basic communication services, Examples of distributed Systems, Fundamentals Issues of Distributed System, Architectural and distributed system Models and mobile computing systems, Resource sharing and the Web Challenges, Basic concepts in distributed computing, Classification of Failures in Distributed Systems, Examples of distributed systems, Various types of distributed system, Introduction to distributed objects, Method of communication between distributed objects. Basic Techniques for Handling Faults in Distributed Systems, Distributed Operating Systems, Overview, Network operating systems, Distributed file systems Introduction to distributed file systems, Various types of distributed file systems, File service architecture, Design and implementation issues in distributed shared memory, Various types of consistency models for distributed shared memory systems.
UNIT-II	Interprocess Communication, Broadcast Protocols, Naming in Distributed Systems, Naming concepts, Naming entities, Locating mobile entities, Removing un-referenced entities, Global State, Termination, And Distributed Deadlock Detection: system model, Resource Vs communication deadlocks, Deadlock prevention, Avoidance, Detection & resolution, Centralized dead lock detection, Distributed dead lock detection, Path pushing algorithms, Edge chasing algorithms., Mutual exclusion, Distributed Mutual Exclusion, Leader Election, Agreement Protocols. Group Membership Protocols. Distributed Scheduling and Load Balancing. Distributed File Systems, And Distributed Shared Memory, Security and Fault-Tolerance Issues, Case Studies of Distributed Systems.
UNIT-III	Synchronization, Limitation of Distributed system, absence of global clock, Logical Clock and Physical Clock, Shared memory, Logical clocks, Lamport's & vectors logical clocks, Clock synchronization, Election algorithms, Distributed transactions, Security in distributed systems, Parallel Processing, Basic Concepts: Introduction to parallel Processing, Parallel processing terminology, Design of parallel algorithms, Design of Parallel Databases, Parallel Query Evaluation, Styles of client /server computing - CORBA.
UNIT-IV	Consistency and Replication, Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols, Fault Tolerance : Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols, Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems Protection and security in distributed systems, Various types of security techniques, Cryptographic algorithms and their pragmatics, Use of digital signature methods for security enhancement.

Recommended Books:
- Tannenbaum A, Maarten Van Steen, Distributed Systems, Principles and Paradigm, Prentice Hall India
- Coulouris G, Dollimore J and Kindberg T, Distributed Systems: Concepts and Design, Pearson Education
- Elmarsi, Navathe, Somayajulu, Gupta, Fundamentals of Database Systems, 4th Edition, Pearson Education
- Singhal M & Shivaratri N, Advanced Concepts in Operating Systems, TMH
- Tanenbaum A, Modern Operating Systems, 2nd Edition, Prentice Hall India

- Welch Attiya, Distributed Computing, Wiley India
- Coulouris, Dollimore and Kindberg, Distributed Systems, Pearson

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   DATA MINING AND DATA WAREHOUSING

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to facilitate the student with the basics of data mining and data warehousing, Cluster analysis, Mining rules, Development process, And various applications.

UNIT-I	Introduction to data mining, Motivation for data mining, Its importance, Data mining functionalities, Role of data mining, Classification of data mining systems, Major issues in data mining, Data warehouse and OLAP technology, Data warehouse, Multidimensional data model, Data Mining Languages, And System Architectures, Implementation, Data cube technology, Data Preprocessing, Data cleaning, Data integration and transformation, Data Mining Languages, Data Mining Primitives, Data mining query language, GUI for data mining system, Architecture of data mining system, Generalization and summarization based characterization, Analytical characterization, Mining class comparisons, Mining descriptive statistical measures in large databases, Intelligent data mining, Introduction to data mining in bioinformatics.
UNIT-II	Mining association rules in large database, Classification and Prediction, Different issues regarding classification and prediction, Cluster Analysis, Types of data in cluster analysis, Categorization and discussion of major clustering methods, Partitioning methods, Hierarchical methods, Density based methods, Grid based methods, Outlier Analysis, Recent trends, Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining spatial, Multimedia, Text, Time series and sequence data, Text databases, World wide web, Application and trends in data mining.
UNIT-III	Classification and Prediction, Issues regarding classification and prediction-classification by decision, Classification based on concepts from association rule mining, Other, Classification methods, Applications and Trends in Data Mining, Data mining system products and Research prototypes Trends in Data mining, Introduction to data mining tools: data mining tool for intrusion detection, Data mining tool for web page surfing prediction, Data mining tool for image classification, Multimedia data management & mining, Data management systems :developments and trends.
UNIT-IV	Data Warehousing: An Introduction to data ware housing and characteristics of a data warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation, Data Warehousing to Data Mining, Data warehousing components, Various aspects of data marts, On Line Analytical processing: OLTP and OLAP systems, Data Modeling, OLAP Tools, Web OLAP, Decision support system, Developing a Data Ware house: Architectural strategies and Organization Issues, Performance Considerations, Tools for Data Warehousing, Case studies.

Recommended Books:
- Han Jiawei, Kamber Micheline, Data Mining: concepts and techniques, 2nd ed., Morgan Kaufmann Publishers
- Berry M J A and Linoff G, Mastering Data Mining: The Art and Science of Customer Relationship Management, Wiley Computer Publishing
- Prabhu C S R, Data Ware housing: Concepts, Techniques, Products and Applications, Prentice Hall of India
- Adrians Pieter, Zantinge Dolf, Data Mining, Addison Wesley
- Seidman, Data Mining with Microsoft SQL Server, Prentice Hall of India
- Berson Alex and Smith Stephen, Data Warehousing, Data mining and OLAP, McGraw Hill

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   E-COMMERCE

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to study e-commerce, Its advantages and disadvantages, Internet marketing, Legal issues, Ethical issues, Information systems, Macro forces and internal commerce.

