B. Tech
Computer Engineering
(Theory Courses)

Syllabus

(for Students admitted till 2014 only)

Department of Computer Engineering
Jamia Millia Islamia

CONTENTS

DEPARTMENT OF COMPUTER ENGINEERING – AN INTRODUCTION

The Department of Computer Engineering was started in the year 2000. Initial years of the department were turbulent as the department faced a unique problem of high attrition rate. But since then the department has kept on evolving itself and now has become one of the leading departments at the Faculty of Engg and Tech.

Two undergraduate courses are running at the department i.e. B.Tech. in Computer Engg and B.E. in Computer Engg. Syllabus for both the courses are updated at regular intervals in order to keep abreast with current trends of the industry.

Apart from the curriculum, the department has actively organized lectures for its students on various technical as well as non-technical topics which are delivered by professionals from the industry. Since the last two years, the department has successfully organized several workshop in which students were provided with a hands on approach for working on microcontrollers.

The Department also runs the Ph. D. program successfully under which a number of research scholars are working in the fields of Networking, Data Mining, Artificial Intelligence and Natural Language processing. The Faculty members at the department have produced quite a large number of papers in various National and International Journals and Conferences. The faculty members have also authored few books in the field of Computer Engg and are actively involved in taking the department to greater heights.

The Department of Computer Engineering runs a very vibrant Student Chapter of Computer Society of India which successfully conducts an annual cultural cum technical fest "AlgoRhythm" and various other events for the overall development of the students throughout the year. We also have an active Linux user group here which is also actively making efforts to improve the student's skills in the field of Linux and open source products.

Scheme of Study of B.Tech (Computer Engineering)

FIRST SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
1.	AS-101	English	30	20	50	2
2.	AS-102	Engineering Physics-I	45	30	75	3
3.	AS-103	Engineering Chemistry-I	45	30	75	3
4.	AS-104	Engineering Mathematics-I	45	30	75	3
5.	CE-101	Elements of Environmental Engineering	45	30	75	3
6.	ME-101	Engineering Mechanics	45	30	75	3
7.	ECS-101	Basics of Electronics Engineering	45	30	75	3
8.	CS-101	Fundamentals of Computing	30	20	50	2
	PRACTICAL LAB					
7.	AS-111	English Language Lab.	10	15	25	1
8.	AS-112	Physics Lab-I	20	30	50	2
9.	AS-113	Chemistry Lab-I	20	30	50	2
10.	ME-111	Engineering Mechanics Lab.	20	30	50	2
11.	ME-113	Engineering Graphics-I	20	30	50	2
12.	ME-114	Workshop Practice –I	20	30	50	2
Total					**825**	**33**

SECOND SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
1.	AS-201	Social Sciences	45	30	75	3
2.	AS-202	Engineering Physics-II	45	30	75	3
3.	AS-203	Engineering Chemistry-II	45	30	75	3
4.	AS-204	Engineering Mathematics-II	45	30	75	3
5.	CE-201	Elements of Civil Engineering	45	30	75	3
6.	ME-201	Thermodynamics	45	30	75	3
7.	EES-201	Basics of Electrical Engineering	45	30	75	3
	PRACTICAL LAB					
8.	AS-212	Physics Lab –II	20	30	50	2
9.	AS-213	Chemistry Lab-II	20	30	50	2
10.	ME-212	Engineering Graphics-II	20	30	50	2
11.	CE-211	Element Civil Engineering Lab.	20	30	50	2

12.	ME-213	Workshop Practice –II	20	30	50	2
13.	EES-211	Basics of Electrical Engineering Lab.	20	30	50	2
Total					**825**	**33**

THIRD SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
1.	CEN – 301	Data Structures & Programming	60	40	100	4
2.	CEN – 302	Digital Logic Theory	60	40	100	4
3.	CEN – 303	Discrete Mathematics	60	40	100	4
4.	CEN – 304	Electronics Devices & Applications	60	40	100	4
5.	AS – 301	Mathematics-I	60	40	100	4
6.	CEN – 306	Signals & Systems	60	40	100	4
	PRACTICAL LAB					
7.	CEN – 391	C Programming Lab	20	30	50	2
8.	CEN – 392	Electronics Devices Lab	20	30	50	2
9.	CEN – 393	Digital Logic Lab	20	30	50	2
Total					**750**	**30**

FOURTH SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
1.	CEN – 401	Computer Organization	60	40	100	4
2.	CEN – 402	Operating System-I	60	40	100	4
3.	CEN – 403	Information Technology	60	40	100	4
4.	CEN – 404	Analog and Digital Communication	60	40	100	4
5.	AS – 405	Mathematics-II (NACP)	60	40	100	4
6.	CEN – 406	System Software	60	40	100	4
PRACTICAL LAB						
7.	CEN – 491	Linux Lab	20	30	50	2
8.	CEN – 492	Data Structure Lab	20	30	50	2

9.	CEN – 493	System Software Lab	20	30	50	2
	CEN – 494	Advanced C Lab	20	30	50	2
Total					**800**	**32**

FIFTH SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
1.	CEN – 501	Computer Architecture	60	40	100	4
2.	CEN – 502	Automata Theory	60	40	100	4
3.	CEN – 503	Computer Network-I	60	40	100	4
4.	CEN – 504	Data Base System	60	40	100	4
5.	CEN – 505	Microprocessor	60	40	100	4
6.	CEN – 506	Operating System-II	60	40	100	4
PRACTICAL LAB						
7.	CEN – 591	Advanced Data Structure Lab	20	30	50	2
8.	CEN – 592	DBMS Lab	20	30	50	2
9.	CEN – 593	Operating System Lab	20	30	50	2
	CEN – 594	Microprocessor Lab	20	30	50	2
Total					**800**	**32**

SIXTH SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
1.	CEN – 601	Computer Graphics	60	40	100	4
2.	CEN – 602	Software Engineering	60	40	100	4
3.	CEN – 603	Object oriented programming	60	40	100	4
4.	CEN – 604	Computer Network-II	60	40	100	4
5.	CEN – 605	Analysis & Design of Algorithm	60	40	100	4

6.	CEN – 606	Parallel & Distributed Systems	60	40	100	4
7.	CEN – 607	Language Processor	60	40	100	4
PRACTICAL LAB						
7.	CEN – 691	Computer Network lab	20	30	50	2
8.	CEN – 692	Object Oriented Programming Lab	20	30	50	2
9.	CEN – 693	Linux utility lab	20	30	50	2
Total					**850**	**34**

SEVENTH SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
CEN – 701 and CEN – 703 are compulsory. A Student has to select any 3 elective papers.						
1.	CEN – 701	Internet Fundamentals - Elective	60	40	100	4
2.	CEN – 702	Management Science	60	40	100	4
3.	CEN – 703	Language Processor-II	60	40	100	4
4.	CEN – 704	Mobile Communication - Elective	60	40	100	4
5.	CEN – 705	Data Mining- Elective	60	40	100	4
6.	CEN – 706	Embedded System- Elective	60	40	100	4
PRACTICAL LAB						
7.	CEN – 791	Computer Graphics lab	20	30	50	2
8.	CEN – 792	Compiler Design lab	20	30	50	2
9.	CEN – 793	Minor Project	40	60	100	4
Total					**700**	**28**

EIGHTH SEMESTER

Sl.No.	Paper Code	Paper Name	End Term Marks	Mid Term Marks	Total Marks	Credit
	THEORY					
CEN – 803 is compulsory. A Student has to select any 3 elective papers.						
1.	CEN – 802	Artificial Intelligence - Elective	60	40	100	4
2.	CEN – 803	Software Project Management	60	40	100	4

3.	CEN – 804	Distributed processing- Elective	60	40	100	4
4.	CEN – 805	Network Security - Elective	60	40	100	4
5.	CEN – 806	Soft Computing Techniques - Elective	60	40	100	4
6.	CEN – 807	Web Mining - Elective	60	40	100	4
PRACTICAL LAB						
7.	CEN – 891	Software project Management Lab	20	30	50	2
8.	CEN – 892	Major Project	240	160	400	16
Total					**850**	**34**

Total Credits required for B.Tech (Computer Engineering): 256

B. Tech.
(Computer Engineering)

First Semester

FUNDAMENTAL OF COMPUTING

Paper Code	**CS- 101**
Course Credits	**2**
Lectures / week	**2**
Tutorial / week	**1**
Course Description	**UNIT – I** Computer fundamentals, Bits and Bytes, CPU, Memory, Input and output devices, I/O devices, Operating system, applications software's. Number system, decimal system, Binary, octal, hexadecimal. **UNIT- II** The C character set, constants, variable, keywords, operator and expressions, decision controls, loops, case, functions, call by value and by reference, array, single dim, 2 dim, multidimensional arrays, strings, library string functions, structures, pointers and structures, dynamic memory allocation using pointers, searching and sorting, linear, binary search, bubble sort selection sort, insertion sort. **UNIT- III** OS definition, role of OS in computer system, multi programming, time sharing, multitasking, multiprocessing, symmetric and asymmetric, cluster system, real time system, client server computing, distributed OS, function of OS (user interface, GUI, program execution, I/O management, Resource management, dos fundamentals. **UNIT- IV** Network, communication models, transmission media, connection topologies, LAN, WAN, MAN, ISO-OSI model of networking, Internet, ISP, WWW, Email, URL, Web browsers, websites, intranet, extranet. **UNIT – V** DBMS, DBMS applications, Advantage of DBMS, Data abstraction,

	data model.
References / Text Books:	• Peter Norton, “Introduction to Computers, Tata Mc-Graw Hill. • M N Doja, “Introduction to Computers and Information Technology” • B. A. Forouzan, “Data Communication and Networking”, TMH, 4th Ed., 2006. • "An Introduction to Database Systems", C.J.Date, Pearson Education. • C Programming by Yaswant Kanetkar
Computer Usage / Software Requires:	

B. Tech.
(Computer Engineering)

Third Semester

DATA STRUCTURE

Paper Code	**CEN-301**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Definition of Data Structure, Types & characteristics of Data structures, Abstract Data Type (ADT), Algorithms: Algorithm Concepts, Definition of Algorithm, Objectives of algorithms, Quality of an algorithm Space complexity and Time complexity of algorithm. Characteristics of an array, Definition of an Array, Implementation of 1-D arrays, Row and Column Major Implementations of 2-D, 3-D and n-D arrays.

