B.E. COMPUTER ENGINEERING-SEMESTER II												
Course Code	Type	Subject	L	T	P	Credits	Evaluation Scheme (Percentage weights)					Pre-requisites
							Theory			Practical		
							CA	MS	ES	CA	ES	
FC006	**FC**	**Mathematics-II**	**3**	**1**	**0**	**4**	**25**	**25**	**50**	**-**	**-**	**None**

COURSE OUTCOMES

1. By the end of this course, the student will be able to solve system of equations and know the concepts of eigenvalue and eigenvector.
2. Know the concepts of Ordinary Differential Equations and its applications.
3. Know the concepts of Special Functions.
4. Know the concepts of Laplace Transforms and its application to solve Differential Equations

COURSE CONTENT

Matrices: Rank, inverse and normal form of a matrix using elementary transformations, consistency of linear system of equations; linear dependence/ independence, linear transformations, eigenvalues and eigenvectors of a matrix, Cayley-Hamilton theorem, diagonalization.

Ordinary Differential Equations: Second & higher order linear differential equation with constant coefficients, general solution of homogenous and non- homogenous equations, Euler-Cauchy equation, Application to mass- spring system and electrical circuits. Power series method.

Special Functions: Beta and Gamma functions, Dirichlet's Integral. Legendre equation, Legendre polynomials and its properties, Bessel equation, and Bessel function of first kind and its properties, ber and bei functions.

Laplace Transforms: Basic properties, Laplace transform of derivatives and integrals. Laplace of periodic functions. Laplace transforms solution of IVP and simultaneous linear differential equations, unit step function, Dirac-Delta function.

Inverse Laplace transform, Convolution theorem

SUGGESTED READINGS

1. G. B. Thomas and R. L. Finney, "Calculus and Analytic Geometry", Pearson Education.
2. R. K. Jain and S. R. K. Iyenger, "Advanced engineering mathematics", Narosa.
3. Erwin Kreyszig, "Advanced engineering mathematics," Wiley.
4. Michael Greenberg, "Advanced engineering mathematics", Pearson Education.

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-requisites
FC007	FC	English-II	2	0	0	2	25	25	50	-	-	None

COURSE OUTCOMES

1. The course will focus on the four integral skills of language, improving the proficiency levels in all of them and to learn to use language as a tool for effective communication.
2. This course will widen the understanding of the learners in all genres of literature (short stories, poetry, autobiographies..) with the help of expository pieces .
3. The course will strive to equip the learner with the ability to express oneself and be understood by others with clarity and precision, in both written and spoken forms.
4. This course will encourage creative use of language through translation, paraphrasing and paragraph writing.
5. Along with the above, the course will also build confidence and encourage the students to use a standard spoken form of English in order to prepare them to face job interviews, workplace and in higher studies.

COURSE CONTENT

Literature

1. Anton Chekov: The Bet
2. Guy de Maupassant: The Necklace
3. D H Lawrence: Odour of Chrysanthemums
4. R K Narayan: Malgudi Days
5. Sarojini Naidu: Bangle Sellers

6. Rupert Brooke: The Soldier/Siegfried Sassoon: Suicide in the Trenches

Language Skills

1. Translation, paragraph writing, paraphrasing, summarizing,
2. Comprehension
3. Presentations/book reviews/reading exercises

SUGGESTED READINGS

1. Martin Hewing, “Advanced English Grammar”:
2. Meenakshi Raman & Sangeeta Sharma, “Technical Communication”
3. Renu Gupta, “A Course in Academic Writing”

SYLLABI OF CORE COURSES

SEMESTER II

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-requisites
CEC01	CC	Discrete Structures	3	1	0	4	25	25	50	-	-	None

COURSE OUTCOMES

1. To be able to analyze and compute time and space complexity of various computing problems.
2. To be able to design algorithms for solving various problems using the concepts of discrete mathematics.
3. To apply the concepts and algorithms learnt in developing large scale applications and modify them.

COURSE CONTENT

Preliminaries: Mathematical Logic, Propositions, Truth Tables, and Logical inferences, Predicates and quantifiers, Methods of Proof.

Set Theory, Relations and Functions: Elements of Set Theory, Primitives of set theory, binary Relation and its Representation, type of Binary Relations, Equivalence relations and partitions. Functions, Types of functions, Inverses and composition of Functions, Pigeon hole principle. Posets, Hasse Diagram, Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice, Boolean Algebra.

Number Theory: Infinity and Natural numbers, Integers, Divisibility and Euclidean algorithm, Prime numbers, Congruence, Modular arithmetic, Euler ϕ function, Public key cryptosystems and RSA.