UNIT-I	Definition and scope of e-commerce, Advantages and constraints, E-Commerce framework, Strategy making in online environment, E-Commerce & media convergence, Anatomy of E-Commerce, Basic Technology, Applications, Architecture framework for electronic commerce, Intranets and extranets, Planning an intranet, Extranets and Supply Chain Management, Hosting a web site, Choosing an ISP, Mobile commerce, Website evaluation and usability testing.
UNIT-II	Market opportunity analysis, Internet marketing, Tracking customers, Customer service, Web portals and web services, Branding, Business models in e-commerce, B2C and B2B models, Advantages and disadvantages, SCM and B2B, Electronic Data Interchange.
UNIT-III	Ethical issues, Legal issues, Copyrights and trademarks, Warranties, Taxation, International issues, Types of electronic Payment systems, Digital token based electronic payment systems, Smart cards and electronic payment system, Electronic money, Requirements for internet-based payments, Types of electronic payment media, Credit cards, Smart cards, E-cash, E-wallet, Electronic Funds Transfer, B2B and e-payment, M-commerce and e-payment.
UNIT-IV	Internal information systems, Macro forces and internal commerce, Workflow automation and coordination, Customization and internal commerce, SCM, Search and resource discovery paradigms, Digital copy rights and e-commerce.

Recommended Books:
- Awad Elias M, Electronic Commerce - From Vision to Fulfillment, 3rd Edition, Pearson Education
- Rayport Jeffrey F and Jaworski Bernard J, Introduction to E-commerce, 2nd Edition, Tata McGraw-Hill Edition
- Kalakota R and Whinston A B, Frontiers of electronic commerce, Pearson Education
- Raynolds Janice, The complete e-commerce book, 2/e, CMP Books

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   DISTRIBUTED DATABASE

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to study distributed database, Its applications, Techniques, Query optimization, Introduction to deductive database, Parallel database, Temporal database, Concept of next generation of database.

UNIT-I	Definition of Distributed Data, Application of Distributed DB, Storage, Fragmentation & Replication, Transparency, Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Reliability and Commit protocols, Distribution and View Integration, Distributed database design, Distributed algorithms for data management, Heterogeneous and Federated Database Systems, Distributed databases features, Distributed database management systems, Review of databases and computer networks, Levels of distribution transparency, Reference architecture.
UNIT-II	Distributed database design, A frame work for distributed database design, The design of database fragmentation, The allocation of fragments. Translational global queries to fragment queries, Equivalence transformation for queries, Transforming global queries into fragment queries, Distributed grouping and aggregate function evaluation, Parametric queries.
UNIT-III	Query optimization , Problems in query optimization, Objectives in query process optimization, Similar representation of queries, Model for query optimization, Join query, General queries, Distributed transactions and concurrency control. Frame work for transaction management, Properties and goals of transaction, Atomicity of distributed transactions , Recovery procedures, Concurrency control for distributed transactions, Foundations of distributed concurrency control, Distributed deadlocks, Concurrency control based on time stamps.
UNIT-IV	Deductive Databases: Recursive Queries, Prolog/Datalog Notation, Basic inference Mechanism for Logic Programs, Deductive Database Systems, Deductive Object Oriented Database Systems, Commercial and Research Prototypes, Parallel database, Multimedia database, Mobile database, Digital libraries, Temporal database, Reliability and protection: Basic concepts, Non-blocking commitment protocols, Reliability and concurrency control, Determining a consistent view of network, Detection and resolution of inconsistency, Check point and cold restart, Authorization and protection, Emerging Database Trends, Active databases, Concept of next generation databases, Data warehouses and executive information system, Parallel query processing, Multi-media databases.

Recommended Books:
- Ceri and Pelagatti Distributed databases principles and systems, McGraw Hill
- Raghuramakrishnan, Database management system, McGraw Hill
- Elmasri R and Navathe S B, Fundamentals of Database Systems, Addison Wesley
- Silbershatz, Korth H F and Sudarshan S, Database System Concepts, 3rd edition, McGraw-Hill, International Edition

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424 BIO-INFORMATICS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:

The objective of the course is to study bio-informatics and computational genomics, Human genome projects history, Genetic algorithms, Comparative genetic algorithms.