Advanced concept of Pointers in C, Dynamic allocation of Memory

UNIT- II

Stack as a ADT, operations on stack, Stack implementation using array and linked list, Applications of Stack: Polish and reverse Polish notations, Recursion, Garbage collection. Queue as ADT, Operations on queue, and Types of queues: Linear Queue, Circular Queue, Priority Queue, and Double Ended Queue, Application of Queue.

UNIT- III

Concept of a Linked List, Linear Single and Double link lists, Circular Single and Double link List, Generalized Linked List, Header Linked list, Applications of Link List.

UNIT- IV

Concepts of a Tree, Tree as ADT, Definitions of n-ary, binary trees, Strictly Binary Tree, Complete Binary Tree, Weight of a tree, Level of a node, Height/Depth of a Tree. Operations on tree, Tree Search Algorithms, Binary Search Tree, Tree traversal Algorithms, AVL Trees, Threaded binary trees, Left Threaded and Right Threaded binary search trees, Heap Tree, Expression tree, Huffman Tree.

Graph: Different terminology associated with Graphs, Types of graphs – directed/undirected, connected/disconnected, cyclic/acyclic, Representation of graphs: Adjacency matrix, linked list. Graph Traversal – BFS, DPF, Graph algorithm-Warshall's, Djikastra's, Minimum Spanning Tree – Prim's and Kruskal's Algorithm.

UNIT – V

Bubble Sort, Sequential Sort, Shell Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Topology sort. Searching Algorithm- Linear Search and Binary Search

References / Text Books:

- Seymour Lipschutz, TMH, Scaumn Series.
- Fundamentals of Data Structure inC by Horowitz, Sahni and Anderson-Freed, University Press, Second Edition.
- Data Structure and Algorithm – John Beidler, Springer

Computer Usage / Software Requires:

Practical implementation can be done on any C Compiler like gcc or Dev C++ with problems on Stack, Queue, Tree and Graph.

DIGITAL LOGIC THEORY

Paper Code	**CEN-302**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Introduction, Binary numbers, Base-conversions, Octal and hexadecimal numbers, complements, binary codes, concept of fixed and floating point numbers, Axiomatic definition of Boolean Algebra, Basic Theorems and properties, Boolean functions and representation in canonical and standard forms, SOP and POS forms, other logic operations, Digital logic gates. **UNIT- II** Karnaugh map methods, limitations of K-maps for larger variables, POS-simplification, NAND/NOR implementation, other 2-level implementations, Don't-care conditions, Tabular method. **UNIT- III** Standard gate assemblies, Hardware aspect of arithmetic logic functions, Half-Adder, Full-Adder, Binary Adder/Subtractor, Decimal Adder, Magnitude Comparator, Demultiplexer, Multiplexer, Encoder, Priority Encoder, Parity Checker/Generator, ROM, PALs and PLAs. **UNIT- IV** Definition and state representation, Flip-Flops, RS, D, JK-M/S, their working characteristics, State Tables, Excitation Tables and triggering, Asynchronous and Synchronous Counters-Design and Analysis, Counter Applications, Description and Operations of Shift Registers, Shift Register/Counters.

UNIT – V

Introduction to Architecture and organization of digital computer, ALU, I/O-Unit, Control Unit, CPU, Microprocessor and Microcomputer, Data and Instruction Formats.

References / Text Books:

- Digital Circuits Design by Morris Mano (4rd Edition).
- W.I. Fletcher, "An Engineering Approach to Digital Design", PHI
- R.J. Tocci, "Digital Systems: Principles, and Applications", PHI
- T.C. Bartee, "Digital Computer Fundamentals", McGraw Hill

Computer Usage / Software Requires:

DISCRETE MATHEMATICS

Paper Code	**CEN-303**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Review of Relations, equivalence relations, partial orders relations, hash function, characteristics function. Algebraic structure: semi-groups, monoids, groups, permutation groups, isomorphism, rings, fields, integral domain; Lattice. **UNIT- II** Definition and properties of graphs, directed and undirected graphs, degree sequence, cycles, path, connectivity, adjacency matrix, incidence matrix. Complete graphs, Regular graphs, Bipartite graphs, Planar graphs. Graph Isomorphism. Euler circuit, Hamiltonian circuit. Coloring of graphs: Welch-Powell algorithm. Shortest path algorithm. **UNIT- III** Introduction to recurrence, common recurrence relations. Generalized linear homogenous and non-homogenous recurrence relations, Solving recurrence relations: Iteration method, characteristic equation method. Introduction to generating functions. Solving recurrences using generating functions. Solving simultaneous recurrence relations. **UNIT- IV** Propositional calculus, principle of inclusion and exclusion, pigeonhole principle, principle of mathematical induction, permutation and combination, recursive functions, Boolean algebra. **UNIT – V** Introduction to Linear programming problems, modeling linear

programming problems. Solving linear programming problems: Graphical methods, Simplex algorithm. Dual of LPP and duality principle.

References / Text Books:

- K. H. Rosen, Discrete Mathematics and its Applications, Seventh Edition, McGraw Hill International Editions.
- C. L. Liu, Elements of Discrete Mathematics, McGraw Hill International Editions.
- E. G. Goodaire, Discrete Mathematics with Graph Theory, Prentice-Hall of India.
- Thomas Koshy, Discrete Mathematics with Applications, Elsevier Academic Press.
- J L Mott, A Kandel, T P Baker, Discrete Mathematics for Computer Scientists & Mathematicians, Prentice-Hall of India.
- K. D. Joshi, Foundations of Discrete Mathematics, Wiley Eastern Ltd.

Computer Usage / Software Requires:

ELECTRONIC DEVICES AND APPLICATIONS

Paper Code	**CEN-304**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Review of p-n junction diode. Characteristics and applications of special types of diodes (schottky barrier diodes, tunnel diodes, varactor diodes, LED, and photodiodes. Rectifiers, Filters and Regulators: Half wave rectifier, ripple factor, full wave rectifier, Capacitor filter. Zener Diode: Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators. Clipper and Clamper Circuits, Special devices: SCR, DIAC, TRIAC characteristics and their applications.

UNIT- II

Transistor construction, Detailed study of currents in a transistor, alpha and beta, Input and Output characteristics of transistor of transistor configurations; BJT Biasing: Fixed bias, Emitter bias, Voltage Divider bias, Collector Feedback, Stabilization Factors, (S, S', S''); Junction Field Effect Transistor: Construction, Transfer Characteristics, MOSFET characteristics (Enhancement and Depletion mode), and Comparison of Transistors, CMOS. JFET Biasing, MOSFET biasing.

UNIT- III

Small Signal low frequency BJT amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, input impedance and output impedance. Comparison of transistor configurations in terms of Ai, Ri, Av, Ro. BJT Small Signal analysis of different configurations. FET Small Signal Model, analysis of

different configurations; Frequency Response Of Transistors: BJT and FET high and low frequency response.

UNIT- IV

Concept of Feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output characteristics, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components and their analysis. Oscillators: Condition for oscillations. RC-phase shift oscillators with Transistor and FET, Hartley and Colpitts Oscillators, Wein Bridge oscillator, Crystal oscillators.

.

UNIT – V

Emitter Coupled Differential Amplifier pair, ADM, ACM and CMRR. Opamp characteristics, Structure of Opamp parameters. Non Linear applications of Opamp: Comparator, Schimidtt Trigger, Precision Rectifier, Logarithmic and Exponontial amplifiers.

Reference / Text Books:

- Boylested and Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall of India, 1992.
- Adel S. Sedra, Kenneth Carless Smith, "Microelectronic Circuits", Oxford University Press, 1998.
- Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", McGraw Hill India, 2009.

Computer Usage / Software Requires:

MATHEMATICS – I

Paper Code	**AS-301**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

COMPLEX VARIABLE

Complex number, Arc and diagram, complex functions, limit, continuity and differentialibility Cauchy-Reimann equations, harmonic functions, construction of analytic functions, by mile-thomson method, conformal mapping, transformations W=Z", I/z , e, (az+b)/cz=d).

UNIT- II

FOURIER SERIES

Periodic functions, Fourier series of functions with period 2 change of interval, Half range sine and cosine series.

UNIT- III

LAPLACE TRANSFORM

Laplace transform, existence theorem, first shift theorem, multiplication and division by T, Laplace transform of deviated inverse Laplace transform, Application to solve Linear differential equations. Unit step function, Dirac delta function-their Laplace transforms, second shifting theorm. Laplace transform of periodic function, Applications.

UNIT- IV

SERIES SOLUTION OF DIFFERNTIAL EQUATION

Series solution, Frobenious method, Legendre and Bessels equations.

UNIT – V

Linear and non-linear partial differential equation of first order, four

standard forms.

References / Text Books:

1. Kreyszig E.”Advanced Engineeering Mathaematics”.
2. Prasad C,”Advanced Engineering Mathematics”.
3. Pati T.”Functions of Complex Variables”.

Computer Usage / Software Requires:

SIGNAL AND SYSTEMS

Paper Code	**CEN-306**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

REPRESENTATION OF DISCRETE AND CONTINUOUS TIME SIGNAL AND SYSTEM

Introduction of signal & classification of signal, Elementry signals, System & classification of system, order of system, Interconnection of system-series or cascade interconnection of subsystem, parallel interconnection of subsystem, series-parallel interconnection of subsystem, feedback interconnection of subsystem, Continuous time and discrete time signals. Representation and classification; continuous time and discrete time systems, representation of linear Time invariant Discrete and continuous time signals: Laplace transformation and its application in system analysis.

UNIT- II

ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS

Fourier series Representation of periodic signals; Response to periodic Signals, Fourier transform and its properties, Inverse Fourier. Transforms; frequency response function, Computation of response from the Fourier Transform; Bandwidth Concept; Analysis of Ideal Filters.

UNIT- III

Z- transform and properties, Inverse Z- Transform; Frequency response of discrete time system; Discrete Fourier transform and its properties; System analysis via DFT

UNIT- IV

Sampling, Nyquist rate and Nyquist interval, Sampling of continuous

and discrete signals in time and frequency; Digital filters and FIR and IIR structures and their Realization, FIR filters, IIR Filters.

