



BRACT'S

Vishwakarma Institute of Technology, Pune – 411 037

Department of Computer Engineering



Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to University of Pune)

Structure & Syllabus of

B.E. (Computer Engineering and IT)

Pattern 'C11'

Effective from Academic Year 2011-12

Prepared by: - Board of Studies in Computer Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by,

Chairman – BOS

Chairman – Academic Board



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Program Educational Objectives (PEO) B.E. (Computer Engineering)

1. Program and Course Outcomes

Programme objectives:

PEO No.	Description of the Objective
I	Preparation: To prepare the students with a commitment towards intellectual, creative and professional growth by application of innovative practices widely accepted by industry or global educational platform.
II	Core competence: To provide students with foundation in application of mathematical & engineering fundamentals to computing solutions that can result in product or process.
III	Breadth: To enable student to exercise problem solving capacity with effective use of analysis, design, development that address idea realization.
IV	Professionalism: To inculcate students with professional and ethical values communication and collaboration skill and involvement in team work as a member having multidisciplinary knowledge useful to the society.
V	Learning Environment: To provide students an academic environment that developed leadership qualities, excellent in subject area of computer engineering and lifelong learning in every sphere of their life.

Course Objectives: Course objectives are specified in the course syllabus.



2. Program and Course Outcomes

Programme Outcomes:

- a. **Broad foundations:** Graduates will understand and apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- b. **Disciplinary Foundation:** Graduates will recognize of the need for, and an ability to engage in, continuing professional development and demonstrate an ability to use current techniques, skills, and tools necessary for computing practices.
- c. **Specialization:** Graduates will have understanding of and ability to apply the concepts and skills related to writing technical documents such as specifications, design and users manuals in appropriate formats.
- d. **Design:** Graduates will be able to analyze, design, implement, and test a solution to real world problems including appreciating the value of efficient design created to meet clearly developed requirements.
- e. **Innovations:** Graduates will demonstrate ability to formulate and answer empirical questions through participation in projects especially addressing design and deployment, of computing infrastructure with technology integration and user-centered design
- f. **Communication skills:** Graduates will demonstrate ability to communicate effectively through verbal and written form.
- g. **Interpersonal skills:** Graduates should be able to interact professionally with others in the workplace and engage themselves, effectively in team work for group projects.
- h. **Engineering and society:** Graduates will understand professional ethical and social responsibility which will prepare them to address local and global impact of engineering solutions.
- i. **Engineering Applications:** Graduates will understand and apply engineering artifacts of engineering solutions in meaningful and useful way to society and global environment.
- j. **Lifelong Learning:** Graduate will acquire skills necessary to engage in life long learning and understanding of need to continuity improve the skills in refining and updating the knowledge base.

Course Outcomes: Course outcomes are specified in the course syllabus.



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MODULE V



Structure, T.E. (Module V)						
FF653, Issue No. 3, Rev 1, dt 02/04/2011						
Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S ₁	CS30101	Operating Systems	3	0	0	3
S ₂	CS30103	Computer Networks	3	0	0	3
S ₃	CS30105	Theory of Computation	3	0	0	3
S ₄	CS30107	Systems Programming	3	0	0	3
T ₁	CS30201	Operating Systems	0	1	0	1
T ₂	CS30203	Computer Networks	0	1	0	1
P ₁	CS30301	Operating Systems & Computer Networks	0	0	2	1
P ₂	CS30307	Systems Programming	0	0	2	1
MP ₅	CS37401	Mini Project	0	0	2	1
* PD ₁	PD ₁	Institute Level Elective	0	0	2	1
CVV ₃	CS30401	Comprehensive Viva Voce	Based on Courses S1, S2			1
SM ₁	CS37301	Seminar(T.E. Semester I) Irrespective of Module	0	0	2	2
		Total	12	2	10	21

**CS30101:: OPERATING SYSTEMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Data Structures and Algorithms, Computer Organization.**Objectives:**

- Identify the role of operating systems and explain the different structures operating systems.
- Describe OS support for processes/threads, and virtual memory, I/O and file systems.
- Evaluate processes and/or threads synchronization mechanisms and explain deadlock conditions and ways to resolve them.
- Identify the different design and implementation concepts for Unix/Linux
- Use Inter-Process Communication techniques under Unix/Linux.
- Mapping with PEOs: II, III, (d).

Unit I**(8+1 Hrs)****Introduction to OS**

A. Architecture, Goals & Structures of O.S., Hardware Abstraction Layer, Basic functions, Interaction of OS and Hardware Architecture, System Calls & OS Services, Batch, Multiprogramming, Multitasking, Time sharing, Parallel, Distributed & Real-time OS.

Overview of 386 programming model, Introduction to Mobile OS: Architecture & Mobile OS Layered Model of Mobile OS.

Examples of OS: Linux, MS-Windows 2000.

B. Variants of Linux

Unit II**(8+1 Hrs)****Process Management**

A. Process Description & Control: Process Concept, Process States, Process Description, Threads, SMP & Microkernels: Processes and Threads, Symmetric Multiprocessing, Microkernels.

Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, Monitors, Classical Problems of Synchronization: Readers-Writers problem, Producer Consumer problem, Dining Philosopher problem.

OS Services layer in the Mobile OS: Generic Services.

B. Message Passing, Sleeping Barber problem.



Unit III (8+1 Hrs)
Scheduling and Deadlock

A. Uniprocessor Scheduling: Types of Scheduling: Preemptive, Non-preemptive, Long-term, Medium-term, Short-term. Scheduling Algorithms: FCFS, SJF, RR, Priority
Multiprocessor Scheduling: Granularity, Design Issues, Process Scheduling
Deadlock: Principles of deadlock, Deadlock Avoidance, Deadlock Detection, Deadlock Recovery, Deadlock Prevention.
OS Services layer in the Mobile OS: Comms Services.
B. Thread Scheduling, Real Time Scheduling.

Unit IV (8+1 Hrs)
Memory Management

A. Memory Management requirements, Memory Partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping.
Virtual Memory: Concepts, Segmentation, Paging, Address Translation, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.
OS Services layer in the Mobile OS: Multimedia and Graphics Services, Connectivity Services.
B. Demand paging, Working Set Model.

Unit V (8+1 Hrs)
I/O Devices, Files & Shell Programming

A. I/O management & Disk scheduling: I/O Devices, Operating System design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID.
File Management: Concepts, File Sharing, File Organization, File Directories, Record Blocking, Free Space management, Security Issues.
Shell and Command Programming, AWK Programming.
B. Organization of I/O functions, Disk Caches, Secondary Storage Management.

Text Books

1. "Operating Systems", Stalling William, Pearson Education, ISBN: 0-13-031999-6, 4th Edition.
2. "Operating System Concepts", Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.



Reference Books

1. “Modern Operating Systems”, Tanenbaum Andrew S., Prentice Hall India, ISBN: 81-7808-447-3, 2nd Edition.
2. “Unix Concepts and Applications”, Das Sumitabha, Tata McGraw Hill, ISBN: 0-07-053475-6, 3rd Edition.

Additional Reading

1. “Operating System Principles”, Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.
2. “Design of the Unix Operating System”, Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. “Unix Shell Programming”, Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. “Unix And Shell Programming”, Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6 , 1st Edition.
5. “The Symbian OS Architecture Sourcebook: Design and Evaluation of a Mobile Phone OS”, Ben Morris, John Wiley & Sons, ISBN: 978-0-470-01846-0, 2007.

**CS30103:: COMPUTER NETWORKS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Data Communication.**Objectives:**

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.
- Mapping with PEOs: II, III, (d).

Unit I**(8+1 Hrs)****Data Link Layer**

A. Overview of protocol suite: OSI and TCP/IP, infrastructure network, ad-hoc network. Design Issues, Error Detection and correction, Examples on Checksum, Stop-and-Wait protocol, Sliding Window protocols, HDLC.

Point-to-Point-Access (PPP): Frame format, Transition states, PPP Stack: LCP, NCP,

B. SLIP, SONET, MPLS.

Unit II**(8+1 Hrs)****Medium Access Control**

A. Channel allocation: Static and Dynamic allocation, Multiple Access Protocols: ALOHA, CSMA, Collision-free and limited-contention protocols, WDMA.

Ethernet: Cabling, MAC sub-layer protocol, Logical link control, Wireless LAN, Broad band wireless, Bluetooth.

B. Switched, fast and Gigabit Ethernet.

Unit III**(9+2 Hrs)****Network Layer**

A. Design Issues, Packet switching, Connectionless and Connection-oriented Services, Virtual Circuit and Datagram Subnets. Autonomous system.

Routing Algorithms: Optimality principle, shortest path routing, flooding, Distance Vector routing, link state routing, hierarchical routing.

Congestion Control and QOS: General Principles, Congestion prevention policies, Load shading, Jitter Control, Quality of Service, Internetworking.

Network layer Protocols: ARP, RARP, IP protocol, IPV6, ICMP, Unicast Routing Algorithms: RIP, OSPF, BGP, Multicast Routing: IGMP, Mobile IP.



B. Routing Algorithms: Broadcast routing, Multicast routing, Routing for mobile hosts.

Unit IV (8+1 Hrs)

Transport Layer

A. Services and service primitives, Elements of Transport protocol: Addressing, Connection establishment and release, flow control and buffering, Multiplexing, Crash recovery, UDP: Introduction, TCP: Introduction, Model, protocol, header, connection establishment and release, connection management, Transmission policy, congestion control, timer management, RPC, Transport layer in Mobile network.

B. Sockets and Socket programming in Linux and Windows.

Unit V (7+1 Hrs)

Application Layer

A. Domain Name System (DNS) and DNS servers, MIME, SMTP, Mail Gateways, Remote login, File Transfer Protocol, SNMP.

Cloud computing: Architectures, working principle.

B. Electronic Mail: Architecture and services, World Wide Web, Wireless Web.

Text Books

1. “Computer Networks”, by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,
2. “Data Communications and Networking”, by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.

Reference Books

1. “Computer Networking- a top-down approach featuring the internet”, by James F. Kurose, Person Education, ISBN- 0321227352, 2nd Edition.
2. “Communication Networks- Fundamental Concepts and Key Architectures”, by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. “Computer Networks and Internet”, by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.
2. “Computer Networks- A Systems Approach”, by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.
3. “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, George Reese, O’Reilly Publication, 2009, ISBN 978-0-596-80163-2. 1st Edition.

**CS30105:: THEORY OF COMPUTATION****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Data Structures.**Objectives:**

- Study abstract computing models (FA, PDA, PM, TM) their languages, grammar, applications, limitations and relevance to modern day computing.
- Learn about the theory of computability and complexity.
- Mapping with PEOs: I, II, (b).

Unit I**(8+1 Hrs)****Automata Theory**

A. Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts to Automata Theory: Alphabets, Strings, Languages and Problems, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence and Minimization of Automata, Conversion of NFA with epsilon to DFA Equivalence of Moore and Mealy Machine. Applications and Limitation of FA.

B. FA with output: Moore and Mealy machine.

Unit II**(8+1 Hrs)****Regular Expressions (RE) and Languages**

A. Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to DFA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Applications of RE: Regular expressions in Unix, GREP utilities of Unix, Lexical analysis and finding patterns in text.

B. Decision properties of Regular Languages.

Unit III**(8+1 Hrs)****Context Free Grammars (CFG) and Languages**



A. Definition, Examples, Derivation, Languages of a Grammar, Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Inherent ambiguity, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs, Chomsky Hierarchy. Regular Grammar: definition, left linear and right linear Regular Grammar, Regular Grammar and Finite Automata.

B. FA to RG and RG to FA. Context Sensitive grammar

Unit IV

(8+1 Hrs)

Push Down Automata

A. Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG. Introduction to Post Machines.

B. Application of CFG: Parser, Markup languages, XML and Document Type Definitions.

Unit V

(8+1 Hrs)

Turing machines and Undecidability

A. Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Post Correspondence Problem, Introduction to Undecidability.

B. Comparison between FA, PDA, Post Machine and TM.

Text Books

1. "Theory of Computer Science: Automata, Languages and Computation", K.L.P. Mishra and N.Chandrasekaran, PHI, ISBN 978-81-203-2968-3, Third Edition.
2. "Introduction to Automata Theory, Languages and Computation", Hopcroft J, Motwani R, Ullman, Addison-Wesley, ISBN 81-7808-347-7, Second Edition.

Reference Books

1. "Introduction to Languages and the Theory of Computation", J. Martin, Tata McGraw-Hill, ISBN 0-07-049939-x, Third edition, 2003.
2. "Introduction to Computer Theory", Cohen D., Wiley Publications, 0-471-51010-6, Second Edition.

Additional Reading

1. "Elements of The theory of Computation", H.R.Lewis, C.H.Papadimitriou, Pearson Education, ISBN 81-7808-487-2, Second Edition.

**CS30107:: SYSTEMS PROGRAMMING****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:**

1. Data Structures
2. Computer Organization
3. C programming

Objectives:

1. To understand the concepts and components of Systems Programming
2. To Learn and understand the fundamentals of Operating systems
3. Mapping with PEOs: II, III, (d).

Unit I**(8+1 Hrs)****Introduction to System Programming**

A.System Software: Concept, introduction to various system programs such as Assemblers, Assembler design, Assembler design options, Loaders, Linkers, Macro Processors, Compilers, Interpreters, Operating Systems, Introduction to Device Drivers. System software machine architecture, the simplified instructional computer, Traditional machines - RISC machines. Machine dependent and machine independent Assembler features, Implementation, Booting Procedure for DOS & Windows.

B. Examples - AIX Assembler, Boot strap loaders and implementation examples- MS-DOS Linker, Sun OS linker

Unit II**(8+1 Hrs)****Machine & Assembly Languages**

A. Overview of the register set and instructions, Evolution from the 386 to Pentium 4 and beyond. Machine instruction set, assembly language, How to run simple assembly language programs under Linux and Windows. Many examples of assembly language code. Interfacing C and assembly language.

B. Instruction description, Pseudo operations, Instruction Mapping

Unit III**(8+1 Hrs)****Encoding and Decoding**

A. Encoding and decoding schemes for the X-86 processor, Covering the entire Instruction set and all Memory Addressing Formats. System Programming Examples: Operating system interfaces, Stack smashing, Dynamic Linking Libraries.

**B. Library Description for IA-32/Intel64.****Unit IV****(8+1 Hrs)****Introduction to Linux**

A. Introduction and essential concepts of LINUX system programming: System Programming, APIs and ABIs, standards, concepts of Linux programming. Program segments/sections; The ELF Format; Linking and loading; Linux dynamic libraries (shared objects); Multitasking and paging; Address translation; Memory Protection; Comparison with Windows.

B. Dynamic linking, API compatibility, Dynamically linked libraries, Overall architecture and limitations.

Unit V**(8+1 Hrs)****Device Drivers**

A. Types of Drivers, Driver History, Driver Issues, Kernel Level Device drivers, Virtual device drivers(VxD), Writing a Driver, Device Driver Stack Buses and Physical Devices, Static Device drivers, Dynamic Device drivers, Device Installation and .Inf files, PnP, Device Namespace, and Named Devices.

Direct X: History, Components, Compatibility, Architecture.

B. .Net Framework and DirectX

Text Books

1. "Systems Programming & Operating Systems", D M Dhamdhare, Tata McGraw Hill Publications, ISBN - 0074635794
2. "Systems Programming", John J Donovan, ISBN - 0070176035

Reference Books

1. "Introduction to 3D Game Programming with Direct X 9.0c: A Shader Approach", Frank Luna, Jones and Bartlett publication, ISBN- 1598220160
2. "Linux System Programming", Robert Love, O'Reilly, ISBN 978-0-596-00958-8



CS30201:: OPERATING SYSTEMS

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites:: Data Structures and Algorithms, Computer Organization.

Objectives:

- Understand Operating System concepts.
- Be familiar with Basic and Advance Unix commands.
- Be able to write Shell and AWK scripts.
- Understand and solve problems involving process control, mutual exclusion, deadlock and synchronization.
- Shell programming in Unix.
- Mapping with PEOs: II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

1. Execution of Advance Unix commands.
2. Write a shell program to sort an array of numbers using any sort method.
3. Execution of AWK related commands.
4. Solve the Readers-Writers problem using Threads and Mutex.
5. Solve the Producer-Consumer problem using Threads and Mutex.
6. Solve the Producers-Consumers problem using Threads and Semaphores.
7. Design a solution to the Sleeping Barber problem.
8. Draw the Gantt charts and compute the finish time, turnaround time and waiting time for the following algorithms:
 - a. First come First serve
 - b. Shortest Job First (Non-Preemptive)
9. Calculate the number of page faults for a reference string for the following page replacement algorithms:



- a. Optimal
 - b. FIFO
10. Calculate the total distance traversed by the disk arm to satisfy the pending requests for the following disk scheduling algorithms:
- a. FCFS
 - b. C-SCAN

Text Books

1. “Operating Systems”, Stalling William, Pearson Education, ISBN: 0-13-031999-6, 4th Edition.
2. “Operating System Concepts”, Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.

Reference Books

1. “Modern Operating Systems”, Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
2. “Unix Concepts and Applications”, Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.

Additional Reading:

1. “Operating System Principles”, Silberschatz A., Galvin P., Gagne G, John Wiley And Sons, ISBN: 9812-53-176-9, 7th Edition.
2. “Design of the Unix Operating System”, Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. “Unix Shell Programming”, Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. “Unix And Shell Programming”, Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.



CS30203:: COMPUTER NETWORKS

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To understand the analysis of network
- Understand the design of network.
- Mapping with PEOs: II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :

- i. Study of web Server.
- ii. PC-to-PC communication using RS-232.
- iii. Install two LAN Cards in one of the machine. Install and study router.
- iv. Introduction to NS-2/NS-3/OMNET
- v. Study of System Socket Calls.

B. Mathematical Analysis

- i. Problems on propagation delay
- ii. Problems on transmission delay
- iii. Problems on latency using queuing theory.
- iv. Problems on performance of network.

Text Books

1. “Computer Networks”, by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,
2. “Data Communications and Networking”, by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.

Reference Books

1. “Computer Networking- a top-down approach featuring the internet”, by James F. Kurose, Person Education, ISBN- 0321227352, 2nd Edition.
2. “Communication Networks- Fundamental Concepts and Key Architectures”, by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.



Additional Reading

1. “Computer Networks and Internet”, by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.
2. “Computer Networks- A Systems Approach”, by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.



CS30301:: OPERATING SYSTEMS AND COMPUTER NETWORKS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Data Structures and Algorithms, Computer Organization

Objectives:

- Be familiar with implementation of a multiprogramming operating system.
- Be familiar with implementation of paging, scheduling.
- Understand the design of computer network.
- Student must be able analyze the packets and write the socket programming.
- Mapping with PEOs: II, III, (d).

List of Practical

Part A:

1. Implementation of a multiprogramming operating system:

- a. Stage I:
 - i. CPU/ Machine Simulation
 - ii. Supervisor Call through interrupt

- b. Stage II:
 - i. Paging
 - ii. Error Handling
 - iii. Interrupt Generation and Servicing
 - iv. Process Data Structure

- c. Stage III:
 - i. Multiprogramming
 - ii. Virtual Memory
 - iii. Process Scheduling and Synchronization
 - iv. Inter-Process Communication
 - v. I/O Handling, Spooling and Buffering

Part B:

1. Study of existing LAN and understand the design and various components. Set up a small network of 3 to 4 computers and Hub/Switch as directed by the instructor. Use Lan Card, UTP Cables and Connectors. Install LAN Cards and Crimp the Structure & Syllabus of B.E.(Computer Engineering) Program- Pattern 'C11', Issue 3, Rev 1 dated 2/4/2011



- connectors. Assign unique IP addresses and share C drive on each machine. Test the network by using PING command. Use protocol analyzer Software.
2. Study any protocol analyzer software (eg. LanExplorer) to learn and use its important features, Study of network monitoring software like ETHREAL software. Assignment to examine TCP/IP and non-TCP/IP protocols (IPX/SPX) and capture them using protocol analyzer Software.
 3. Program to implement sliding window protocol
 4. TCP Socket programming in Linux
 5. UDP Socket programming in Linux
 6. Mini Project.

