COMPUTER ENGINEERING AND INFORMATION TECHNOLOGY

T. Y. B. Tech. (Information Technology)
Effective from A. Y. 2013-14

INDEX

List of Abbreviations

Sr. No.	Abbreviation	Stands for:
1	DEC	Departmental Elective Course
2	PSC	Professional Science Course
3	PCC	Program Core Course
4	LC	Laboratory Course
5	HSSC	Humanities and Social Science Course
6	MLC	Mandatory Learning Course
8	LLC	Liberal Learning Course
9	BSC	Basic Science Course

Program Educational Objectives (PEOs)

1. To create graduates with sound knowledge in information technology who can contribute effectively to the needs of IT industry and the society at large.

2. To create graduates with sufficient capabilities in technologies used particularly in the sectors of communications, distributed computing and testing which are relevant to Indian IT industry.

3. To develop among students ability to formulate, analyse and solve real life problems faced in software industry.

4. To provide opportunity to students to learn the latest trends in information technology and make them ready for life-long learning process.

5. To make the students aware of professional ethics of the Software Industry, and prepare them with basic soft skills essential for working in community and professional teams.

6. To prepare the students for graduate studies through competitive examinations, enabling them to reach higher echelons of excellence.

Programme Outcomes:

a. Graduates will demonstrate basic knowledge in fundamentals of programming, algorithms and programming technologies.

b. Graduates will demonstrate basic knowledge of networking with mobile technologies, multimedia technology, distributed computing, testing and topics of current relevance to IT industry.

c. Graduates will have knowledge of the best practices in software development in industry.

d. Graduates will demonstrate the ability to design creative solutions to real life problems faced by the industry.

e. Graduates will demonstrate capability to work in teams and in professional work environments

f. Graduates will be able to communicate technical topics in written and verbal forms.

g. Graduates will demonstrate an understanding of the problems of the IT industry.

h. Graduates will demonstrate their ability to use the state of the art technologies and tools including Free and Open Source Software (FOSS) tools in developing software.

i. Graduates will demonstrate good performance at the competitive examinations like GATE, GRE, and CAT for higher education.

j. Graduates will demonstrate their qualities of learning and demonstrating latest technology

k. Graduates will have developed the capability for self-learning.

CURRICULUM STRUCTURE OF T. Y.-B.TECH (Information Technology)

Effective from A. Y. 2013-2014

I-Semester:

Sr. No	Course Type / code	Subject Title	Contact hours			Credits
			L	T	P	
01	DE-09003	*Department Elective	3	-	-	3
02	PCC/IT-09001	Network Architecture and Wireless Protocol	3	-	-	3
03	PCC/CT-09003	Database Management Systems	3	-	-	3
04	PCC/IT- 09002	System Programming and Operating System	3	-	-	3
05	PCC/IT- 09003	Graphics and Multimedia	3	-	-	3
06	LC/IT- 09004	Network Architecture and Wireless Protocol Lab	-	-	2	1
07	LC/CT -09007	Database Management Systems Lab	-	-	3	2
08	LC/IT- 09005	System Programming and Operating System Lab	-	-	3	2
09	LC/IT- 09006	Graphics and Multimedia Lab	-	-	2	1
10	MLC//ML-09001	Constitution of India	2	-	-	2
11	HSSC/AS-09002	Humanities course	2	-	-	2
		Total	**19**	**-**	**10**	**25**

*Department Elective: Human Computer Interaction

II-Semester:

Sr. No	Course Type / code	Subject Title	Contact hours			Credits
			L	T	P	
01	OEC/ SEC	Open Elective/Science Elective Course Refer to Annexure I	3	-	-	3
02	PCC/IT-09007	Language Processors	3	-	-	3
03	PCC/IT-09008	Algorithms and Complexity	3	-	-	3
04	PCC/IT-09009	Software Development Processes	3	-	-	3
05	DE/IT	**Department Elective 2	3	-	-	3
06	LC/IT-090010	Language Processors Lab	-	-	3	2
07	LC/IT-090011	Algorithms and Complexity Lab	-	-	3	2
08	LC/IT-090012	Software Development Processes Lab	-	-	3	2
09	DE lab 2	**Department Elective Lab 2	-	-	3	2
10	LLC/LL-09001	Refer to Annexure II	1	-	-	1
		Total	**16**	**-**	**12**	**24**

**Department Elective – 2	Code	**Department Elective Lab– 2	Code
SOA: Service Oriented Architecture	DE09018	Service Oriented Architecture Lab	DE09021
DS: Distributed Systems	DE09019	Distributed Systems Lab	DE09022
CBDP: Cloud and Big Data Platforms		Cloud and Big Data Platforms Lab	
UCCCA: Unified Communications and Contact Center Applications		Unified Communications and Contact Center Applications Lab	

DE - 09003 HUMAN COMPUTER ITERACTION

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Overview of HCI, Theories and Principles:
Introduction, Goals of System Engineering, Goals of User-Interface Design, Usability of Interactive systems, Motivations for Human Factors in Design, Guidelines, Principles, Theories, Conceptual, Semantic, Syntactic and Lexical Model, GOMS and the Keystroke-level Model, Object-Action Interface Model

Unit 2 **(6 Hrs)**

Managing Design Processes and Tools and Testing:
Three pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Expert Reviews, Usability Testing and Laboratories, Acceptance Tests, Evaluation during active use, Specification Methods, Interface Building Tools, and Evaluation Tools

Unit 3 **(6 Hrs)**

Design Principles for Designing GUI Objects:
Direct manipulation (examples, explanations), Visual Thinking and Icons, 3D Interfaces, Virtual Reality, Fitt's Law, Introduction to Menu Selection, Form Fill-in, and Dialog Boxes, Task Related Organizations, Fast Movement through Menus, Item Presentation Sequence, Response Time and Display Rate, Data Entry with Menus, Menu Layout, Command-Organizational Strategies, Naming and Abbreviations, Command Menus, Web user interface, Natural Language in Computing

Unit 4 **(6 Hrs)**

Interaction Styles:
Introduction to Interaction Devices, Keyboards and Function Keys, Pointing devices, Speech and Auditory Interfaces, Speech Recognition, Image and video displays, Printers, Response time and display rate with respect to display, Goals of Collaboration, Asynchronous and Synchronous Interfaces, Face-to-Face Interfaces , Ubiquitous Computing

Unit 5 **(6 Hrs)**

Presentation Design Issues:
Error Messages, Display Design, Individual-Window Design, Multiple Window Design, Co-ordination by Tightly-coupled Windows, Color, Printed Versus Online Manuals, Preparation of Online facilities, Online Tutorials, Online Communities for User Assistance, Design case studies

Unit 6 **(6 Hrs)**

Information Search and visualization:

Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization, OAI Model for Website Design

Text Books:

- Ben Shneiderman, "Designing the User Interface", 4th Edition, Pearson Education, 2008, ISBN 81-7808-262-4
- Alan Dix, Janet Finlay, Gregory Abowd, and Russell Beale," Human-Computer Interaction," Prentice Hall

Outcomes

This course introduces the impact of human factors on User Interface Design.