UNIT – V

Random variables: probability distribution and density function and density functions, Uniform, Gaussian, Exponential and Poisson distributions, Statistical averages, Stochastic process, Systems with Stochastic Inputs; Auto and cross correlation functions; Power spectral density, Noise- Its types

References / Text Books:

- A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall.
- R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall.
- B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press.
- Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International Edition.
- Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons(Asia) Private Limited.
- Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons (SEA) Private Limited.
- M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB" Tata Mc Graw Hill Edition.
- I. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
- Ashok Ambardar, "Analog and Digital Signal Processing", Second Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company).

Computer Usage / Software Requires:

B. Tech.
(Computer Engineering)

Fourth Semester

COMPUTER ORGANIZATION

Paper Code	**CEN-401**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

INTRODUCTION TO COMPUTER ORGANIZATION

Components of a computer, Organization of a computer, Review of Digital Logic Circuits and Digital Components, Data Representation, Register Transfer, Microoperations, Hardware Design of Microoperations.

UNIT- II

PROCESSING UNIT

Instructions, Operations and operands, Addressing modes, Instruction formats, Data path in a CPU, Control Unit implementation, Microprogrammed control, Characteristics of CISC and RISC processors, Performance of a processing unit.

UNIT- III

MEMORY SUBSYSTEM

Memory Hierarchy, Main Memory Unit, Internal organization of a memory chip, Organization of a main memory unit, SRAM, DRAM and ROM, Error corrective memories, Interleaved memory Units, Cache memory unit, Concept of cache memory, Mapping functions, Organization of a cache memory unit, fetch and write mechanisms, Memory management unit.

UNIT- IV

INPUT/OUTPUT SUBSYSTEM

Access of I/O devices, I/O ports, I/O control mechanisms, Program controlled I/O, Interrupt controlled I/O, DMA controlled I/O, I/O interfaces, System buses, peripherals, terminals, video displays, magnetic storage disks, magnetic tapes, CD ROMs

UNIT – V

HIGH PERFORMANCE PROCESSOR

Instruction pipelining, Pipeline hazards, super scalar processors, Performance consideration. Multi-processor systems, Shared memory systems, Interconnection networks, Cache in multiprocessor systems.

References / Text Books:

- William Stallings, "**Computer Organization and Architecture: Designing for Performance**" 9th Edition, Pearson Education
- D.A. Patterson and J.L. Hennessy, "**Computer Organization and Design, the Hardware/Software Interface**", Morgan Kaufmann
- V.C.Hamacher, Z.G. Vranesic and S.G. Zaky, "**Computer Organization**", 4th edition, McGraw Hill
- M. Morris Mano, "**Computer System Architecture**" Prentice Hall.

Computer Usage / Software Requires:

OPERATING SYSTEM- I

Paper Code	**CEN-402**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I INTRODUCTION TO OPERATING SYSTEM**

Definition, What Operating Do, Single Processor Systems, Multiprocessor/parallel Systems. Concept of Multiprogramming, Time-sharing System, Operating System Operation: Dual Mode Operation: Kernel Mode, User Mode. Distributed system, Real Time system, Process Management, Memory Management, Storage Management.

UNIT- II

Operating System Services, System Call, Types of System calls, System Programs, Operating System Design and Implementation, Operating system structure, User Operating- System Interface.

UNIT- III

PROCESS MANAGEMENT & PROCESS SCHEDULLING

The Process, Process State, Process Control Block, Process Scheduling, Operations on Processes, Interprocess Communication (IPC). Concept of Threading, scheduling levels, Scheduling Criteria, Scheduling Algorithms: First Come, First Served, Shortest Job First, Priority Scheduling, Round Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling, Multiprocessor Scheduling

UNIT- IV

PROCESS COMMUNICATION AND SYNCHRONIZATION

Background**,** The Critical- Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization: Bounded- Buffer Problem, The Reader- Writers Problem, Dining- Philosophers Problem, Monitors: Usage, Dining- Philosophers Solution using Monitors.

UNIT – V

MEMORY-MANAGEMENT STRATEGIES

Background**,** The Critical- Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization: Bounded- Buffer Problem, The Reader- Writers Problem, Dining- Philosophers Problem, Monitors: Usage, Dining- Philosophers Solution using Monitors.

References / Text Books:

- Peterson: Silberschatz, Galvin "Operating System Concepts", Addison Wiley 2006, 7th Addition.
- Milenkovic, Milan: Operating system concepts and Design, McGraw Hill, 1994.
- Andrew S. Tannenbaum, "Modern Operating Systems", PHI, 3rd Edition, 2011,
- E. Madnick, J. Donovan, "Operating Systems", Tata McGraw Hill,
- "Operating Systems: Internals and Design Principles" by William Stallings
- "Operating Systems: A Concept-Based Approach" by D. M. Dhamdhere
- Operating Systems: A Modern Perspective" by Gary J. Nutt

Computer Usage / Software Requires:

Gcc, Dev c++

INFORMATION TECHNOLOGY

Paper Code	**CEN-403**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

What is information technology? Data and Information, types of information, information security and integrity, disaster recovery, privacy and piracy. Advantages and impacts of information technology, applications of information technology, IT services and support.

UNIT- II

Input Devices: Pointing Devices, Scanning Devices, Audio Input Devices, Video Input Devices, Human biology Input Devices. Output Devices: Video Display Devices, CRT, flat panel, video controllers; Printers, impact printers and non-impact printers, Sound Output, 3D Output.

UNIT- III

Magnetic storage devices, floppy, hard disk drive, tape, RAID; Optical Storage Devices, CD, CD-RW, DVD, DVD-RW; How read and write works on storage medium, Drive Speed and Performance. **Microchips**: RAM, ROM, CMOS, Flash, How memory works; case studies of Intel, AMD, Cyrix.

UNIT- IV

Modem, DSL, ISDN, ISP, TCP/IP, DNS, Telnet, FTP; Web Security: Data Security, firewalls, how virus works, hazards and risks; intranets, extranets; DTV, HDTV, SDTV, Videoconferencing; Graphics and Multimedia: Bitmap and Vector Graphics, Interactive multimedia, hypermedia, HTML, 3D modeling, animation; Compression techniques, JPEG, MPEG.

UNIT – V

Business Intelligence, E-commerce: B2B, B2C, C2C case studies; Data Mining and Warehousing; ERP, Emerging Technologies and Trends.

References / Text Books:

- Peter Norton, "Introduction to Computers, Tata Mc-Graw Hill.
- Williams Sawyer, "Using Information Technology" Tata Mc-Graw Hill.
- M N Doja, "Introduction to Computers and Information Technology"

Computer Usage / Software Requires: Not required

ANALOG AND DIGITAL COMMUNICATION

Paper Code	**CEN-404**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Classification of signals, difference between analog & digital signals, elements of a communication system, Radio frequency spectrum, limitations in communications. Modulation: Needs & Methods. Analog Modulation, Frequency Modulation, Phase Modulation. **UNIT- II** Generation and detection of AM & FM signals. Radio transmitters and receivers. Introduction to transmitting & receiving Antennas. PLL, AGC, AFC, Tracking Diversity. **UNIT- III** Concept of BW, Noises & Channel Capacity of different communication systems such as two wires, Coaxial cable, Wave guides, wireless media, Microwave, satellite, Fibre-optics etc. **UNIT- IV** Information Capacity, sampling Theorem, pulse modulation, PAM, PPM, PWM, Pulse Code Modulation (PCM), Delta modulation, Comparison of PCM & DM, The Complete PCM system, Adaptive DM, Differential PCM (DPCM), Spread Spectrum, Communication Multiplexing(TDM, FDM), Switching (Circuit, Message, & Packet). **UNIT – V** PSK, FSK, DPSK, Synchronous & Asynchronous Communication, Start Stop bit data transfer. Bit level transfer & Byte level data transfer, data transfer efficiency. Modems (Synchronous & Asynchronous) Error detection and correction methods (Parity bit, Block Parity, VRC, LRC, hamming Code, Checksum error detection

etc.)

References / Text Books:	• Advanced Electronics Communication by Wayne Tomasi. • Introduction to Digital & Data Communication by Micheal A Miller. • Communication Electronics by Louis E. Frenzel Jr. • Electronic Communication by John Kennedy.

MATHEMATICS – II (NACP)

Paper Code	**AS-405**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

INTERPOLATION WITH EQUAL & UNEQUAL INTERVALS OF THE ARGUMENT

Newton-Gregory, gauss, Sterling's and Bessel's formula, Aitkin's and cubic spline interpolation methods for equal intervals, Newton's divided difference and Lagrange formula for unequal intervals; inverse interpolation using Lagrange formula and the method of successive approximation, double interpolation.

UNIT- II

NUMERICAL DIFFERNTIATION AND NUMERICAL INTEGRATION

Numerical successive differentiation using forward, backward and central differences interpolation formula, and Newton's divided difference formula. Review of trapezoidal, Simpson's 1/3 and 3/8 rules, numerical integration using Boole's rule, waddle's rule, Gaussain legendre and lobatto rules, error in quadrature formula, romberg integration, and numerical double integration.