Counting: Counting and analysis of algorithms, Permutations, Combinations, Asymptotic behavior of algorithms, Recurrence relation, generating functions

Principles of Counting: Principles of inclusion-exclusion, Pigeon hole principle, Permutations, Combinations.
Mathematical induction: proof by induction, Groups & rings, Recursion, Recurrence relation, Characteristic Polynomial. Generating Functions.
Logic: Propositional Logic, Logical Inference, First order logic, applications
Graphs: Graph isomorphism, Paths and Cycles, Graph coloring, Critical Path, Eulerian paths and circuits, Hamiltonian paths and circuits, Bipartite Graphs, Digraphs, Multigraphs.
Probability: Overview of probability theory , Discrete distributions.

SUGGESTED READINGS

1. Keneth H. Rosen, "Discrete Mathematics and Its Applications", TMH.
2. C.L. Liu, "Elements of Discrete Mathematics", TMH.
3. Kolman, Busby & Ross, "Discrete Mathematical Structures", PHI.
4. Narsingh Deo, "Graph Theory With Application to Engineering and Computer Science", PHI.
5. Charles S. Grimmstead, J. Laurie Snell "Introduction to Probability".
6. Kai Lai Chung, "A Course in probability theory".

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-requisites
CEC02	CC	Data Structures	3	0	2	4	15	15	40	15	15	None

COURSE OUTCOMES

1. Candidate will be able to choose the appropriate data structure for a specified problem and determine the same in different scenarios of real world problems.
2. Become familiar with writing recursive methods and reducing larger problems recursively in smaller problems with applications to practical problems.
3. Be able to understand the abstract properties of various data structures such as

stacks, queues, lists, trees and graphs and apply the same to real life problems of sorting, searching, traversals for skill enhancement in problem solving.
4. Be able to implement various data structures in more than one manner with the advantages and disadvantages of the different implementations for energy efficient by using efficient representation of problems.

COURSE CONTENT

Introduction: Basic Terminology: Elementary Data Organization, Data Structure Operations, Algorithms Complexity and Time-Space Trade off.
Arrays: Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing, Insertion And Deletion in Array, Single Dimensional Arrays, Two Dimensional Arrays, Bubble Sorting, Selection Sorting, Linear Search, Binary Search, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array.
Stacks and Queues: Introduction to Operations Associated with Stacks Push & Pop, Array representation of stacks, Operation associated with stacks: Create, Add, Delete, Application of stacks recursion polish expression and their compilation conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem, Representation of Queues, Operations of queues: Create, Add, Delete, Front, Empty, Priority Queues and Heaps, Dequeue.
Recursion: Recursive thinking, Recursive Definition of Mathematical Formulae, Recursive Array Search, Recursive Data Structure, Problem Solving With Recursion, Back Tracking
Linked Lists: More operations on linked list, polynomial addition, Header nodes, doubly linked list, generalized list, circular linked lists.
Trees: Trees – mathematical properties, Binary Search Trees and their representation, expression evaluation, Complete Binary trees, Extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, Complexity of searching algorithm, Path length, Huffman’s algorithm, General trees, AVL trees, Threaded trees, B trees, Trie data structure
Sorting: Insertion Sort, Quick sort, two-way Merge sort, Heap sort, sorting on different keys, External sorting.
Graphs: Sequential representation of graphs, Adjacency matrices, Search and Traversal of graphs: Depth first, breadth first, topological sort.

Outline of Practical Work:
- Programs based on sorting and searching, implementing stacks, queues , simple calculator using postfix expression, command line calculator changing infix to postfix, implementation of linked lists - a simple editor program, traversal of binary trees , binary search tree creation, insertion, deletion, traversal sorting. AVL tree creation and rotations, Traversal of graphs using BFS and DFS , implementation of topological sorting.Templates and Containers
Survey of new data structures.

1. Nell B Dale,“C++ data structures”,ISBN-10: 1449646751, 5-th edition.
2. Freetextbooks.com. Algorithms and data structures. Available :http://www.freetechbooks.com/algorithms-and-data-structures-f11.html
3. Robert Lafore,“Data structures in Java”.

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-requisites
CEC03	CC	Digital Logic Design	3	0	2	4	15	15	40	15	15	None

COURSE OUTCOMES

1. To be able to design a fairly complex digital system from a set of specifications or a description of the system
2. To be able to analyze, test and troubleshoot a digital system
3. To be proficient in using the design tools used in industry to synthesize the digital circuits.

COURSE CONTENT

Introduction to Digital Systems

Number Systems and Codes: Binary, octal and hexadecimal number systems, Number-Base Conversions, Complements of Numbers, Signed numbers, Fixed and floating point numbers, Binary Arithmetic, Binary Codes: BCD, Gray, Excess-3, ASCII, Error detection and correction codes - parity check codes and Hamming code.