UNIT-I	Introduction to Life Sciences: Levels of organization in nature: atom, Molecule, Organelle, Cell, Tissue, Organ, Organ system, Unicellular and multicellular organisms, Branches of Biology - Cell Biology - Cell as the structural and functional unit of life - Structural components of cell - Types of cells - Prokaryotic, Eukaryotic, Animal and Plant cell, Important Biomolecules- Nuclei acids, Proteins, Enzyme, Internet and Bioinformatics, Introduction to Data Mining, Applications of Data Mining to Bioinformatics, Problems and Applications of Bioinformatics, introduction to Bioinformatics Soft wares, Genetic Analysis Software, Phylip Biological databases, Kinemages for biological structure, Dynamic Programming Sequence Alignment.
UNIT-II	Human Genome Project, History, Nucleic acids, Genes, Genomes, Contribution of various countries, About National Institutes of Human Genome Project (NHGRI), Introduction and need of Human Genome Project, Rough and final draft of the Human genome Project, Goals of the HGP, Uses and applications, Overview of genomics and proteomics, Biocomputing: Introduction to String Matching Algorithms, Database Search Techniques, Sequence Comparison and Alignment Techniques, Use of Biochemical Scoring Matrices, Introduction to Graph Matching Algorithms, Automated Genome Comparison and its Implication, Automated Gene Prediction, Automated Identification of Bacterial Operons and Pathways, Introduction to Signaling Pathways and Pathway Regulation. Gene Arrays, Analysis of Gene Arrays, Systems Biology-an introduction, Markov chains and applications: Machine Learning Methods, Hidden Markov models, Applications of HMM in gene identification and Profiles HMMs, Neural Networks and Support Vector machines.
UNIT-III	Terminologies and Ontologies, Multiple Sequence Alignment, 1D Motifs, Algorithms and Databases, 3D structure alignment, MUSTA algorithm for geometric hashing and multiple Alignment, Hidden Markov models, Molecular energetic and dynamics, Protein structure prediction, Genetic networks, Gene finding algorithms.
UNIT-IV	Comparative genomics algorithms, Genome Alignment, Phylogenetic algorithms, Natural, Language Processing, Proteomics, 3D motifs & Final Thoughts, Application of Bio-Informatics, Cheminformatics in Biology, Conventions for representing molecules, Cheminformatics, Resources, Bioinformatics in harmaceutical industries, Bioinformatics in immunology, Bioinformatics in agriculture, Bioinformatics in forestry, Geoinformatics, Legal, Ethical and commercial ramifications of bioinformatics, Biosensing. Basics of Computer Aided Drug Design (CADD), Microarray Bioinformatics, Synthetic Biology and Systems Biology. Soft computing methods in Bioinformatics- Basics of Hidden Markov Models, Artificial Neural Networks, Genetic Algorithms and Ant Colony Optimization.

Recommended Books:
- Mount David, Bioinformatics: Sequence and Genome analysis, 2ed, Cold Spring HarborLaboratory Press
- Claverie J M and Notredame C, Bioinformatics for Dummies, Wiley Editor
- Essential Biology (Abridged) Campbell, Cambridge
- Krane D E and Raymer M L, Fundamental Concepts of Bioinformatics, Pearson education
- Letovsky S I, Bioinformatics, Kluwer Academic Publishers
- Baldi P and Brunak S, Bioinformatics, The MIT Press
- Setubal J and Meidanis J, Introduction to Computational Molecular Biology, PWS Publishing Co, Boston

- Lesk A M, Introduction to Bioinformatics, Oxford University Press
- Rastogi S C, Mendiratta N and Rastogi P, Bioinformatics: Concepts, Skills & Applications, CBS Publishers & Distributors, New Delhi
- Vyas S P and Kohli D V, Methods in Biotechnology and Bioengineering
- Singer M and Barg P, Exploring Genetic Mechanism
- Fogel G B and Corne D W, Evolutionary Computation in Bioinformatics
- Genetic Library Construction and Screening: Advanced Techniques and Applications: Lab Manual
- Patterson B K, Techniques in Quantification and Localization of Gene Expression
- Mont D W, Bioinformatics: Sequence and Genome Analysis
- Evens W J and Grant G R, Statistical Methods in Bioinformatics: An Introduction
- Liu B H, Statistical Genomics: Linkage Mapping and QTL Analysis

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   SEMANTIC WEB

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to study semantic web, Web classification, Describing web resources in RDF, Web ontology language and applications of semantic web.

UNIT-I	Structured Web Documents in XML, Introduction to the Web, Web Version, Web Classification, Web Services, Web 1.0, Web 2.0, The Semantic Web Vision, Today's Web, From Today's Web to the Semantic Web Layered approach to Semantic Web Technologies, Overview of Structured Web Documents in XML, XML Language Overview, Structuring, Namespaces, Addressing and Querying XML Documents, Processing of documents.
UNIT-II	Describing Web Resources in RDF, Understanding content: Metadata, Metadata standards, XML+ metadata specification, RDF Basics, XML-Based Syntax, RDF Schema: Direct Inference System for RDF, Querying in RQL, Identifiers URI, UNICODE, SPQRQL, Cryptograph in SW, RIF/SWRL.
UNIT-III	Web Ontology Language:, Web Ontology Language, OWL, Future Extensions, Case study of any one ontology editor i.e Sesame or Protege, Monotonic Rules syntax and Semantics, Non monotonic Rules syntax and semantics, FOAF, DB pedia, SIOC, Next Bio, Linking Open Data, Open PSI, OWL DL, OWL FULL.
UNIT-IV	Applications Semantic Applications, Demonstrating power of semantic technology for search, Personalization, Contextual directory and custom/enterprise applications, Next generation semantic content management, Contributions of IR, AI, Logic, NLP, DB and IS to Semantic Web, Ontology integration versus interoperation, Proof Language, Digital Signature, Semantic Memory.

Recommended Books:
- Singh Munindar P and Huhns Michael N, Service-Oriented Computing, Wiley & Sons
- Erl Thomas, Service-Oriented Architecture (SOA): Concepts, Technology, And Design, Prentice Hall

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE–421/422/423/424   FUZZY SET THEORY AND APPLICATIONS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the paper is to study Fuzzy sets and application. Introduce neuro fuzzy system and Different modeling system.