UNIT- III

NUMERIC SOLUTIONS OF ALGEBRAIC & TRANSCENDENTAL EQUATIONS

Bisection, Regula false position, Newton Raphson , Graeffe's Root squaring and iteration methods for the solution of non-linear algebraic and transcendental equations involving one variable, rate of convergence and error analysis of the methods, and Newton Raphson

Paper Code	method for the solution of a system of non linear equations.
Course Credits	
Lectures / week	
Tutorial / week	**UNIT- IV**
Course Description	**SOLUTION OF A SYSTEM OF SIMULTANEOUS LINEAR EQUATIONS AND CURVEFITTING** Gauss elimination methods and gauss Jordan methods, III conditioned linear system, gauss seidal and Crout's methods for the solution of a system of linear equations in four unknown; general curve (linear, quadratic, exponential and other non linear functions) fitting using methods of least squares. **UNIT – V** **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS AND BOUNDED VALUE PROBLEMS** Numeric approximation solutions of a system of simultaneous and higher order differential equations using Taylor's series method, Picard's method and Ranga – kutta fourth order method; Ranga – kutta fehlberg method, modified euler's and milne's method; solutions of boundary value problems using finite differences method and cubic Spline method. **IMPORTANT NOTE:** In a total of five questions to be set in the final examination, 50% questions woulsd be on numerical methods and remaining 50% would be on computer applications of numeric methods suing C/C++ language.
References / Text Books:	• M.K.Jain , SRK lyengar and R.K.jain "Numerical Methods for scientific and engineering computation", 4th edition , New age international publication • S.S. Sastri "Introductory methods of numerical analysis" 3rd edition prentice hall of India publication • Steven C chapra and Raymond P. Canale "Numerical methods for

engineers", 2nd edition TMH publication

- B.S. Grewal "Numerical Methods in Engineering and Science " 3rd edition, prentice hall of India publication

Computer Usage / Software Requires:

SYSTEM SOFTWARE

Paper Code	**CEN-406**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Introduction, fundamental of language processing and specification, language processor development tools, Data structure of language processing, scanning and parsing. Machine structure and Machine language: Approach to new machine, state table and diagram, Machine structure, memory, registers, Data, Instructions, special features. Address modifications. **UNIT- II** Elements of assembly language programming, review of instruction format, Addressing modes, Functions of Assembler, Design of Assemblers: single pass assemblers, two pass assembler, Macros processors: Macro instruction, features of macro preprocessor, implementation of Macros. **UNIT- III** Relocation and linking concept, Design of linker, self-relocating program, linking of overlays. Loader: Function of loader, various loading schemes, general loader, relocating loader, Direct linking loader, Dynamic loading, Design of absolute loader, Design of direct linking loader. **UNIT- IV** UNIX basic commands, File system, I/O Redirection and piping, processes in Unix, Communication commands. **UNIT – V** Decision, Loops- while, until and for loops, break and continue, File

	meta characters, Functions of shell, exporting variables, trapping signals, shell variables $?, $$, $#, $*, $1, system administration.
References / Text Books:	• System programming and operating system By D.M. Dhamdere, TMH 2nd Revised edition. • System programming By John J. Donovan, TMH Reprint 2005. • Unix programming By Allen Cox , Wrox publication • Unix Shell Programming By Yashwant Kanetker, BPB Publication
Computer Usage / Software Requires:	e.g. Mac or Linux Operating System, Bash Shell, Gedit, GCC

B. Tech.
(Computer Engineering)

Fifth Semester

COMPUTER ARCHITECTURE

Paper Code	**CEN-501**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Introduction to computer architecture; Moor's law; Evolution of computer architectures and current trends; classifications of computer architecture; concepts of look ahead, Pipelining, parallelism, Implicit and explicit vectors; system attributes and performance; multi-computers and multi-processors; NUMA, UMA and COMA models; supercomputers-vector supercomputer and SIMD.

UNIT- II

Advanced processor technology: Design Space of Processors, Inter-processes communication (asynchronous and synchronous), Instruction Set Architectures, CISC and RISC scalar processors, differences between CISC and RISC; Super-scalar and vector Processors: super-scalar processor; Memory Hierarchy technology: hierarchical memory technology. Inclusion, coherence and locality; visual memory models, TLB, paging and segmentation.

UNIT- III

Design of Arithematic circuit, Logical circuits, ALU, N-bit Parallel Adder, Comparison of Various parallel adders, Array Multiplication, sequential multiplier, signed multiplication, unsigned multiplication, designing fast and efficient algorithm for multiplication and Division, integer representation, floating point representation. Range of representation, Floating point operation, Register Transfer and Microoperation: Register transfer language, register transfer, bus and memory transfer, arithmetic microoperations, logic microoperations,

shift microoperations, using RTL to specify digital system.

UNIT- IV

Basic concepts and its application to implement hardware loops, Hard wired circuit to compute factorial, sum of series. Design and implementation of a very simple CPU, a relatively simple CPU Specification, fetching, decoding, executing, establishing required data paths, design of ALU, Designing control unit using hardwired control, design verification; real world example, short comings of simple CPUs

UNIT – V

Introduction, tasks of super-scalar processing, parallel decoding, super-scalar instruction issues and policies, shelving, scope of shelving, shelving buffer, operand fetch policies, renaming, preserving the sequential consistency of instructions execution, sequential consistency model, reorder buffer, super-scalar CISC and RISC

References / Text Books:

- Kai Hwang, "Advanced Computer architectures, Parallelism, Scalability & Programmability", McGraw Hill,
- Sima, Fountain & Kacsuk, "Advanced Computer architectures a design space approach", Pearson education
- John L. Hennessy & David A. Patterson, "Computer Architecture, A Quantitative Approach",Morgan Kaufmann, 3rd edition,2003.
- Rafiquzamman and Chandra, "Modern Computer Architecture". Galgotia Publication.
- J. P. Hayes, "Computer Architecture and Organization", McGraw Hill, 1998.
- W. Stallings, "Computer Organization & Architecture", PHI, 2001.

AUTOMATA THEORY

Paper Code	**CEN-502**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**

Course Description

UNIT – I

Introduction to Finite Automata, strings, alphabets and languages, graphs & trees, state tables & diagram, NDFA & DFA concepts, Conversion of NFA to DFA, Minimization of FA, Mealy & Moore machines, state and machine equivalence.

UNIT- II

Regular Expressions, Identities for Regular expressions, Arden's Theorem, Conversion of FA to RE, Pumping Lemma for Regular sets.

UNIT- III

Context free Grammar, Chomsky Normal form and Greibach Normal form, Pushdown Automata, Context Free languages, Chomsky Classification of languages, Simplification of CFG, Pumping Lemma for context free languages, properties of context free languages, Push down automaton (PDA), conversion from PDA to CFG.

UNIT- IV

Turing Machines, Computing with Turing Machines, Non-deterministic Turing Machines, unrestricted grammars, context sensitive languages, Church's Thesis, Universal Turing Machines.

UNIT – V

Halting Problems, Unsolvable Problems about Turing Machines,

	Time bounded Turing Machines, The Class P and NP Languages, NP Completeness, Some NP Complete Problems
References / Text Books:	• J.E. Hopcroft & J.D. Ullmann, "Introduction to Automata Theory Language and Computation", Narosa Publications. • K. L. P. Mishra & Chandrasekaran, “Theory of Computer Science: Automata, Languages and Computation”, 3rd Edition, PHI • H.R. Lewis & C.H. Papadimitrou, "Elements of the Theory of Computation", PHI • John C. Martin, "Introduction to Languages and the Theory of Computation", McGraw-Hill International • D.A. Cohen, "Introduction to Computer Theory", John Wiley.
Computer Usage / Software Requires:	

COMPUTER NETWORKS-I

Paper Code	**CEN-503**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Introduction: Data Networks, LAN, MAN, WAN, Uses of Computer Networks, LAN Technologies- Transmission, Topologies, Access methods. Network Architecture, Protocol and standards, References Model OSI-ISO, TCP/IP – Overview, IP Address, Classes, Sub-netting, Fundamentals of digital communication, Channel capacity, Bit error rate, Multiplexing Techniques- TDM, FDM, CDMA.

UNIT- II

The Physical Layer: Theoretical basis for Communication , Guided and Unguided Communication media, Communication Satellites, Digital signal encoding Format- NRZ-L, NRZ-I, Manchester, Differential Manchester, Bipolar, 2B1Q. Switching Techniques- Circuit Switching, Message Switching, Packet switching.

UNIT- III

The Data Link Layer: Data Link Layer design issues, Error Detection and Correction, Flow control Protocols, Stop and Wait protocol, Sliding - window Flow control, Error control, stop and wait ARQ, Go-back-N, Selective repeat ARQ, Examples of Data link Protocols- HDLC.

UNIT- IV

The Medium Access Control Sub Layer: The channel allocation problem, ALOHA, Multiple access Protocols, Collision free Protocols, IEEE Standards for LANs and MANs, Bridges, Wireless LANs, IEEE 802.11, Blue tooth, High speed LANs.

UNIT – V

The Network Layer: Network Layer Design issues, Routing Algorithms- Dijsktra's , Bellman-Ford, Link state, Distance vector, Hierarchical Routing. Congestion control Algorithms, Quality of Service, Internetworking, Internet Architecture and Addressing.

References / Text Books:

- B.A. Forouzan, " Data Communication and Networking", TMH, 4TH Edition.
- A.S. Tanebaum, " Computer Networks", 4th Edition Pearson Education.
- W. Stallings, " Data and Computer Communication", 7th Edition , Pearson Education.
- Comer E. Doughlas, " Computer Networks and Internet", 2nd Edition Pearson Education.
- W.R. Stevens, UNIX Network Programming, Vol I, Networking APIs: Sockets and XTI, Pearson Education, 3rd Edition.

Computer Usage / Software Requires:

C++/ JAVA/ MATLAB/ NS2

DATABASE MANAGEMENT SYSTEM

Paper Code	**CEN-504**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Database – Characteristics, advantages, disadvantages and applications. Data models, schemas and instances. Difference between Hierarchical, Network and relational model. Three schema architecture and data independence. Client server architecture for DBMS. Classification of DBMS. **UNIT- II** Data modeling using E-R diagram, Entity type, entity sets, attribute and keys. Weak entity. Relational model concepts, Relational database schemas, Constraint violations. Relational Algebra and Relational calculus. Introduction to Tuple relational calculus and Domain relational calculus. Codd's Rule for Relational Database. Indexes and Hash Indexes. **UNIT- III** Design guidelines for Relational schemas, Functional dependency, normal forms based on primary keys. Definition of First Normal form, Second normal form, Third normal form and BCNF. **UNIT- IV** Multivalued Dependency and Fourth Normal form, Join dependency and fifth Normal form. Inclusion dependency, Other dependencies and Normal form. Transaction processing concepts, Locks, Serializability and concurrency control, Database Security. **UNIT – V** SQL: Data Manipulation, Data Definition, Commercial RDMS: Oracle / MySql / Sql Server , PL/SQL . PL/SQL programming,

views, cursors and Trigger, Introductions to Distributed database,

Object oriented database, Mobile database, Multimedia database, Geographic Information system, data warehousing and data mining.

References / Text Books:

- Fundamentals of Database Systems, Elmasri, Navathe, Pearson Education, IVth Edition. Pearson Education.
- Database system concepts, Henry F Korth, Abraham Silberschatz, S. Sudurshan, McGraw-Hill.
- An Introduction to Database Systems, C.J.Date, Pearson. Education
- Data Base System, Michael kifer and et all, Pearson Education
- Database Management Systems ,Ramakrishnan, Gehrke;Mcgraw-Hill
- The Database Book –Principle and Practice" By Narain Gehani, University Press
- A first course in Database Systems, Jeffrey D. Ullman, Jennifer Windon, Pearson Education.