Text Books

1. “The Logical Design of Operating Systems”, Shaw, Alan C, Prentice Hall, 1974.
2. “Computer Networks”, by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,

Reference Books

1. “Operating System Concepts”, by Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.
2. “Communication Networks- Fundamental Concepts and Key Architectures”, by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. “Operating System Principles”, Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.
2. “Design of the Unix Operating System”, Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. “Unix Shell Programming”, Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. “Unix And Shell Programming”, Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.
5. “Modern Operating Systems”, Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
6. “Unix Concepts and Applications”, Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.
7. “Computer Networks- A Systems Approach”, By Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 4th Edition, ISBN-978-81-312-1045-1.



CS30307:: SYSTEMS PROGRAMMING

Credits: 01

Teaching Scheme: -Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand the concepts and components of Systems Programming
- To Learn and understand the fundamentals of Operating systems
- Mapping with PEOs: II, III, (d).

List of Practical

1. Implementation of Macros.
2. Implementation of Nested macros.
3. Design and implementation of 1 pass assemblers.
4. Design and implementation of 2 pass assemblers.
5. Design of an Editor: Design of a Line or Screen Editor using C Language.
6. Symbol table generation for input *.c file.
7. Design Lex specifications for the tokens – keywords, identifiers, numbers, operators, white spaces.
8. Implementation of Toy-code generator.
9. Simulation of linkers.
10. Simulation of loaders.
11. 3-4 assignments on DLL on Linux shared library.
12. Use of different debugger tools.



BRACT'S

Vishwakarma Institute of Technology, Pune – 411 037

Department of Computer Engineering

Text Books

1. "Systems Programming & Operating Systems", D M Dhamdhere, TMH, ISBN – 0074635794

Reference Books

1. "Introduction to 3D Game Programming with Direct X 9.0c: A Shader Approach", Frank Luna, Jones and Bartlett publication, ISBN- 1598220160



BRACT'S

Vishwakarma Institute of Technology, Pune – 411 037

Department of Computer Engineering

MODULE VI



Structure, T.E. (Module VI)						
FF653, Issue No. 3, Rev 1, dt 02/04/2011						
Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S ₅	CS30102	Software Engineering	3	0	0	3
S ₆	CS30111	Principles of Programming Languages	3	0	0	3
S ₇	CS30106	Database Management Systems	3	0	0	3
S ₈	CS30108	Design and Analysis of Algorithms	3	0	0	3
T ₃	CS30202	Software Engineering	0	1	0	1
T ₄	CS30211	Principles of Programming Languages	0	1	0	1
P ₃	CS30302	Software Engineering	0	0	2	1
P ₄	CS30306	Database Management Systems	0	0	2	1
MP ₆	CS37402	Mini Project	0	0	2	1
* PD ₂	PD	Institute Level Elective	0	0	2	1
CVV ₄	CS30402	Comprehensive Viva Voce	Based on Courses S5, S7			1
PS ₁	CS37302	PROJECT STAGE 1 (T.E. Semester II) Irrespective of Module	0	0	4	2
		Total	12	2	12	21



CS 30102:: SOFTWARE ENGINEERING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
- Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, (e).

Unit I

(8+1 Hrs)

Software Process Models and OO Methodologies

A. Overview of Software Engineering, Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Code-and-Fix, Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Extreme Programming, Cleanroom Methodology, CMMI, Impact of Processes and Outcomes, Process Selection and applicability, Software Engineering Principles and Practices, The importance of modeling, UML Building blocks: things, relationships and diagrams, Architectural views: use case, design, implementation, process and deployment, Levels of detail: visualization, specification and construction, Object properties: Abstraction, encapsulation, Modularity, Hierarchy

B. Overview of OO Methodologies: OOAD, OOSE, OMT, DSDM

Unit II

(8+1 Hrs)

Requirement Engineering and Model Driven Development

A. Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods, Overview of Model Driven Development, Introduction to Model Driven Architecture: MDA Terms and Concepts, Model Mappings, Marking Models, Executable Models, MOF and XMI, Introduction to UML Metamodel



B. Programming In Small Versus Programming In Large, Extensibility Mechanisms and its usage, Introduction to OCL , UML 2.0 Diagram set

Unit III

(8+1 Hrs)

System Behavior Analysis

A. Static Behavior: Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases, The Domain Perspective, Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Class Models and Use Case Models, Judging the Domain Model, Capturing system behavior in use cases

Dynamic Behavior: Sequence diagrams, object lifelines and message types, Modeling collections multiobjects, Refining sequence diagrams, Collaboration diagrams, States, events and actions, Nested machines and concurrency, Modifying the object model to facilitate states, Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swimlanes, concurrency and synchronization

B. Study of other Behavioral Diagrams: Communication Diagram, Interaction Overview Diagrams, Timing Diagrams

Unit IV

(8+1 Hrs)

System Design Engineering

A. Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles, Reference Architectures Architectural Design: Software Architecture, Data Design and Architectural Design, Design of Software Objects, Features and Methods, Cohesion and Coupling between Objects, Coupling and Visibility, Interfaces, Interfaces with Ball and Socket Notation, Templates, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control , Modeling associations and collections, Preserving referential integrity , Achieving reusability, Reuse through delegation, Identifying and using service packages, Improving reuse with design patterns

B. User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation, Software Reuse, Component-Based Software Engineering

Unit V

(8+1 Hrs)

System Implementation and Project Management

A. Packages and interfaces: Distinguishing between classes/interfaces, Exposing class and package interfaces, Component and deployment diagrams: Describing dependencies, Deploying components across threads, processes and processors

Project Activities, Project Definition, Structures and Frameworks, Strategy and Project Management, Role of Teams, Types of Teams and Team Life Cycles, Teamwork, Project Planning, Project Scheduling, Project Cost Estimation, Risk analysis and Planning, Risk Structure & Syllabus of B.E.(Computer Engineering) Program- Pattern 'C11', Issue 3, Rev 1 dated 2/4/2011



Estimation and Control, Classic Mistakes, Empirical Cost Estimation, COCOMO, Software Sizing, Software Scope Management, Introduction to Function Point Analysis

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.
3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002) ISBN-10: 0130912972 ISBN-13: 978-0130912978



CS30111:: PRINCIPLES OF PROGRAMMING LANGUAGES

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: C,C++

Objectives:

- To learn the fundamental concepts of programming languages & the various programming paradigms.
- To increase the capacity to express ideas using a programming language.
- To learn to choose an appropriate programming language for a designed task.
- To learn the important features of different types of languages and their relevance
- To learn past the superficial differences in languages and recognize the commonalities in meaning.
- To develop the ability to quickly learn new programming languages.

Unit I

(8+2 Hrs)

Introduction to Programming languages

A. Role of programming languages, Necessity of studying programming languages, characteristics of a good programming language, Effects of Environments on languages (batch Processing, Interactive, Embedded, Programming Environment) Language design issues, Programming paradigms. **Imperative programming:** Mutable, Data Types. Concept of binding, Type system (strong, weak, static, dynamic), type compatibility, named constants. Sequence control with Expressions, Conditional Statements, Loops. **Procedural:** Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Activation Records, parameter passing methods, Procedure Calls, Function Calls, Recursion .

B. User-Defined Data Types, Pointer and reference types, User-Defined Data Values, Passing and Returning Objects of User-Defined Data Types.

Unit II

(8+1 Hrs)

Object Oriented Programming (Language: C++)

A. Classes and Objects, Methods, Inheritance, Polymorphism, Interfaces, Operators. Protection Mechanisms: Public-Private-Protected, Access Control Lists and Friend Classes, References, Constructors, Anywhere declaration of Local Variables, Deep Copying, Shallow Copying, Destructors, Dynamic Memory Allocation, New, Delete, Garbage Collection.



B. Abstract Data types, Static and Stack-Based Storage management.

Unit III (8+2 Hrs)

Object – Oriented Programming (Java)

A. Classes & Objects, Constructors, Access Modifiers, Instance Methods, this & static keywords. Inheritance, Types of inheritance, Constructors in Derived Classes, Overriding & Hiding Fields & Methods, Abstract Classes & methods, Final Classes & Final Methods. Interfaces & Packages - Interfaces, Putting Classes together. Exception Handling - built-in exceptions, checked & unchecked exceptions. Multithreading – Thread life Cycle thread Priority, Thread Methods. Inter-thread Communication. Java I/O – Introduction to Streams, File Management / Processing, primitive/ Object Data Processing. Graphical Programming - Applet, Event Handling.

B. User defined exception, Multilevel Inheritance, Hierarchical Inheritance, Concurrent Issues with thread programming, Deadlock.

Unit IV (8+1 Hrs)

Functional Programming (Language: Haskell)

A. Programming as Composition of Operations, Features of functional programming language, Absence of Mutable, Lambda Calculus, Absence of Control Structures, Types – values & operations, Ordered type, type checking, Expressions, Eager & lazy evaluation, Functions, Guarded Equations/ Commands, Optimized Implementation of Recursion, Applications

B. List transforming functions in Haskell, List & String Comprehensions in Haskell.

Unit V (8+2 Hrs)

Case Studies of Programming Languages

A. Overview of the building blocks of the language, procedures, control structures, their motivation(s), target user base, choice and paradigms of features, special features relevant to Matlab, PHP-HTML, LEX & YACC, Prolog

B. HTML-CSS-JavaScript, LISP

Text Books

1. “Programming Languages Design and Implementation”, T. W. Pratt, M.V. Zelkowitz, Publications, ISBN 10: 0130276782, 4th Edition
2. “Java: The Complete Reference”, Herbert Schildt, TMG Publication, ISBN 9780070636774 , 7th Edition

Reference Books

1. “Haskell: The Craft of Functional Programming”, S. Thompson, Addison Wesley, ISBN 0201342758, 2nd Edition
2. "Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw-Structure & Syllabus of B.E.(Computer Engineering) Program- Pattern ‘C11’, Issue 3, Rev 1 dated 2/4/2011



Hill Publishing Company Ltd, ISBN 0 - 07 – 462038 - X,

Additional Reading

1. “Programming Languages: Principles and Paradigms” A. B. Tucker, R. Noonan, McGraw-Hill, ISBN 0-07-048704-9
2. “Programming Languages: Principles and Practice”, K. C. Loudon, Thomson Publications, 981-243-130-6 , 2nd Edition
3. “The C++ Programming Language”, B. Stroustrup, Addison-Wesley, 81-317-0521-8, 3rd Edition
4. “MATLAB Programming for Engineers”, Stephen J. Chamman, Thomson Learning Publication, ISBN 981-254-893-9, 3rd Edition
5. “Programming In Prolog”, Clocksin W F, Mellish C S, Narosa Pblishing House, ISBN 8185198552, 3rd Edition
6. “Lex & Yacc”, John R. Levine, Tony Mason, Doug Brown, Shroff Publishers, ISBN 81-7366-062-X, 2nd Edition.
7. “HTML, CSS, Java Script, Perl, Python and PHP”, Schafer Steven, Dreamtech India Pvt Ltd., ISBN 81-265-0620-2
8. “LISP”, Patrick Henry Winston, Berthold, Pearson Educaation, ISBN 81-7808-155-5, 3rd Edition

**CS30106:: DATABASE MANAGEMENT SYSTEMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Data structures**Objectives:**

- To understand importance of Database Management System (DBMS) over traditional file processing system.
- To understand significance of requirement analysis phases in designing entity relationship data model.
- To apply normalization process to design a relational model in the required normal form.
- To use SQL to create database objects, populate tables, and retrieve data.
- To understand the concept of transaction and the implementation of transaction management process.
- Mapping with PEOs: II, III, (d).

Unit I**(8+2 Hrs)****Introduction to DBMS and ER Data Model**

A. Data Storage: File processing system, Disadvantages; DBMS: Need of DBMS, Terms: Data, Database, Metadata, Data Dictionary, Database System, Database Management System, Data Abstraction, Data Independence, System Architecture of DBMS; Data Model: Definition, ER and Relational Data Model, Object Oriented, Object Relational Models; ER Model: Entity, Entity Set, Attributes, Primary Key, Relationship, Types and Attributes of Relationship, Role, Cardinality Ratio, Participation Constraint, Weak Entity Set, EER Features.

B. Hierarchical and Network Data Models, Comparison of Different Data Models, Selection as 1. Entity Vs Attribute, 2. Entity Vs Relationship, 3. Binary Vs Ternary Relationship, Tools for Designing ER Model, Introduction of Popularly used Relational

Unit II**(8+2 Hrs)****Relational Data Model**

A. Relational Data Model: Terms: Relation, Schema, Attributes, Tuples, Domains, Relation Degree (or Arity) and Cardinality, Relation Intention and Extension, Super Key, Candidate Key, Primary Key and Foreign Key, Relational Model Constraints, Schema Diagram, ER to Relational Mapping; Database Query Languages: Relational Algebra,



Tuple Relational Calculus.

B. Characteristics of Relation, Codd's Twelve Rules for Relational DBMS, Domain Relational Calculus, Life Cycle of a Relational Database, Reverse Engineering: Relational Database into ER/ EER Model.

Unit III

(8+1 Hrs)

Normalization

A. Normalization: Anomalies of un-Normalized Relation, Need of Normalization, Pros and Cons of Normalization, Denormalization; Functional Dependency: Trivial, Full, Partial, Transitive, Multivalued, Join, Inclusion Dependency, Dependency Diagram, Inference Rules For Functional Dependencies, Closure of Functional Dependencies, Algorithms to find: 1. Candidate Key, 2. Closure of Attribute Set, 3. Minimal Cover of Functional Dependencies; Normal Forms: Checking of Lossless Join Decomposition and Dependency Preservation, Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF.

B. Normal Forms: 5NF and DKNF, Normalization at Conceptual Level.

Unit IV

(9+2 Hrs)

Structured Query Language (SQL)

A. SQL: Introduction, Types of queries: DDL, DML, Select, TCL, DCL, Advantages and Disadvantages of SQL; DDL: Create, Drop, Alter Various Database Objects (Table, Table Constraints, View etc.); DML: Insert, Delete and Update Queries, TCL; SELECT Queries: Simple and Nested Queries, Set Membership, Aggregate Functions, Group-by, Having Construct, Join Types, Set Operations, Set Comparison, SQL String Functions PL/SQL: Block, Cursor, Cursor Types, Procedure, Trigger, Row-level, Statement-level Triggers.

B. DCL-Security and Authorization, SQL Date-Timestamp and Numerical Functions, PL/SQL Function, Mapping of Relational Algebra to SQL.

Unit V

(7+1 Hrs)

Transaction Management

A. Transaction: Concept, ACID properties, Transaction States; Schedule: Definition, Types, Serializability, Conflict and View Serializability, Precedence Graph, un/Recoverable Schedule, Cascadeless Schedule, Deadlock; Concurrency Control Protocols: Lock Based, Timestamp Based Protocol; Recovery System: Log Based Recovery, Checkpoints and Shadow Paging.

B. Tree and Multiversion Protocol for Concurrency Control, ARIES Recovery Technique, Deadlock Handling.

Text Books

1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill Structure & Syllabus of B.E.(Computer Engineering) Program- Pattern 'C11', Issue 3, Rev 1 dated 2/4/2011



International Edition, ISBN- 0-07-228363-7, 4th Edition.

2. “Fundamentals of Database Systems”, Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.

Reference Books

1. “Database Systems”, Thomas Connolly and Carolyn Begg, Pearson Education, ISBN 81-7808-861-4, 3rd Edition.
2. “Database Management Systems”, Ramakrishnan and Gehrke, McGraw-Hill International Edition, ISBN 0-07-115110-9, 3rd Edition.

**CS30108:: DESIGN AND ANALYSIS OF ALGORITHMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Data Structures and Files**Objectives:**

- Fundamental understanding of the mathematics used to analyze, evaluate, and design algorithms
- Develop the ability to assess the advantages and disadvantages of different types of algorithms.
- Understand methods for designing time and space efficient algorithms.
- Increased ability to design and implement efficient solutions to problems.
- Proving problems NP-Completed and understand its impact in Computer Science
- Mapping with PEOs: III, (e).

Unit I (9+1 Hrs)**Unit 1: Overview of Time Complexity analysis, Divide and Conquer and Greedy Strategies.**

A. Time Complexity notations, Stable matching problem. Overview of Brute Force algorithms (sorting/searching). Using Recurrence equations and Mathematical Induction to find Time Complexity and prove correctness of algorithms. Divide and Conquer : Analyzing Quick Sort, Merge Sort. Strassen's Matrix Multiplication, Finding median, Counting Inversions, Integer Arithmetic, Application of Divide and Conquer to Geometric Problems. Greedy Method : Analysis of Minimum Spanning Tree and Shortest Path algorithms, Scheduling Algorithms. Optimal Storage Problems.

B. Finding Maximum and Minimum, Convex Hull problem.

Unit II (8+1 Hrs)**Dynamic Programming Strategy**

A. General Strategy, Review of Multistage graphs, OBST and 0/1 Knapsack, Traveling Salesperson Problem, Shortest path in a Graph, Sequence Alignment problem, Scheduling problem.

B. String Editing Problem.

Unit III (7+1 Hrs)**Backtracking and Branch & Bound**



A. Backtracking: General Strategy, n Queen's problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack, Sum of Subsets

Branch and Bound: General Strategy, 0/1 Knapsack, Traveling Salesperson Problem

B. Postage stamp problem, $n*n*n$ Queens problem.

Unit IV

(7+1 Hrs)

NP-Theory

A. Overview of Deterministic and Non Deterministic Algorithms, Complexity-intractability, Non-Deterministic Polynomial time (NP) Decision problems, Cooks Theorem implication. NP-Hard problems : Halting problem.

NP-Complete problems- Satisfiability problem, vertex cover problem, graph problems, scheduling, code generation problems, Dealing with NP completeness.

B. Simplified NP-Hard Problems.

Unit V

(9+1 Hrs)

Overview of Parallel Algorithms, Approximation algorithms and Randomized Algorithms.

A. Parallel Algorithms : Selection, Merging two sorted lists, Sorting and Shortest path in a graph algorithms using Parallel strategy. Approximation algorithms : TSP algorithms, Load Balancing problem, Graph problems. Randomized algorithms : Las Vegas and Monte Carlo categories. Quick Sort and Median finding, Min Cut problem, Coupon Collector problem.

Files: Definition and concepts, File organizations, File Operations, Processing of sequential, Index-sequential and direct files.

B. Preparata's sorting algorithm, Approximation algorithm for graph coloring.

Text Books

1. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition, 1998. ISBN 81-7515-257-5
2. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6

Reference Books

1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0
2. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" ,PHI 2nd edition, 2001. ISBN 81-203-2141-3



CS 30202:: SOFTWARE ENGINEERING

Credits: 01

Teaching Scheme: -Tutorial 1 Hr/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
- Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, (a).

List of Contents

A TERM-WORK containing the record of the following:

1. To study modeling methodologies and identify their applicability to various categories of projects.
2. To understand Requirement Elicitation Techniques and recognize types of requirement while preparing System Requirement Specification.
3. To study MDD / MDA and identify the importance of Model Transformation.
4. To study types of MOF and metamodel concepts for various diagrams in UML 2.0.
5. To identify System Scope, Actors, Use Cases, Use Case structuring for a given problem and perform Use Case narration in template form with normal/alternate flows.
6. To identify Entity, Control, Boundary objects and trace object interactions for scenarios from use cases.
7. To identify object states, transitions, entry-exit points, concurrency, action parallelism and prepare a state chart diagram for given object scenario.