- Provides the students knowledge of designing efficient user interfaces
- Introduces them various models for designing user interfaces
- Teaches the basics of Cognitive theory, ethnography, participatory design paradigms
- Enables developing efficient tools/applications based on the knowledge of usability, response time, display rate
- Introduces various interaction ways to the system in various applications like virtual reality, video games etc.
- Teaches them the co-ordination of multiple windowing system and their synchronization

IT - 09001 NETWORKS ARCHITECTURE & WIRELESS PROTOCOLS

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(8 Hrs)**

Network Layer: Addressing

Network layer services, IPv4, Problems with IPv4, strategies to bridge the limitations (IP subnetting, CIDR, DHCP, NAT), Network design with CIDR, IPv6, Dual stack, Addressing, Options, Extension headers, Packet forwarding

Unit 2 **(8 Hrs)**

Network Layer: Other Protocols

Routing algorithms: Unicast protocols: RIP, OSPF, BGP and multicast routing protocols, ICMP, IGMP, DHCP, enhancements to all protocols in V6

Unit 3 **(6 Hrs)**

Transport Layer: Protocols

Services, Transport layer protocols, UDP, TCP: State Transition diagram, flow control, error control, TCP Timers, Queuing disciplines, TCP Congestion control, Quality of Service

Unit 4 **(6 Hrs)**

Wireless Networks

Link Layer: IEEE 802.11 WLAN protocols, CSMA/CA, Connecting Devices, Wireless Application Protocol, Mesh networks: limitations, Wireless Sensor Networks, Zigbee Protocol, Wireless Personal Area Networks

Unit 5 **(6 Hrs)**

Network Management

Infrastructure for Network Management, SNMP, SMI, MIB, security and administration, ASN.1

Unit 6 **(6 Hrs)**

Applications

Traditional Applications(WWW, HTTP, FTP, Email, Telnet, SSH, DNS), Peer-to-Peer Networks, Socket programming

Text Books:

- B. A. Forouzan and Firouz Mosharraf, Computer Networks, A Top-Down Approach, Tata McGraw-Hill, 2012
- Pete Loshin, IPv6:Theory, Protocol, and Practice, Elsevier, 2004
- Vijay K Garg, Wireless Communications and Networking, Morgan Kaufmann, 2008

References:

- Larry L Peterson and B S Davie, Computer Networks: A Systems Approach, Elsevier,2012
- W. Richard Stevens, TCP/IP Illustrated, Vol. 1: The Protocols, 2nd Edition, Pearson, 2012
- B. A. Forouzan, “Data Communications and Networking”, 4th Edition, Tata McGraw-Hill, 2010
- William Stallings, “Data and computer Communication”, 7th Edition, Pearson Education, ISBN-81-297-0206-1
- A S Tanenbaum, “Computer Networks”, 4th Edition, Pearson Education, ISBN 9788177581652
- Alberto Leon Garcia and Indra Widjaja, “Communication Networks, Fundamental Concepts and Key Architectures”, 2nd Edition, Tata McGraw-Hill. 2004, ISBN-10: 007246352X

- J.F. Kurose and K. W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet" , 2nd Edition, Pearson, 2003, ISBN-13: 9780201976991

Outcomes

The goal of this course is that the student will develop an understanding of the underlying structure of networks and how they operate. At the end of this course a student should be able to

- Explain basic networking concepts by studying client/server architecture, network scalability, geographical scope, the Internet, intranets and extranets.
- Identify, describe and give examples of the networking applications used in everyday tasks such as reading email or surfing the web.
- Describe layered communication, the process of encapsulation, and message routing in network equipped devices using appropriate protocols.
- Design and build an Ethernet network by designing the subnet structure and configuring the routers to service that network.
- Manage network management and systems administration.
- Construct a patch cord to connect a host computer to a network.

CT - 09003 DATABASE MANAGEMENT SYSTEM

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(4 Hrs)**

Introduction:
Basic concepts, Advantages of a DBMS over file-processing systems, Data abstraction, Data Models and data independence, Components of DBMS and overall structure of DBMS, Data Modeling, entity, attributes, relationships, constraints, keys E-R diagrams, Components of E-R Model.

Unit 2 **(4 Hrs)**

Relational Mode:
Relational Model: Basic concepts. Attributes and domains, concept of integrity and referential constraints, schema diagram. Relational Query Languages: Relational Algebra and Relational Calculus: Tuple relational and domain relational calculus.

Unit 3 **(4 Hrs)**

SQL:
Introduction to SQL, Characteristics and advantages of SQL, SQL Data Types and Literals, DDL, **Tables**: Creating, modifying, deleting, Views: Creating, dropping, Updation using Views, DML, SQL Operators, SQL DML queries, SELECT query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple variables, set comparison, ordering of tuples, aggregate

functions, nested queries, Database modification using SQL Insert, Update and Delete queries, Dynamic and Embedded SQL and concept of stored procedures, Query-by-example.

Unit 4 **(4 Hrs)**

System R- Relational Database Design:
Notion of normalized relations, functional dependency, decomposition and properties of decomposition, Normalization using functional dependency, Multi-valued dependency and Join dependency. Storage and File Systems: Secondary Storage, RAID, File Organization, Indices, Static and Dynamic Hashing, B-trees and B+ Trees

Unit 5 **(4 Hrs)**

Query Processing and Transaction management:
Measures of query cost, Selection operation, sorting and join operation, Transaction Concept, Components of transaction management, Concurrency and recovery system, Different concurrency control protocols such as timestamps and locking, validation, Multiple granularity, Deadlock handling, Different crash recovery methods such as log-based recovery, shadow-paging, Buffer management and Remote backup system.

Unit 6 **(6 Hrs)**

Object-Based Databases:
Nested Relations, Complex Types and Object Orientation, Querying with Complex Types, Creation of Complex Values and Objects, Comparison of Object-Oriented and Object-Relational Databases.

Database Architectures:
Database system Architecture: Centralized, Client Server, Parallel and Distributed Systems. Web enabled System.

Text Books:
- Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database system concepts”, 5th Edition, McGraw Hill International Edition.
- Raghu Ramkrishnan, Johannes Gehrke, “Database Management Systems”, Second Edition, McGraw Hill International Editions.

Reference Books:
- Rob Coronel, “Database systems : Design implementation and management”, 4th Edition, Thomson Learning Press.
- Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, Third Edition, Pearson Education, 2003.

Outcomes
After completing this course the students should be able to
- Understand basic concepts in Database Management System
- Know various types of Data Models such as E R Model, Relational Database Model
- Understand the Tuple Relational Calculus & Domain Relational Calculus
- Learn the SQL Queries
- Learn the Functional Dependencies, Decomposition of Relations

- Learn the Storage & File Systems
- Learn the Query Processing & Transaction Management

IT - 09002 SYSTEM PROGRAMMING AND OPERATING SYSTEM

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Introduction to System software and Operating Systems structures:
Evolution of operating system, Batch, timesharing, multiprogramming, multi tasking distributed and real time. Introduction to Assembler, Linker and Loader, Fundamentals: System concepts, system components & architecture, booting process. O.S. Services , System Calls, System Programs, System Structures, Virtual Machines.

Unit 2 **(6 Hrs)**

Memory Management :
Memory hierarchy**,** Cache memory, Cache mapping, multilevel cache, split cache. Contiguous and non-contiguous,paging, segmentation – concepts, Virtual memory, management of Virtual memory: demand paging performance of demand paging page replacement algorithms, thrashing

Unit 3 **(6 Hrs)**

Processes And Threads:
Concepts and structures in process managements, Process scheduling. Scheduling Concept of threads, user level and system level threads, Application programming primitives for process and thread management.

Unit 4 **(6 Hrs)**

Concurrent Programming and Synchronization:
Need for Inter process Synchronization: Race conditions mutual exclusion and critical section problems, Process synchronization mechanisms - semaphores, locks, monitors, Deadlock problems and solutions, Classical problems in concurrent programming: Producer/Consumer, readers/writers.