Computer Usage / Software Requires:

e.g. Mac / Linux / Windows Operating System, Bash Shell, MYSQL

MICROPROCESSOR

Paper Code	**CEN-505**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Review, Organization and architecture of 8085 Microprocessor, Instructions of 8085 & Programming techniques, Machine Language Vs Assembly Language, Basic concepts of timing & control unit, Timing Diagrams for 8085. **UNIT- II** Minimal System, Necessity for interfacing, Address space partitioning – Memory mapped I / O & I / O Mapped I / O, Advantages and Disadvantages, Types of Interfacing devices – I / O ports, Programmable peripheral interfaces 8255, 8259 (PIC), 8251 (USART), 8253 (Timer), 8279 (Keyboard Controller), Coprocessors. **UNIT- III** Hardware scheme for data transfer – Programmed Data transfer, Interrupt Data Transfer, Various interrupt Schemes, Multiple Interrupt, Enabling, Disabling and Masking of Interrupts Particularly in 8085, DMA & DMA Controller. **UNIT- IV** Study of important 8 – bit Microprocessors & their Comparison, Introduction to 16 – bit processors – 8086, 8088 and 68000 Coprocessor & comparison. Introduction to 32 – bit Microprocessors. **UNIT – V** Microprocessors based system design, Introduction and Basic concept, Introduction to MDS, system Design Kits, Introduction to Microcontroller, Some Practical applications.

References / Text Books:	• A.P. Mathur, "An Introduction to Microprocessors" Tata McGraw Hill, 1995. • K.L. Short, "Microprocessor & Programmed Logic", 2nd Ed., PHI, 1994 • R.G. Gaonkar, "Microprocessor Architecture programming and application", Wiley Eastern Ltd., 1994. • Bhurchandi, "Advanced microprocessor", TMH 2007
Computer Usage / Software Requires:	

OPERATING SYSTEM-II

Paper Code	**CEN-506**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Introduction, defining deadlocks, modeling of deadlocks, Conditions for deadlock, dealing with deadlock, Deadlock avoidance and deadlock prevention, Recovery from deadlock. **UNIT- II** Introduction, Files and File System, File Structure, File naming and file types, File attributes, File Operation, Implementation of File Operations, File Access, Directories- Single Level, Two level, hierarchical or Tree Structure, Acyclic Graph structure and file sharing, File Protection, File system Mounting. File system implementation- introduction, file system structure, Implementation of data structures, Implementation of FILE Operations, File allocation Methods, Free Space Management, Directory implementation, File System Inconsistency, File system Performance Issues. **UNIT- III** Introduction, Disk Scheduling, Disk Scheduling Criteria, Disk Scheduling algorithms, Raid Structure- Raid levels. Security Issues- Introduction, Security Objectives, Security Problems, Intruders, some standard security attacks, Security levels, Inside system attacks, Outside system attacks- Viruses, types of Viruses, worms, bots, mobile code, Root kit. **UNIT- IV** Distributed Operating system: Introduction, Characteristics of distributed systems, Network operating Systems, Issues in Distributed Operating system, Communication in Distributed

Systems- Message passing model, Remote Procedure Calls.

UNIT – V

Introduction, introduction to Mobile Devices, Characteristics of mobile devices, Mobile OS, Android OS- power Management, memory management, scheduling, IPC, File management, Security. Case- Studies- Linux- Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, interprocess Communication, Security.

References / Text Books:

- Operating System Concepts: 8th Edition: Avi Silberschatz, Galvin, Greg Gagne.
- Principles of Operating Systems: Naresh Chauhan

Computer Usage / Software Requires:

B. Tech.
(Computer Engineering)

Sixth Semester

COMPUTER GRAPHICS

Paper Code	**CEN-601**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Introduction Computer Graphics and Primitive Algorithms:

Introduction to Image and Objects, Image Representation, Basic Graphics Pipeline, Bitmap and Vector-Based Graphics, Applications of Computer Graphics, Display Devices, Cathode Ray Tubes, Raster Scan Display, Random-Scan Display, Flat Panel Display, Input Technology, Coordinate System Overview, Scan-Conversion of graphics primitives: Scan-Conversion of a Lines (Digital Differential Analyzer Algorithm, Bresenham's Line Drawing Algorithm, Scan Conversion of Circle and Ellipse , Bresenham's Method of Circle Drawing, Midpoint Circle Algorithm, Drawing Ellipses and other Conics.

UNIT- II

Basic raster graphical algorithm for 2D primitives, Transformation: Translation, Rotation, Scaling, Mirror Images, Coordinate system, 3DTransformation, Rotation about an arbitrary axis, Orthogonal Projections, Multiple Views, Isometric Projection, Perspective Projections (one ,two and three vanishing points), Wire Frame Perspective, 3D transformation.

UNIT- III

Window, View port, clipping algorithms, Curves and Surfaces: Circle drawing algorithm, Ellipse drawing algorithm, Bezier curve, B-spline curve, surfaces, Solid modelling. Parallel projection, Perspective projection, Computation of vanishing point, Visible

surface determination: Z-buffer algorithm, Scan line algorithm, Area subdivision algorithm, Ray tracing algorithm, Painter's Algorithm.

UNIT- IV

Illumination mode, Specular reflection model, Shading models for curve surfaces, Rendering, Recursive ray tracing, Texture mapping Advanced Modelling Techniques Procedural Models, Fractal Models, Grammar based models, particle systems.

UNIT – V

Object Rendering, Introduction Object-Rendering, Light Modeling Techniques, illumination Model, Shading, Flat Shading, Polygon Mesh Shading, Gouraud Shading Model, Phong Shading, Transparency Effect, Shadows, Texture and Object Representation, Ray Tracing, Ray Casting, Color Models. Introduction to animation, Key-Frame Animation.

References / Text Books:

- Hearn & Baker - Computer Graphics C version, 2nd ed. Pearson Education.
- Roger and Adams - Mathematical Element for Computer Graphics, 2nd ed., Tata McGraw Hill.
- W.K. Gilloi, Interactive Computer Graphics, PHI.
- Foley - Computer Graphics Principles & Practice, 2nd ed. Pearson Education.
- David F. Rogers, "Procedural Element for computer graphics", McGraw Hill.

Computer Usage / Software Requires:

OpenGL, Turbo C.

SOFTWARE ENGINEERING

Paper Code	**CEN-602**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Definition, Program Vs Software, Software processes, Software life cycle models: Build and Fix, Waterfall, Prototype, Iterative Enhancement Model, Evolutionary and Spiral models, RAD Model. **UNIT- II** Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. **UNIT- III** Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management. Problem Analysis, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Behavioral and non-behavioral requirements, Software Prototyping. **UNIT- IV** Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design. Software Reliability: Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calendar time Component, Overview of Quality Standards like ISO 9001, SEI-CMM **UNIT – V** Software process, Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, and Cause effect graphing, Structural testing: path testing, Data flow and mutation

testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards. Software Maintenance: Management of maintenance, Maintenance Process, Maintenance Models: Quick fix, Iterative Enhancement, Reuse Oriented etc. Reverse Engineering, Software RE-enginnfieering, Coguration Management, Documentation

References / Text Books:

- Pressman, "Software Engineering- A Practioner's Approach, 7th Edition", Tata McGraw Hill.
- Prof. K.K.Aggarwal & Yogesh Singh: Software Engineering, New Age International.
- Pankaj Jalote, "An Integrated Approach to Software Engg" Narosa Publishing House, New Delhi.

Computer Usage / Software Requires:

OBJECT ORIENTED PROGRAMMING

Paper Code	**CEN-603**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Object Oriented Paradigm, Structured vs Object Oriented Development, Concept of Object and classes, Encapsulation, Polymorphism, Inheritance Generic Programming, Merits and demerits of OOP. **UNIT- II** Introduction, Class specification, Class objects, Defining member function, Inline functions, Data Hiding, Empty class, Pointers inside a class, Passing objects as parameters, Returning objects from functions, Friend function and class, Static data and member functions. Constructors and destructors, Overloading of constructors, Dynamic initialization through constructors, Copy constructors, Static data members with constructors and destructors. Pointers to objects, Array of objects, this pointer, Self-referential classes. **UNIT- III** Function and Operator overloading, Overloading of unary and Binary operators, Limitations of overloading of increment and decrement operators, overloading of arithmetic, Relational, assignment, new and delete, subscript operators. Data conversion between objects. Complete conversion. Overloading through friend functions. Tracing memory leaks. **UNIT- IV** Declaration of derived class, forms of inheritance, constructors and destructors in derived class, types of inheritance, abstract class, Virtual functions: Need of virtual functions, Pointers to derived class

objects, Pure virtual functions, Virtual destructors, Rules of writing virtual function.

UNIT – V

Function and Class templates, Overloadable function templates, Inheritance of class templates, Class templates with overload able operators. Exception handling: Error and exception, exception handling constructs, Throwing an exception, Catching all exception. Hierarchy of File stream classes, opening and closing of files, File modes, Saving and reading of objects, handling of errors during file manipulation.

References / Text Books:

- The C++ Programming Language by B. Stroustrup, Pearson Education.
- Thinking in C++ by Bruce Eckel, Pearson Education.
- Object Oriented Programming in C++ by N.Barkakati, PHI.
- Mastering C++ by Venugopal, Tata McGraw Hill.
- C++ How to Program by Deital and Deital, Pearson Education.

Computer Usage / Software Requires:

Mac or Linux Operating System using gcc or any other compiler with programs from each unit.