UNIT-I	Fuzzy Logic, The concept of fuzziness, Introduction to Fuzzy Logic, Basic Definition and terminology, Logical aspects of fuzzy sets, Basic connectives, Additional topics on connectives, Classical and Fuzzy Sets: Overview of Classical Sets, α-cuts, Properties of α-cuts, Decomposition Theorems, Extension Principle, Membership Function, Fuzzy rule generation, Operations on Fuzzy Sets, Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations, Fuzzy Arithmetic, Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations, Fuzzy Logic, Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.
UNIT-II	Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks, Application of Fuzzy Logic, Medicine, Economics etc, Set Theoretic Operators, Membership functions- formulation and parameterization, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy models, Fuzzy Associative Memories, Neuro-Fuzzy Modeling, Applications of fuzzy set theory, Fuzzy sets and expert systems fuzzy databases and queries, Decision making in fuzzy environments, Applications of fuzzy sets in engineering and management, Empirical research in fuzzy set theory, Future perspectives.
UNIT-III	Classical and Fuzzy Sets, Overview of Classical Sets, Membership Function, Operations on Fuzzy Sets, Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations, Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations, Fuzzy Relations: Crisp & Fuzzy Relations, Projections & Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on single set, Equivalence, Compatibility & Ordering Relations, Fuzzy Relation Equations, Fuzzy linear equations, Possibility theory, Neural nets, Approximate reasoning, Genetic algorithms, Fuzzy optimization.
UNIT-IV	Possibility Theory: Fuzzy Measures, Evidence & Possibility Theory, Possibility versus Probability Theory, Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges, Uncertainty based Information: Information & Uncertainty, Non specificity of Fuzzy & Crisp sets, Fuzziness of Fuzzy Sets, Applications of Fuzzy Logic, Fuzzy modeling and control, Introduction to fuzzy controller design.

Recommended Books:
- Klir G J & Folyger T A, Fuzzy Sets, Uncertainty & Information, PHI
- Klir G J & Yuan B, Fuzzy sets & Fuzzy logic, PHI
- Anderson J A, An Introduction to Neural Networks, PHI
- Krogh Hertz J, Palmer R G, Introduction to the Theory of Neural Computation, Addison-Wesley
- Mitchell Melanie, An Introduction to Genetic Algorithm, PHI
- Rajasekharan S, Vijayalekshmi Pai S A, Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
CSE-421/422/423/424   ADVANCED NETWORKS

L	T	P	Cr
3	1	-	4

Internal Evaluation: 50 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of the course is to basics of networks, Packet switched networks, Optical networks.

UNIT-I	Basics of Networks, Digitalization, Service integration, Network services and layered architecture, Traffic characterization and QOS, Networks services, Network elements and network mechanisms
UNIT-II	Packet switched networks, OSI and IP models, Ethernet (IEEE 802.3), Token ring(IEEE 802.5),FDDI, DQDB, Frame relay, SMDS, Internet working with SMDS, Secure shell (open ssh), NTP, SMTP, HTTP, HTTPS, NFS, TCP & UDP services.
UNIT-III	Internet and TCP/IP networks, Overview internet protocol, TCP and VDP, Performance of TCP/IP networks circuit switched networks, SONET, DWDM, Introduction to IPV6,IPV6 protocol architecture, IPV6 address basics, Address notations, Unicast address neighbor discovery, IPV6 address in the DNS, Enabling IPV6 on the DNS server, DSL, Intelligent networks, CATV, ATM and wireless networks, Adressing, Signalling and routing, ATM header structure, Adaptation layer, Management and control, BISDN, Interworking with ATM, Wireless channel, Link level design, Channel access, Network design and wireless networks.
UNIT-IV	Optical networks and switching, Optical links, WDM systems, Cross-connects, Optical LAN's, Optical paths and networks, TDS and SD, Modular switch designs-Packet switching, Distributed, Shared, Input and output buffers.

Recommended Books:
- Warland Jean and Varaiya Pravin, High Performance Communication Networks, 2nd Edition, Harcourt and Morgan Kauffman, London
- Gracia Leon, Widjaja, Communication networks, Tata Mc Graw Hill,New Delhi
- Stockebrand Benedikt, IPV6in practice a unixer 's guide to the next generation internet, Springer berlin Heidelberg
- Kasera Sumit, Sethi Pankaj, ATM Networks, Tata McGraw Hill,New Delhi
- Forouzan Behrouz A, Data Communication and Networking, Tata Mc Graw Hill, New Delhi

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   REMOTE SENSING AND GIS

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To equip students with the basic knowledge remote sensing data/ geographical information system and their usefulness in various civil engineering applications.