Unit 5 **(6 Hrs)**

Inter process Communication:
Introduction to open MP and MPI Streams and pipes. Shared memory, Asynchronous communication. Signals. Operating system interfaces for application programming using openMP and MPI, pipes, shared memory, signal handling

Unit 6 **(6 Hrs)**

File Management :
File Organization, concept of files & directories, Hierarchical structure of file,
Space allocation, Free space management Security issues, and Protection mechanism.

Text Book:
- D. M. Dhamdere : "Systems programming and operating system", Tata McGraw Hill.
- Abranhan Silberschatz, Peter B Galvin; Operating System Concepts, Addition Wesley Publishing Company.

References:
- Milenkovic; Operating System Concepts and Design; McGraw Hills.
- Andrew Tanenbaum " Operating Systems: Design and Implementation " PHI

Outcomes
On completion of this course, students should have
- A detailed knowledge of the basic issues in and interacting with operating systems. These basic issues include topics selected from multitasking, process synchronisation, inter-process communication, memory and storage management, and other fundamental operating system mechanisms.
- Learned and practiced problem solving skills on operating systems specific topics, this includes designing and implementing programs that operating system functions and algorithms.

IT - 09003 GRAPHICS AND MULTIMEDIA

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Basic concepts:
Introduction to computer graphics, lines, line segments, vectors, pixels and
frame buffers, vector generation, DDA and Bresenham's line and circle drawing algorithms, antialiasing, polygon representation, entering Polygons, Polygon filling: Seed fill, Edge fill, scan conversion algorithm

Unit 2 **(8 Hrs)**

Transformations:

Introduction, matrices, , homogeneous coordinates,

Basic 2D transformation like Scaling, Rotation, Translation, reflection etc 3-D Transformations: 3-D geometry, primitives, transformations, Rotation about an arbitrary axis, Concept of parallel and perspective projections, Viewing parameters, 3D viewing transformations.

Unit 3 **(6 Hrs)**

Segments and Animation:

Introduction, segment table, segment creation, closing, deletion, renaming. Image transformations, raster techniques, Devices for producing animation, computer assisted animation, video formats, real time animation, frame-by-frame animation, method for controlling animation, animation software.

Unit 4 **(6 Hrs)**

Introduction to multimedia:

Multimedia basic concepts, Multimedia building blocks, multimedia applications design considerations; goals and objectives; architectural support for multimedia processing. Multimedia Authoring Fundamentals: authoring fundamentals, card/page based, time based, icon based, frame based and object based authoring, interactive multimedia software authoring basics.

Unit 5 **(6 Hrs)**

Multimedia audio:

Basic sound concepts, audio capture, sound processor, WAV file format for sound, MIDI standard, audio coding: PCM encoding, Linear Predictive coding , ADPCM

Unit 6 **(10 Hrs)**

Image and Video:

Image: Representation of image in digital format . BMP, TIFF file formats

Image Compression: Need of Image Compression, Image Compression techniques Huffman coding , run length coding, JPEG

Video technology , Video capture, video, processing, NTSC, PAL, SECAM television standards, HDTV, Video Compression based on motion compensation H .261, MPEG1

Textbooks:

- D. Hearn, M. Baker, “Computer Graphics – C Version”, 2nd Edition, Pearson Education,
- J. Foley, Van Dam, S. Feiner, J. Hughes, “Computer Graphics Principles and Practice”, 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9
- Ze-Nian Li, Mark S. drew, “ Fundamentals of Multimedia “, Pearson education, ISBN 81-7758-823-0

References:

- D. Rogers, “Procedural Elements for Computer Graphics”, 2nd Edition, TATA Mc-Graw-Hill Publication, 2001, ISBN 0 – 07 – 047371 - 4
- F. Hill, “Computer Graphics: Using OpenGL”, 2nd Edition, Pearson Education, 2003 ISBN 81– 297 – 0181 – 2
- S. Harrington, “Computer Graphics”, 2nd Edition, McGraw-Hill Publications, 1987 ISBN 0 – 07 – 100472 – 6
- G.S. BALUJA “Computer Graphics and multimedia “, DHANPAT Rai and Co.
- Rajan Parekh , “ Principles of multimedia : Tata McGrawhill, ISBN 978-0-07-058833-2

Outcomes

This course teaches the fundamental concepts in multimedia that are useful in design on modern information systems based on multimedia

- Insight to multimedia file formats that are useful in design of multimedia applications
- State of the art tools and environments for design of multimedia applications using basic components viz. audio, image, and video with considering network protocols.

IT - 09004 NETWORKS ARCHITECTURE & WIRELESS PROTOCOLS LABORATORY

Teaching Scheme

Practical: 2 hrs/week

Examination Scheme

Term work - 50

Oral -50

List of assignment:

1. Implementation of Data Link Layer Protocols: Stop & wait protocol, Sliding window protocol.
2. Implementation of Network layer functions e.g. Routing, flow control
   TCP/IP socket programming
   Windows socket programming
3. Implementation of network security algorithm : Data Encryption Standard and ciphers
   Configuration of Router, DNS, Proxy Server, Web server, Mail Server.
4. Network management : IP tables
5. Case study of existing networks, Study of network components & resources.
6. Case Study of Network tool “NetSim- Network Simulator”
   Network Basics
   OSI Reference Model
   RS-232
   LAN & WAN Protocols
7. Programming :-
   - Transmission Flow Control
   - Spanning Tree
   - PC to PC communication
   - Leaky Bucket Algorithm
   - Error Correcting Code –Hamming Code
   - Error Detecting Code –CRC
   - Distance Vector Routing
   - Cryptography – Advanced – DES,RSA

Outcomes

The goal of this course is that the student will develop an understanding of the underlying structure of networks and how they operate. At the end of this course a student should be able to

- Explain basic networking concepts by studying client/server architecture, network scalability, geographical scope, the Internet, intranets and extranets.
- Identify, describe and give examples of the networking applications used in everyday tasks such as reading email or surfing the web.
- Describe layered communication, the process of encapsulation, and message routing in network equipped devices using appropriate protocols.
- Design and build an Ethernet network by designing the subnet structure and configuring the routers to service that network.
- Manage network management and systems administration.
- Construct a patch cord to connect a host computer to a network.

CT - 09007 DATABASE MANAGEMENT SYSTEM LABORATORY

Teaching Scheme
Lectures : 3 hrs/week

Examination Scheme
Term Work – 50 marks
Practical –50 marks

List of Assignments:

1. Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem.
2. The logical design performs the following tasks: Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.
3. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/PostgreSQL on Linux platform
4. Perform DML and DDL using all possible SQL commands and with the help any one host languages like C, C++, VB etc (i.e. embedded SQL)
5. Perform DML and DLL using PL/SQL and PL/pgSQL for the above problems.
6. Assignment based on object based database.
7. Assignment based on Indexing.
8. Design a mini project for any live problem as per SE constraints and implement using the techniques studied for above assignments.