COMPUTER NETWORK - II

Paper Code	**CEN-604**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Review of Physical & Data link layer, ISDN, X.25 Frame Relay, ATM, IP Addresses: Classful, Classless Addressing, CIDR Notation, Special Addresses, Private Addresses, Subnetting and Supernetting. **UNIT- II** The Transport Service, Elements of Transport Protocols, A Simple Transport Protocol, The Internet Transport Protocols; UDP, TCP, Flow control, Silly window syndrome, TCP timers, Performance Issues. **UNIT- III** Traditional Cryptography, Cryptographic Principles, Secret Key Algorithm: Substitution cipher, Transposition cipher, DES, Public Key Algorithm: RSA, Diffie- Helman , MD5, Authentication protocol, Digital Signature, Security in the Internet, Firewalls. **UNIT- IV** Datagram, Fragmentation, Delivery , Forwarding, Routing of IP Packets, ARP and RARP, ICMP, IGMP. IPV4 Protocols , IPV6 (over view), Security in the Internet: IPSec, PGP, VPN. **UNIT – V** Domain Name System , Remote Login , Simple Network Management Protocol, File Transfer Protocol, Electronic Mail: Simple Mail Transfer Protocol, Post Office Protocol, Internet Mail Access Protocol, WWW, HTTP.
References / Text Books:	

- B. A. Forouzan, “TCP/IP Protocol Suite”, TMH, 3rd Edition., 2006.
- Andrew S. Tanenbaum “ Computer Networks” by Pearson Education ,fourth edition.
- William Stallings “ Cryptography and Network security” by PHI, Third edition

- William Stallings “ High speed Networks and Internets” by Pearson education, second edition.
- Comer E. Doughlas, “Internetworking with TCP/IP, Vol. 1, PHI, 2000

ANALYSIS & DESIGN OF ALGORITHMS

Paper Code	**CEN-605**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Introduction: What is algorithm? Why analyze algorithm? RAM Model of Computation. Best-case, worst-case and average-case complexity analyses. Asymptotic Notations: Big-Oh, Big-Omega, Theta notations, Small-oh, Small-omega notations, Rules of notations. Solving recurrence equations: Iterative method, Recursion-tree method, Guess method, Master method, Master's theorem, and proof of master's theorem. Rate of growth of functions and their ranking. Review and analysis of searching and sorting algorithms, lower bound of comparison-based sorting.

UNIT- II

Divide and Conquer Strategy: Introduction, Counterfeit coin detection, binary search, merge sort, quick sort, integer multiplication, matrix multiplication (Strassen's algorithm), exponentiation problem, polynomial multiplication, median-finding problem, closest pair of points problem. When to avoid divide-&-conquer strategy.

UNIT- III

Graph Algorithm: Introduction, topological sorting, Dijkstra's algorithm shortest path for weighted graph, DFS algorithm, BFS algorithm, articulation points in bi-connected graph, strongly connected components. Greedy Algorithm: Introduction, change-making problem, Huffman coding, Minimum spanning tree problem, disjoint set data structure, prims and kruskal algorithm, 0/1 knapsack problem, fractional knapsack problem, activity selection problem.

UNIT- IV

Dynamic Programming: Introduction, fibonacci series calculation, 0/1 knapsack problem, matrix chain multiplication, Longest common subsequence problem, optimal binary tree search problem, memoization, Floyd-Warshal's algorithm. Backtracking: The general method, 8-queen problem, sum of subsets.

UNIT – V

String Search Problem: Naïve algorithm, Rabin-karp algorithm, FSA based algorithm, knuth-morris-pratt algorithm. Complexity theory: P class of problem, NP-class of problem, Decidability of problems, Halting problem, Polynomial reduction problem, Cook's theorem, NP hardness and NP completeness.

References / Text Books:

- T H Cormen, C E Leisersor, and R L Rivest, Introduction to Algorithm, Third Edition, PHI.
- Richard Neapolitan and Kumarss Naimipour, Foundation of Algorithms, Fourtht Edition, Jones & Bartlet.
- A V Aho, J E Hopcroft and J D Ullman, The Design and analysis of computer algorithms, Pearson Education
- E Horwitz, and S Sahni, Fundamentals of Computer Algorithm, PHI
- Goodrich & Tamassia, Algorithm Design, Wiley
- A Levitin, Introduction to the Design & Analysis of Algorithms, 2nd Edition, Pearson Education.

Computer Usage / Software Requires:

- NPTEL Lectures for Algorithms
- MIT Open Courseware for Algorithms

PARALLEL & DISTRIBUTED SYSTEM

Paper Code	**CEN-606**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Basic Concepts: Introduction to parallel processing, parallel processing terminology, decomposition, complexity, throughout, speedup, measures, data dependence, resource dependence, Bernstein's conditions levels of parallelism in programs. Program flow-control flow, data flow, Distributed systems – Introduction, advantages, and tightly-coupled loosely-coupled systems. Hardware and software requirements, design issues.

UNIT- II

Parallel Processing – Structure & Organization: Taxonomy of parallel processes: granularity, basic architectures, multiprocessors, vector processors, pipeline:-both linear as well as non liner pipeline ,optimal design, Arithematic pipeline, Instruction pipeline, Pipeline hazards and their solution ,reservation table, scheduling;,

UNIT- III

Systolic, wavefront array, cube architecture, hypercube, CCC, pyramid, prism, network architecture – binarytree, hypertree butterfly, shuffle exchange, dataflow architecture, connection machine.System attributes to computers, clock rate, CPI,MIPS rate,throughput rates,UMa, NUMA,COMA modelsPerformance Laws:-Amdahl,Gustafson, Sun and Ni laws

UNIT- IV

Parallel Algorithms: PRAM model of computation, Elementary parallel algorithms – Broadcast, prefix sums, permutation, parallel selection, merging, sorting, Odd-even, bitonic merge, dictionary operations, elliss, Algorithm Graph Algorithms, Matrix-

transportation, multiplication,

SIMD algorithm for matrix multiplication ,solving linear systems.

UNIT – V

Parallel & Distributed Programming: Parallel Programming environments, models, synchronous asynchronous programming, modulla-2, occamm, FORTRAN, DAP FORTRAN, C-linda, Actus, data flow programming, VAL etc,. MPI, Open MP

References / Text Books:

- Michael J. Quinn, "Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994
- Kai Hwang, "Advanced Computer Architecture – Parallelism, Scalability, Programmability", McGraw Hill Inc, 1993.
- Wilkinson, "Parallel Programming using networked computer" , Pearson Education India, 20006
- S. G. Akl, "The Design and Analysis of parallel algorithms", Englewood Cliffs, NJ, 1989
- S. Tanenbaum, "Modern Operating System", PHI, 1996.
- R. H. Perrott, "Parallel Programming", Addison Wesley, 1987.
- T. G. Lewie and H. Ele-Revini, "Introduction to Parallel computing", PHI, NJ, 1992.
- S. Lakshmivardhan and S.K. Dhall, "Analysis and design of parallel algorithm – arithmetic and matrix problems", McGraw Hill, 1990
- J. M. Crichlow, "An introduction to distributed and parallel computing", PHI, 1988

Computer Usage / Software Requires:

LANGUAGE PROCESSOR - I

Paper Code	**CEN-607**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**

Course Description

UNIT – I

Introduction to compilation, The tasks of a compiler, Language processing system, Analysis of the Source Program, Phases and Passes in compilers, cousins of compilers, compiler construction tools.

UNIT- II

Role and position of a Lexical analyzer, Input buffering, tokens, lexemes & pattern, review of Regular Expressions, Finite State Machines, Finite Automata based Pattern Matching. Specification and recognition of tokens, a language for specifying lexical analyzer, Design of lexical analyzer generator.

UNIT- III

Role and position of a Parser, A simple Backtracking parser, Predictive Parsing, A review of Context Free Grammar, Derivation tree, Ambiguity. Parsing approaches.

Top-down Parsing: Left recursive grammars, Left factoring, LL (1) Parsing, LL (1) grammars, error recovery in Top down parsers.

UNIT- IV

Bottom Up Parsing technique, Overview of Operator precedence parser, Shift reduce parsing, Finite automata of LR(0) items and LR (0) parsing, SLR parsing, Canonical LR Parsing, LALR Parsing. Compaction of LR parsing table, Error recovery strategies, Yacc: an

LALR(1) Parser generator.

UNIT – V

Syntax Directed Definitions and translations, Attributes and Attribute grammar, construction of syntax trees, bottom up evaluation of S attributed definition, L- attributed definition, Top down translation, Analysis of syntax directed definitions.

References / Text Books:

- Aho, Sethi, Ullmann & Lam “Compilers: Principles, techniques and tools”, Pearson Education Asia
- Keith Cooper & Linda Torczon, "Engineering a Compiler", Morgan Kaufmann publication.
- Levine, Mason, and Brown, “Lex & Yacc”, O’ Reilly publication.
- Vinu V. Das, “Compiler Design using FLEX and YACC” PHI.

Computer Usage / Software Requires:

Tools like, LEX \ FLEX, YACC & Bison.

B. Tech.
(Computer Engineering)

Seventh Semester

INTERNET FUNDAMENTALS

Paper Code	**CEN-701**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

ARP, ARP Operation, Packet Format, Encapsulation, four Different cases using ARP, Proxy ARP, RARP, Packet format, Encapsulation, RARP servers, Alternative solutions to RARP. BOOTP operations, packet format, DHCP, Static address allocation, DHCP packet.

UNIT- II

ICMP encapsulation, Types of Messages, Message Format, Error Reporting messages: Destination unreachable, source Quench, Time Exceeded, Parameter Problem Query Messages: Echo Request & Reply, Timestamp request & Reply, Address- Mask Request and Reply, Router solicitation and Advertisement. Group management, IGMP messages, IGMP Operations, Joining a group, Leaving a Group, Monitoring Membership, Encapsulation.

UNIT- III

Intra and inter domain routing, distance vector routing, RIP, RIP Msg format, Timers in RIP, link state routing, OSPF, types of links, OSPF Packets, Path vector routing, BGP, BGP Services, Eternal & Internal BGP, Types of autonomous systems, Types of packets.

UNIT- IV

FTP: control connection, data connection, communication, over control and data connection, TFTP Web Documents: Static Documents, Dynamic Documents, Active Documents, HTTP: Transaction, persistent v/s non-persistent connection, PROXY Server. Remote login, TELNET: concepts, time sharing

environment, NVT (N/W virtual terminal)

UNIT – V

Stationary Hosts, Mobile Hosts, Agents, Three Phases, Inefficiency in Mobile IP, Double crossing, Triangle routing, N/w security: Cryptography, Symmetric key cryptography, Public key Cryptography, Privacy, Digital Signatures, Security in the internet, IP security, PGP, Firewall, Packet Filtering firewall, PROXY firewall.

References / Text Books:

Computer Usage / Software Requires:

- Comer, D: "Internetworking with TCP/IP", PHI, 1997. Vol. I, II,III.
- Breudans P.Kehoe: Zen and Art of Internet-A Beginner's Guide: PTR Prentice Hall (1994).
- H.M. Deital: "Java How to Program", McGraw Hill, 1998.