8. To prepare detailed Activity diagram with notational compliance to UML 2.0 indicating clear use of pins, fork-join, synchronization, datastores.
9. To prepare Class diagram for a defined problem with relationships, associations, hierarchies, interfaces, roles and multiplicity indicators.
10. To prepare Component and Deployment diagram for a defined problem.

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition, 2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman, 'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e, 2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.
3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002) ISBN-10: 0130912972 ISBN-13: 978-0130912978



CS30211:: PRINCIPLES OF PROGRAMMING LANGUAGES

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Computer Programming

Objectives:

- To understand basic concepts of Object Oriented Programming.
- To understand inheritance, polymorphisms, templates, file handling.
- To understand the concept of Interfaces, Packages.
- To understand the concept of Exception Handling and Multithreading
- To understand the concept of Applets and AWT

List of Contents

A TERM-WORK containing the record of the following:

1. A C++ program to implement the concept of inheritance.
2. A C++ program to implement the concept of function/operator overloading.
3. A C++ program to implement the concept of virtual function.
4. A C++ program to implement the concept of friend function / class.
5. Design and implement a reusable collection class (templates), creation and manipulation of files.
6. A C++ program to implement the concept of exception handling.
7. A JAVA program to implement the concept of Class, Constructor, instance variable & class variable.
8. A JAVA program to implement the concept of inheritance, interface & package.
9. A JAVA program to implement the concept of multithreading.
10. A JAVA program for file handling.
11. Design a simple applet application with event handling.



Text Books

1. "Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw-Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 – X, 4th Edition
2. "Java: The Complete Reference", Herbert Schildt, TMG Publication, ISBN 9780070636774 , 7th Edition

Reference Books

1. "The Waite Group's Object oriented Programming in C++",R. Lafore, Galgotia Publications, ISBN 81-7515-269-9, 3rd Edition
2. "Core Java 2 Volume – I ” ,Cay S Horstmann, Gary Cornell, Pearson Education, ISBN 9788131719459, 8th Edition

Additional Reading

1. "Core Java Volume .II “ Cornell G, Horstmann C S , Sunsoft Press, ISBN 81-7808-018-4

**CS 30302:: SOFTWARE ENGINEERING****Credits:** 01**Teaching Scheme:** - Laboratory 2 Hrs/Week**Prerequisites:** Data Structures**Objectives:**

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, (a).

List of Practical

1. To narrate Requirement Definition Document for the target system with following three areas:
 - a. Problem Identification
 - b. Problem Definition
 - c. Problem Statement
2. To narrate System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 Std guidelines.
3. To decompose and organize the problem domain area into broad subject areas and identify the boundaries of problem/system. Specify the behavior of the target system and map requirements to Use cases.
The System Context Diagram depicts the overall System behavioral trace and Requirement Capture diagram depicts the hierarchical Use case Organization. The Use Case diagram should encompass
 - a. Actors (External Users)
 - b. Transactions (Use Cases)
 - c. Event responses related to transactions with external agents.
 - d. Detection of System boundaries indicating scope of system.
4. To depict the dynamic behavior of the target system using sequence diagram. The Sequence diagram should be based on the Scenarios generated by the inter-object Communication. The model should depict:
 - a. Discrete, distinguishable entities (class).



- b. Events (Individual stimulus from one object to another).
 - c. Conditional events and relationship representation.
5. To depict the state transition with the life history of objects of a given class model. The model should depict:
 - a. Possible ways the object can respond to events from other objects.
 - b. Determine of start, end, and transition states.
 6. To depict the dynamic behavior using detailed Activity diagram.
 7. To develop logical static structure of target system with Class diagram. To prepare Class Collaboration-Responsibility (CRC) cards for the Conceptual classes traced from System analysis phase. The design model should depict
 - a. Relationship between classes: inheritance, Assertion, Aggregation, Instantiation
 - b. Identification of objects and their purpose.
 - c. Roles / responsibilities entities that determine system behavior.
 8. To represent physical module that provides occurrence of classes or other logical elements identified during analysis and design of system using Component diagram. The model should depict allocation of classes to modules. To narrate the Program Design Language Constructs for the target system.
 9. To represent deployment view of the system through Architecture Diagram.
 10. To implement the system according to specification.

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman, 'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.



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3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002) ISBN-10: 0130912972 ISBN-13: 978-0130912978

**CS30306:: DATABASE MANAGEMENT SYSTEMS****Credits:** 01**Teaching Scheme:** - Laboratory 2 Hrs/Week**Prerequisites:** Data structures**Objectives:**

- Deep understanding of database design.
- Implementation of database systems.
- Conversant with oracle database: SQLPlus, PL/SQL.
- Mapping with PEOs: II, III, (d).

List of Practical

1. Choose a database application; you propose to work on throughout the course. Perform requirement analysis in detail for the same.
2. Draw an entity-relationship diagram for the proposed database.
3. Translate above E/R model to relational model.
4. Normalize these relations up to 3NF. Check normalized relations for lossless join decomposition.
5. Create tables for the above schema using DDL queries. Apply appropriate constraints. Alter the table design by adding/removing column and constraints. Write DML statements to modify data in tables.
6. Execute 'SELECT' queries using various operators. Also make use of order by, group by, having clause, aggregate functions and set operators.
7. Write queries involving multiple tables using equijoin, non equijoin, self join and outer join. Write queries involving subqueries.
8. Create views, indices, and sequence on your database schema involving two or more tables. Use SQL single row functions: date, time, string functions etc.
9. Write meaningful stored functions, procedures, triggers in PL/SQL. Make use of cursors.



Mini project: For the above created database, design front end and develop a complete database application. Use suitable application development environment. Generate necessary reports using appropriate tool. Mini project should be done individually.

Text Books

1. “Fundamentals of Database Systems”, Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.
2. “SQL, PL/SQL”, Bayross Ivan, BPB Publications New Delhi, ISBN 81-7656-964-X, 3rd Edition.

Reference Books

1. “Oracle: Applications Development”, Bayross Ivan, BPB Publications, New Delhi, ISBN 81-7656-912-7.
2. “Oracle SQL * Plus”, Gennick Jonathan, Shroff Publishers & Distributors P Ltd Mumbai, ISBN 81-7366-606-7.



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MODULE VII



Structure, B.E. (Module VII)						
FF653, Issue No. 3, Rev 1, dt 02/04/2011						
Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S ₁	CS41101	Digital Signal Processing	3	0	0	3
S ₂	CS41103	Embedded Systems	3	0	0	3
S ₃	CS42101 CS42103 CS42105 CS42107 CS42109	ELECTIVE I Advanced Computer Graphics Parallel Algorithms Mobile Computing Software Design and Architecture Business Intelligence	3	0	0	3
S ₄	CS42111 CS42115 CS42117 CS42119 CS42121	ELECTIVE II Software Testing and Quality Analysis Human Computer Interaction Artificial Intelligence Information Retrieval Computer Architecture	3	0	0	3
T ₁	CS41201	Digital Signal Processing	0	1	0	1
T ₂		ELECTIVE II	0	1	0	1
P ₁	CS41303	Embedded Systems	0	0	2	1
P ₂		Elective I	0	0	2	1
PS ₂	CS47303	PROJECT STAGE 2 (B.E. Semester I) Irrespective of Module	0	0	6	4
		Total	12	2	10	20

**CS41101:: DIGITAL SIGNAL PROCESSING****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To understand how to analyze and manipulate digital signals in various domains and design digital filters.
- Mapping with PEOs: II, III, (c).

Unit I**(8+1 Hrs)****Introduction to signals and systems**

A. Classification of Signals: Analog, Discrete-time and Digital, Basic sequences and sequence operations. Discrete-time (D.T) systems, Properties of D. T. Systems and Classification Linear Time Invariant Systems, impulse response, linear convolution and its properties, , DTS described by difference equations, Recursive and Non recursive, Relaxed and Non relaxed systems, Periodic Sampling, Sampling Theorem, Frequency Domain representation of sampling, reconstruction of a band limited Signal, A to D conversion Process: Sampling, quantization and encoding.

B. Properties of LTI systems, parallel and cascade connection, Correlation of DTS.

Unit II**(8+1 Hrs)****Z and Fourier transforms**

A. Z-transform, ROC and its properties, Inverse z transform by inspection, partial fraction and complex inversion, Z transform properties: multiplication by exponential sequence, Linearity, time shifting, frequency shifting, time reversal, convolution theorem initial value theorem, final value theorem, System Functions for LTI Systems: Stability and causality, inverse systems, significance of poles/zeros, Unilateral Z-transform: solution of difference equation with and without initial condition. Representation of Sequences by Fourier Transform, F. T. theorems: convolution theorem, and windowing theorem.

B. Symmetry properties of F. T, F. T. theorems: Linearity, time shifting, frequency shifting, time reversal, differentiation.

(8+1 Hrs)**Unit III****Frequency analysis of Signals and Systems**



A. Frequency Response of LTI Systems: Ideal frequency selective filters, magnitude and phase response, group delay, Frequency Response for Rational System Functions: Frequency Response of a single zero or pole, Frequency response from pole-zero plot using simple geometric construction

Sampling the F.T., Fourier representation of finite-duration sequences, The Discrete Fourier Transform, Properties of DFT: circular shift, duality, symmetry, Circular Convolution, Linear Convolution using DFT, Effective computation of DFT and FFT, DIT FFT, Overlap and save algorithm, Inverse DFT using FFT(DIF)

B. Properties of DFT: Linearity, DIF FFT, Goertzel Algorithm, Inverse DFT using FFT(DIT)

Unit IV

(9+1 Hrs)

Design of Digital Filters

A. Concept of filtering, Ideal filters and approximations, specifications, IIR filter design from continuous time filters: Characteristics of Butterworth, Chebyshev approximations, impulse invariant and bilinear transformation techniques, Design examples, FIR filter design using windows: properties of commonly used windows, systems with Linear phase, Generalized Linear phase systems, Four Types of GLPS (Type I), Design Examples, Design using Kaiser window, Comparison of IIR and FIR Filters .

B. Four Types of GLPS (Type II, III, IV), Examples on Filter Design (IIR & FIR)

Unit V

(7+1 Hrs)

Realization of Filters

A. Block diagrams and Signal flow graph representation of LCCDE, Basic structures for IIR Systems: direct form, cascade form, parallel form, feedback in IIR systems, Basic Structures for FIR Systems: direct form, cascade form, structures for linear phase FIR Systems,

Detail Study of DSP chip architecture as an example of ADSP 21XX series and their desirable features.

B. Instruction set of ADSP 21XX series processor and some examples.

Text Books

1. "Digital signal processing", Proakis J., Manolakis D., Prentice Hall Publications ISBN 9780072957167, 3rd Edition.
2. "Discrete time signal processing", Oppenheim A., Schaffer R., Buck J., Prentice Hall Publications, ISBN 0-849-31093-8 2nd Edition

Reference Books

1. "Digital Signal Processing: A Computer Based Approach", Mitra S., Tata McGraw- Hill, ISBN 0-07-044705-5
2. "Digital Signal Processing", Vallavraj A., S Salivahanan, Tata McGraw- Hill, ISBN 0-07-463996, 2nd Edition

**CS41103:: EMBEDDED SYSTEMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:**

Understanding of Microprocessors , I/O device Interfacing.

Objectives:

- To understand engineering issues in the development of embedded software, such as the importance of addressing the user's concerns, working with limited resources, maintainability, dependability.
- To design and implement module structure to solve a problem, and evaluate alternatives and check its correctness
- Mapping with PEOs: II, III, (c).

Unit I**(9+1 Hrs)****Introduction to Embedded Systems**

A. Embedded Systems: Components, Classification, Characteristics of ES. Review of Microprocessors and Microcontrollers. Embedded Processor Technology, Application Specific System Processor. CISC, RISC , Power Management of peripherals, Reset Ckt / Watch Dog Timers, Structural Units of Microprocessor , Processor and ,Memory Selection ,Interfacing of Processor Memory, I/O Bus management techniques. Serial/Parallel Bus , Bus Design Issues Arbitration

B. Study of Bus Parameter CAN, I2C, SPI.,USB

Unit II**(8+1 Hrs)****Microcontroller (ARM, ARDUINO , RENESAS <any one.)**

A. Family Architecture ,Features ,Data / Programme Memory, Reg set ,Reg Bank, Special Function Registers, Data Memory, Programme Memory, Interrupt Structure , Timer Prog ,Serial Port Prog , Misc Features.

B. Memory I/O Design & Interfacing, Timer Calculation

Unit III**(7+1 Hrs)****PIC Microcontrollers**

A. Features, Architecture Pin Out, Capture /Compare /Pulse width modulation Mode , Block Dia Prog Model, Rest /Clocking, Mem Org, Prog/Data, Flash Eprom, Add Mode/Inst Set Prog , I/o, Interrupt , Timer, ADC



B. Design Parameters problem solving. PWM ADC Timers

Unit IV

(8+1 Hrs)

I/O Interfacing

A. ADC / DAC ,Switch, LED Devices , LCD, High Power Devices Relays , OP Amps : Adder, Subtractor, Gain , Low Pass filter, High Pass filter, Integrator, Differentiator, Current to Voltage Converter, Timing /Counting Devices. Communication using RS232C , Sensors, Magnetic, Temperature, Pressure,

B. Design Implementation of OP Amps

Unit V

(8+1 Hrs)

RTOS

A. Device drivers, Interrupts, Interrupt Service Routines, Scheduling Algo, Inter Process Communication, Process Synchronisation. Multiple Tasks, Threads, Processes. Shared Data / Priority Inversion Char: of RTOS, Real Time Scheduling of RTOS

B. Case Study of Embedded Systems in Detail.(H/W + S/W Algo)

Text Books

1. Raj Kamal 'Embedded Systems ' , Tata McGraw-Hill . ISBN0-07-049470-3
2. Dr. K. V. K. K. Prasad "Embedded/Real time System : Concepts, Design, & Programming ". Dreamtech Press

Reference Books

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma "Programming for Embedded system " Wiley -Dreamtech India Pvt. Ltd.
2. Sriram Iyer , Pankaj Gupta,"Embedded Real time Systems Programming", Tata Mc-Graw Hill, 2004.

Additional Reading

1. Microcontroller Handbook

**CS42101:: ADVANCED COMPUTER GRAPHICS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Computer Graphics**Objectives:**

- To learn about recent research advances in Computer Graphics, Computational Geometry, Interactive Techniques, and Visualization.
- To gain first-hand experience with the challenges of efficient and accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
- To explain the principles and techniques underlying 3D computer graphics and 3D API.
- To develop programming skills in 3D computer graphics.
- To introduce advanced techniques for 3D rendering and modeling.
- Implement key components of the rendering pipeline, especially visibility, rasterization, viewing, and shading.
- Mapping with PEOs: V, (j).

Unit I**(8+1 Hrs)****OpenGL**

A. OpenGL over windows, SDK, Extensions, GLUT, GLU, OpenGL primitives, Programming language: Blending, 3D viewing(camera analogy), Lighting model, Culling, Fog, Texture mapping.

B. OpenGL over Linux, pBuffer rendering, Shadowing Techniques.

Unit II**(8+1 Hrs)****Graphics Hardware**

A. Graphics card, Components of graphics card, General-Purpose computation, GPU, GPGPU, CUDA architecture, CUDA Programming: Type qualifiers, Execution configuration, vector types, functions, APIs.

B. How graphics card works? GeForce 6800 series GPU architecture.

Unit III**(8+1 Hrs)****Advanced Rendering Techniques**



A. Point based rendering, Mesh Simplification, Spatial partitioning, Solid Modeling, Subdivision surfaces: Catmull-Clark subdivision, Subdivision rules, Visibility Computation: culling types, cells and portals, hardware support.

B. Splines , Tessellation, 3D viewing.

Unit IV

(8+1 Hrs)

Photorealistic and Volume Rendering

A. Global Illumination, Normals and reflections, Ray-Tracing algorithm and mathematical formulation, Photon mapping algorithm, Monte Carlo algorithm, Volume graphics overview, Direct volume rendering, Marching square algorithm.

B. Monte Carlo mathematical formulation, Marching cubes algorithm.

Unit V

(8+1 Hrs)

Texture Synthesis and Image Processing

A. Texture synthesis, Image processing: Digital image representation, Image data structures, Sampling and Quantization, Image enhancement in spatial domain.

B. Image compression, Image synthesis.

Text Books

1. "Procedural Elements for Computer Graphics", Rogers David F.,Tata McGraw Hill, 2001, ISBN 0-07-047371-4.
2. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. "Computer Graphics", M Paulin Baker, Donald Hearn, PHI, 2001, ISBN 81-203-09440-8.
2. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8.

Additional Reading

1. "Computer graphics: A Programming approach", Harrington Steven, Tata McGraw Hill, ISBN 0-07-026753-7.
2. "Advanced Animation and Rendering Techniques : Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, acm press, ISBN: 0201544121.
3. "CUDA by Example: An Introduction to General-Purpose GPU Programming" , Jason Sanders, Edward Kandrot, Addison-Wesley, ISBN-13: 978-0-13-138768-3.

**CS42103:: PARALLEL ALGORITHMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

1. To learn concept of parallel processing concept and its requirements.
2. To learn about recent research advances in parallel processing, Computational efficiency.
3. To learn and compare Performance Measures, speed-up, efficiency of Parallel Algorithms
4. Mapping with PEOs: II, III, (c).

Unit I**(8+1 Hrs)****Introduction**

A. Introduction, Parallel Computers, Parallel Processing Concepts,, Need of alternative model, Elements of Parallel Computing, Level of Parallelism, Taxonomy of parallel Computers, Models for Parallel Computations such as Binary Tree, Network Model, PRAM, Hypercube etc.

B. Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit II**(8+1 Hrs)****Parallel Computing Paradigms**

A. Binary tree, Growing by doubling, Pointer jumping, Divide and Conquer, Partitioning, Performance Measures of Parallel Algorithms, speed-up and efficiency of Parallel Algorithms.

B. Examples to Illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.

Unit III**(8+1 Hrs)****Parallel Algorithms**

A. Scalar product of two vectors, Matrix Multiplication, Partial sums, Binomial Coefficients, Range Minima Problem, Tree Algorithms, graph Algorithms

B. Spanning Tree Problem, Biconnected components problem.



Unit IV

(8+1 Hrs)

Array Manipulation

A. Searching & Merging, Parallel search on CREW PRAM, Parallel Search with more data, searching in Unsorted array, Merging by ranking, Bitonic Merging, Sorting Algorithms

B. Sorting Algorithms

Unit V

(8+1 Hrs)

Algebraic Equations and Matrices

A. Geometric Interpretations, Bisection Method, and Determinant of a matrix, System of Linear Equations: Gauss Elimination, Fourier transforms, Polynomial Multiplication, Matrix Inversion.

B. Parallel Algorithms on Gauss Seidal, Numerical Integration etc.

Text Books

1. "Introduction to Parallel Algorithms", C. XAVIER, S S IYENGAR, A Wiley Interscience Publication ISBN 0-471-25182-8,
2. "Designing Efficient Algorithms for Parallel Computer" M.J. Quinn, Mc Graw Hill.



CS42105:: MOBILE COMPUTING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites:

- Communication Engineering
- Computer Network

Objectives

- To understand various wireless networks and their working characteristics.
- To understand characteristics of local and wide area network technologies such as Bluetooth, 802.11 and GSM.
- Distributed systems platforms for mobile computing, including proxy based architectures and service discovery and interaction platforms.
- Mapping with PEOs: I, V, (j).

Unit I

(8+1 Hrs)

Cellular Network

A. Introduction, Generations (1G,2G,3G,4G), Why cellular networks? Basic cellular system, Frequency allocation, System capacity and frequency re-use, Concept of frequency reuse channels, Co-channel interference and its reduction factor. Types of non co-channel interference, Cell splitting.