Outcomes

After completing this course the students should be able to

- Understand basic concepts in Database Management System
- Know various types of Data Models such as E R Model, Relational Database Model
- Understand the Tuple Relational Calculus & Domain Relational Calculus
- Learn the SQL Queries
- Learn the Functional Dependencies, Decomposition of Relations

- Learn the Storage & File Systems
- Learn the Query Processing & Transaction Management

IT - 09005 SYSTEM PROGRAMMING & OPERATING SYSTEM LABORATORY

Teaching Scheme
Lectures: 2hrs/week

Examination Scheme
Term Work – 50 marks
Practical – 50 marks

List of Assignments

1. Designing a simple assembler for hypothetical machine.
2. Design simple macro processor
3. Implementation of CPU scheduling algorithms.
4. Process creation and inter process communication using openMP and MPI programming.
5. Deadlock handling-Bankers' algorithm.
6. Demand paging implementation-using algorithms like LRU, LFU,etc.
7. Implementation of first-fit, best-fit and worst fit algorithms for memory allocation.
8. Implementation of reader-writers' problem (with and without readers and writers priority).
9. Thread synchronization using semaphores.
10. Implementation of producer-consumer problem

Outcomes

After completing this course the students should be able to

- Implement translators (assembler, macro pre-processor) in a high level programming language like C, C++
- Implement different programs in compiler generation tools like FLEX & Bison
- Implement come intermediate code generation d) Implement code optimization techniques
- Students will be technically more familiar with Computer Systems.

IT - 09006 GRAPHICS AND MULTIMEDIA LABORATORY

Teaching Scheme
Engagement : 3 hrs/week

Examination Scheme
Term Work – 50 marks
Oral – 50 Marks

List of Assignments:

1. Write a program to implement algorithm for line drawing
2. Write a program to implement algorithm for circle generation
3. Write a program to implement 2-D transformations
4. Write a program to implement 3-D transformations
5. Write a programme to generate animation effect
6. Study of authoring tool – Director 8, to create presentation using multimedia files.
7. Parsing WAV sound files and reading it by programming in C/VC++
8. Designing Media player using MCI commands to play sound – WAV, MIDI, AVI files etc.
9. Understanding standard Image file formats e.g. BMP, TIFF,

10. Implementation of the Huffman coding algorithm

Outcomes

This course teaches the fundamental concepts in multimedia that are useful in design on modern information systems based on multimedia

- Insight to multimedia file formats that are useful in design of multimedia applications
- State of the art tools and environments for design of multimedia applications using basic components viz. audio, image, and video with considering network protocols.

ML -09001 Constitution Of India

Teaching Scheme	**Examination Scheme**
Lectures : 2 hrs/week	20 marks: Continuous evaluation- Asignments /Quiz End - Sem Exam – 30 Marks

Unit 1 **(5 hrs)**

Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases.

Unit 2 **(5 hrs)**

Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance.

Unit 3 **(4 hrs)**

Union Executive – President, Prime Minister, Parliament & the Supreme Court of India.

Unit 4 **(4 hrs)**

State executive – Governors, Chief Minister, State Legislator and High Courts.

Unit 5 **(4 hrs)**

Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.

Unit 6 **(4 hrs)**

Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments.

Text Books:

1. Durga Das Basu: “Introduction to the Constitution of India” (Students Edn.) Prentice –

Hall EEE, 19th/20th Edn., 2001.
2. "Engineering Ethics" by Charles E.Haries, Michael. S.Pritchard and Michael J.Robins Thompson Asia, 2003-08-05.

Reference Books:

1. "An Introduction to Constitution of India" by M.V.Pylee, Vikas Publishing, 2002.

Outcomes:

At the end of this course students will be aware about the Constitution:

- Appreciate the complexity of implementation of any law.
- Appreciate the roles and functions of various high officials.
- Know about Fundamental rights of citizens of India.
- Understand the Electoral process.
- Understand the provisions made for special groups and categories in the constitution

AS -09002 Humanities course / Applied Psychology

Teaching Scheme	**Examination Scheme**
Lectures : 4 hrs/week	100 marks:
Practical : 2hrs/week	Assignments /Practical(T1 and T2)- 40 Marks,
	End - Sem Exam – 60 Marks

Unit 1 **(4 hrs)**

Introduction to Psychology:
Definition, Nature and Aims, Counseling, Industrial and Social Psychology, Creativity and its application. Mind Mapping and Problem Solving, Self Awareness, Johari window.

Unit 2 **(6 hrs)**

Personality:
Carl Jung's type theory, Bandura's Social learning, Big Five model Indian Perspective on Personality- Panchakosh Model, SWOT analysis, life planning, emotional intelligence.

Unit 3 **(8 hrs)**

Organizational Behaviour:
Behaviour at workplace (personality, attitude and perceptions), Motivation, Job satisfaction, Leadership and Group dynamics, Engineering Psychology (Ergonomics), Man-machine relation, Group dynamics, Transactional analysis

Unit 4 **(4 hrs)**

Stress Management:
Nature, types and causes of stress, General Adaptation Syndrome (GAS), Coping with Stress- Cognitive, Emotional, and Behavioural techniques, Type A and B theory.

Text Books

1. Morgan, C.T., King, R.A., Weisz, J.R., & Schopler, J. (2001). *Introduction to Psychology*. 7th Edition. New Delhi: Tata McGraw Hill
2. Schultz, D. & Schultz, S. E. (2002). *Psychology and Work Today*. 8th Edition. Pearson Education

Reference Book

1. Hilgard, E. R., Atkinson, R. C., Atkinson, R.L. (1975). *Introduction to Psychology*. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
2. Golman, Daniel. (1998). *Working with Emotional Intelligence*. Bloomsbury Publishing Plc.
3. Matthewman, L., Rose, A., & Hetherington, A. (2009). *Work Psychology*. Indian Edition. Oxford University Press.

Practical Work

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1: Self Awareness (20 Marks) **(4 hrs)**

Aims/Objectives for the Year- Newspaper Activity, SWOT analysis, Personal Effectiveness Scale, Johari Window.

2: **Level of Adjustment (10 Marks)** **(6 hrs)**

Adjustment Inventory By M.L. Saxena, Interpretation and Explanation

3: Stress and Personality (15 Mark) **(8 hrs)**

Student's Stress Scale by Dr. Manju Agrawal, Type A- B theory and test, Interpretation and Explanation

4:Emotional Quotient (5 Mark) **(4 hrs)**

Concept of EQ, EQ test by N.K.Chadha, Interpretation and Explanation

Outcomes:

After successful completion of the course students will be able-

1. To understand different aspects of their personality and to learn various life skills
2. To strengthen the skills required in industrial/workplace settings
3. To overcome stressful situations effectively with the help of psychological approach
4. To improve their social interactions.

OEC INFORMATION SYSTEMS

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1: **(6 hrs)**

Introduction:
Define and understand the term information systems (IS). Technology, people, and organizational components of an information system, various types of information systems, nature of information systems in the success and failure of modern organizations, Understand and plan for the future of managing IS. Information systems for automation, organizational learning and strategic support, Formulate and present the business case for a system

Unit 2: **(8 hrs)**

Database Management and Internet:
Importance of databases in modern organizations, Working of database management systems, Database design, Query Processing, how organizations are getting the most from their investment in database technologies. Role of telecommunications in organizations, Types of computer networks, Extranets, Intranets, Working of Internet, Basic Internet services, World Wide Web.

Unit 3: **(6 hrs)**

Information Systems Development and Acquisition:
Process used by organizations to manage the development of information Systems. Major phases of the systems development life cycle: systems identification, selection, and planning; system requirement specifications; system design; system implementation; and system maintenance. Software prototyping, rapid application development, object-oriented analysis and design methods of systems development and their strengths and weaknesses, Factors in building a system in-house, along with situations, three system development options: external acquisition, outsourcing, and end-user development.

Unit 4: **(4 hrs)**

Organizational Information Systems:
Characteristics of the operational, managerial, and executive levels of an organization, decision support systems, expert systems, office automation systems, collaboration technologies

Unit 5: **(6 hrs)**

Electronic Commerce:
Business to Customer e-commerce, Business to Business e-commerce, Customer to Customer e-commerce, Advantages and disadvantages of e-commerce, E-Commerce System Architecture, Payment schemes in e-commerce, Cash transactions in e-commerce, e-commerce applications.