Combinatorial Logic Systems: Basic logic operation, Logic gates and Truth tables, Positive and Negative Logic, Boolean Algebra: Basic postulates and fundamental theorems, SOP and POS forms, Min terms, Max terms, Canonical Form, Gate level Minimization: K-map and Quine-McCluskey tabular methods, NAND/NOR implementations

Design Concepts using Hardware Description Language: VHDL Programming Structure, Model, Test Bench, Simulation Tool

Combinational Logic Modules, their applications and VHDL Modeling: Decoders, encoders, multiplexers, demultiplexers, Parity circuits, Comparators, Code Converters, Arithmetic modules- adders, subtractors, BCD Adder, ALU and multipliers, Implementing boolean function with multiplexers / decoders

Introduction to different logic families: Operational characteristics of BJT and MOSFET as switch, Structure and operations of TTL and CMOS gates, Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product etc, Gates with Open Collector/Drain outputs, Tristate logic gates

Sequential Logic systems and VHDL Modeling: Basic sequential circuits- latches and flip-flops: RS-latch, SR-flipflop, D-latch, D flip-flop, JK flip-flop, T flip-flop, Setup-time, HOLD Time, Propagation delay, Timing hazards and races, Characteristic Equations

Sequential logic modules, their applications and VHDL Modeling: Multi-bit latches and registers, shift register: Bidirectional, Universal and Ring Counter; counters: Ripple, Up/Down, Mod N, BCD Counters etc.

State machines: Definition, Classification: Mealy, Moore; Analysis of state machines using D flip-flops and JK flip-flops, Design of state machines - state table, state assignment, transition / excitation table, excitation maps and equations, logic realization, State machine design using State Diagram, and using ASM charts, Design examples

Memory: Read-only memory, Read/Write memory - SRAM and DRAM, EPROM, EEPROM, USB Flash drive

Advanced Topics: synchronous sequential circuits, Testing and testability of logic circuits, Programmable Logic Devices: PROM, PLA, PAL, GAL, SPLDs,CPLDs and their applications, State-machine design with sequential PLDs, FPGAs

Guidelines for Practical Work: In the practical portion of this course, students will use VHDL to model digital systems in a simulator. Students will model basic gates, combinational circuits, sequential circuits, memory and state machine based designs.

1. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", 3rd Edition, McGraw-Hill
2. R.J. Tocci., N.S.Widmer, G.L. Moss, "Digital Systems, Principles and Applications",11th Edition, Pearson Education
3. M. Morris Mano and Michael D. Ciletti,"Digital Design", 5th Edition, Pearson
4. Mohammed Ferdjallah,"Introduction to Digital Systems: Modeling, Synthesis, and Simulation Using VHDL", Wiley.

5. Alan B. Marcovitz,"Introduction to Logic Design", 3rd Edition, McGraw-Hill

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-requisites
CEC04	CC	Analog and Digital Communication	3	1	0	4	25	25	50	-	-	None

COURSE OUTCOMES

1. To gain an understanding of the scientific principles, working and applications of communication systems
2. To gain an understanding of modulation techniques
3. To acquire the skills needed to design communication systems for different applications

COURSE CONTENT

Representation of signals and systems: Fourier Series,Fourier transform and its properties, Hilbert transform, pre-envelope representation, representation of band pass signals**.**

Analog communication: Elements of communication, amplitude modulation & demodulation, DSB-SC Modulation & demodulation, SSB-SC Modulation & demodulation, frequency modulation (direct method only), NBFM, WBFM, frequency demodulation (balanced slope detector and phase discriminator).

Probability theory and random process: probability theory random variables and transformations random processes, mean, correlation, covariance, moments, power spectral density, Gaussian process, Stationarity, Central limit theorem.

Sampling and pulse communication: Sampling theorem , types of sampling, PAM , PPM, PWM.

Pulse code modulation: Quantization (linear & nonlinear), PCM, DPCM, DM.

Digital modulation techniques: Matched filters, Correlator receivers, Gram Schmidt

orthogonalization process, ASK, FSK, PSK, QPSK, Error analysis of BPSK, BFSK & QPSK.
SUGGESTED READINGS 1. Taub, "Principles of communication," McGrawHill

B.E. COMPUTER ENGINEERING-SEMESTER III												
Course Code	**Type**	**Subject**	**L**	**T**	**P**	**Credits**	**Evaluation Scheme (Percentage weights)**					**Pre-requisites**
							Theory			**Practical**		
							CA	**MS**	**ES**	**CA**	**ES**	
CEC05	**CC**	**Design and Analysis of Algorithms**	**3**	**0**	**2**	**4**	**15**	**15**	**40**	**15**	**15**	**None**

COURSE OUTCOMES

1. To be able to analyze a problem in terms of processing steps, time and space complexity.
2. To be able to design and implement the algorithms for any given application.
3. To be able to develop software applications using various programming languages in collaborative groups.
4. To apply the principles learnt in solving problems encountered in career or real life situations.

CONTENTS

Introduction: Algorithm Design paradigms- motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic behavior of algorithms, Asymptotic Notations, Recurrence relation,

Algorithm approaches: Divide-and-conquer Approach: Strassen's matrix multiplication,