UNIT-I	Remote sensing, Components of Remote sensing, Energy, Sensor, Interacting Body, Active and passive Remote Sensing, Platforms: Aerial and Space Platforms. Synoptivity and Repetitively. Electro Magnetic Radiation (EMR) and spectrum, Black Body Radiation, Planck's law, Stefan-Boltzman law. EMR Interaction with Atmosphere and Earth Materials, Atmospheric characteristics- Scattering of EMR - Raleigh, Mie, Non–selective and Raman Scattering. EMR Interaction with Water vapour and ozone, Atmospheric Windows, Significance of Atmospheric windows, EMR interaction with Earth Surface Materials, Radiance, Irradiance, Incident, Reflected, Absorbed and transmitted energy, Reflectance, Specular and diffuse reflection surfaces, Spectral Signature, Spectral Signature curves EMR interaction with water, Soil and earth surface.
UNIT-II	Optical and Microwave Remote Sensing- Satellites, Classification based on orbits, Sun Synchronous and Geo Synchronous, Based on purpose, Earth Resources Satellites, Communication satellites, Weather satellites, Spy satellites, Satellite sensors. Resolution: Spectral, Spatial, Radiometric and Temporal Resolution, Description of Multispectral Scanning, Along and Across Track Scanners, Description of sensors in Landsat, SPOT, IRS series- Current Satellites, Radar-Speckle-Back Scattering, Side Looking Airborne Radar, Synthetic Aperture Radar, Radiometer, Geometrical characteristics.
UNIT-III	Geographic Information system, Components of GIS, Hardware, Software and Organizational Context. Data: Spatial and Non–Spatial, Maps: Types of Maps, Projection: Types of Projection, Data Input: Digitizer, Scanner, Editing, Raster and Vector data structure, Analysis using Raster and Vector data-retrieval, Reclassification, Overlaying, Buffering, Data Output, Printers and Plotters.
UNIT-IV	Visual Interpretation of Satellite Images, Elements of Interpretation, Interpretation Keys Characteristics of Digital Satellite Images, Image enhancement, Filtering, Classification, Integration of GIS and Remote Sensing, Application of Remote Sensing and GIS, Urban Applications, Water resources, Urban Analysis, Watershed Management, Resources Information systems.

Recommended Books:
- Lillesand T M, Kiefer R W and Chipman J W, Remote Sensing and Image Interpretation, JohnWiley & Sons, 2007
- Sabinne F F, Remote Sensing Principles and Interpretation, Waveland Press, 2007
- Burrough P A and McDonnell R, Principles of GIS, Oxford University Press, 1998
- Heywood D I, Cornelius S, Carver S, An Introduction to GIS, Pearson Education, 2006

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   ADVANCED ENGINEERING MATHEMATICS

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
3	-	-	3

Course Objective:
The aim of the syllabus is to study the convergence behavior of various infinite series, To solve the applications based on double integral (surface integral) and triple integral (volume integral). The last unit 'functions of complex variables' has been added due to its usefulness in evaluating large number of new definite integrals, The theory of differential equations, The study of electric fields, Thermodynamics, And fluid mechanics.

UNIT-I	Convergence and divergence, Comparison tests, D'Alembert's ratio test, Integral test, Raabe's test, Logarithmic and Cauchy root tests, Gauss's test.
	Alternating series, Absolute convergence, Conditional convergence and Uniform Convergence.
UNIT-II	Differentiation of vectors, Scalar and vector point functions Gradient of a scalar field and directional derivative, Divergence and curl of a vector field and their physical interpretations, Del applied twice to point functions, Del applied to product of point functions.
	Integration of vectors, Line integral, Surface integral, Volume integral, Green's, Stoke's and Gauss divergence theorems (without proof), And their simple applications.
UNIT-III	Double integral, Change of order of integration Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution.
	Triple integral, Volume of solids, Change of variables, Beta and gamma functions and relationship between them.
UNIT-IV	Functions of a complex variable, Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, Limit and continuity of a function, Differentiability and analyticity.
	Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems, Conformal transformation, Standard transformations (Translation, Magnification & rotation, Inversion & reflection, Bilinear).

Recommended Books:
- Kreyszig F, Advanced Engineering Mathematics
- Grewal B S, Higher Engineering Mathematics
- Sastry S S, Engineering Mathematics Part-I
- Piskunov, Differential and Integral Calculus
- Jain R K and Iyengar S R K, Advanced Engineering Mathematics
- Greenberg Michael D, Advanced Engg. Mathematics

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   ENVIRONMENTAL ASSESSMENT AND MODELING

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The main objective of this course is to introduce students to various methodologies required for environmental impact assessment of a project.

UNIT-I	Evolution of environmental impact assessment (EIA), EIA at project, Regional and policy level, Strategic EIA, EIA process, Screening and scoping criteria, Rapid and comprehensive EIA, Specialized areas like environmental health impact assessment, Environmental risk analysis, Economic valuation methods, Cost benefit analysis, Expert system and GIS applications, Uncertainties.
UNIT-II	Environmental policies and legislation, Legislative and environmental clearance procedures in India and other countries, Sitting criteria, Public participation, Resettlement and rehabilitation.
UNIT-III	Methodologies- Practical applications of EIA, EIA methodologies, Baseline data collection, Prediction and assessment of impacts on physical, Biological and socio economic environment, Environmental management plan, Post project monitoring, EIA report and EIS, Review process.
UNIT-IV	Environmental systems Modeling, Principles of modeling, Classification, introduction to air quality models, Meteorology, Atmospheric stability and turbulence, Gaussian plume model and modification, Numerical models, Transport and fate of pollutant in aquatic system, Introduction to river, Estuarine and lake hydrodynamics, Stratification and eutrophication of lakes, Dissolved oxygen model for streams, Temperature models.