B. Signal and signal propagation, IEEE 802.11 standard, 802.11a,b,g, 802.15, 802.16.

Unit II

(8+1 Hrs)

GSM Communication

A. System Architecture: GSM Radio subsystem, Interfaces, Network and switching subsystem, Operation subsystem. GSM channels, GSM protocol architecture, Location tracking and call setup, Security, Data services N/W signaling, GSM mobility management, Administration and maintenance.

Handoff- Initialization of handoff, Delaying handoff, Forcing handoff, Power different handoff. Mobile assisted handoff, Intersystem handoff.

B. Survey of GSM network, Hard, Soft Handoff.

Unit III

(9+1 Hrs)

GSM Bearer Services



A. SMS architecture protocol, Hierarchy, VOIP services for mobile networks.

WAP: model and architecture, Gateway, protocol stack.

Telecommunication system: GPRS, wireless in local loop, DECT, EDGE, UMTS, Paging systems, CDPD.

B. Wireless application environment, Bluetooth.

Unit IV

(8+1 Hrs)

Mobile Network and Transport layer

A. Mobile Network layer: Mobile IP, Mobile node, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Mobile ad-hoc networks.

Mobile Transport layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP.

B. TCP over 2.5/3G wireless networks.

Unit V

(7+1 Hrs)

Mobile Databases

A. Database hoarding, Data caching, Data cache and web cache maintenance in mobile environments, Client-Server computing and adaptation, Query processing, Data recovery process, Issues relating to quality of service, Digital audio broadcasting: DAB System, DAB objects, Object transfer protocol, DVB: DVB system.

B. Mobile Billing

Text Books

1. "Mobile Communications", Jochen Schiller, 2nd edition, Pearson education, ISBN- 81-297-0350-5
2. "Mobile Communication", G.K.Behera, Lopamudra Das, Scitech publications, ISBN -9788183711791

Reference Books

1. "Wireless and Mobile Network Architectures", Yi-Bing Lin, Imrich Chlamtac, Wiley publication, ISBN-9971-51-366-8
2. "Mobile Computing", Raj Kamal, Oxford University press, ISBN 978-0-19-568677-7

**CS 42107:: SOFTWARE DESIGN AND ARCHITECTURE****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Software Engineering**Objectives:**

- To describe what patterns are, how to use them, and why they are important.
- To understand contribution of patterns towards the design process efficiency
- To trace the relationship between patterns and traditional methods
- To learn the relationship among patterns, frameworks, object-oriented languages, and software architecture
- To identify fundamental and advanced concepts of design and architectural patterns
- To Structure systems by applying architectural patterns
- To focus on Archetypes and Architecture Documentation
- Mapping with PEOs: I, V, (j).

Unit I**(8+1 Hrs)****Introduction to Software Architecture and Design**

A. Software Architecture Vs Software Design, Software Architecture Relationships to Other Disciplines, Foundations of Software Architecture, Software architecture in the context of the overall software life cycle ,Role of Software Architect, Architectural Styles, Architectural Frameworks, Designing, Describing, and Using Software Architecture, IS2000: The Advanced Imaging Solution, Global Analysis, Conceptual Architecture View, Module Architecture View, Execution Architecture View, Code Architecture View.

B. CASE study of Architectures: Air traffic control case study, Flight simulation case study, SOA, SOMF, TOGAF, CORBA, EJB.

Unit II**(8+1 Hrs)****Architectural Patterns and Design Patterns**

A. Introduction to software Patterns: Architectural Patterns, Design Patterns and Idioms. Architectural Patterns: Blackboard, Pipe and filter, Design Patterns proposed by GoF: Creational Patterns, Structural Patterns, and Behavioral Patterns. Design Patterns proposed by Buchman: Object Management Patterns Adaptation Patterns, Communication Patterns, Patterns for Distribution, Patterns for Interactive Systems, Adaptable Systems, Analysis Patterns.



B. Design patterns in java, software design anti-patterns.

Unit III

(8+1 Hrs)

Enterprise Architecture Patterns

A. Layering, Organizing Domain Logic, Mapping to Relational Databases, Web Presentation, Domain Logic Patterns, Data Source Architectural Patterns, Object-Relational Behavioral Patterns, Object-Relational Structural Patterns, Object-Relational Metadata Mapping Patterns, Web Presentation Patterns, Distribution Patterns, Offline Concurrency Patterns

B. TADG Architecture Patterns, IBM Patterns for e-business

Unit IV

(8+1 Hrs)

Enterprise Architecture Integration

A. Defining EAI, Data-Level EAI, Application Interface-Level EAI, Method-Level EAI, User Interface-Level EAI, The EAI Process, An Introduction to EAI and Middleware, Transactional Middleware and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database-Oriented Middleware and EAI, Java Middleware and EAI, Implementing and Integrating Packaged Applications, XML and EAI, Message Brokers, Process Automation and EAI.

B. Enterprise Integration Patterns

Unit V

(8+1 Hrs)

Archetype Patterns

A. Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern, Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern

B. Application of archetypes in a particular domain to understand pattern mapping.

Text Books

1. Erich Gamma, Richard Helm, Ralph Johnson, "Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610
2. Martin Fowler , "Patterns of Enterprise Application Architecture", Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426



Reference Books

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan, Documenting Software Architectures: Views and Beyond Addison-Wesley Professional 2003, ISBN-10: 0201703726, ISBN-13: 9780201703726
2. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt, "Pattern-Oriented Software Architecture Volume 1, 2, 3, 4, 5", Publisher: Wiley, 1 edition (August 8, 1996-2004), ISBN-10: 0471958697, ISBN-13: 978-0471958697

Additional Reading

1. Fred A. Cummins, "Enterprise Integration: An Architecture for Enterprise Application and Systems Integration", Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103
2. David S. Linthicum, Enterprise Application Integration Addison-Wesley Professional 2003, ISBN-10: 1402052626



CS42109:: BUSINESS INTELLIGENCE

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Database Management Systems.

Objectives:

- To understand the technology and processes associated with Business Intelligence framework.
- To demonstrate understanding of Data Warehouse implementation methodology and project life cycle.
- To understand how to identify the metrics, indicators and make recommendations to achieve the business goal for a business scenario.
- Mapping with PEOs: IV, V, (h), (i).

Unit I

(7+2 Hrs)

Introduction to Business Intelligence

A. Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components- BI Process, BI Technology, BI Roles & Responsibilities.

B. Data Warehouse versus Data Marts, Data Warehouse Architecture.

Unit II

(9+1 Hrs)

Basics of Data Integration (Extraction Transformation Loading)

A. Concepts of Data Integration, Need and Advantages of using Data Integration, Introduction to Common Data Integration Approaches, Introduction to ETL using Kettle, Introduction to Data Quality, Data Profiling Concepts and Applications.

B. Data Cleaning and Data Reduction.

(8+2 Hrs)

Unit III

Introduction to Multi-Dimensional Data Modeling

A. Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star and Snowflake Schema, Introduction to Business Metrics and KPIs, Creating Cubes using Microsoft Excel.

B. Comparison of different Data Warehouse Schemas.



Unit IV

(8+1 Hrs)

Basics of Enterprise Reporting

A. Introduction to Enterprise Reporting, Concepts of Dashboards, Balanced Scorecards, Enterprise Reporting using MS Access / MS Excel.

B. Types of Enterprise Reports, Components of Reporting System.

Unit V

(8+1 Hrs)

Data Mining for BI

A. Need of Data Mining, Knowledge Discovery in Database (KDD), Architecture of Data Mining System, Data Mining on Different kind of Data, Data Mining Functionalities.

B. kNN Classifier, k-means Clustering.

Text Books

1. “Business Intelligence”, David Loshin, Morgan Kaufman, ISBN 978-1-55860-916-7, 2003 Edition.
2. “Data Mining: Concepts and Techniques”, Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. “Business Intelligence for the Enterprise”, Mike Biere, Pearson Education, ISBN 0-13-141303-1, 2003 Edition.
2. “Business intelligence Roadmap”, Larissa Terpeluk Moss, Shaku Atre, Pearson Education, ISBN 0201784203, 2003 Edition.

**CS 42111:: SOFTWARE TESTING AND QUALITY ASSURANCE****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Software Engineering**Objectives:**

- To understand Software Measurement Theory and Software Test Automation
- To practice Software Testing Techniques and Strategies
- Understand the fundamental concepts, approaches, and methodologies in software quality management and assurance.
- Understand the framework and general approach of several Quality System Standards and Total Quality Management (TQM).
- Mapping with PEOs: III, (e).

Unit I**(7+1 Hrs)****Software Measurement**

A. Measurement Theory and Why to Measure the Software, Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Aspects of Software Size, Software Length and Reuse, Software Functionality and Complexity, Types of Structural Measures, Control Flow Structures, Halstead's Software Science, Product Quality Metrics, In-Process Quality Metrics, The Rayleigh Model, Exponential Distribution and Reliability Growth Models

B. SRE process, Reliability Concepts: Hardware and Software, Deploying SRE

Unit II**(9+1 Hrs)****Principles of Testing**

A. Testing Concepts: Purpose of Software Testing, Testing Principles, Goals of Testing, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures, Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods, Levels of Testing

White-Box Testing: Test Adequacy Criteria, Static Testing, Structural Testing, Code Complexity Testing, Mutation Testing, Data Flow Testing

Black-Box Testing: Test Case Design Criteria, Requirement Based Testing, Positive and Negative Testing, Boundary Value Analysis, Equivalence Partitioning State Based Testing, Domain Testing

B. Analysis of Flow Graphs, Complexity Measures and computations

**Unit III** (8+1 Hrs)
Functional Testing

- A.** Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment, Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Benefits of Formal Test Documentation, Types of Testing Documentation, Verification Testing, Validation Testing, Integration Testing, System and Acceptance Testing, GUI Testing, Regression Testing
- B.** Software Defects: Origins of Defects, Defect Classes, Defect Repository / Test Design, Developer/Tester Support for Defect Repository, Need for Testing

Unit IV (9+1 Hrs)
Higher Order Testing

- A.** Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client –Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing, Testing VS Test Automation, Tool evaluation and selection, Automation team roles, Architectures, Planning and implementing test automation process
- B.** IEEE Standards Related to Testing, ISO 12207 & IEEE/EIA Std12207on Testing, ISO 9000:2000 on Testing, ISO 9003, IEEE Std 1012, IEEE Std 1028

Unit V (7+1 Hrs)
Software Quality Assurance

- A.** Quality Concepts, Software Quality Assurance, Planning for SQA, Six Sigma Principles, Malcolm Baldrige Assessment, Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Ishikawa's Seven Basic Tools, Using Agile Methods to Improve Software Testing, Building Agility into the Testing Process, Software Maintenance, Purpose of Inspection, Cost of Inspections, Defect Detection and Prevention, Feedback, Feed-forwards and Control, Flow of Inspection Process, Activities of Inspection, Economics of Inspections
- B.** Software Benchmarks and Baselines, Key Factors for Software Assessment and Benchmark Studies, Identifying Software Best and Worst Practices

Text Books

1. Fenton, Pfleeger, "Software Metrics: A Rigorous and practical Approach", Thomson Brooks/Cole, ISBN 981-240-385-X.



2. Desikan, Ramesh, “ Software Testing: principles and Practices”, Pearson Education, ISBN 81-7758-121-X.

Reference Books

1. Burnstein, “Practical Software Testing”, Springer International Edition, ISBN 81-8128-089-X
2. William E. Perry, “ Effective Methods for Software Testing”, John Wiley and Sons, ISBN 9971-51-345-5

Additional Reading

1. Nina Godbole, “Software Quality Assurance: Principles And Practice”,Alpha Science International, Ltd (August 1, 2004) ISBN-10: 1842651765 ISBN-13: 978-1842651766
2. Ronald Radice, “Software Inspections”, Tata McGraw Hill, ISBN 0-07-048340-X
3. Capers Jones,” Software Assessments, Benchmarks, and Best Practices” ,*Burlington, Vermont* Publisher: Addison-Wesley Professional 2000 ISBN-10: 0201485427 ,ISBN-13: 9780201485424

**CS42115:: HUMAN COMPUTER INTERACTION****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To understand the influence of the human factors on the interface design and development of application software.
- To study the methods and techniques for user-centered design and task analysis-based structural design of the interactions.
- To provide the concepts and strategies for making design decisions for user interface.
- Mapping with PEOs: II, III, (c).

Unit I**(7+1 Hrs)****Introduction**

A. Human, Input-Output Channels, Human Memory, Thinking, Emotions, Computer, Input-Output Devices, Definition of HCI, Usability, Interface, Goals of System Engineering, Goals of User Interface Design, Motivations for Human Factors in Design, Paradigms for Interaction.

B. Selection of Product/System with Interface and Study of Its Usability.

Unit II**(9+2 Hrs)****Principles, Models & Guidelines**

A. Principle 1: Recognize the Diversity, Principle 2: Use the Eight Golden Rules of Interface Design, Principle 3: Prevent Errors, Guidelines for Data Display, Guidelines for Data Entry, Conceptual, Semantic, Syntactic and Lexical Model, GOMS and Keystroke-Level Model, Stages of Action Models, Linguistic Models, BNF, Task Action Grammar.

B. Specialized Users and Their Relevance to Selected Product/System.

Unit III**(8+2 Hrs)****Design Process and Interaction Styles**

A. Design, Three Pillars of Design, Process of Design, Ethnographic Observations, Participatory Design, LUCID, Scenarios, Navigation Design, Screen Design and Layout, Specification Methods, Interaction Styles, Direct Manipulation Systems, Menu Selection, Form-Fillin, Natural Language, Command Language, Dialog Design Notations.

**B. Web/Interface Design for Selected Product/System.****Unit IV****(8+2 Hrs)****Evaluation Techniques and Implementation support**

A. Usability Testing, Heuristic Evaluation, Expert Reviews, Usability Surveys, Semiotic Analysis, Acceptance Tests, Evaluation During Active Use, Elements of Windowing Systems, Individual Window Design, Multiple Window Design, Coordination by Tightly-Coupled Windows, Image Browsing by Tightly-Coupled Windows.

B. Usability Evaluation of Selected Product/System.

Unit V**(8+1 Hrs)****Documentation and Groupware**

A. Classification of Documents, Printed Manuals, Online Facilities, Error Messages, Groupware, Goals of Co-operations, Asynchronous Interactions, Synchronous Distributed, Face to Face, Applying CSCW to Learning, Social Networks, Social Networking Sites.

B. Documentation Design for Selected Product/System.

Text Books

1. "Human-Computer Interaction", Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. "Designing the User Interface", Ben Shneiderman, Pearson Education, ISBN 81-7808-262-4, 3rd Edition.

Reference Books

1. "The Elements of User Interface Design", Theo Mandel, John Wiley & Sons, Inc, ISBN 0-471-16267-1.
2. "The Essentials of User Interface Design", Alan Cooper, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0213-4.

Additional Reading

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "The Essential Guide to User Interface Design", Wilbert O. Galitz, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0280-0, 2nd Edition.
3. "Human-Computer Interaction in the New Millennium", John M. Carroll, Pearson Education, ISBN 81-7808-549-6.

**CS42117:: ARTIFICIAL INTELLIGENCE****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To learn and understand the knowledge representation techniques for knowledge base
- Mapping with PEOs: III, IV, (f).

Unit I**(8+1 Hrs)****Introduction**

A. Introduction, A.I. Representation, AI Techniques, Representation of Knowledge, Knowledge Base Systems, State Space Search, Production Systems, Problem Characteristics, types of production systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation

B. Criteria for Success, Turing Test.

Unit II**(8+1 Hrs)****Heuristics Search Techniques**

A. Depth First Search, Breadth First Search, Generate & test, Hill Climbing, Best First Search, A* and AO* Algorithm, Constraint satisfaction, Means-Ends Analysis. Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence, Secondary search.

B. Applications Minimax Algorithm.

Unit III**(8+1 Hrs)****Predicate Logic**



A. Using predicate logic: Predicate Calculus, Predicate and arguments, ISA Hierarchy, Frame notation, Resolution, Natural Deduction.

Representing simple facts in Logic - Logic Programming, Computable functions in predicates, resolution, unification, Forward and backward reasoning, Expert System, Basics of PROLOG.

B. Propositional Logic, Case study of Expert system in PROLOG.

Unit IV

(8+1 Hrs)

Structured Knowledge Representation

A. TMS (Truth maintenance system), Statistical and probabilistic reasoning, Associative Networks, Semantic Nets, Frames Structures, Learning – Concept of Learning – Learning Automata, Genetic Algorithm, Learning by induction

Planning: Block world, strips, Implementation using goal stack, Non linear planning, Hierarchical planning, and least commitment strategy.

B. Conceptual Dependency & Scripts, Various types of learning.

Unit V

(8+1 Hrs)

Natural Language Processing

A. Introduction, Syntactic processing, Semantic analysis and representation structures. Grammers and Parsers, Discourse and Pragmatic processing.

B. Augmented Transition Network, Understanding.

Text Books

1. "Artificial Intelligence", Elaine Rich and Kerin Knight, Tata McGraw Hill, ISBN 0-07-460081-8.
2. "Artificial Intelligence: A Modern Approach", Stuart Russell & Peter Norving Pearson Education, 2nd Edition.

Reference Books

1. "Prolog Programming For Artificial Intelligence" , Ivan Bratko , 2nd Edition Addison Wesley, 1990.
2. "Introduction to Artificial Intelligence.", Eugene, Charniak, Drew Mcdermott, Addison Wesley

Additional Reading

1. "Introduction to AI and Expert Systems", Patterson, PHI
2. "Principles of Artificial Intelligence", Nilsson, Morgan Kaufmann.
3. "Artificial Intelligence and Intelligent Systems", N.P. Padhy, OXFORD, 2005



CS42119:: INFORMATION RETRIEVAL

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Data Communication.

Objectives:

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.
- Mapping with PEOs: III, (a).

Unit I

(9 Hrs)

Introduction

A. Introduction to Information retrieval, A Taxonomy of Information Retrieval Models, Retrieval: Ad Hoc and Filtering, A Formal Characterization of IR Models, Classic Information Retrieval, Set Theoretic Models, Fuzzy Set Model, Algebraic Models, Probabilistic Models, Structured Text Retrieval Models.

B. Models for Browsing
SLIP, SONET, MPLS.

Unit II

(8 Hrs)

Retrieval Evaluation and Querying

A. Recall and Precision, Alternative Measures, Reference Collections, Keyword Based Querying, Pattern Matching, Structural Queries, User Relevance Feedback.

B. Automatic Local Analysis, Automatic Global Analysis.

Unit III

(8 Hrs)

Indexing and Searching

A. Inverted Files, Suffix Trees and Suffix Arrays, Signature Files, Boolean Queries, Sequential Searching, Pattern Matching, String Matching Allowing Errors, Regular Expressions and Extended Patterns, Pattern Matching using Indices, Structural Queries.

B. Compression.

Unit IV

(8 Hrs)

Web Searching



- A. Characterizing the Web, Search Engines, Browsing, Metasearchers, Searching using Hyperlinks, Parallel IR, Distributed IR,
- B. Web Issues.

Unit V

(7 Hrs)

Multimedia IR

- A. Data Modeling, Query Languages, A Generic Multimedia Indexing Approach, One Dimensional Time Series , Two Dimensional Color Images , Automatic Feature Extraction.
- B. Image features and similarity functions.

Text Books

1. “Modern Information Retrieval”, by Ricardo Baeza-Yates, Berthier Ribeiro-Neto, Addison Wesley Longman Publishing Co. Inc, ISBN:020139829X, 1999.
2. “Introduction to Information Retrieval”, by Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. ISBN: 0521865719, 2008.