Unit 6: **(6 hrs)**

Information Systems Ethics, Computer Crime, and Security:
Impact of computer ethics on information systems, Issues associated with information privacy, accuracy, property and accessibility, computer crime and list several types of computer crime, computer virus, worm, Trojan horse, and logic or time bomb, various methods for providing computer security, IT Act 2000.

Text Books:
- "Information Systems Today, Managing in the Digital World" , Third Edition by Leonard M. Jessup; Joseph S. Valacich, Publisher: Prentice Hall
- "Introduction to Information Technology", V. Rajaraman, PHI

Reference Books:
- "Information Systems Management in Practice" Barbara C. McNurlin, Ralph H. Sprague, Publisher: Pearson Education.

Outcome
After studying this course it will develop ability to:

- Analyse functional and non-functional requirements to produce a system architecture that meets those requirements
- Understand and apply process and methodology in building the application
- Create design models using known design principles (e.g. layering) and from various view points (logical, physical etc.)
- Explain and justify all the design choices and tradeoffs done during the application's development

IT - 09007 LANGUAGE PROCESSORS

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Language Processors:
Introduction, Language Processing activities, Fundamentals of Language Processing, Fundamentals of Language specification, Language Processing development tools
Data Structures for Language Processing: Search Data Structures, Allocation Data Structures
Scanning and Parsing: Scanning, Parsing

Unit 2 **(6 Hrs)**

Assemblers, Linkers & Loaders:
Assemblers, Structure of an assembler, Error handling and Symbol Table management in assembler, Handling constants, literals, labels and Procedures, Loaders: Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features - Relocation, Program Linking Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage.

Unit 3 **(6 Hrs)**

Macro Processor:
Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Macro Parameters – Positional, Keyword, Actual, Design and implementation of simple macro processor, Nested Macro processor – Macro call within macro definition and macro definition within macro definition, Design and implementation of nested macro processor.
General Macro processing concepts - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Macro Processor Design Options - Recursive Macro Expansion, implementation Examples - MASM Macro Processor.

Unit 4 **(6 Hrs)**

Compiler : Lexical and Syntax Analysis :
Lexical Analysis: Translator Issues, Overview of the translation process, compilation process, front end and back end model, lexical analysis: hand coding and automatic generation of lexical analyzer (LEX), LEX specification details.
Syntax Analysis: Introduction: Role of parsers and issues of separating lexical and syntax Analysis, parsing theory: Top down and bottom parsing algorithms. Automatic generation of parsers (YACC), YACC specification file, Error detection and recovery.

Unit 5 **(6 Hrs)**

Static Semantic Analysis and Intermediate Code Generation:

Need of semantic analysis, Syntax directed translation schemes for declaration processing, type analysis, scope analysis and intermediate code generation. Intermediate code generation for declaration, assignment, iterative statements, case statements, arrays, structures, conditional statements, Boolean expressions, procedure/function definition and call.

Unit 6 **(6 Hrs)**

Code Generation & Code Optimization :
Issues in code generation, machine model, order of evaluation, Sethi Ullman algorithm for expression trees, Aho Johnson algorithm, register allocation and code selection. Code Optimization: Introduction, selected optimizations like common sub expression removal, loop invariant code motion, strength reduction etc.

Text Books:
- D. M. Dhamdere: "Systems programming and operating system", Tata McGraw Hill.
- Alfred V. Aho, A. V. R. Sethi and J.D. Ullman "Compiler principle, techniques and tools" Addison Wesley

References:
- Andrew W. Apple "Modern Compiler Implementation in C", Cambridge University Press 1998.
- John Levine, Tony Mason & Doug Brown, "Lex and Yacc", O'Reilly

Outcomes
On completion of this course, students should have a detailed knowledge of the basic issues in translators.
- These basic issues include topics selected from assemblers, pre-processors, HLL translators and fundamental language translation mechanisms.
- Learned and practiced problem solving skills on language translator systems specific topics, this includes using tools like lex and yacc used in translation process.

IT - 09008 ALGORITHMS AND COMPLEXITY

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(8 Hrs)**

Introduction:
Instruction counts, Growth functions, Necessity of time and space analysis of algorithms, Order notations (O, Θ, Ω notations), Problem Instance size, Frequently occurring recurrence relations in analysis of algorithms

Unit 2 **(4 Hrs)**

Data Structures:
Arrays, Linked lists, Stacks and Queues. Binary search trees, Hash tables, Basics of graphs and

their representations, Heaps and Heapsort

Unit 3 **(6 Hrs)**

Design Techniques :
Divide and Conquer, Greedy Algorithms, Dynamic Programming

Unit 4 **(6 Hrs)**

Design Techniques :
Backtracking, Branch-and-bound

Unit 5 **(8 Hrs)**

Selected Algorithms from various areas:
Graph Theory: Elementary Algorithms : DFS, BFS, Topological Sort, Minimum spanning trees (Kruskal and Prim's algorithms), Shortest Paths : Single Source shortest paths, All pairs shortest paths
String Matching: The naïve string-matching algorithm, The Robin-Karp algorithm, The Knuth-Morris-Pratt algorithm

Unit 6 **(4 Hrs)**

Complexity Theory :
Lower-bound arguments, NP-completeness : Introduction to NP-Complete, Reducibility (SAT, Independent Set, 3VC, Subset Sum & Partition, Hamiltonian Circuit)

Text Books:
- Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms" , PHI

Reference Books:
- E. Horowitz and S. Sahni. "Fundamentals of Computer Algorithms" , Galgotia, 1991
- Brassard, "Fundamental of Algorithm." , PHI
- Horowitz and Sahani, "Fundamentals of computer Algorithms", Galgotia.

Outcomes
This course is one of the most fundamental courses in Computer Engineering that would make Computer Engineers serious programmers. This course
- Introduces the need of analyzing algorithms and basic techniques used in the analysis
- Makes students aware of standard design techniques
- Makes students aware of complexity theory. Students equipped with all these topics will always be keen on writing efficient code, use standard techniques to solve problems from different domains and go for approximate solutions when the problems are computationally hard
- This course would give them an edge over other software professionals who know only technology.

IT - 09009 SOFTWARE DEVELOPMENT PROCESSES

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Software Development process:
Software Crisis and Myths, Software Process and development: Generic view of Process, Software life cycle and Models, Analysis and comparison of varies models, an agile view of process.

Unit 2 **(6 Hrs)**

Requirement Engineering:
Requirements Engineering Tasks, Initiating requirement engineering process, Eliciting requirement, developing use-cases, building the Analysis Model, Negotiating and Validating requirement. Building the Analysis Model

Unit 3 **(6 Hrs)**

System Design Overview:
Design process and design quality, Design concepts, Design Model. Pattern based software design., Architectural Design, User Interface Design.
UML:Different methods: Rambaugh / Booch / Jackmbsons, need for standardization. Diagramming in UML(Use CASE, Class, Interaction, State diagrams)CASE TOOLS.

Unit 4 **(6 Hrs)**

Validation and Testing:
Strategic approach to Software Testing, Strategic Issues, Test Strategies for conventional Software, Validation Testing , System Testing, Debugging. White Box Testing & Black Box Testing

Unit 5 **(6 Hrs)**

Web Engineering:
WebApp Engineering layers Web Engineering processes planning for web engineering projects project management issue for web engineering . Metrics, Requirement analysis
Anyalasis models for web engineering Design for webApps Testing for webApps.