Recommended Books:
- Biswas A K, Environmental Impact Assessment for Developing Countries, Butterworth-Heinemann, 1994
- Rau G J and Wooten C D, Environmental Impact Analysis Handbook, McGraw-Hill, 1980
- Jain R K, Urban L V and Stacey G S, Environmental impact analysis: a new dimension in decision making, Van Nostrand Reinhold Co., 1981
- Thomann R V and Muller J A Principles of Surface Water Quality Modelling and Control, Harper & Row, 1987

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   QUALITY CONTROL AND RELIABILITY

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:

UNIT-I	Concept of quality, Need, Factor influencing quality, Types of quality, Quality control, Cost of quality control, Types of costs, Quality assurance, Inspection and quality control, Quality characteristics, Quality circles, Quality and productivity, Quality and reliability, ISO definition of quality, Various phases till TQM and its meaning to industries, Customers and employees, Contribution of various quality gurus, Quality management, Tools for continuous quality improvement.
UNIT-II	Review of fundamental statistical concept, Frequency distribution, Central tendency, Measures of dispersion, Probability distributions, Statistical quality control, causes of variation, Theory of control charts, Type I and Type II errors, Preliminary decisions, Control charts for mean and range, Control charts for mean and standard deviation, Control chart for attributes, Chart for proportion nonconforming (p-chart) chart for number of nonconforming items, chart for number of nonconformities, Their advantages and disadvantages, Applications.
UNIT-III	Acceptance Sampling, Purpose, Acceptance by Attributes, Single sampling plans. O.C. curve selection of sampling plans, Acceptance number, Type A and Type B errors, O.C. curves, Double sampling plan and its analysis, Multiple and sequential sampling, A.O.Q.L., Acceptance sampling plans under risk, Design of various sampling plans, Dodge-Roming type system for acceptance sampling by attributes (use of various tables), Determination of process average, Acceptance sampling by variables.
UNIT-IV	Reliability, Factor effecting Reliability, Failure and its types, Failure curve, Majors of reliability, MTBF, MTTF, Relationship b/w reliability failure rate and MTBF and its characteristics, System reliability (components in series and parallel) System reliability with stand by components, Redundancy, Operating characteristics curve, Reliability and life testing plans, Types of test, Maintainability, Availability.

Recommended Books:
- Gupta C, Statistical Quality control
- Mitra Amitava, Fundamental of Quality Control and Improvement
- Wadsworth Harrism M, Modern Methods for Quality Control and Improvement
- Grant E L, Statistical Quality Control
- Ams Tadter B L, Reliability Mathematics

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   CONSUMER ELECTRONICS

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To make the students understand the basic concepts of modern consumer electronics products. After undergoing this course the students will have the knowledge and technical understanding of various electronic products needed in day to day activities.

UNIT-I	Loudspeakers and Microphones, Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.
UNIT-II	Television Standards and systems: Components of a TV system – interlacing – composite video signal, Colour TV – Luminance and Chrominance signal, Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.
UNIT-III	Optical Recording and Reproduction: Audio Disc – Processing of the Audio signal – read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.
UNIT-IV	Telecommunication Systems: Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, Packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones, cellular modems, Home Appliances: Basic principle and block diagram of microwave oven, washing machine hardware and software, components of air conditioning and refrigeration systems.

Recommended Books:
- Bali S P, Consumer Electronics, Pearson Education, 2005
- Hoff Philip, Hoff Philip Herbert, Consumer electronics for engineers, Cambridge University Press, 1998
- Davidson Homer L, Troubleshooting & Repairing Consumer Electronics Without a Schematic, McGraw Hill, 2004

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   RENEWABLE ENERGY RESOURCES

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To make the students aware about the various renewable and non conventional resources of energy available, Their potential and utilization. The students learn how to meet the growing energy needs by the use of environmental friendly renewable energy resources.

UNIT-I	Introduction to non-conventional/renewable energy sources, Importance of these sources for sustainable development and environmental protection Solar radiations, Measurement of solar radiation, Characteristics of solar spectra including wavelength distribution, Radiation properties and spectral characteristics of materials, Selective surfaces and basics of solar collectors, Solar collection devices and their analysis, Solar collector characteristics, Solar pond, Application of solar energy to space heating etc.
UNIT-II	Biomass as an energy Source, Energy plantations, Conversion technologies – thermal, Chemical and biological, Photosynthesis, Biogas generation, Classification of biogas plants. Principles of Bioconversion, Types of bioreactors, Reaction kinetics, Reactor design and analysis, Materials-Municipal refuse, Sewerage, Industrial wastes, Agricultural wastes, Animal and human wastes, Landfill systems, Properties and uses of biogas. Bioconversion techniques, Utilization of industrial wastes such as bagasse, Household and community combustion systems, Gasification, Sizing, Beneficiation of fuels, Thermodynamics and kinetics of gasification, Types of gasifiers, Combustion characteristics of bio fuels, Utilization in conventional engines and or power generation including cogeneration.
UNIT-III	Waves, Nature and availability of energy from waves onshore and off-shores, Principles of wave converters, Energy conversion and transmission. Origin and nature of tides, Tidal heads and duration, Principles of tidal energy conversion, Site Selection, Cycles and load factors, Regulation and control of tidal power generation. Ocean thermal energy conversion (OTEC), Temperate and tropical oceans, Principles of OTEC systems, Site selection, Power cycles, Selection of working fluids, Pumps and turbines, Heat exchanger criteria, Power transmission and system efficiency.
UNIT-IV	Introduction to wind energy, Basic components of a wind energy conversion system (WECS), Classification of WECS, Applications of Wind Energy, Environmental aspects, Wind Energy Developments in India. Geothermal resources, Location and potential assessment, Classification and characteristics of geothermal resources, Chemical and physical properties of geothermal brines, Control of scale deposition, Drilling, Logging and cementing operations for geothermal wells, Principles of power production system and cycles, Thermal Utilization and mineral recovery, Ecological and safety considerations.