Reference Books

1. “Information Retrieval”, C. J. Van Rijsbergen, Information Retrieval Group, University of Glasgow, online at <http://www.dcs.gla.ac.uk/Keith/Preface.html>.
2. “Information Retrieval Data Structures & Algorithms” by Bill Frakes, Ricardo Baeza-Yates, Prentice-Hall, ISBN 0-13-463837-9, 1999.

**CS42121:: COMPUTER ARCHITECTURE****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Computer Organization ,Operating Systems ,Microprocessors**Objectives :**

- To understand the concept of Parallel Processing and Parallel Architectures
- Mapping with PEOs: I, II, (b).

Unit I**(8+1 Hrs)****Overview of Parallel Processing**

A. Necessity of high performance, Constraints of conventional architecture, Parallelism in Uniprocessor system, Evolution of parallel processors, Architectural Classification, Flynn's, Fengs , handlers classification. Pipeline, Vector, Array and Multiprocessors architecture basics, Bernstein's' condition for parallelism, dependence graphs. Parallel Programming Models Shared memory, Message passing model concepts Performance metrics and Measures, Minsk's conjecture Speedup performance Laws, Amdahl's & Gustafson's laws.

B. Applications of Parallel Processing

Unit II**(8+1 Hrs)****Pipeline Architecture**

A. Principles and implementation of Pipelining, Classification of pipelining processors, Arithmetic and Instruction pipelining, Instruction level parallelism (ILP) Pipelining hazards and resolving techniques, Data forwarding. register renaming pipeline reservation table, sequencing and collision, Branch problem, branch penalty .prediction. Delayed branching Branch target buffer Advanced pipelining techniques, loop unrolling techniques, br Superscalar pipelining, speedup, in order, out of order execution, VLIW processor software scheduling, Software pipelining.

B. EPIC IA 64, Predicated execution, speculative loading, Register stack engine, Case study: Super scalar Architecture- Pentium

Unit III**(8+1 Hrs)****Vector and Array Processor**

A. Basic vector architecture, Issues in Vector Processing, Vector Instructions Register to Register and Memory to Memory Architectures Vector performance, Vector Chaining



, Vector loops and recurrence vectorizers and optimizers, Cray I Cray Y-MP
SIMD Computer Organization: Distributed & shared memory model Processing Element (PE) Masking and Data Routing Inter PE Communication
Interconnection networks of SIMD, Static Vs Dynamic network, Permutations, Shuffle exchange, Bit reversal hyper cube ,mesh network, Iliac, omega, blocking, non blocking networks.

Compute Unified Device Architecture (CUDA) Hardware , Memory, Thread model
Parallel Algorithms For Array Processors: Matrix Multiplication. Sorting on mesh, hypercube and CUDA Vectorization and Parallelization methods

B. Systolic Architecture ,CM-2,Cyber 205, Iliac Architecture

Unit IV

(8+1 Hrs)

Multiprocessor Architecture

A. UMA, NUMA, COMA MPP Processor. Loosely and Tightly coupled multiprocessors, characteristics of multiprocessors & multiprocessing, Inter Processor communication network, Time shared bus, Crossbar switch, Interleaved memories S access, C access.

Cache coherency and bus snooping and directory based protocols. Massively Parallel Processors (MPP), Inter Processor Communication and Synchronization.

Multithreaded Architecture Latency hiding techniques, Principles of multithreading, Issues and solutions. Multithreaded processors model, context switching policies. Blocked multithreading, Interleaved multithreading, simultaneous multithreading.

Software multithreading, thread concept, lightweight process (LWP), bounded, unbounded threads, thread management : thread scheduling & control by thread library & kernel (State transition diagram)

B. Cluster and grid computing concepts.

Unit V

(8+1 Hrs)

Parallel Software Issues

A. Operating systems for multiprocessors systems, software issues for multiprocessors Message Passing Interface (MPI) Principles of Parallel Algorithm design: Decomposition, tasks and Dependency graphs. Parallel language constructs. Programming using message passing and shared memory paradigms (Sorting, searching, matrix problems)

Parallel programming languages POSIX thread, Java threads

B. Writing parallel programs, analytical modeling of parallel programs

Text Books

1. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill ISBN 0-07-113342-9
2. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition ISBN 007-066354-8



3. V. Raja Raman, L Siva ram Murthy, "Parallel Computers Architecture and Programming", PHI ISBN 81-203-1621-5

Reference Books:

1. Dezso Sima, Fountain, Kacsuk“ Advanced Computer Architecture “ Pearson Education Asia ISBN 981-4053-74-0
2. Culler, Jasvinder Pal Singh, Gupta “Parallel Computer Architecture“ Morgan Kaufman (ELSVIER) ISBN 81-8147-189-X
3. Grama ,Gupta , Karypis, Vipin Kumar : Introduction to Parallel Computing “ Pearson learning ISBN 978-81-317-0807-1



CS41201:: DIGITAL SIGNAL PROCESSING

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Nil

Objectives:

- To understand how to analyze and manipulate digital signals in various domains
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

- 1 Verification of sampling Theorem:
- 2 Linear Convolution
- 3 GDE
- 4 Correlation.
- 5 Pole Zero Implementation
- 6 Magnitude and Phase response of a system
- 7 DFT
- 8 Circular convolution
- 9 FFT Algorithms (DIT/DIF)
- 10 Design IIR filter using analog filter approximations
- 11 Designing FIR filters using windowing techniques

Students should implement the above assignments in Matlab .



Text Books

1. “Digital signal processing”, Proakis J., Manolakis D., Prentice Hall Publications ISBN 9780072957167, 3rd Edition.
2. “Discrete time signal processing”, Oppenheim A., Schafer R., Buck J., Prentice Hall *Publications*, ISBN 0-849-31093-8 2nd Edition

Reference Books

1. “Digital Signal Processing: A Computer Based Approach”, Mitra S., Tata McGraw- Hill, ISBN 0-07-044705-5
2. “Digital Signal Processing”, Vallavraj A., S Salivahanan, Tata McGraw- Hill, ISBN 0-07-463996, 2nd Edition



CS 42211:: SOFTWARE TESTING AND QUALITY ASSURANCE

Credits: 01

Teaching Scheme: -Tutorial 1 Hr/Week

Prerequisites: Software Engineering

Objectives:

- To understand Software Measurement Theory and Software Test Automation
- To practice Software Testing Techniques and Strategies
- Understand the fundamental concepts, approaches, and methodologies in software quality management and assurance.
- Understand the framework and general approach of several Quality System Standards and Total Quality Management (TQM).
- Mapping with PEOs: III, (e).

List of Contents

A TERM-WORK containing the record of the following:

1. To Prepare Test Plan for the given problem. The Test plan consists of following issues.
 - a. Purpose of the test.
 - b. Location and schedule of the test.
 - c. Test descriptions.
 - d. Pass and Fail Criteria.
2. To identify and narrate Test cases, Test scripts/procedures. To learn Test suite in manual testing using Rational Test Manager tool to explore testing basic concepts.
3. To study difference between Automation Testing and Manual Testing use Rational Robot and Rational Test Manager (Hands on).
4. To perform Unit testing especially indicating the traced Independent data paths, Control paths and Error handling paths. Prepare control flow graphs for the unit under test. Compute the Cyclomatic complexity of the unit.
5. To perform Data Flow testing for the Program Segments by identifying the Definition-Use chain and type of data flow anomaly.



6. To perform Mutation Analysis of the Program Segments along with mutant history, mutation score and type of mutation by using any Code analysis Tool (JUNIT).
7. To perform Black-Box Testing for all the units contained in the architectural segments using Equivalence Partitioning, Boundary Value Analysis and Orthogonal Array testing methods.
8. To study exploratory Testing for the Module under Test and merits/demerits of this technique.
9. To study Regression Testing / GUI Testing of the System under construction with Unit and Integration profiles by using any Functional Testing Tool.
10. To study Web Based Testing for Web Application incorporating any Open Source Tool available. To study Performance Testing, Load Testing, Security Testing, Stress Testing, Demonstrate on link Test expectation.

Text Books

1. Fenton, Pfleeger, “Software Metrics: A Rigorous and practical Approach”, Thomson Brooks/Cole, ISBN 981-240-385-X.
2. Desikan, Ramesh, “Software Testing: principles and Practices”, Pearson Education, ISBN 81-7758-121-X.

Reference Books

1. Burnstein, “Practical Software Testing”, Springer International Edition, ISBN 81-8128-089-X
2. William E. Perry, “Effective Methods for Software Testing”, John Wiley and Sons, ISBN 9971-51-345-5

Additional Reading

1. Nina Godbole, “Software Quality Assurance: Principles And Practice”, Alpha Science International, Ltd (August 1, 2004) ISBN-10: 1842651765 ISBN-13: 978-1842651766
2. Ronald Radice, “Software Inspections”, Tata McGraw Hill, ISBN 0-07-048340-X
3. Capers Jones, “Software Assessments, Benchmarks, and Best Practices”, Burlington, Vermont Publisher: Addison-Wesley Professional 2000 ISBN-10: 0201485427 ,ISBN-13: 9780201485424



CS42215:: HUMAN COMPUTER INTERACTION

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To identify and incorporate key social, cognitive and physiological factors that influence user perceptions, understandings and usages of Information Technology.
- To motivate students for interviews and field-work with users for improved practical approach in interface/interaction design.
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

1. Design user persona for the users of selected product/system.
2. Perform GOMS analysis for selected product/system.
3. Conduct a contextual inquiry for selected product/system.
4. Design an interface prototype for selected product/system.
5. Evaluate an interface using usability testing / evaluation technique.

Text Books

1. “Human-Computer Interaction”, Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. “Designing the User Interface”, Ben Shneiderman, Pearson Education, ISBN 81-7808-262-4, 3rd Edition.

Reference Books

1. “The Elements of User Interface Design”, Theo Mandel, John Wiley & Sons, Inc, ISBN 0-471-16267-1.
2. “The Essentials of User Interface Design”, Alan Cooper, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0213-4.



Additional Reading

1. “The Design of Everyday Things”, Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. “The Essential Guide to User Interface Design”, Wilbert O. Galitz, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0280-0, 2nd Edition.
3. “Human-Computer Interaction in the New Millennium”, John M. Carroll, Pearson Education, ISBN 81-7808-549-6.



CS42217:: ARTIFICIAL INTELLIGENCE

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To learn and understand the knowledge representation techniques for knowledge base.

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

- i. Implement Tic-tack-toe problem using heuristic functions.
- ii. Implement A* Algorithm with any example
- iii. Implement AO* algorithm
- iv. Implement mini-max search to solve at least two game problems
- v. Implement the concept of constraint satisfaction problem
- vi. Implement the concept of Resolution in knowledge Representation.
- vii. Implement Goal stack planning
- viii. Implementation of truth maintenance system using prolog
- ix. Development of mini-expert system using prolog



Text Books

1. "Artificial Intelligence", Elaine Rich and Kerin Knight, Tata McGraw Hill, ISBN 0-07-460081-8.
2. "Artificial Intelligence: A Modern Approach", Stuart Russell & Peter Norving, Pearson Education, 2nd Edition.

Reference Books

1. "Prolog Programming For Artificial Intelligence", Ivan Bratko , 2nd Edition Addison Wesley, 1990.
2. "Introduction to Artificial Intelligence.", Eugene Charniak, Drew McDermott, Addison Wesley

Additional Reading

1. "Introduction to AI and Expert Systems", Patterson, PHI
2. "Principles of Artificial Intelligence", Nilsson, Morgan Kaufmann.
3. "Artificial Intelligence and Intelligent Systems", N.P. Padhy, OXFORD, 2005



CS42219:: INFORMATION RETRIEVAL

Credits: 01

Teaching Scheme: - Tutorial 1 Hrs/Week

Prerequisites: Data Communication.

Objectives:

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :

1. Write a program for text retrieval using fuzzy set model.
2. Write a program for text retrieval using probabilistic model.
3. Write a program for keyword based text retrieval.
4. Write a program for text retrieval using pattern matching.
5. Write a program for creating inverted index file.
6. Study of multimedia retrieval.
7. Study of search engine architecture.

Text Books

1. “Modern Information Retrieval”, by Ricardo Baeza-Yates, Berthier Ribeiro-Neto, Addison Wesley Longman Publishing Co. Inc, ISBN:020139829X, 1999.
2. “Introduction to Information Retrieval”, by Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. ISBN: 0521865719, 2008.



Reference Books

1. “Information Retrieval”, C. J. Van Rijsbergen, Information Retrieval Group, University of Glasgow, online at <http://www.dcs.gla.ac.uk/Keith/Preface.html>.
2. “Information Retrieval Data Structures & Algorithms” by Bill Frakes, Ricardo Baeza-Yates, Prentice-Hall, ISBN 0-13-463837-9, 1999.



CS42221:: COMPUTER ARCHITECTURE

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Objectives:

1. To build analytical thinking
2. To understand the practical implementation of parallelism with problem solving.
3. To study Compute Unified Device Architecture and implement parallel algorithms
4. Mapping with PEOs: I, II, (b).

Course Instructor will assign problems relevant to Units I to V. Students will implement the assignments in laboratory. Group of 2-3 students will be given different problems and will have to present it for assessment

1. Problems from Chapters 1, 2, 3 (Text book 1.)
2. Problems from Chapters 6, 7, 8 (Text book 1.)
3. Simulate a SIMD Machine with programmable PE s and solve Sorting problems.
4. Implement prefix , dot product computation in CUDA
5. Matrix operations in CUDA and simulation on Hypercube.
6. Case Studies of current supercomputers.

Text Books

1. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill ISBN 0- 07-113342-9
2. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition ISBN 007-066354-8
3. V. Raja Raman, L Siva ram Murthy, "Parallel Computers Architecture and Programming", PHI ISBN 81-203-1621-5

Reference Books

1. Dezso Sima, Fountain, Kacsuk“ Advanced Computer Architecture “ Pearson Education Asia ISBN 981-4053-74-0
2. Culler, Jasvinder Pal Singh, Gupta “Parallel Computer Architecture“ Morgan Kaufman (ELSVIER) ISBN 81-8147-189-X



BRACT'S

Vishwakarma Institute of Technology, Pune – 411 037

Department of Computer Engineering

3. Grama ,Gupta , Karypis, Vipin Kumar : Introduction to Parallel Computing “
Pearson learning ISBN 978-81-317-0807-1



CS41303:: EMBEDDED SYSTEMS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Microprocessor Interfacing Techniques.

Objectives:

- To understand engineering issues in the development of embedded software, such as the importance of addressing the user's concerns, working with limited resources, maintainability, dependability.
- To design and implement module structure to solve a problem, and evaluate alternatives and check its correctness
- Mapping with PEOs: II, III, (c).

List of Practical

1. Study of Microcontroller Development Kit
2. Generate a frequency == <YOUR ROLL NO.: * 1000> Hz. Using all 3 Timers on Microcontroller Kit.
3. Establish Serial Communication between PIC KIT and PC.
4. Read Analog Data , Convert to BCD / ASCII and display it on PC.
5. Read PIC Kit to Read input from a switch count number key presses and display on LED Display.
6. Stepper Motor Controller using PIC KIT. Use switch press to change Direction and Increase / Decrease Speed.
7. Op Amps Filter High Pass , Low Pass.
8. Op Amps Gain Adder, Subtractor.
9. Interface sensors (thermal, Opto Coupler etc.)with Microcontroller
10. Interface sensors (magnetic)with Microcontroller



11. Interface Proximity Switch with Microcontroller.

12. Interface R_2R ladder with MCS-51.

13. Study of RTOS

Text Books

1. Raj Kamal 'Embedded Systems', Tata McGraw-Hill . ISBN0-07-049470-3
2. Dr. K. V. K. K. Prasad "Embedded / real time System : Concepts, Design, & Programming ". Dreamtech Press

Reference Books

1. Sensor Spec manuals
2. Microcontroller Manuals



CS42301:: ADVANCED COMPUTER GRAPHICS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To gain first-hand experience with the challenges of efficient and accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
- To introduce a current 3D graphics API.
- To develop programming skills in 3D computer graphics.
- Become acquainted with some advanced topics in computer graphics; these might include texturing, physically-based modeling, procedural modeling, curves and surfaces, global illumination, interaction, and visualization.
- Mapping with PEOs: V, (j).

List of Practical

1. Implement an OpenGL program to draw different 2D shapes.
2. Implement an OpenGL program to draw 2 overlapped shapes and use alpha blending.
3. Implement an OpenGL program to draw 3D cube and apply transformations.
4. Implement an OpenGL program to draw 12 spheres and apply different light effects.
5. Implement an OpenGL program to draw scene and apply fog effect.
6. Implement an OpenGL program to draw 3D cube and apply different textures on different faces.
7. Implement CUDA program for the prefix addition.
8. Implement CUDA program for the multiply two matrices.
9. Draw histogram of 256-color bmp image.
10. Implement a program for edge detection using Gaussian filter.



Text Books

1. "Procedural Elements for Computer Graphics", Rogers David F., Tata McGraw Hill, 2001, ISBN 0-07-047371-4.
2. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. "Computer Graphics", M Paulin Baker, Donald Hearn, PHI, 2001, ISBN 81-203-09440-8.
2. "Digital Image Processing", Rafael C. Gonzalez, Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8.

Additional Reading

1. "Advanced Animation and Rendering Techniques : Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, acm press, ISBN: 0201544121
2. "CUDA by Example: An Introduction to General-Purpose GPU Programming", Jason Sanders, Edward Kandrot, Addison-Wesley, ISBN-13: 978-0-13-138768-3.



CS42303:: PARALLEL ALGORITHMS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To learn concept of parallel processing concept and its requirements.
- To learn about recent research advances in parallel processing, Computational efficiency.
- To learn and compare Performance Measures, speed-up, efficiency of Parallel Algorithms
- Mapping with PEOs: II, III, (c).

List of Practical

1. Implement the concept of Parallel Algorithm using simple algorithms like sum of n numbers, prefix sums etc.
2. Implement the concept of Divide and Conquer
3. Implement Matrix multiplication
4. Implement Range minima Problem
5. Implement Tree algorithm
6. Implement Graph Algorithm
7. Implement Parallel Merge Application
8. Implement any one Parallel Algorithm on Algebraic Equations.

Text Books

1. "Introduction to Parallel Algorithms", C. XAVIER, S S IYENGAR, A Wiley Interscience Publication ISBN 0-471-25182-8,
2. "Designing Efficient Algorithms for Parallel Computer" M.J. Quinn, Mc Graw Hill.



CS42305:: MOBILE COMPUTING

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Computer Networks

Objectives:

- Understand the basic of mobile communication.
- Understand the gaming applications on mobile.
- Understand the transfer of files in mobile network.
- Mapping with PEOs: I, V, (j).

List of Practical

Assignments should be implemented on android operating systems.

1. Design simple GUI application with activity and intents e.g. calculator.
2. Design an application to handle address book and call log.
3. Design an application to display map with current location.
4. Design an application to send SMS and emails.
5. Design a client server application to communicate with database server.
6. Design an application for voice calling over IP.
7. Design an application for sending files.
8. Design a gaming application.
9. Design GSM network of 5 nodes and implement handoffs.
10. Design a GSM network and access the channel using ALOHA.

Text Books

1. "Beginning Android Application Development", Wei-Meng Lee, Wrox publication, ISBN: 978-1-118-01711-1, March 2011.
2. "Mobile Communications", Jochen Schiller, 2nd edition, Pearson education,



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ISBN- 81-297-0350-5.