MANAGEMENT SCIENCE

Paper Code	**CEN-702**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Definition and concept of management, Evolution of management thought. Systems approach and Decision Theory approach to management. Process of decision making. **UNIT- II** Types of plans, major steps in managerial planning. Strategies, MBO organization; nature and purpose, Process of Organization. Basic Department, Co-ordinating, supervision, communication and direction. Leadership, Motivation. **UNIT- III** Nature and purpose, control techniques and Information Technology. International Management: Japanese Management Vs. U.S. Management Managerial functions in International Business. **UNIT- IV** Defining and classifying groups, Group Processes, Group task. Group Cohesivness.Conflict Management: Discovery of conflicts, Processing of grievances, conflicts resolution, conflict and intergroup relations. **UNIT – V** Nature of stress Potential Sources of Stress. Consequences strategies.

References / Text Books:	• Koontz, H. and Weihrich, H., :Essencial of Management” • Mathur, S.S. Principles of Management” • Agarwal, R.D. Organisation and Management” • Robbin. S.P., “Organisational Behaviour”
Computer Usage / Software Requires:	

LANGUAGE PROCESSOR - II

Paper Code	**CEN-703**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**

Course Description

UNIT – I

Introduction to Type Checking: Type systems, Specification of simple type checker, equivalence of type expressions, Type checking for expression and statements, type conversions, overloading of functions and operators.

UNIT- II

Storage Organization, Storage allocation strategies, access to non local names, memory allocation in block structured language. Symbol attributes and Symbol table entries, Local Symbol Table management, Global Symbol table structure, dynamic storage allocation, Symbol Table for block structured language.

UNIT- III

Intermediate representations, Types of TAC statements, TAC implementation, TAC generation for Assignment statements, Declarative statements, Boolean expression & Flow of control statements. Short circuit code, Backpatching.

UNIT- IV

Code Optimization, Early Optimizations: Principle sources of optimization, Common-Subexpression elimination, Copy Propagation, Constant Folding Algebraic Simplifications, Loop Optimizations: Code Motion, Induction-Variable Optimizations.

Control Flow Analysis, Flow Graph, Dominator, Natural Loops,

Data Flow Analysis, Gen & Kill information, Iterative Algorithm for IN & OUT Computation.

UNIT – V

Issues in the design of a code generator, The target machine, code generation from DAG, Heuristic Node Listing Algorithm, Code generation from a tree, Labeling Algorithm, Function Gencode, A simple code generator.

References / Text Books:

- Aho, Sethi, Ullmann & Lam "Compilers: Principles, techniques and tools", Pearson Education Asia
- Keith Cooper & Linda Torczon, "Engineering a Compiler", Morgan Kaufmann publication.
- Levine, Mason, and Brown, "Lex & Yacc", O' Reilly publication.

Computer Usage / Software Requires:

MOBILE COMMUNICATION

Paper Code	**CEN-704**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** Introduction to Mobile and cellular Communication systems, Frequencies for radio communication, Basic cellular system, Transmission problems and its solution in cellular system, cellular geometry, components of a cellular Mobile network, cellular communication from 1G to 3G. **UNIT- II** Cellular Geometry, Concept of Frequency re-use channels, Cell splitting, Sectoring and Clustering of a cell, Co-channel interferences and system capacity, Trunking and Grade of services, Microcell zone concept. **UNIT- III** GSM Architecture, Channels used in GSM, Location tracking and call setup, Mobility management, Frame structure for GSM, Handover, Security in GSM, GSM call recording functions, Subscriber and service data Management, GSM network identities, Traffic cases in GSM. **UNIT- IV** CDMA Architecture, Chipset sequence in CDMA, Channels used in CDMA, CDMA system design, capacity of a CDMA system, Next generation cellular technology 4G, 4G Softwares, Advantages of 4G Network technology over 3G, Applications of 4G. **UNIT – V** GPRS Architecture, Benefits of GPRS, GPRS attach and detach procedure, GPRS Traffic cases, Introduction to Wireless Application Protocol WAP, WAP Architecture, Applications of WAP,

Introduction to Mobile IP.

References / Text Books:	• Theodore S. Rappaport, Wireless communications Principles and Practice, Pearson Education. • William C.Y. Lee, Wireless and cellular communications, McGraw Hill publication. • Jochen Schiller, Mobile Communications, Pearson Education 2012. • Vijay K. Garg, Wireless communication and Networking, Elsevier Morgan Kaufmann Publishers. • Mobile Communication Hand Book", 2nd Edition, IEEE Press. 2002
Computer Usage / Software Requires:	XML/ JAVA/ .NET

DATA MINING

Paper Code	**CEN-705**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Introduction to Data Mining: KDD, Process and Data Mining; KDD Steps; Types of Data for Data Mining, Data Mining Functionalities, Mining Frequent Patterns, Association, Correlation, Classification, Prediction, Cluster Analysis, Outlier Analysis, and Evolution Analysis; Classification of Data Mining Systems.

Data Preprocessing: Introduction to Data Preprocessing; Descriptive Data Summarization, Visualization of Descriptive Data Summaries; Data Cleaning methods, Data Integration; Data Transformation: Smoothing, Aggregation, Generalization, Normalization and Feature Selection; Data Reduction; Data Discretization and Concept Hierarchy Generation.

UNIT- II

Data Warehouse and OLAP Technology: Introduction and features of Data Warehouse; Operational Database Systems vs. Data Warehouses; Difference Between OLTP and OLAP; Multidimensional Data Models, Various OLAP Operations; Three-Tier Data Warehouse Architecture; Types of OLAP Servers.

Association Rule Mining: Frequent Itemsets, Closed Itemsets, and Association Rules; Support and Confidence; Apriori Algorithm, Itemsets Using Candidate Generation; Generating Association Rules from Frequent Itemsets; FP-Growth Algorithm for Mining Frequent Itemsets without Candidate Generation; Mining Closed Frequent Itemsets; Correlation Analysis.

UNIT- III

Classification Rule Mining: Introduction to Classification and Prediction; Classification by Decision Induction; Attribute Selection Measures: Information measures, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks; Classifier Accuracy Measures; Predictor Error Measures; Accuracy Enhancement Methods: Bagging and Boosting; Lazy Learners: K-Nearest-Neighbour Classifier; Prediction : Introduction to Linear and Non-Linear Regression

UNIT- IV

Cluster Analysis: Introduction to Cluster and Clustering; Data Types and Dissimilarity Measures in Cluster Analysis; Categorization of Clustering Methods; Partitioning-Based Clustering: k-means Algorithms, k-medoids algorithms (PAM, CLARA, CLARANS); Hierarchical Clustering: Agglomerative and Divisive Methods (e.g.: AGNES, DIANA, BIRCH); Density-Based Clustering: DBSCAN. Methods of Outlier Analysis.

UNIT – V

Introduction to Web Mining and Text mining. Complexities involved in Web data and Text data. Introduction to Natural Language Processing techniques. Problem discussions and Case study.

References / Text Books:

1. Jiawei Han, Micheline Kamber: Data Mining Concepts and Techniques, 3rd Edition, Morgan Kaufman Publishers.
2. Tan, Steinbach and Kumar: Introduction to Data Mining – Pearson Publication.
3. H. Witten and E. Frank: Data Mining – Practical Machine Learning Tools and Techniques with Java Implementations, 2nd Edition, Morgan Kaufmann, Publishers.
4. Web Data Mining – Bing Lui, Springer Publication.

Computer Usage /

Practical implementation can be done on any tool like WEKA, Rapid Miner, GATE for problems of Association rule Mining,

Software Requires: Classification and Clustering.

EMBEDDED SYSTEM

Paper Code	**CEN-706**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Embedded system:- Definition, components, I/O, Processor, Memory, Characteristics, attributes, design metrics , design challenges, application areas, Issues of designing efficient Embedded system, Difference between ES and PC, Design Technology, Integration and Testing of Embedded Hardware and Firmware, Embedded System Development Environment:-IDE, compiler, assembler, simulator, Emulator, debugging, Target hardware debugging and Boundary Scan , EDLC, Trends in the Embedded Industry:-Processor trends, OS trends, Development languages trends, Open Standard and framework.

UNIT- II

Microcontroller:-Introduction, criteria for choosing a microcontroller**,** Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, Memory Organization of 8051,SFR, Addressing Modes, Instruction set including bit manipulating instruction and programming using it, Subroutine, Stack, Time delay generations and calculations, I/O port programming, Programming of 8051 Timers, Counter Programming. Watch Dog Timer, Real Time clock.

UNIT- III

8051 hardware connections, basics of Communication with 8051**,** Basics of Communication, Overview of RS-232, I^2C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts,

Programming of External hardware interrupts, Programming of the serial communication interrupts, Interrupt priority in the 8051

UNIT- IV

Basic Concepts of Interfacing, Introduction8051 Interfacing to an external memory and Accessing External data Memory and External Code Memory, Interfacing to LCD/Keyboard, DAC/ADC, Sensors, a Stepper Motor, Interfacing with 8255

UNIT – V

S/W H/W Co-design. RTOS:- introduction, type, overview of commercially available RTOS, Introduction to ES design using RTOS ., Soc, NOC, Introduction to Arm , Pic, and AVR Processors and other recent processors

References / Text Books:

- Shibu K V , "Introduction to Embedded Systems" , TMH 2009
- M.A. Mazidi and J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", PHI, 2004
- Frank Vahid & Tony Givargis, "Embedded System Design ", John Wiley & sons , 2002
- David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.
- Raj Kamal, "Embedded Systems", TMH, 2004.
- K.J. Ayala, "The 8051 Microcontroller", Penram International, 1991.
- Dr. Rajiv Kapadia, "8051 Microcontroller & Embedded Systems", Jaico Press
- Dr. Prasad, "Embedded Real Time System", Wiley Dreamtech, 2004.
- Wayne Wolf, "Computers As Components , Principle of Embedded Computing System Design" , Morgan Kauf man

Computer Usage /

Software Requires: Publishers, 2008.

B. Tech.
(Computer Engineering)

Eighth Semester

ARTIFICIAL INTELLIGENCE

Paper Code	**CEN-802**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, and problem formulation.

UNIT- II

Searching for solutions, uniformed search strategies – Breadth first search, depth first search, Depth limited search, Iterative-deepening depth first search bi-direction search - comparison. Search with partial information (Heuristic search) Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions. Local search Algorithms: Hill climbing, simulated, annealing search, local beam search, genetic algorithms. Constrain satisfaction problems: Backtracking search for CSPs local search for constraint satisfaction problems.