Unit 6 **(6 Hrs)**

Planning and Management of Project:
Project Management, metrics for process and projects, estimation, project scheduling, risk management, Importance of software quality and measurements software Engineering techniques for quality assurance, change management. ISO 9000 and CMM/PCMM.

Text Books:

- Pressman R., "Software Engineering, A Practitioners Approach", 6th Edition, Tata
- MCGraw Hill Publication, 2004, ISBN 007-124083-124083-7
- G. Booch, J. Rumbaugh, and I. Jacobson. The Unified Modelling Language User Guide. Addison Wesley, 1999
-

Reference Books:

- Shari Pfleeger, "Software Engineering", 2nd Edition. Pearsons Education, 2001
- Ian Sommerville, "Software Engineering", 6th Edition, Addison-Wesley, 2000
- Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Pub.House.

Outcomes

This core course teaches the fundamental concepts in software development and introduces the best practices in software industry. This course

- Introduces the software development life cycle that professionals should know before entering in software industry,
- makes aware of software ethics,
- Prepares for the working in community and professional teams by way of understanding the basic elements and whole software development process.

Departmental Elective -2

DE - 09018 SERVICE ORIENTED ARCHITECTURE

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

INTRODUCTION TO SOA, EVOLUTION OF SOA:

Fundamental SOA; Common Characteristics of contemporary SOA; Benefits of SOA; A SOA timeline(from XML to Web Services to SOA); The continuing evolution of SOA (Standards organizations and Contributing vendors); The roots of SOA(comparing SOA to Past architectures).

Unit 2 **(6 Hrs)**

PRINCIPLES OF SERVICE – ORIENTATION:

Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; Service orientation and Object-orientation; Service layer abstraction; Business service layer; Orchestration service layer;

Unit 3 **(6 Hrs)**

WEB SERVICES AND SOA:

The Web services framework; Services (as Web Services); Service Registry; Service descriptions (with WSDL); Messaging (with SOAP), Transactions, Coordination, Business Activity, Orchestration, Choreography; Addressing, Reliable Messaging, Policies, Metadata, Security, Notification and Events; Semantic Web Services; restful Services;

Unit 4 **(6 Hrs)**

BUSINESS PROCESS DESIGN:
Business Process Management basics; WS-BPEL language basics; WS-Coordination overview; Service oriented business process design; WS-addressing language basics; WS-Reliable Messaging language basics; Service Component Architecture basics;

Unit 5 **(6 Hrs)**

ENTERPRISE PLATFORMS AND SOA:
SOA platform basics; Enterprise Service Bus basics (including basic and complex patterns); SOA support in J2EE; SOA support in .NET; SOA Reference Architecture;

Text Books:

- Service-Oriented Architecture Concepts and Technology and Design-Thomas Erl, Pearson Education, 2005
- Understanding SOA with Web Services – Eric Newcomer, Greg Lomow, Pearson Education, 2005
- Developing Enterprise Web Services – An Architect's Guide – Sandeep Chatterjee, James Webber Pearson Education, ISBN 81-297-0491-9

References:

- Patterns: Service Oriented Architecture and Web Services - http://www.redbooks.ibm.com/abstracts/sg246303.html?Open
- RESTful Web Services article - http://www.ibm.com/developerworks/webservices/library/ws-restful/index.html?S_TACT=105AGX01&S_CMP=HP
- IBM developerWorks Web Services Zone - http://www-128.ibm.com/developerworks/websphere/zones/webservices/
- SOA Reference Architecture – http://www.ibm.com/developerworks/library/ar-archtemp/ http://www.soablueprint.com/reference_architecture
- ESB Patterns - http://www.ibm.com/developerworks/websphere/library/techarticles/0712_grund/0712_grund.html
- Service Component Architecture - http://www.osoa.org/display/Main/Service+Component+Architecture+Home http://www.ibm.com/developerworks/library/specification/ws-sca/
- Architectural Styles and the Design of Network-based Software Architectures - http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm
- SUGGESTED READING: IT Architecture and Middleware, Strategies for Building Large Integrated Systems, Chris Britton, ISBN 0-201-70907-4
- SOA Compass - http://www.ibmpressbooks.com/bookstore/product.asp?isbn=0131870025

Outcomes

This course gives

- Brief about the concept of Service Oriented Architecture.
- Expose students to trends in SOA Governance and how they impact on the various disciplines involved in service planning, delivery and management and what business benefits are enabled by the SOA architecture style and how these add value to the various disciplines involved in service planning, delivery and management.

DE - 09019 DISTRIBUTED SYSTEMS

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Introduction:
Introduction to Distributed systems, Motivation and goals, broad overview and advantages of distributed systems, Design issues in distributed systems such as transparency, scalability.

Unit 2 **(6 Hrs)**

Communication:
Layered Protocols Lower Level, Transport Level and Higher-level Protocols, Asynchronous Transfer mode Networks, client-server model, Remote Procedure call, RMI.

Unit 3 **(6 Hrs)**

Synchronization in Distributed systems:
Clock synchronization, Logical Clocks, Physical Clocks, Clock synchronization algorithms, Mutual exclusion, A centralized algorithms, A distributed algorithms, A token ring algorithms, comparison of the three algorithms, Election algorithms, The Bully algorithms, Ring algorithms, Dead Locks in distributed systems, Distributed deadlock detection.

Process and Processors in Distributed Systems:
Threads, System models, Processor allocation, Scheduling in distributed systems, Fault tolerance and real time distributed systems.

Unit 4 **(6 Hrs)**

Distributed File and Directory Services:
Distributed file service requirements, File service components Flat file service , Directory Service, Client module, Design issues, implementation techniques.
Distributed shared memory:

Shared memory, Consistency models, Page based Distributed shared memory, Shared – variable Distributed shared memory, Object based Distributed Shared Memory.

Unit 5 **(6 Hrs)**

Distributed Object -Based Systems:
CORBA, DCOM, GLOBE.
Distributed document and coordination based systems:
Lotus Notes, TIB/RENDEZVOUS JINI.
Security concerns in distributed systems:
Security models.

Unit 6 **(6 Hrs)**

Advanced Topics in Web/Distributed Systems:
Cloud Computing, Data Processing in Large Clusters, Distributed Storage Systems & Virtualization

Text Books:
- Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design" , PHI Publication
- Andrew S. Tanenbaum. “Distributed Operating Systems", Pearson Education

Reference Books:
- Andrew S. Tanenbaum & Maarten van Steen,”Distributed Systems –Principles and Paradigms" PHI Publication.
- George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems, Concepts and Design”, Fourth Edition, Addison Wesley
- Kenneth P. Birman “Reliable Distributed Systems: Technologies, Web Services, and Applications” Springer.
- Galli D.L., “Distributed Operating Systems: Concepts and Practice”, Prentice-Hall.
- Mullender S., “Distributed Systems”, Addison Wesley.

Outcomes:

This course aims to convey an understanding of the problems of programming distributed systems.
- Understanding the fundamentals of distributed systems
- Understanding and reason about different paradigms: Grid, Peer-to-Peer, Client-server
- Use of the parallel programming language POPC++
- Use of the programming environment MPI
- Reason about scalability and analyzing achieved and achievable execution performance
- Understanding inter-process communication, time concepts, event ordering, and synchronization, local and global states.