Recommended Books:
- Sukhatme S P, Solar Energy: Principles of Thermal Collection and Storage, TMH
- Garg and Prakash, Solar Energy: Fundamentals and Applications, Tata McGraw Hill
- Chang, Energy Conversion, Prentice Hall
- Soo, Direct Energy Conversion, Prentice Hall
- Duffic and Beckman, Solar Engineering of Thermal Processes, John Wiley

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   ADVANCED COMMUNICATIONS

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
The objective of this course is to have a fundamental knowledge of the basics of wireless networks, Basis of communications, Various standards, Advanced intelligent networks.

UNIT-I	Evolution of mobile radio communications, Theoretical basis for data communication, Guided transmission media, Wireless transmission media, Wireless transmission, Communication satellites, PSTN, Mobile telephone system, Cable television, Examples of wireless comm. systems, Paging systems, Cordless telephone systems, Comparison of various wireless systems.
	Introduction to 1G cellular networks, Second generation cellular networks, Third generation wireless networks, Fourth generation cellular networks, Wireless in local loop, Wireless local area networks, Blue tooth and Personal Area networks.
UNIT-II	Cellular standards: AMPS, CTACS, IS-54, IS-36,GSM,CDMA, Digital cellular standard, CT2 standard for cordless telephone, Digital European cordless, Telephone(DECT), PACS, PDC, PHC, US PCS, UMTS, IMT-2000, LTE.
	Spectrum Allocation, Basic Cellular Systems, Performance Criteria, Operation of cellular systems, Analog cellular systems, Digital Cellular Systems.
UNIT-III	Frequency Reuse, Channel assignment strategies, Handoff Strategies, Interference and system capacity, Tracking and grade off service, Improving coverage and capacity.
	Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, Space division multiple access, Packet ratio, Capacity of a cellular systems.
UNIT-IV	Difference between wireless and fixed telephone networks, Development of wireless networks, Fixed network transmission hierarchy, Traffic routing in wireless networks, Wireless data services, Common channel signaling, ISDN (Integrated Services digital Networks), Advanced intelligent networks.
	Intelligent cell concept, Applications of intelligent micro-cell Systems, In-Building Communication, CDMA cellular Radio Networks.

Recommended Books:
- Rappaport Theodore S,Wireless Communications-Principles and Practices,2/e, PHI.
- Tanenbaum Andrew S, Computer Networks, 4th Edition, PHI.
- Nocopolitidis P, Wireless Networks, John Wiley & Sons.

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   ENTREPRENEURSHIP

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

L	T	P	Cr
3	-	-	3

Course Objective:

UNIT-I	Concept of Entrepreneurship, Development Evolution of the concept of an Entrepreneur, Entrepreneur Vs. Intrapreneur, Entrepreneur Vs. Entrepreneurship, Attributes and characteristics of a successful Entrepreneur, Role of Entrepreneur in India economy and developing economics with reference to self-Employment, Entrepreneurship Culture. Definition and types of Small scale industries, Role, Scope and performance in national economy, Problems of small scale industries, Industrial Sickness, Causes of sickness, Indian scenario, Government help, Management strategies, Need for trained entrepreneurs
UNIT-II	Engineering Economics, Importance of economics for engineers, Present value and future value, Wealth, Goods, Wants, Value and price, Capital, Money, Utility of consumer and producer goods, Cost, Elements of cost, Prime cost, Overhead, Factory cost, Total cost, Selling price, Nature of cost, Types of cost, Depreciation, Causes of depreciation, Methods of calculating depreciation, Economic analysis of investment and selection of alternatives, Nature of selection problem, Nature of replacement problem, Methods used in selection of investment and replacement alternatives. Tools for evaluation of techno economic feasibility project report, SWOT analysis.
UNIT-III	Creating Entrepreneurial Venture, Business Planning Process, Environmental Analysis – Search and Scanning, Identifying problems and opportunities, Defining Business Idea, Basic Government Procedures to be complied with, Role of Central Government and State Government in promoting Entrepreneurship – Introduction to various incentives, Subsidies and grants – Export Oriented Units – Fiscal and Tax concessions, District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB) The FOUR Entrepreneurial Pitfalls (Peter Drucker)
UNIT-IV	Business Incubation, Origin and development of business incubators in India and other countries, Types of incubators, Success parameters for a business incubator, Benefits to industries, Institutes, Government and Society, Future prospects. Special Aspects of Entrepreneurship, Social entrepreneurship, International entrepreneurship, Rural entrepreneurship, Community Development, Women entrepreneurship.

Recommended Books:
- Gupta P K, Strategic Entrepreneurship, Everest Publishing House
- Meredikh G G, Nelson RE, And Neck PA, The practice of Entrepreneurship
- Tarachand, Engineering Economics
- A Hand Book for New Entrepreneurs by EDI, Ahemdabad
- Hisrich Peters Entrepreneurship (Tata Mc Graw)
- Williamsons, Cost and Management Accounting, Prentice Hall of India
- Holl H David, Entrepreneurship-New Venture Creation, Prentice Hall of India
- Vasant De, Dynamics of Entrepreneurship Development
- Rao and Pareek, Handbook of Entrepreneurship

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:

UNIT-I	System of linear algebraic equations and Eigen value problems, Elimination method, Gauss method, Gauss-Jordan method, Eigen values and Eigen vectors, Bounds on Eigen values, Jacobi methods for symmetric matrices, Householder's method for symmetric matrices.
	Interpolation problem, Linear interpolation, Lagrange interpolation, Newton interpolation, Interpolation with equidistant points, Spline interpolation, Least square approximation.
UNIT-II	Numerical differentiation and integration, Differentiation of continuous functions, Forward difference quotient, Central difference quotient, Error analysis, Derivatives from differences table, Higher-order derivatives, Richardson extrapolation techniques, Newton-Cotes method, Trapezoidal rule, Simpson's rule, Higher order rules, Romberg integration, Numerical solution of ordinary differential equations, Taylor's series method, Euler and modified Euler method, Runge-Kutta methods, Milne's method, Adam-Bashforth- Moultan method.
UNIT-III	Basic concept of optimization, Classification of optimization, Optimization techniques, Engineering applications of optimization, Classical optimization techniques, Unconstrained optimization single-variable optimization, Multivariable optimization, Multivariable optimization, Multivariable optimization with equality constraints, Solution by direct search method, Solution by Lagrange-multipliers method, Multivariable optimization with inequality constraints, Kuhn-Tucker conditions.
UNIT-IV	General non-linear programming problem, Classification of non-linear programming problem, Unconstrained optimization techniques, Direct search method, Gradient method.
	Dynamic programming, Multistage decision process, Representation of a multistage decision process, Conversion of nonserial system to a serial system, Types of multistage decision problems, Principle of optimality, Computational procedure in dynamic programming, Linear programming as a case of dynamic programming, Applications of dynamic programming.

Recommended Books:
- Rao S S, Engineering Optimization, New Age International Ltd
- Balaguruswamy E, Numerical Method, Tata McGraw Hill
- Jain M K, Iyengar S R K, Numerical methods for Scientific & Engineering Computation
- Hamidi Taha H, Operations Research, Prentice Hall of India, New Delhi
- Philips, Revindran & Solgebery, Operations Research, Wiley ISE
- By Gerald Curtis F & Whealley G Patrick, Applied Numerical Analysis, Pearson Education Ltd

B TECH (7th /8th SEMESTER) COMPUTER SCIENCE AND ENGINEERING
OE-431/432   OPERATIONS MANAGEMENT

L	T	P	Cr
3	-	-	3

Internal Evaluation: 25 Marks
External Examination: 50 Marks
Duration of Examination: 03 Hours

Course Objective:
To impart knowledge on productivity, Forecasting demand, Aggregate and capacity planning and control functions, Inventory models, Sequencing and scheduling etc, Which will be helpful for the students joining industrial organizations.

UNIT-I	Productivity, Definition, Various methods of measurement, Factors effecting productivity, Strategies for improving productivity, Various Approaches, Product life cycle, Role 3S's – Standardization, Simplification, Specialization, Break Even Analysis. Forecasting demand, Forecasting Framework, Forecasting cost and accuracy, Uses and Methods, Delphi, Exponential Smoothing, Forecasting Errors, MAD, Regression Methods, Linear Model for single & multiple variables, Brief idea of computerized forecasting systems.
UNIT-II	Facilities Planning, Objectives, Strategies, Product design-Process design- assembly chart-Operation process chart-Scrap and Equipment Estimation-Facility Design, Management and planning tools, Flow, Space and activity relationship, Flow patterns, Layout planning, Systematic layout planning, Types of layout, Process layout, Product layout, Computerized Plant Layout- CRAFT, ALDEP, CORELAP, Assembly Line balancing, Problems and solutions of assembly lines, Group Technology layout, Cellular Systems, Retail service layout.
UNIT-III	Aggregate planning, Basic Concept, Definition of MRP systems, MRP versus Order point, MRP Elements, Types of MRP – MRP I & II, Structured Bill of Materials, Master Production Schedule, Modular Bill and Materials, Capacity planning & control, Language, Medium range, Short range capacity planning, Scheduling Operations Various methods for line & intermittent production systems, Gantt chart, Sequencing - Johnson algorithm for n-Jobs-2 machines, N- Jobs-3 machines, 2 Jobs n-machines, N-Jobs m-machines Various means of measuring Introduction to JIT, Just- in Time (JIT) Manufacturing, Elements, KANBAN, Effects on layout, Workers & vendors, Optimized production technology (OPT).
UNIT-IV	Materials Management, Strategic importance of materials in manufacturing industries, Relevant costs, Inventory control models, Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage, Purchase discounts, Sensitivity analysis, Inventory control systems, Systems, Service level, Stock out risk, Determination of order point & safety stock, Selective inventory control ABC, FSN, SDE, VED etc.

Recommended Books:
- Chary, Production & Operations Management, TMH, New Delhi.
- Schoroeder, Operations Management, MGH, New York.
- Chase, Acquilano and Jacobs, Operations Management for Competitive Advantage, Tenth Edition, 2003, Tata McGraw Hill Edition
- Tersine Richard J, Principles of Inventory and Materials Management, Fourth Edition, 1994, Prentice Hall International
- Tomkins White, Bozer Frazelle, Tanchoco and Trevino, Facility Planning, Second Edition, John Wiley & Sons
- Francis, Et al, Facility Layout and Location, Second Edition, 1999, Prentice Hall of India.
- Buffa S S, Modern Production Management, John Wiley Pub.
- Martinich, Production & Operations Management, John Wiley SE.
- Panneerselvam, Production & Operation Management, PHI, New Delhi