UNIT- III

Min-max, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search. Knowledge – Based Agents, Logic, propositional logic, Resolution patterns in proposional logic, Resolution, Forward & Backward. Chaining. First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution.

UNIT- IV

Classical planning problem, Language of planning problems, Expressiveness and extension, planning with state – space search, Forward states spare search, Backward states space search, Heuristics for stats space search. Planning search, planning with state space search, partial order planning Graphs.

UNIT – V

Forms of learning, Induction learning, Learning Decision Tree, Statistical learning methods, learning with complex data, learning with Hidden variables – The EM Algorithm, Instance Based learning, Neural Networks.

References / Text Books:

- Introduction to Artificial Intelligence – Rajendra Akerkar, PHI.
- Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.
- Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition,
- Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).
- Artificial Intelligence and Expert Systems – Patterson PHI
- Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson
- PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.

Computer Usage / Software Requires:

SOFTWARE PROJECT MANAGEMENT

Paper Code	**CEN-803**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

INTRODUCTION TO PROJECT MANAGEMENT

Project Management Concepts; define the characteristics of a project. Explain the need for project management. Compare and contrast the roles of project managers in organizational environments. Describe the systems development cycle. Explain the roles of systems analysis and systems management in the life cycle of a project.

UNIT- II

SOFTWARE PROJECT PLANNING

Project Activities, and work breakdown structure, Produce a statement of work (SOW) and decompose overall project goals. Develop a work breakdown structure (WBS), using established tools and techniques, to achieve stated project objectives.

UNIT- III

PROJECT MANAGEMENT PLAN

Project Scheduling and tracking techniques, Produce a task-flow network, using established tools and techniques, and analyze the contingencies, interrelationships, and critical path(s) of the work elements. Produce a Gantt chart, using established tools and techniques, to schedule the completion of all work elements.

UNIT- IV

PROJECT ECONOMICS

Project costing, project estimation techniques, automated estimation tools. Develop cost estimates and budgets with cost accounts to plan project expenditures.

UNIT – V

PROJECT CONTROL AND CLOSURE

Define the concept of earned value performance measurement. Describe how project management information systems (PMIS) are used to monitor, evaluate, and control planned cost and schedule performance. Project management issues with regards to new technologies.

References / Text Books:

- Mathur, S.S. Principles of Management"
- Robbin. S.P., "Organisational Behaviour"
- K.K. Aggarwal & Yogesh Singh: SOFTWARE ENGG:
- Pankaj Jalote, "An Integrated Approach to Software Engg" Narosa Publishing House, New Delhi.
- Pressman, "Software Engineering- A Practioner's Approach, 7th Edition", Tata McGraw Hill.

Computer Usage / Software Requires:

DISTRIBUTED PROCESSING

Paper Code	**CEN-804**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Distributed Computing-introduction, definition , its history; Distributed Computing system definition and its evolution, reasons for its popularity, Strength and weaknesses of distributed computing, Different forms of Computing: Minicomputer model, workstation model,worksatation server model, Processor pool Model; Cluster:- definitions, reasons for its popularitycluster computer system architectutre, Windows cluster, solaris cluster, Linux cluster; Using cluster, distributed Computing System models: Distributed operating system, Introduction to DCE, architecture of Distributed Applications, Toolkits. Frameworks, and component, Introduction to UML

UNIT- II

Message passing:-Introduction, desirable features of a good message passing system, Issues in IPC by Message passing, synchronization, Buffering, Multidatagram messages, Encoding and decoding of message data, Process addressing, Failure handling, IPC :- Program interface, Event synchronization, time outs and threading, deadlock and time out data Representation, data encoding, Text Based protocols, event diagram and Sequence diagram , connection oriented versus connectionless IPC, evolution of Paradigms for Interprocess Communication

UNIT- III

Group Communication: Unicasting versus multicasting, Multicast API, Connectionless versus connection oriented Multicast Reliable

multicast versus unreliable multicasting, basic multicast API, Reliable multicast API, Ordering and their implemenation: Absolute, causal, Consistent Distributed Computing Paradigms:- paradigms and abstraction, an example application Paradigms for distributed application:-Message Passing, Client-server paradigm, Peer to Peer paradigm. Message system paradigm Remote Procedure call model, distributed Object Paradigms, Object space, mobile agent paradigm, Network services Paradigm, Collaborative Application(Group ware) Paradigm, Message Queue System Paradigm:- Point to Point message model, Publish/subscribe message model Mobile agent:- Basic architecture, advantages of Mobile agents, Mobile-agent Framework system.

UNIT- IV

Remote Procedure Calls : Introduction, RPC model, transparency, implementation, stub generation, RPC messages, Marshalling Arguments and result, server management Call semantics, Communication protocols for RPCs, Complicated RPCs, client server binding sequential RPCs, RPC in hetregeneous environment, Light weight RPC, Optimizing for better performance Socket Metaphor in IPC, Datagram Socket API, Stream mode Socket API, sockets with non-blocking I/O Operations, Secure Socket API

Client server paradigm issues, software engineering issues for a network service, Connection Oriented and connectionless Servers

Iterative servers and concurrent server, stateful servers.

Synchronization :Mutual exclusion, deadlock, election algorithm, Resource Management: Introduction, desirable features of a good global scheduling algorithm, task assignment approach, load balancing approach, Load sharing approach; Process management: introduction, Process migration, threads.

UNIT – V

Distributed file system: introduction, desirable features of a good

DFS, file models, File accessing models, file sharing semantics, file caching semantics, file replication, fault tolerance, atomic transaction, design principles

Distributed object: Message passing versus distributed objects, distributed object architecture, distributed object system, RPC, remote method invocation, RMI architecture API for RMI,RMI application, comparison of RMI and socket API, Client Call back, Stub downloading, RMI security manager,

Common Object Broker architecture: basic architecture, Corba Object interface, Inter-ORB protocol, object server and object client, CORBNA object references, CORBNA naming service and the interoperable naming service, CORBA Object services, Object adapter, Java IDL.

References / Text Books:

- Distributed Computing Principles and Application - M.L.Liu, Pearson Education
- Distributed Operating system, Pradeep K Singh, PHI
- Distributed ystem Concepts and design, Coulooouris, Pearson Education
- Distributed System, Principles and paradigm , Tanenbaum,PHI

Computer Usage / Software Requires:

NETWORK SECURITY

Paper Code	**CEN-805**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I** The need for security, Security approaches, Principles of security, Types of Attacks, Services and Mechanisms, Algorithm types and Modes. Secret Key Cryptography: Block Encryption, DES rounds, S-Boxes ,IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES. Advance Encryption Standard AES. **UNIT- II** Kanpsack, RSA, Defiie-Hellman, use of public key cryptography Digital signature, Confidentiality and Non-repudiation, Public Key Infrastructure Algorithms, RSA: keys generating , encryption and decryption. Other Algorithms: PKCS, Diffie-Hellman, El-Gamal, Elliptical curve cryptography, DSS, Zero-knowledge signatures. **UNIT- III** Length of HASH, uses, Message Digest 4 and 5: algorithm (padding, stages, digest computation.) SHA: Overview, padding, stages. Message Authentication Codes (MACs). **UNIT- IV** Authentication Methods, Passwords, Single sign on, Authentication Protocol, Kerberos: purpose, authentication, serer and ticket granting server, keys and tickets, use of AS and TGS, replicated servers. Kerberos V4: names, inter-realm authentication, Key version numbers., KDC's Certification Revocation, Inter domain, groups, delegation. Authentication of People: Verification techniques, passwords, length of passwords, password distribution.

UNIT – V

Electronic mail security, IP security, Network management security. Security for electronic commerce: Secure Socket Layer. Secure Electronic Transaction, Pretty Good Privacy, IP Security, Intruders and Viruses, Firewalls, Intrusion Detection system. Securing a Wireless Network.

References / Text Books:

- Stallings, W., Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall Print.,2003
- Atul Kahate, Cryptography and Network Security, McGraw Hill.Jochen Schiller, Mobile Communications, Pearson Education 2012.
- Kaufman, C., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall Print, 2002.
- Behrouz A Forouzan, Cryptography and Network Security, 2nd Edition 2010, McGraw Hill.

Computer Usage / Software Requires:

C++/ PYTHON /JAVA

SOFT COMPUTING TECHNIQUES

Paper Code	**CEN-807**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**

Course Description

UNIT – I

Introduction to Soft Computing, various types of soft computing techniques: Neural Networks, Fuzzy Logic, Genetic algorithm, Probabilistic reasoning and Approximation. Intelligent systems, Machine Intelligence, Applications of Soft computing.

UNIT- II

Function of Neuron, Biological Neuron, Artificial Neuron, Brain vs Computer, Neural Network architectures and characteristics, Basic Model of ANN: connections, weights, bias, activation functions. McCulloch-Pitts Neuron, Hebb Training algorithm, Linear seperability, XOR problem.

UNIT- III

ANN Learning, Learning Rules, Supervised learning: Perceptron, Multi-layer perceptron, ADALINE, MADALINE, Back-propogation training algorithm. Unsupervised learning: Kohonen Self-organizing feature map, Learning vector quantization. Feedback Networks: Hopfield Networks etc. Applications of ANN.

UNIT- IV

Introduction to Fuzzy logic, Fuzzy set theory, Fuzzy set vs Crisp set, Fuzzy relation & Crisp relation, Fuzzy logic operations, Tolerance & Equivalence relations, Membership functions, Features of membership functions, Membership value assignment, Basic Fuzzy

arithmetic.

UNIT – V

Fuzzification, Defuzzification, Fuzzy rules, Fuzzy If-Then rule, Fuzzy rule base system, Fuzzy inference system: Models of FIS. Applications of Fuzzy logic. Introduction to Genetic algorithm: working principle, encoding, fitness function, reproduction, Inheritance, cross-over. Applications of Genetic algorithm.

References / Text Books:	• Karray and Silva, "Soft Computing & Intelligent Systems Design", Pearson Education. • Timothy J Ross, "Fuzzy Logic with Engineering Applications", Wiley. • Sivanandam & Deepa, "Principles of Soft Computing Techniques", Wiley Publication. • Rajasekaran & Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications", PHI. • David E Goldberg, "Genetic Algorithm in Search, Optimization & Machine Learning", Pearson. • S. Haykin, "Neural Networks: A Comprehensive Foundations" Pearson.
Computer Usage / Software Requires:	MATLAB 2009 or above