Reference Books

1. “Wireless and Mobile Network Architectures”, Yi-Bing Lin, Imrich Chlamtac, Wiley publication, ISBN-9971-51-366-8.
2. “Mobile Computing”, Raj Kamal, Oxford University press, ISBN 978-0-19-568677-7



CS 42307:: SOFTWARE DESIGN AND ARCHITECTURE

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Software Engineering

Objectives:

- To describe what patterns are, how to use them, and why they are important.
- To understand contribution of patterns towards the design process efficiency
- To trace the relationship between patterns and traditional methods
- To learn the relationship among patterns, frameworks, object-oriented languages, and software architecture
- To identify fundamental and advanced concepts of design and architectural patterns
- To Structure systems by applying architectural patterns
- To focus on Archetypes and Architecture Documentation
- Mapping with PEOs: I, V, (j).

List of Practical

1. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Abstract Factory and Composite design patterns. State the complete pattern specification and note the difference between the patterns.
2. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Facade and Proxy design patterns. State the complete pattern specification and note the difference between the patterns.
3. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Flyweight and Iterator design patterns. State the complete pattern specification and note the difference between the patterns.
4. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Template and Command design patterns. State the complete pattern specification and note the difference between the patterns.



5. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Mediator and Observer design patterns. State the complete pattern specification and note the difference between the patterns.
6. Select a complex system and narrate concise specification for the same. Develop architecture specification and use archetypes to recognize the architectural elements.

Text Books

1. Erich Gamma, Richard Helm, Ralph Johnson, ,“Design Patterns: Elements of Reusable Object-Oriented Software” (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610
2. Martin Fowler ,“Patterns of Enterprise Application Architecture”, Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426

Reference Books

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan, Documenting Software Architectures: Views and Beyond Addison-Wesley Professional 2003, ISBN-10: 0201703726, ISBN-13: 9780201703726
2. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt ,”Pattern-Oriented Software Architecture Volume 1, 2, 3, 4, 5”, Publisher: Wiley, 1 edition (August 8, 1996-2004), ISBN-10: 0471958697, ISBN-13: 978-0471958697

Additional Reading

1. Fred A. Cummins ,“Enterprise Integration: An Architecture for Enterprise Application and Systems Integration”, Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103
2. David S. Linthicum, Enterprise Application Integration Addison-Wesley Professional 2003, ISBN-10: 1402052626



CS42309:: BUSINESS INTELLIGENCE

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Database Management System.

Objectives:

- To allow the students to apply Technical, Behavioral, Process concepts on real-life project.
- To design an enterprise dashboard that depicts the key performance indicators this helps in decision making.
- Mapping with PEOs: IV, V, (h), (i).

List of Practical

1. Design a star / snowflake schema for a data warehouse for an organization.
2. Project 1: Data in disparate data sources such as Excel, text file, databases etc. will be provided to the students. They will be expected to extract, cleanse, integrate and load it into the data-warehouse.
3. Project 2: Design reports according to given business scenarios. The data for the reports is to be pulled from the data-warehouse built in the earlier project.

Text Books

1. “Business Intelligence”, David Loshin, Morgan Kaufman, ISBN 978-1-55860-916-7, 2003 Edition.
2. “Data Mining: Concepts and Techniques”, Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. “Business Intelligence for the Enterprise”, Mike Biere, Pearson Education, ISBN 0-13-141303-1, 2003¹ Edition.
2. “Business intelligence Roadmap”, Larissa Terpeluk Moss, Shaku Atre, Pearson Education, ISBN 0201784203, 2003 Edition.



Additional Reading

1. “Delivering business intelligence with Microsoft SQL server 2008”, Brian Larson, Tata McGraw Hill Edition, ISBN 978-0-07-014259-6, 2009 Edition.
2. “Foundations of SQL Server 2005 Business Intelligence”, Lynn Langit, Springer (India) Pvt. Ltd., ISBN 978-81-8128-708-3.

**CS47303:: PROJECT STAGE 2****Credits:** 04**Teaching Scheme:** - Practical 6 Hrs/Week**Aim**

This course addresses the issues associated with the successful management of a software development project. The course emphasizes project life cycle phases requirement engineering, system analysis and system design. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and their career. The Project Work can lead to:

- a. Transform existing systems into conceptual models.
- b. Transform conceptual models into determinable models.
- c. Use determinable models to obtain system specifications.
- d. Select optimum specifications and create physical models.
- e. Apply the results from physical models to create real target systems.

Objectives

1. To provide an understanding of the project planning process and problem scoping
2. To define roles and work with cross functional teams
3. To establish clear project objectives and milestones
4. To create effective and deliverable project plans
5. To perform rigorous analysis and design activities for solution planning
6. To select appropriate technology for implementation and testing
7. Mapping with PEOs: III, IV, (f).

Overview of the Course:

1. The Student Project Group is expected to make a survey of situation for identifying the requirements of selected Technological Problem. The Student Project Group will be monitored by Internal Guides and External Guides (if any).
2. The project requires the students to conceive, design, implement and operate a mechanism (the design problem). The mechanism may be entirely of the student's own design, or it may incorporate off-the-shelf parts. If the mechanism incorporates off-the-shelf parts, the students must perform appropriate analysis to show that the parts are suitable for their intended purpose in the mechanism.
3. The project must be open-ended – meaning that there is not a known correct answer to the design problem. Students are expected to apply their creativity (simply copying or re-creating something that already exists is not acceptable).



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4. The project must have an experimental component. Students must conceive, design, implement and operate an appropriate experiment as part of the project. The experiment might be to collect data about some aspect of the design (i.e., to verify that the design will work as expected). Alternatively, the experiment could be to verify that the final mechanism performs as expected.
5. Upon receiving the approval, the Student Project Group will prepare a preliminary project report consisting Requirement Definition Document, Feasibility Study Document, System Requirement Specification, System Analysis Document, Preliminary System Design Document. All the documents indicated will have a prescribed format.
6. The Project Work will be assessed jointly by a panel of examiners having more than Five Years experience. The Project Groups will deliver the presentation of the Project Work which will be assessed by the panel.
7. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work, understanding of the Project, analysis and design performed for the project.
8. The Student Project Groups are expected to work on the recommendations given by the panel of examiners. In no case any variation in Project Theme will be permitted.

Assessment Scheme

Sr. No.	Content	Marks
1	System Requirement Specification	20
2	Feasibility Study	10
3	System Analysis	30
4	System Design	30
5	Presentation of the Project Work	10

Outcomes:

Upon completion of the course, the students will be to:

1. Identify major issues in complex situations; and know how to prepare alternative solutions and make decisions.
2. Becoming aware of the need to think and act in an entrepreneurial manner by developing the ability to: critically and creatively understand innovations and development, work independently and collaboratively.

Note:



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The student needs to identify a technological problem in the area of Computer Engineering or Information Technology of their choice and address the problem by formulating a solution for the identified problem. The project work needs to be undertaken by a group of maximum FOUR and minimum of THREE students. The Project work will be jointly performed by the project team members.

The Project Group will prepare a synopsis of the project work which will be approved by the concerned faculty member. The project should not be a reengineering or reverse engineering project. In some cases, reverse engineering projects will be permissible based on the research component involved in it. The project work aims at solving a real world technical problem. Hence ample literature survey is required to be done by the students. Application-oriented projects will not be acceptable. Low-level custom User Interface development and its allied mapping with a particular technology will not be accepted.

Following is the list of recommended domains for Project Work:

Computer Networks	Image Processing
Operating Systems	Artificial intelligence
Network Security	Expert Systems
Digital Signal Processing	Object Oriented Systems
Systems Programming	Modeling and Design
Real Time Systems	System Testing
Embedded systems	Storage Management
Cluster Computing	Client-Server Computing
Mobile & Wireless Communications	Cloud Computing
Multimedia Systems	Protocol Engineering



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MODULE VIII



Structure, B.E. (Module VIII)						
FF653, Issue No. 3, Rev 1, dt 02/04/2011						
Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S ₅	CS40102	Machine Learning	3	0	0	3
S ₆	CS40106	Compiler Design	3	0	0	3
S ₇	CS42102 CS42104 CS42106 CS42110	ELECTIVE III Image Processing Neural Networks Network Security Multimedia Systems	3	0	0	3
S ₈	CS42112 CS42114 CS42116 CS42118 CS42120	ELECTIVE IV Distributed Systems Product Design Convergence Technologies Geographical Information Systems Data Mining and Warehousing	3	0	0	3
T ₃	CS40202	Machine Learning	0	1	0	1
T ₄		ELECTIVE IV	0	1	0	1
P ₃	CS40306	Compiler Design	0	0	2	1
P ₄		ELECTIVE III	0	0	2	1
PS ₃	CS47308	PROJECT STAGE 3 (B.E. Semester II) Irrespective of Module	0	0	8	6
		Total	12	2	12	22

**CS40102:: MACHINE LEARNING****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To introduce students to several prominent areas of machine learning, including feature extraction, decision trees, neural networks, genetic algorithms, Bayesian learning, clustering, ensemble learning, support vector machines, and reinforcement learning, and illustrate what types of problems the different methods are suited for.
- To give students hands-on experience with these methods and tools for implementing and using them on real-world problems.
- To give students experience with performing simulations and doing statistical data analysis of the results.
- Mapping with PEOs: III, IV, (f).

Unit I**(8+1 Hrs)****Introduction**

- A.** Learning – Concept of Learning – Learning Automata, Genetic Algorithm, Learning by induction Basic concepts, Various types of learning.
- B.** Evaluating and debugging learning algorithms.

Unit II**(8+1 Hrs)****Neural Networks and Learning**

- A.** Learning by experience, Competitive learning, Delta rule, Back propagation, various rules of learning
- B.** Examples on Neural network learning.

Unit III**(8+1 Hrs)****Supervised Learning**

- A.** Supervised learning setup. LMS, Logistic regression. Perceptron. Exponential family. Generative learning algorithms. Gaussian discriminant analysis. Naive Bayes. Support vector machines. Model selection and feature selection, Ensemble methods: Bagging, boosting, ECOC.
- B.** Real time Examples on Learning



Unit IV **(8+1 Hrs)**
Unsupervised Learning

- A. Clustering. K-means, EM. Mixture of Gaussians, Factor analysis. PCA. MDS. pPCA, Independent components analysis (ICA).
- B. Real time examples on Unsupervised Learning.

Unit V **(8+1 Hrs)**
Analytical Learning

- A. Introduction to analytical learning. Combining Inductive and Analytical Learning,
- B. Reinforcement Learning

Text Books

1. Machine Learning, Tom Mitchell, McGraw , 1997, 0-07-042807-7
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT press, 2004.

Reference Books

1. Jacek M. Zurada, "Introduction to Artificial neural System", JAICO publishing house,2002

**CS40106:: COMPILER DESIGN****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Theory of Computation.**Objectives:**

- To understand the theory and practice of compiler implementation.
- To learn the application of grammars and formal languages in compiler writing; the process involved in the design of a high-level programming language.
- To learn lexical analysis, a variety of parsing techniques and semantic analysis of a programming language, along with error detection and recovery.
- To learn various storage allocations, code generation and code optimization techniques.
- Mapping with PEOs: III, (e).

Unit I**(8+1 Hrs)****Lexical Analysis and introduction to Syntax Analysis**

A. Introduction to Compiler, Phases and Passes, Bootstrapping, Cross Compiler, Role of a Lexical Analyzer, Specification and Recognition of Tokens, LEX, Expressing Syntax, Top-Down Parsing, Predictive Parsers.

B. Implementing Scanners, operator precedence parsers.

Unit II**(8+1 Hrs)****Syntax and Semantic Analysis**

A. Bottom-Up Parsing, LR Parsers: constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, YACC, Type Checking, Type Conversion.

B. Symbol-Table Structure.

Unit III**(8+1 Hrs)****Syntax-Directed Translation and Intermediate Code Generation**

A. Syntax-Directed Definitions, Bottom-Up Evaluation, Top-Down Translation, Intermediate Representations, Intermediate Code Generation. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.



B. More about translation: Array references in arithmetic expressions, case statements.

Unit IV (8+1 Hrs)
Code Generation

A. Issues in Code Generation, Basic Blocks and Flow Graphs, Next-use information, A simple Code generator, DAG representation of Basic Blocks, Peephole Optimization.

B. Generating code from dags.

Unit V (8+1 Hrs)
Code Optimization and Run Time Environments

A. Introduction, Principal Sources of Optimization, Optimization of basic Blocks, Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues.

B. Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing.

Text Books

1. “Compilers: Principles, Techniques and Tools”, A. V. Aho, M. S. Lam, R. Sethi, J. D. Ullman, Addison Wesley, ISBN 978-81317-2101-8, Second Edition, 2007.
2. “Engineering a Compiler”, K. Cooper, L. Torczon, Morgan Kaufmann, ISBN 1-55860-698-X, First Edition, 2003.

Reference Books

1. “Advanced Compiler Design and Implementation”, S. S. Muchnik, Morgan Kaufmann, ISBN 8178672413, First Edition, 1997.
2. “Lex & Yacc”, J. R. Levine, T. Mason, D. Brown, “Lex & Yacc”, J. R. Levine, T. Mason, D. Brown, O’Reilly, ISBN 1-56592-000-7, Second Edition, 1992.

Additional Reading

1. “Compiler Construction: Principles and Practice”, K. Loudon, Course Technology, ISBN 0-534-93972-4, First Edition, 1997.



CS42102:: IMAGE PROCESSING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To explore several different image processing techniques, and learn to improve images with them.
- To get familiarized to image enhancement and compression.
- Mapping with PEOs: II, III, (c).

Unit I (8+1 Hrs)

Introduction to image processing

A. Components of image processing system, Scenes and Images, Vector Algebra, Orthogonal Transform, Human Visual System, color vision color model: RGB, HVS, YUV, CMYK, and some basic relationships between pixels, linear and non linear operations.

B. Application of different color models in Image processing.

Unit II (8+1 Hrs)

Image Formation and Digitization

A. Geometric Model, Photometric Model, Sampling, Digitization, Elements of Digital Geometry, Image Properties, Representation

B. Overview of application of Image processing.

Unit III (8+1 Hrs)

Image Processing

A. Basic gray level transformations, histogram processing, enhancement using logical and arithmetic operations Image Enhancement - Contrast Intensification, Smoothing, Sharpening Image Restoration -- Square Error Restoration Techniques, Singular Value Decomposition.

B. Image Compressing - Basic - Lossy Compression, Loss-Less Compression.

Unit IV (8+1 Hrs)

Image transform



A. Introduction to two dimensional orthogonal and unitary transforms, properties of unitary transforms one-two dimensional discrete Fourier Transform (DFT), Wavelet transforms. Cosine, sine transforms.

B. Slant, KL, affine transforms. Applications of transforms in Image processing.

Unit V

(8+1 Hrs)

Compression fundamental

A. File format (bmp, tiff, pcx, gif, jpeg.) Compression fundamentals, image compression models, error free compression: LZW coding, Bit plane Coding, Lossless Predictive Coding, lossy compression: lossy Predictive Coding, Transform, vector Quantization, image compression standard: Binary Image, Continuous Tone Still Image, Video.

B. Elements of information theory, error free compression: VLC, JPEG compression standards Fractal.

Text Books

1. "Digital Image Processing", Rafael Gonzalez & Richard Woods, Pearson publications, ISBN 0132345633, 3rd Edition.
2. "Fundamental of Digital Image Processing", Anil K. Jain, PHI publication, ISBN 13: 9780133361650, 5th Edition.

Reference Books

1. "Digital Image Processing", Pratt, Wiley Publication, ISBN 0-471-37407-5, 3rd Edition.
2. "Digital Image Processing", K.R. Castleman, Prentice Hall: Upper Saddle River, NJ, 3, ISBN 0-13-211467 -4, 3rd Edition.

**CS42104:: NEURAL NETWORKS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To focus on the foundations of neural network theory and the application of neural network models in engineering, cognitive science, and artificial intelligence.
- To introduce the neural networks as means for computational learning.
- To present the basic network architectures for classification and regression.
- Mapping with PEOs: III, IV, (f).

Unit I**(8+2 Hrs)****Introduction**

A. Introduction and Role of Neural Network (NN), Fundamentals of Biological Neural Networks, Basic Principles of ANN and their early Structures, Design of NN, NN models.

B. Learning Rules, Supervised, Unsupervised learning.

Unit II**(8+1 Hrs)****Perceptrons**

A. Basic Structure, Single-Layer Perceptron, Multilayer Perceptron, Adaline and Madaline, Derivation of BP algorithm, BP Case Study: Character Recognition, EXOR (XOR) Problem,

B. Perceptron Case Study

Unit III**(8+2 Hrs)****Hopfield Networks**

A. Binary Hopfield Networks, Bidirectional Associative Memory Principle, Walsh Functions, Network Stability, Continuous Hopfield Models, Continuous Energy Function.

B. Hopfield Network Case Study: Character Recognition, Traveling Salesman Problem.

Unit IV**(8+1 Hrs)****Adaptive Resonance Theory(ART)**

A. The ART Network Structure, Network Operation, Properties of ART, ART-1 Structure & Syllabus of B.E.(Computer Engineering) Program- Pattern 'C11', Issue 3, Rev 1 dated 2/4/2011



Network, ART-1 Case Study: Character Recognition.

B. Case Study: Speech Recognition

Unit V

(8+2 Hrs)

Training & Recurrent Networks

A. Cognitron and Neocognitron, Statistical Training, annealing Methods, Cauchy Training of NN, Boltzman training of weights, Recurrent Back Propagation Network, Recurrent/Discrete time Networks, Fully Recurrent Networks.

B. Recurrent Back Propagation Network Case Study: Character Recognition..

Text Books

1. “Principles of Artificial Neural Networks”, Daniel Graupe, World Scientific Publishing, ISBN 13-978-981-270-624-9, 2nd Edition.
2. “Artificial Neural Networks”, B. Yegnanarayana, PHI Learning Private Limited, ISBN 978-81-203-1253-1, 2010 Edition.

Reference Books

1. “Introduction to Artificial Neural Systems”, Jacek M. Zurada, Jaico Publishing House, ISBN81-7224-650-1, 2006 Edition.
2. “Neural Networks a Comprehensive Foundation”, Simon Haykin, Pearson Education, ISBN 81-7808-300-, 2nd Edition.

Additional Reading

1. “Neural Networks a Classical Approach”, Satish Kumar, Tata McGraw-Hill Publishing Company Limited, ISBN 0-07-048292-6, 2004 Edition.
2. “Neural Networks for Pattern Recognition”, Christopher M. Bishop, OXFORD University Press, ISBN 0-19-566799-9.

**CS42106:: NETWORK SECURITY****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Computer Networks.**Objectives:**

- To understand various attacks in the network.
- To learn various cryptographic techniques.
- To understand authentication techniques.
- Mapping with PEOs: IV, V, (i).

Unit I**(8+1 Hrs)****Introduction**

A. Protocol Vulnerabilities: DoS and DDoS, session hijacking, ARP spoofing, Pharming attack, wireless LAN vulnerabilities.

Software vulnerabilities: Phishing, buffer overflow, formatted string attack, Cross-site scripting attack. Virus and Worm Features, Internet Scanning Worms.

B. Protocol analyzer (Wireshark), Spoofing tool.

Unit II**(8+2 Hrs)****Private key cryptography**

A. Mathematical background for cryptography: modulo arithmetic, GCD (Euclids algorithm), algebraic structures (Groups, Rings, Fields, Polynomial Field). Data Encryption Standard: Fiestel structure, round function, modes of operation. Message authentication code (MAC), Attacks on DES, linear cryptanalysis.

B. Chinese remainder theorem, Elementary Ciphers (Substitution, Transposition and their Properties).

Unit III**(8+2 Hrs)****Public key cryptography**

A. RSA: Key generation in RSA, mathematics behind RSA, practical issues in RSA, attacks on RSA, Public Key Cryptography Standards (PKCS), Key management (digital certificate, public key infrastructure).

Cryptographic hash: properties, applications (hashed based MAC, digital signature), performance, attacks.



Diffie-Hellman key exchange: protocol, parameter choice, attack.