DE - CLOUD AND BIG DATA PLATFORMS

Teaching Scheme
Lectures : 3 hrs/week

Examination Scheme
100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Introduction to Cloud and Virtualization

Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.
Cloud Computing Architecture: Cloud delivery models- SaaS, PaaS, LaaS.Cloud Deployment Models- Public Cloud, Private Cloud External Cloud and Hybrid Cloud
Quality of service (QoS) and Service level agreements (SLAs)(e.g., completion time, availability, response time) in clouds.
Virtualization: Role of virtualization in enabling the cloud Types of Virtualizations, Compute, Network and Storage Virtualization's, Hypervisor / Virtual Machine Monitor Architecture, Type 1 and 2. Full, para and hardware assisted virtualization.VM Technology, Resource management, VM Migration, Migrationconsiderations- cost saving, interoperability, SLA and transparency
Hypervisors:KVM, Xen, ESXi

Cloud Orchestration: Elements of Cloud Orchestration, Examples platforms: OpenStack and vSphere

VMware specific Virtualization Platforms: vSphere, vSphere Architecture, vSphere Compute, Storage virtualization with vSphere, Network Virtualization with vSphere, Clustering and HA in vSphere

Unit 2 **(3 Hrs)**

OpenStack

Open Stack Deep dive: Covers Networking, Storage,Authentication modules of OpenStack, Quantum, Keystone and Cinder, Swift

Unit 3 **(10 Hrs)**

Platform as a Service

Paas: Platform as a Service, Cloud Foundry Overview, Azure Overview and Architecture, Google App Engine Overview, Amazon Web Services

Unit 4 **(4 Hrs)**

Software Defined Networking

Software Defined Networking, OpenFlow, OpenvSwitch, Mininet, SDN Controllers, History and evolution of SDN, Control and data plane separation, Virtual networking, Nicira, Open Flow standard, Open Floodlight Controller to OpenStack

Unit 5 **(10 Hrs)**

Big Data in the Cloud

Data in the cloud, Map Reduce – Hadoop Framework, Apache Hadoop programming, examples, BigTable, Hive, Pig, Greenplum, Mahout

Unit 6 **(3 Hrs)**

Cloud Security

Issues with Multi-tenancy, Isolation of users/VMs from each other, VM vulnerabilities, hypervisor vulnerabilities, VM migration attacks, Cloud security such as developing cloud security models, end-to-end methods for enforcing, Security policies and programming models with privacy aware APIs

References and Readings :

- http://docs.openstack.org/
- http://mininet.org/
- https://www.opennetworking.org/
- http://pubs.vmware.com/vsphere-50/index.jsp
- https://developers.google.com/appengine/
- http://www.windowsazure.com/en-us/
- http://www.cloudfoundry.com/
- http://aws.amazon.com/developers/getting-started/
- Danielle Ruest and Nelson Ruest, virtualization, A beginners Guide, Tata McGraw Hill,
- Dinakar Sitaram and Geetha Manjunath, Moving to the cloud, Elsevier
- Kai Hwang, Geoffrey and KJack, Distributed and Cloud computing, Elsevier

Outcomes:

Upon completion, students will have obtained a deep understanding of cloud computing platforms, server Virtualization Technologies, software environments, and will be able to engage in cloud-related research, development and service.

DE - UNIFIED COMMUNICATIONS AND CONTACT CENTER APPLICATIONS

Teaching Scheme

Lectures : 3 hrs/week

Examination Scheme

100 marks: Continuous evaluation-
Assignment/Quizzes – 40 marks
End Sem Exam - 60 marks

Unit 1 **(6 Hrs)**

Introduction to digital and IP Telephony

Digital Telephony: Circuit Switched networks, SS7, ISDN, Exchanges, E.164 Numbering Plans
IP Telephony: Packet Switched Networks, Signaling & Media separation, Media Encapsulation RTP and RTCP, Audio and Video Codecs

Unit 2 **(10 Hrs)**

VoIP Protocols

H.323 Network Elements: Terminals, Gateway, Gatekeeper, Multipoint Control Unit
H.323 Protocol: RAS Channel, H.225 Call signaling, H.245 Media signaling
H.323 Call flows: Basic Audio and Video Call flows
SIP Network Elements: Registrar, Proxy, UAS, UAC, B2BUA
SIP Protocol:Requests & Responses, Methods, Headers & Parameters, Message Structure, Transactions & Dialogs, Session Description Protocol
SIP Call Flows: Basic Audio and Video Call Flows
H.248 Protocol: Media Gateways, Media Gateway Controllers, Commands, Transactions, Contexts, Terminations, Descriptors, Packages

Unit 3 **(6 Hrs)**

Unified Communications

Local and Network features: Call Forward, Call Coverage, Automatic Call Back, User Displays, Resource Optimization.
Voice & Data Integration: IM, presence, voice mail,
Collaboration: Call Conferencing,Voice, Video, Data & Content integration.
Mobility: Mobile Clients, Session Border Controllers.
Business Applications: Framework for custom applications, Computer Telephony Interface, Application Sequencing.

Unit 4 **(8 Hrs)**

Inbound Contact Center

Call Centers: Introduction, Evolution and classification of Contact Centers.
Inbound Contact Center: Introduction, Self Service/Interactive Voice Response, Routing, Intelligent Routing, VXML
Agent: Skills, Selection Algorithms, Modes, Service Observing, Recording

Unit 5 **(8 Hrs)**

Outbound Contact Center and Reporting

Outbound Contact Center: Introduction, Proactive Contact: Voice, SMS, E-mail & Chat.
Contact Center Reporting: Types of Reports, Business use cases.
Analytics: Agent Performance, Occupancy,

Unit 6 **(6 Hrs)**

Emerging technologies in Telecommunications

High Availability: Load balancing, Reliability, Failover & Failback, Location Redundancy, Hardware footprint, Cloud Computing: Applications in Telecommunications
Analytics in Voice & Data, Diagnostics & Management
Emerging Technologies: Google Glass, webRTC, Hosting on Cloud.

References and Readings :

- http://docs.openstack.org/

- http://mininet.org/
- https://www.opennetworking.org/
- http://pubs.vmware.com/vsphere-50/index.jsp
- https://developers.google.com/appengine/
- http://www.windowsazure.com/en-us/
- http://www.cloudfoundry.com/
- http://aws.amazon.com/developers/getting-started/
- Danielle Ruest and Nelson Ruest, virtualization, A beginners Guide, Tata McGraw Hill,
- Dinakar Sitaram and Geetha Manjunath, Moving to the cloud, Elsevier
- Kai Hwang, Geoffrey and KJack, Distributed and Cloud computing, Elsevier

Text Books:

- Allan Sulkin, "PBX Systems for IP Telephony" McGraw-Hill Professional

Reference Books:

- ITU-T H.323 Packet-based multimedia communications systems
- ITU-T H.225 Call Signaling Protocols and media stream packetization
- ITU-T H.245 Control protocol for multimedia communication
- IETF RFC 3261 SIP: Session Initiation Protocol
- IETF RFC 4566 SDP: Session Description Protocol
- Contact Center for Dummies, Wiley Publishing Inc.
- Real Time Communication with WebRTC, O'Reilly Publishing

Outcomes:

Upon completion, students will have obtained a deep understanding of Contact Center Applications, Telecommunication Protocols, IP Telephony, Voice on IP and will be able to engage in Emerging Trends in Telecommunication.