Elliptic Curve Cryptography (ECC): equation of a curve, find the inverse, ECC over prime fields, ECC over binary field.

B. Diffie-Hellman key exchange on EC Groups, EC- based digital signature.

Unit IV

(8+1 Hrs)

Authentication and access control

A. Authentication: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Centralized Authentication, The Needham-Schroeder Protocol, Kerberos.

Access Control in Operating Systems: Discretionary Access Control, Mandatory Access Control, Role Based Access Control.

B. Recent trends in Operating system.

Unit V

(8+1 Hrs)

Applying security

A. Network layer security: IPSec for IPV4 and IPV6.

Transport layer security: SSL and TLS.

Application layer security : Security services, web security considerations, and S/MIME, PGP, PEM, Https, Honey pots, VPN.

B. Cyber laws.

Text Books

1. “Network Security and Cryptography”, by Bernard Menezes, Cengage Learning, 2010, ISBN 81-315-1349-1, 1st Edition.
2. “Cryptography and Network Security-Principles and Practices” by William Stallings, Pearson Education, 2006, ISBN 81-7758-774-9, 4th Edition.

Reference Books

1. “Computer Security: Art and Science”, by Matt Bishop, Pearson Education, 2002, ISBN 0201440997, 1st Edition.
2. “Network security, private communication in a public world”, by Charlie Kaufman, Radia Perlman and mike speciner, Prentice Hall, 2002, ISBN 9780130460196, 2nd Edition.

Additional Reading

1. “Security architecture, design deployment and operations”, by Christopher M. King, Curtis Patton and RSA press, McGraw-Hill, 2001, ISBN 0072133856, 1st Edition.
2. ‘INSIDE NETWORK Perimeter Security’ by Stephen northcatt, leny zeltser, et al, Pearson Education Asia, ISBN 8178087618, 1st Edition.

**CS42110:: MULTIMEDIA SYSTEMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To introduce students to the different media used and the design issues in multimedia systems with understanding of multimedia programming.
- To train students in the application of suitable evaluation techniques for multimedia systems.
- Provide an opportunity for students to apply design, implementation and evaluation concepts and techniques to the development of a realistic multimedia system.
- Mapping with PEOs: II, III, (c).

Unit I**(8+1 Hrs)****Introduction to multimedia**

A. What is multimedia? characteristics of multimedia presentation, Multimedia building blocks, multimedia and internet, Multimedia architecture, Windows multimedia support, Hardware support, Distributed multimedia applications, Streaming technologies, Multimedia database systems, Multimedia authoring tools, overview of multimedia software tools.

Input-Output technologies: Key technology issue, Pen input, Video and image display system, Printout technology, Image scanner, Digital voice and audio, Full motion video.

B. Multimedia Document Architecture, (MHEG, SGML, ODA, OMF etc.), Multimedia applications.

Unit II**(8+1 Hrs)****Text and Image**

A. Text: Types of text, Text compression: Huffman coding, LZ & LZW, Text file formats: TXT, DOC, RTF, PDF, PS. Image: Image fundamentals, Image data types, image File formats, - (BMP, TIFF, JPEG, PCX etc), Enhancement by point processing, Spatial filtering.

Image compression: Types of compression: lossy & lossless, symmetrical & asymmetrical, intraframe & interframe Hybrid, Lossless: RLE, Shannon- Fano algorithm, Arithmetic coding. Lossy: Vector quantization, fractal compression technique, transform coding, psycho-analysis, and interframe correlation.

B. Hybrid: JPEG-DCT, MMDBS-Feature extraction of images.

**Unit III****(8+1 Hrs)****Audio**

A. Nature of sound waves, characteristics of sound waves, digital representation of audio, psychoacoustic, and elements of audio systems: Microphone, amplifiers, speakers, synthesizer, sound card, MIDI, digital audio, CD formats. Audio file formats: WAV, AIFF, VOC, AVI, MPEG Audio File formats, RMF, WMA etc.

B. MMDBS – Feature extraction of Audio.

Unit IV**(8+1 Hrs)****Video**

A. Video signal formats, Video transmission standards: EDTV, CCIR, CIF, SIF, HDTV, digitization of video, video recording systems: VHS, Video Compact Cassette, DVCAN, Camcorder, Lesser disc, VCD, DVD-video, micro-MV, Video file formats: MOV, RealVideo, H-261, H-263, cinepack. Nerodigital, Video editing, DVD formats

B. MMDBS – Feature extraction of Video.

Unit V**(8+1 Hrs)****Multimedia Application Design**

A. Virtual reality design, Application workflow design issues, Distributed application design issues, Application like interactive, Television, Video conferencing, Video on demand.

VR devices: Hand Gloves, Head mounted tracking system, VR chair, CCD, VCR, 3D Sound system, Head mounted display. Virtual Objects, Basics of VRML.

Uses of animation, types of animation, principles of animation, Techniques of animation: Onion Skinning, Motion Cycling, masking, Flip Book animation, Rotoscoping & blue-screening, color cycling, morphing, animation on the web, 3D animation.

B. Creating animation using Flash, 3D-Max.

Text Books

1. "Principles of Multimedia", Ranjan Parekh, TMH, ISBN 0-07-058833-3
2. "Fundamentals of Multimedia", Li Ze-Nian, Drew Mark S., Pearson Education, ISBN 81-297-0438-2

Reference Books

1. "Digital Image Processing", Rafael C. Gonzalez, Richard E. Woods, 2nd Ed Prentice Hall, ISBN: 0-201-18075-8
2. "Data Compression Book", Mark Nelson, 2nd edition, M & T Books ISBN 1-55851 1 541



Additional Reading

1. “Flash 8 Bible”, Robert Reinhardt, Snow Dowd, acromedia, ISBN:9788126507375
2. “Foundation AS Animation: Making Things Move!”, Keith Peters, Friends of ED publication, ISBN: 1590595181
3. “3ds max Animation and Visual Effects Techniques”, Sanford Kennedy, 2nd edition, Charles River Media, ISBN:9788177224924



CS42112:: DISTRIBUTED SYSTEMS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Operating Systems.

Objectives:

To study the different design issues of Distributed Operating Systems.

- Create an awareness of the major technical challenges in distributed systems design and implementation.
- Expose students to current technology and distributed infrastructure software.
- Expose students to past and current research issues in the field of distributed systems.
- Provide experience in the implementation of typical algorithms used in distributed systems.
- Mapping with PEOs: II, III, (c).

Unit I

(8+1 Hrs)

Introduction

A. Introduction to Distributed Systems, Examples of Distributed Systems, Hardware and Software Concepts, Design issues.

System models: Introduction, Architectural Model, Fundamental Models.

B. Distributed Systems Goals, Distributed Computing System models.

Unit II

(8+1 Hrs)

Communication

A. Interprocess Communication: Message Oriented Communication, Stream Oriented Communication.

RPC: RPC Model, Transparencies in RPC, Implementation, Stub Generation, RPC Messages, Server Management, Call Semantics, Communication Protocols, Distributed Objects: Remote Method Invocation.

B. LRPC, Events and Notifications.

Unit III

(8+1 Hrs)

Synchronization

A. Time and Global States: Clock Synchronization, Logical Clocks, Global State, Event Ordering.



Distributed Deadlock Algorithms for Avoidance, Prevention, and Detection: Centralized Approach, Hierarchical Approach, WFG Based Fully Distributed, Deadlock Recovery.
Co-ordination: Election Algorithm: Bully Algorithm, Ring Algorithm, Mutual Exclusion: Centralized Approach, Distributed Approach (Ricart and Agrawala).
Distributed Transaction: Transaction Model, Classification, Implementation, Concurrency Control: 2 Phase Locking, Strict 2 PL.
B. Distributed Deadlock Algorithms for Detection: Probe Based Fully Distributed Approach, Mutual Exclusion: Token-Passing Algorithm.

Unit IV**(8+1 Hrs)****Fault Tolerance**

A. Introduction to Fault Tolerance, Failure Models, Failure Masking by Redundancy: Triple Modular Redundancy.
Process Resilience: Design Issues, Failure Masking and Replication, Agreement in Faulty Systems: Two Army Problem, Byzantine Generals Problem.
Reliable Client Server Communication, Reliable Group Communication.
Distributed Commit: 2 Phase Commit.
B. Distributed Commit: 3 Phase Commit and Comparison of 2PC and 3PC, Distributed Recovery.

Unit V**(8+1 Hrs)****Distributed File Systems and Distributed Shared Memory**

A. Name Services: Name Entities, Name Resolution: Linking, Mounting, Iterative and Recursive Algorithms, Case Study: DNS Directory, X.500 Distributed Naming Service
Distributed File Systems: SUN NFS, CODA.
Distributed Shared Memory: Introduction, Architecture of DSM Systems
Design and Implementation Issues of DSM: Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategies, Thrashing, Heterogeneous DSM.
Case Studies: Mach, Amoeba.
B. Distributed File Systems: SFS, xFS, Plan 9, Comparison of different DSF, Distributed Shared Memory: Grid, Clusters.

Text Books

1. “Distributed Systems Principles and Paradigms”, Andrew S. Tanenbaum & Maarten Van Steen, Prentice Hall India, ISBN 81-7808-789-8, 1st Edition.
2. “Distributed Operating Systems Concepts and Design”, Pradeep K. Sinha, Prentice Hall India, ISBN: 81-203-1380-1, 1st Edition.



Reference Books

1. “Distributed Systems – Concepts and Design”, George Coulouris, Jean Dollimore & Tim Kindberg, Addison-Wesley, ISBN: 0-201-61918-0, 3rd Edition.
2. “Distributed Operating Systems”, Andrew S. Tanenbaum, Addison Wesley Longman, ISBN: 81-7808-294-2, 1995.

Additional Reading

1. “Advanced Concepts In Operating Systems”, Mukesh Singhal, Niranjana G. Shivaratri, McGrawHill, ISBN: 0-07-113693-2, 1994.
2. “Distributed and Parallel Systems: From Cluster to Grid Computing”, Peter Kacsuk, Thomas Fahringer, Zsolt Nemeth, Springer, ISBN: 978-0-378-69857-1, 2007.
3. “Distributed Computing: Principles, Algorithms, and Systems”, Kshemkalyani, Singhal, Cambridge University Press, ISBN-13: 978-0-521-87634-6, 1st Edition.
4. “Distributed Computing: Principles and Applications”, M. L. Liu, Addison-Wesley, ISBN-10: 0201796449, 2004.



CS42114:: PRODUCT DESIGN

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand design and development process for products
- To study effect of product development on business plans, team work and growth.
- Mapping with PEOs: II, III, (c).

Unit I

(9+1 Hrs)

Introduction and User Studies

A. Product Design, Products, Difference between Product and Service, Understanding of Problem Areas, Visual Design, User Segments, Specialized Users, Children, Physically Challenged and Colorblind Users, Illiterate and Old Users, Left-Handers, Accommodating Specialized Users into Product Design, User Studies, User Persona, Guidelines for User Studies, Developing Questionnaires, Interviewing Users, Observing Users, Photographic Studies of Products in Use, Role of Creativity in Understanding of Latent Needs.

B. Selection of a Product for Design Study such as Antivirus, Operating System, Mobile Phones, Web Browsers, Accounting Software etc.

Unit II

(7+2 Hrs)

Design and Usability Evaluation

A. Design Methodology for Products, Services and Events, Design of Integrated Systems, Contextual Enquiry, Design Process, Three Pillars of Design, Guidelines for Product Development, Logical User Centered Iterative Design (LUCID), Ethnography, Ethnographic Observations and Research, Participatory Design, Design Issues, Human Information Processing, Human Memory, Fitt's Law, Hick's Law, Heuristic Evaluation, Cognitive Walkthroughs, User Testing Using Think Aloud Protocol, Task Analysis, GOMS, Measurable Human Factors.

B. Ethnographic and Cultural Study of Selected Product.

Unit III

(8+2 Hrs)

Categorization of Products

A. Products for Future Use, Products to be Used in Groups, Devices used in Public Structure & Syllabus of B.E.(Computer Engineering) Program- Pattern 'C11', Issue 3, Rev 1 dated 2/4/2011



Places, Products that Enrich User Experience, Embedded Products, Designer Products, Interfaces, Complexity of Interfaces, Design of Multi-Modal Interfaces, Expressive Interfaces, Natural Interfaces, Tangible Interfaces, Faulty Interfaces.

B. Classification of Selected Products and Possible Variances with Extended Features.

Unit IV

(8+2 Hrs)

Design Management and Professional Practice

A. Designer, Designer Attributes, Role of a Designer, Designer Classification, Setting Up a Design Office, Location, Size, Legal Framework, Infrastructure, Organization of Supplies and Human Resources, Work Environment, Finding Clients, Business Correspondence, Advertising, Professionalism, Ethics, Need for Ethics, Unethical Practices, Cyber Crimes, Human Factors, Cognitive Psychology, Human Information Processing, Managing Teamwork, R&D Activities, Design Evaluation, IPR, Copyrights, Patents and Trademarks, Design Registration Laws and Procedure.

B. Identification of IPR (Copyrights, Patents and Trademarks) Issues with Selected Products.

Unit V

(8+1 Hrs)

Product Life and Marketing

A. Defining Business Policy, SWOT Analysis, Study of Product Life Cycle, Stages - Introduction, Growth, Maturity, Decline, Evaluation Parameters, Monitoring of Sale and Competition, Assessing Market Potential, Market Research, Consumer Research and Demographic Aspects, Establishing Market Segment and Their Dimensions, Developing a Strategy to Introduce New Products, Developing a Product Plan, Pricing Policy, Factors Influencing Prices, Factors Influenced by Prices, Product Positioning.

B. Analysis of Prices and Related Pricing Policy for Selected Product.

Text Books

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "Product Design and Development", Karl Ulrich and Steven Eppinger, McGraw-Hill, 2004, ISBN 978-0072471465, 3rd Edition.

Reference Books

1. "Design Secrets: Products 2: 50 Real-Life Projects Uncovered", Industrial Designers Society of America, Edited by Lynn Haller, Cheryl Dangel Cullen, Publisher: Rockport Publishers, Oct 2004, ISBN 978-1592530717.
2. "The Design of Future Things", Donald A. Norman, Basic Books, ISBN 978-0-465-00227-6, 2007 Edition.



Additional Reading

1. “What is a Designer: Things, Places, Messages”, Norman Potter, Publisher: Princeton Architectural Press, 2002, ISBN 978-0907259169, 4th Edition.
2. “History of Modern Design” David Raizman, Prentice Hall, 2004, ISBN 978-0131830400.

**CS42116:: CONVERGENCE TECHNOLOGIES****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Computer Networks.**Objectives:**

- To understand need of convergence.
- To learn various networks, and signaling in that network.
- To understand voice and data communication.
- Mapping with PEOs: II, III, (c).

Unit I**(7+2 Hrs)****Introduction to Convergence**

A. what is network Convergence, the promise of network convergence, networking issues and convergence, Voice and data network characteristics, benefits of IP centric network, challenges of converged network, introduction to VOIP, applications of converged networks, VOIP implementation challenges.

B. voice and data network growth factor, effects of network convergence on businesses.

Unit II**(9+1 Hrs)****Protocols and Standards for Convergence**

A. Protocols Supporting VOIP: Multicast IP, RTP, RTCP, RSVP, RTSP, SDP, SAP, SIP.
Subscriber Lines: T1/T3, DS0, DS1, DS3, E1/E3.

Signaling Standards: H.323, SIP. Gateways, Gatekeepers.

B. MGCP, Audio and Video Codecs.

Unit III**(9+1 Hrs)****Switching networks**

A. ISDN: conceptual view of ISDN, transmission structure, user-network interface configuration, ISDN Protocol Architecture, ISDN connection, Addressing, Interworking, PRI, BRI, LAPD,

Basic Call control, SS7.

B-ISDN standards, Broadband services, B-ISDN architecture, B-ISDN protocol reference model.

B. ISDN standards, SDH.

**Unit IV****(7+1 Hrs)****Frame Relay and SMDS**

A. Frame Relay Circuits, Frame mode protocol architecture, frame mode call control, LAPF, Congestion in frame relay networks, approaches to congestion control, Traffic rate management, Explicit congestion avoidance, implicit congestion control.

SMDS: introduction to SMDS, SMDS interface protocol, SMDS addressing.

B. Comparison of SMDS with other LAN technologies.

Unit V**(8+1 Hrs)****ATM technology**

A. ATM VPI& VCI, Creation of virtual channel, Definitions of Virtual circuit and permanent virtual circuit, ATM reference model, step-by-step PVC example of how ATM network processes cells, AAL, Adaption layer from voice over ATM perspective AAL1,AAL2, AAL3, Connection admission control (CAC). Cell Loss Priority (CLP), ATM and convergence technology.

B. ATM versus Frame relay, ATM versus SONET.

Text Books

1. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
2. "Voice over IP Technologies" by Mark A. Miller, P.E., Wiley Publications, 2002, ISBN 81-265-0286-X, 1st Edition.

Reference Books

1. "Computer Communications and Networking Technologies", by Michael A. Gallo, William M. Hancock, Cengage Learning, 2002, ISBN81-315-0364-X, 1st Edition.
2. "ATM network concepts and protocols", by Sumeet Kasera and Pankaj Sethi, Tata McGraw Hill, 2001, ISBN 0-07-463776-2, 1st Edition.

Additional Reading

1. "VOIP", by Ulyess Black, Pearson Education, 2001, ISBN 0130652040, 2nd Edition.
2. "Multimedia communication system techniques standards and networks", by K.R. Rao, Zoran Bojkovic and Dragorad Milovanovic, Pearson Education, 2002, ISBN 0-13031398-X, 1st Edition.

**CS42118:: GEOGRAPHICAL INFORMATION SYSTEMS****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Nil**Objectives:**

- To increase student awareness of GIS technology and provide opportunities to process, analyze and visualize spatial data and information.
- To understand the complexities of data manipulation, analysis, and mapping at different scales of space, time, and complexity.
- To study applications of GIS and Remote Sensing.
- Mapping with PEOs: I, V, (j).

Unit I**(8+1 Hrs)****GIS and Maps**

A. Fundamentals of GIS: Roots of GIS, Overview of Information System, Four Ms, GIS Definition and Terminology, GIS Queries, GIS Architecture, Models of GIS, Framework for GIS, GIS Categories, Levels/Scales of Measurement. Map Language: Map as a Model, Classification of Maps, Spatial Referencing System, Map Projections, Commonly Used Map Projections, Grid Systems, Computer in Map Production, Digital Database in a GIS, Linkage of GIS to Remote Sensing

B. Selection of a GIS Application in Various Domains such as Weather Forecasting, Urban Planning. Agriculture. Defense. Network Applications.

Unit II**(8+2 Hrs)****Remote Sensing Fundamentals**

A. Remote Sensing - Basic Principles: Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials, Microwave Remote Sensing: Radar Principle, Factors affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Interpreting SAR Images, Geometrical Characteristics. Remote Sensing Platform and Sensors: Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.

B. Study of Satellites such as IRS, OCEANSAT-1, IKONOS etc.

(8+2 Hrs)**Unit III****Image Processing**



A. Digital Image Processing: Basic Character of Digital Images, Preprocessing, Registration, Enhancement, Spatial Filtering, Transformations, Classification, Image Classification and GIS. Visual Image Interpretation: Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image Interpretation Equipments.

B. Study of GIS Hardware and Software required specially for Image Processing.

Unit IV

(8+2 Hrs)

Spatial Data Modeling and Management

A. Spatial Data Modeling: Stages of GIS Data Modeling, Graphic Representation of Spatial Data, Raster GIS Models, Vector GIS Models, GIS Data Management: Database Management Systems, GIS Data File Management, Database Models, Storage of GIS Data Object based Data Models, Temporal Topology, Organizational Strategy of DBMS in GIS.