IT - 09010 LANGUAGE PROCESSOR LAB

Teaching Scheme
Lectures: 3hrs/week

Examination Scheme
Term Work – 50 marks
Practical – 50 marks

List of Assignments:

1. Designing a simple assembler for hypothetical machine. Student should handle data segment, code segment, symbol table management as well as error handling.
2. Design simple macro processor. Student should handle macro with as well as without parameters, he/must handle keyword as well as actual parameters,
3. Design a nested macro processor [Call to a macro processor inside macro definition].
4. Calculator (text or graphics) using LEX and YACC or Document Editor(find, replace, macro) using LEX and YACC, or Similar kind of assignment using LEX and YACC.
5. Lexical Analyser for a subset of C/C++ using LEX
6. Intermediate code generation (Triple, Quad) for a subset of C/C++

7. Any two optimization techniques on Intermediate Code Generation :
    - Constant expression evaluation.
    - Local copy propagation.
    - Common sub expression elimination.
    - Loop invariant code movement.

Outcomes:

After completing this course the students should be able to

- Implement translators (assembler, macro pre-processor) in a high level programming language like C, C++
- Implement different programs in compiler generation tools like FLEX & Bison
- Implement come intermediate code generation
- Implement code optimization techniques
- students will be technically more familiar with Computer Systems.

IT - 09011 ALGORITHMS AND COMPLEXITY LAB

Teaching Scheme
Lectures: 3hrs/week

Examination Scheme
Term Work – 50 mark
Practical – 50 mark

List of Assignments:

1. Recursive and Iterative (Non Recursive) algorithm for specific problem and their complexity measures (Comparison Expected)
2. Verification of (worst and average) complexity measures of following sorting techniques
3. Selection sort, Bubble sort, Heap sort, Merge sort and Quick sort
4. Minimum Spanning tree as an example of Greedy approach [Prim's VS. kruskal]
5. Implementation of Single Source and All Pairs Shortest algorithms
6. Finding longest common subsequence of given two sequences using Dynamic Programming
7. 8-Queens Problem – Iterative and Recursive versions
8. Pattern Matching Algorithms: Naïve, Robin-Karp and KMP
9. Finding closest pair of points

Outcomes:

This course is one of the most fundamental courses in Computer Engineering that would make Computer Engineers serious programmers. This course

- Introduces the need of analyzing algorithms and basic techniques used in the analysis
- Makes students aware of standard design techniques
- Makes students aware of complexity theory. Students equipped with all these topics will always be keen on writing efficient code, use standard techniques to solve problems from different domains and go for approximate solutions when the problems are computationally hard
- This course would give them an edge over other software professionals who know only technology.

IT - 09012 SOFTWARE DEVELOPMENT PROCESSES LAB

Teaching Scheme
Lectures : 3 hrs/week

Examination Scheme
Oral –50 marks
Term Work – 50 marks

1. Define scope for the given problem statement and prepare the following diagram using UML

- Package Diagram
- Class Diagram
- Object Diagram
- Use cases
- Interaction or Activity Diagram
- State chart Diagram
- Sequence Diagram
- Collaboration diagram
- Development Diagram

Outcomes:

- Develop the ability to design and apply software development life cycle for complex engineering applications.
- Develop the ability to design UML & Sequence diagrams for complex applications.
- Understand the theoretical concepts of Software development.

Department Elective -2 Lab

DE - 09021 SERVICE ORIENTED ARCHITECTURE LAB

Teaching Scheme
Lectures: 3hrs/week

Examination Scheme
Term Work – 50 marks
Oral – 50 marks

List of Assignments

1. Eclipse as an Integrated Development Environment [IDE)
2. Developing Plugins for Eclipse
3. Websphere Everyplace Solution Development Workshop
4. Workplace Client Technology, Micro Edition application programming
5. Develop a Portlet application using IBM Rational Application Developer V6
6. Create, deploy, publish, and consume a simple Web service
7. Build dynamic Java applications with Ajax
8. Applications development using SCA and SDO

DE - 09022 DISTRIBUTED SYSTEMS LAB

Teaching Scheme

Examination Scheme

Lectures: 3hrs/week

Term Work – 50 marks
Oral – 50 marks

List of Assignments:

1. Implementation of sockets
2. Implementation of RPC / RMI
3. Implementation of Lamports algorithm.
4. Implementation of Ring and Bully algorithm
5. Study of NFS
6. Study of Cloud , Grid etc
7. Implementation of MPI
8. Study of Distributed System

Outcomes:

- Understanding and reason about different paradigms: Grid, Peer-to-Peer, Client-server
- Use of the parallel programming language POPC++
- Use of the programming environment MPI
- Reason about scalability and analyzing achieved and achievable execution performance
- Understanding inter-process communication, time concepts, event ordering, and synchronization, local and global states.

CT - CLOUD AND BIG DATA PLATFORMS LABORATORY

Teaching Scheme
Lectures : 3 hrs/week

Examination Scheme
Term Work – 50 marks
Practical –50 marks

List of Assignments:

1. Writing Map and Reduce Programs
2. Working with Hadoop
3. Working with KVM and setting up VM Migrations
4. Working with OpenStack.

Outcomes:
Hands on expertise on working with Map-Reduce, Hadoop and open Source cloud Platforms

CT UNIFIED COMMUNICATIONS AND CONTACT CENTER APPLICATIONS LABORATORY

Teaching Scheme
Lectures : 3 hrs/week

Examination Scheme
Term Work – 50 marks Practical –50 marks

List of Assignments:

1. Setup PBX(Asterisk) and make station-station call
2. Demonstrate/Debug Signaling modes with H.323 Protocol using ethereal sniffer
3. Demonstrate/Debug Signaling modes with SIP Protocol using ethereal sniffer
4. Simulate Branch and establish Branch connectivity*
5. Use SIPP to emulate a SIP UAS.
6. State machine programming exercise to demonstrate feature interactions.
7. Setup IVR (OpenIVR) and integrate with PBX (Asterisk)
8. Design Inbound callflow and deploy on IVR
9. Design Outbound callflow and deploy on IVR
10. Create webpage for peer-to-peer communication using WebRTC

Outcomes:
Hands on expertise on working with Contact Center protocols, IVR, WebRTC in Telecommunication domain

Annexure I

List of Open Elective / Professional Science courses offered by ALL Departments

Sr. No	Department	Course
1	Civil	Finite Elements in Engineering
2	Mechanical	1. Unconventional Machining Processes 2. Modern Control Systems 3. Power Plant Engineering
3	Electrical	1. Industrial Drives 2. Control System Engineering
4	Electronics and Telecommunication	Electronic Communication Systems
5	Metallurgy and Material Science	Composite Materials
6	Instrumentation and Control	Industrial Automation
7	Production	1. Introduction to ERP 2. Operations Efficiency
8	Computer Engineering	Information Systems
9	Information Technology	Information Systems
10	Applied Science	1. Humanities Course 2. Constitution of India
11	Innovation Centre	Liberal Learning Course

Annexure II

List of Liberal Learning courses offered at Institute Level

- **Agricultural** – Animal Science, Forestry, Horticulture, Floriculture, Sustainable Agriculture, Veterinary
- **Arts** – Graphic Design, Interior Design, Fashion Design
- **Basic Sciences** – Astronomy, Astro- Physics, Biology, Genetics, Kinesiology, Microbiology, Neuro Sciences.
- **Business** – Administration, Communication, Entrepreneurial studies, Hostel Management, Marketing.
- **Defense Studies** - Military Studies, Naval Studies, Air Force Studies, War strategies.
- **Education** - Education policies, Engineering Education, Teacher Training.
- **Environmental Sciences** – Ecology, Meteorology
- **Linguistics** – Word Language
- **Medicine** – Health Studies Nutrition and dietetics
- **Performing Arts**- Music, Dance Theatre, Cinema

- **Philosophy**- Religious Studies
- **Sports and Athletics**