B. Design a Spatial Database for a Selected Application.

Unit V

(8+1 Hrs)

Data Input, Quality and Analysis

A. Data Input and Editing: The Data Stream, Data Input Models, Data Input Methods, GPS for GIS Data Capture, Data Editing. Data Quality Issues: Components of Data Quality, Accuracy, Precision and Resolution, Consistency, Completeness, Sources of Error in GIS, GIS Output, Modeling Errors and Error Evaluation. Data Analysis and Modeling: Format Conversion, Data Medium Conversion, Spatial Measurement Methods, Buffering Techniques, Overlay Analysis, Modeling Surfaces.

B. Identification of Data Inputs Outputs and Study of Required Analytical Approach.

Text Books

1. "Remote Sensing and Geographical Information Systems", M. Anji Reddy B S Publications, Second Edition, 2006.
2. "Introduction to Geographic information systems", Kang-Tsung Chang, Tata-McGraw-Hill Publications, Third edition, 2006. ISBN: 978-0073101712.

Reference Books

1. "Principles of Geographical Information Systems", Peter A Burroughs and McDonnell, Oxford University Press, 1998. ISBN 978-0198233657.
2. "The GIS Book", George B Korte, Onward press (Thomson Learning), 5th Edition, 2001. ISBN 81-7800-112-8.

Additional Reading

1. Bolstad, Paul "GIS Fundamentals.", Eider Press. 2nd edition 2005. ISBN 978-0-9717647-2-9.

**CS42120:: DATA MINING AND WAREHOUSING****Credits:** 03**Teaching Scheme:** - Theory 3 Hrs/Week**Prerequisites:** Database Management Systems.**Objectives:**

- Know the basics of data warehousing, dimensional design
- Understand different dimensional models and other related issues
- Understand OLAP, its operations and types
- Mapping with PEOs: III, (e).

Unit I**(8+2 Hrs)****Introduction to DWH and OLAP**

A. Decision Support System: Introduction to Decision Support System (DSS), DSS Components, Decision Types; Data warehouse (DWH): Need, Definition, Advantages of DWH, OLTP Vs DWH, 3-tier Architecture, DWH Design Process, ETL Process, DWH Back-end Tools and Utilities, Metadata Repository, Models of DWH: Enterprise Warehouse, Data Mart, Virtual Warehouse, Comparison; OLAP: Data Cube and OLAP, Concept Hierarchies, OLAP Operations: Drill-Down, Roll-Up and Extreme Roll-Up, Slice-Dice and Pivot, OLAP Types, OLAP Query Processing, Computation of Data Cube.

B. ETL Tools, Commercial DWH Vendors/ Tools and their Comparison, Project Failure Reasons, Data Analytics, Business Intelligence, SAS Software.

Unit II**(8+1 Hrs)****Dimensional Modeling**

A. Dimensional Modeling: Dimensional Model Vs ER Model, DWH Schemas: Star, Snowflake, Fact Constellation, their Comparison, Techniques to Handle Changing Dimensions, Aggregation, Families of Fact Tables, Fact Less Fact Tables; Data Warehouse Indexing: Factors used to select an Indexing Technique, Properties of a Good Indexing Technique for DWH, Indexing Techniques: Projection Index, Bitmap Index (Pure and Encoded), Join Index and their Comparison.

B. Case Studies of Data Warehouse Applications in various Industry Segments.

Unit III**(8+2 Hrs)****Data Mining and Functionalities**



A. Introduction: Need of Data Mining, Knowledge Discovery in Database (KDD), Architecture of Data Mining System, Data Mining on Different kind of Data, Data Mining Functionalities; Data Preprocessing: Need, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation; Cluster Analysis: Categories of Clustering methods, Partitioning methods: k-Means, k-Medoids ; Prediction: Numerical Prediction, Linear, Non-Linear Regression; Outlier Analysis: Applications, Techniques.

B. Data Mining Task Primitives, Query Language, System Classification, Data Mining Issues.

Unit IV

(9+2 Hrs)

Classification

A. Classification: Decision Tree Classifier, Rule Based Classification, Bayesian Classification, Neural Network Classification: Back Propagation Algorithm, Lazy Learner: kNN Classifier, Case-Based Reasoning, Other: Fuzzy Set Approach, Classifier Accuracy Measures, Techniques for Evaluating Classifier Accuracy; Frequent Itemset Mining: Interesting Item Set Mining: Market Basket Analysis, APriori Algorithm, Generating Association Rules, Types of Association Rules, Correlation Analysis.

B. Support Vector Machine, Associative Classification, other Classification Techniques: Genetic Algorithm, Rough Set, Constraints Based Association Mining.

Unit V

(7+1 Hrs)

Data Mining on different Databases

A. Multimedia Data Mining, Web Mining, Text Mining, Spatial Data Mining, Mining on Social Networks, Multirelational Data Mining.

B. Data Mining Applications, Trends/ Challenges of Data Mining, Mining Sequence Patterns in Transactional Database, Graph Mining, Data Mining Tools- Dbminer/ WEKA/ Oracle DM Tools/ OLE DB/ Ida.

Text Books

1. "The Data Warehouse Lifecycle Toolkit", Kimball, Reeves, Ross, Thornthwaite, John Wiley, ISBN 9971-51-415-X, 2002 Edition.
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Decision Support and Data Warehouse Systems", Mallach Efrem G, Tata McGraw Hill, ISBN 978-0070486843, 2009 Edition.
2. "Mastering Data Mining: The art and science of customer relationship management", M Berry and G. Linoff, John Wiley, ISBN 9971-51-369-2, 2001 Edition.



Additional Readings

1. “Building A Data Warehouse For Decision Support”, Poe Vidette, Klauer Patricia, Brobst Stephen, Prentice Hall Inc., ISBN 0-13-769639-6, 2nd Edition.
2. “Data Mining : Theory and Practice” , Soman K P, Diwakar Shyam, Ajay V, New Delhi, Prentice Hall Of India, ISBN 81-203-2897-3, 2006 Edition.



CS40202:: MACHINE LEARNING

Credits: 01

Teaching Scheme: - Tutorial 1 Hrs/Week

Prerequisites: : Nil

Objectives:

- To introduce students to several prominent areas of machine learning, including feature extraction, decision trees, neural networks, genetic algorithms, Bayesian learning, clustering, ensemble learning, support vector machines, and reinforcement learning, and illustrate what types of problems the different methods are suited for.
- To give students hands-on experience with these methods and tools for implementing and using them on real-world problems.
- To give students experience with performing simulations and doing statistical data analysis of the results.
- Mapping with PEOs: III, IV, (f).

A TERM-WORK containing the record of the following:

A. Assignments :

1. Implement the concept of Classification
2. Implement Delta rule
3. Implement Back Propagation Algorithm
4. Implement the concept of Support Vector Machine
5. Implement any Clustering Algorithm
6. Implement analytical Learning

Text Books

1. Machine Learning, Tom Mitchell, McGraw , 1997, 0-07-042807-7
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT press, 2004.



BRACT'S

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Department of Computer Engineering

Reference Books

1. Jacek M. Zurada, “Introduction to Artificial neural System”, JAICO publishing house,2002



CS42212:: DISTRIBUTED SYSTEMS

Credits: 01

Teaching Scheme: -Tutorial 1 Hr/Week

Prerequisites: Operating Systems.

Objectives:

- To study the different design issues of Distributed Operating Systems.
- To study various methods of communication in Distributed Operating Systems.
- To analyze Distributed File System.
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

1. Implement Remote Method Invocation.
2. Simulate Cristian's or Berkeley's algorithm for clock synchronization.
3. Simulate Lamport's algorithm for clock synchronization using counters or physical clock.
4. Simulate the Ring or Bully election algorithm.
5. Simulate the Ricart Agrawala's distributed algorithm for mutual exclusion.
6. Problem solving of Wait-die and Wait –wound scheme for deadlock prevention.
7. Simulate Wait for Graph based Centralized or Hierarchical or Distributed algorithm for deadlock detection.
8. Simulate Recursive or Iterative name resolution algorithm.
9. Simulate the Byzantine General's Problem.
10. Simulate any one of the Consistency models.



Text Books

1. “Distributed Systems Principles and Paradigms”, Andrew S. Tanenbaum & Maarten Van Steen, Prentice Hall India, ISBN 81-7808-789-8, 1st Edition.
2. “Distributed Operating Systems Concepts and Design”, Pradeep K. Sinha, Prentice Hall India, ISBN 81-203-1380-1, 1st Edition.

Reference Books

1. “Distributed Systems – Concepts and Design”, George Coulouris, Jean Dollimore & Tim Kindberg, Addison-Wesley, ISBN: 0-201-61918-0, 3rd Edition.
2. “Distributed Operating Systems”, Andrew S. Tanenbaum, Addison Wesley Longman, ISBN: 81-7808-294-2, 1995.

Additional Reading:

1. “Advanced Concepts in Operating Systems”, Mukesh Singhal, Niranjana G. Shivaratri, McGrawHill, ISBN: 0-07-113693-2, 1994.
2. “Distributed and Parallel Systems: From Cluster to Grid Computing”, Peter Kacsuk, Thomas Fahringer, Zsolt Nemeth, Springer, ISBN: 978-0-378-69857-1, 2007.
3. “Distributed Computing: Principles, Algorithms, and Systems”, Kshemkalyani, Singhal, Cambridge University Press, ISBN-13: 978-0-521-87634-6, 1st Edition.
4. “Distributed Computing: Principles and Applications”, M. L. Liu, Addison-Wesley, ISBN-10: 0201796449, 2004.



CS42214:: PRODUCT DESIGN

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Nil

Objectives:

- To identify and incorporate key social, cognitive and physiological factors that influence user perceptions, understandings and usages of Information Technology.
- To motivate students for interviews and field-work with users for improved practical approach in interface/interaction based product design.
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

Design a questionnaire for study of selected product.

1. Study specialized user population and their impact on the design of selected product.
2. Perform a GOMS analysis for any task(s) related with selected product.
3. Study faulty interfaces/interactions related with selected product.
4. Analyze the cybercrimes related with selected product and suggest preventive measures.

Text Books

1. “The Design of Everyday Things”, Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. “Product Design and Development”, Karl Ulrich and Steven Eppinger, McGraw-Hill, 2004, ISBN 978-0072471465, 3rd Edition.

Reference Books

1. “Design Secrets: Products 2: 50 Real-Life Projects Uncovered”, Industrial Designers Society of America, Edited by Lynn Haller, Cheryl Dangel Cullen, Publisher: Rockport Publishers, Oct 2004, ISBN 978-1592530717.



2. “The Design of Future Things”, Donald A. Norman, Basic Books, ISBN 978-0-465-00227-6, 2007 Edition.

Additional Reading

1. “What is a Designer: Things, Places, Messages”, Norman Potter, Publisher: Princeton Architectural Press, 2002, ISBN 978-0907259169, 4th Edition.
2. “History of Modern Design” David Raizman, Prentice Hall, 2004, ISBN 978-0131830400.



CS42216:: CONVERGENCE TECHNOLOGIES

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Nil

Objectives:

- To understand the next generation technology.
- Understand the switching techniques.
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Study of audio and video data.
2. Signal passing through network for voice data.
3. Study of E/T cables.
4. Study of gatekeepers in convergence technology.
5. Study of ISDN devices.
6. Study of SIP implementation.
7. Study of SS7 implementation.
8. Comparison of ISDN and B-ISDN.
9. Use of frame relay in convergence.
10. Examples on convergence



Text Books

1. “ISDN and Broadband ISDN with frame relay and ATM” by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
2. “Voice over IP Technologies” by Mark A. Miller, P.E., Wiley Publications, 2002, ISBN 81-265-0286-X, 1st Edition.

Reference Books

1. “Computer Communications and Networking Technologies”, by Michael A. Gallo, William M. Hancock, Cengage Learning, 2002, ISBN81-315-0364-X, 1st Edition.
2. “ATM network concepts and protocols”, by Sumeet Kasera and Pankaj Sethi, Tata McGraw Hill, 2001, ISBN 0-07-463776-2, 1st Edition.

Additional Reading

1. “VOIP”, by Ulyess Black, Pearson Education, 2001, ISBN 0130652040, 2nd Edition.
2. “Multimedia communication system techniques standards and networks”, by K.R. Rao, Zoran Bojkovic and Dragorad Milovanovic, Pearson Education, 2002, ISBN 0-13031398-X, 1st Edition.



CS42218::GEOGRAPHICAL INFORMATION SYSTEMS

Credits: 01

Teaching Scheme: - Tutorial 1 Hrs/Week

Prerequisites: Nil

Objectives:

- To study applications of GIS & Remote Sensing
- To study Data Modeling and Analysis required by these systems.
- Mapping with PEOs: I, V, (j).

List of Practical

A TERM-WORK containing the record of the following:

1. Prepare a map for the selected geographical area as per topological survey.
2. Design a spatial database for the entities related with a geographical area specified in above map.
3. Study the connectivity of maps with spatial databases.
4. Analyze a case study of any GIS application of your choice.
5. Prepare a presentation on any latest GIS technology / technique / software / hardware.

Text Books

1. “Remote Sensing and Geographical Information Systems”, M. Anji Reddy B S Publications, Second Edition, 2006.
2. “Introduction to Geographic information systems”, Kang-Tsung Chang, Tata-McGraw-Hill Publications, Third edition, 2006. ISBN: 978-0073101712.

Reference Books

1. “Principles of Geographical Information Systems”, Peter A Burroughs and McDonnell, Oxford University Press, 1998. ISBN 978-0198233657.
2. “The GIS Book”, George B Korte, Onward press (Thomson Learning), 5th Edition, 2001. ISBN 81-7800-112-8.



BRACT'S

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Department of Computer Engineering

Additional Reading

1. Bolstad, Paul “GIS Fundamentals.”, Eider Press. 2nd edition 2005. ISBN 978-0-9717647-2-9.



CS42220:: DATA MINING AND WAREHOUSING

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Database Management Systems.

Objectives:

- Study different functionalities of data mining, various algorithms, and get an overview of significant data mining applications
- Mapping with PEOs: III, (e).

List of Contents

A TERM-WORK containing the record of the following:

1. Design a star / snowflake schema for a data warehouse for an organization.
2. Use ETL tool for extract-transform-load operations
3. OLAP Data cube implementation and operations
4. Data mining: Implement clustering algorithms
5. Classification algorithms
6. Association rule mining
7. Prediction, Linear Regression
8. Outlier analysis

Text Books

1. “The Data Warehouse Lifecycle Toolkit”, Kimball, Reeves, Ross, Thornthwaite, John Wiley, ISBN 9971-51-415-X, 2002 Edition.
2. “Data Mining: Concepts and Techniques”, Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.



Reference Books

1. “Decision Support and Data Warehouse Systems”, Mallach Efrem G, Tata McGraw Hill, ISBN 978-0070486843, 2009 Edition.
2. “Mastering Data Mining: The art and science of customer relationship management”, M Berry and G. Linoff, John Wiley, ISBN 9971-51-369-2, 2001 Edition.

Additional Readings

1. “Building A Data Warehouse For Decision Support”, Poe Vidette, Klauer Patricia, Brobst Stephen, Prentice Hall Inc., ISBN 0-13-769639-6, 2nd Edition.
2. “Data Mining: Theory and Practice” , Soman K P, Diwakar Shyam, Ajay V, New Delhi, Prentice Hall Of India, ISBN 81-203-2897-3, 2006 Edition.

**CS40306:: COMPILER DESIGN****Credits:** 01**Teaching Scheme:** - Laboratory 2 Hrs/Week**Prerequisites:** Knowledge of C.**Objectives:**

- To design and implement the various phases of a compiler for a concise programming language.
- Mapping with PEOs: III, (e).

List of Practical

1. Assignment to understand basic syntax of LEX specifications, built-in functions and Variables.
2. Implement a Lexical Analyzer using LEX for a subset of C.
3. Implement a parser for an expression grammar using YACC and LEX .
4. Generate and populate appropriate Symbol Table.
5. Implementation of Semantic Analysis Operations (like type checking, verification of function parameters, variable declarations and coercions) possibly using an Attributed Translation Grammar.
6. Implement the front end of a compiler that generates the three address code for a simple language.
7. Generate an appropriate Target Code from the given intermediate code assuming suitable processor details.
8. A Register Allocation algorithm that translates the given code into one with a fixed number of registers. (Optional)
9. Implementation of Instruction Scheduling Algorithm. (Optional)
10. Implement Local and Global Code Optimizations such as Common Sub-expression Elimination, Copy Propagation, Dead-Code Elimination, Loop and Basic-Block Optimizations. (Optional)



Text Books

1. “Lex & Yacc”, J. R. Levine, T. Mason, D. Brown, “Lex & Yacc”, J. R. Levine, T. Mason, D. Brown, O'Reilly, ISBN 1-56592-000-7, Second Edition, 1992.
2. Compilers: Principles, Techniques and Tools”, A. V. Aho, M. S. Lam, R. Sethi, J. D. Ullman, Addison Wesley, ISBN 978-81317-2101-8, Second Edition, 2007.

Reference Books

1. “Engineering a Compiler”, K. Cooper, L. Torczon, Morgan Kaufmann, ISBN 1-55860-698-X, First Edition, 2003.
2. “Advanced Compiler Design and Implementation”, S. S. Muchnik, Morgan Kaufmann, ISBN 8178672413, First Edition, 1997.



CS42302:: IMAGE PROCESSING

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objective:

- To study various operation of Image processing.
- Mapping with PEOs: II, III, (c).

List of Practical

All the assignments should be done using 'MATLAB'.
Optional support of 'C' may be used.

1. Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.
2. Study of statistical properties- mean, standard deviation, profile, variance and Histogram Plotting.
3. Histogram equalization & modification.
4. Gray level transformations such as contrast stretching, negative, power law transformation etc.
5. Spatial Domain filtering- smoothing & sharpening filters.
6. DCT/IDCT of given image.
7. Edge detection using Sobel, Prewitt and Roberts operators.
8. Morphological operations- erosion, dilation, opening & closing on binary image.
9. Pseudo coloring.
10. Creating noisy image and filtering using MATLAB.



Text Books

1. "Digital Image Processing", Rafael Gonzalez & Richard Woods, Pearson publications, ISBN 0132345633, 3rd Edition.
2. "Fundamental of Digital Image Processing", Anil K. Jain, PHI publication, ISBN 13: 9780133361650, 5th Edition.

Reference Books

1. "Digital Image Processing", William Pratt, Wiley Publication, ISBN 0-471-37407-5, 3rd Edition.
2. "Introduction to Matlab 7 for Engineering", William J.Palm, McGraw Hill Publication, ISBN 0072922427, 2nd Edition.



CS42304:: NEURAL NETWORKS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites:

Objectives:

- To give design methodologies for artificial neural networks.
- To demonstrate neural network applications on real-world tasks.
- Mapping with PEOs: III, IV, (f).

List of Practical

1. Implement any classification problem using Single Layer Perceptron.
2. Design a Perceptron Network for handwritten digit recognition.
3. Design a Backpropagation Network for any real time application.
4. Design a Kohonen network for any real time application.
5. Implement the concept of Associative memory using Hopfield Network.
6. Implement the concept of ART.
7. A Mini Project using ANN.

Text Books

1. “Principles of Artificial Neural Networks”, Daniel Graupe, World Scientific Publishing, ISBN 13-978-981-270-624-9, 2nd Edition.
2. “Artificial Neural Networks”, B. Yegnanarayana, PHI Learning Private Limited, ISBN 978-81-203-1253-1, 2010 Edition.

Reference Books

1. “MATLAB Programming for Engineers”, Stephen J. Chapman, Thomson Learning, ISBN981-254-893-9, 3rd Edition.
2. “Introduction to Artificial Neural Systems”, Jacek M. Zurada, Jaico Publishing House, ISBN81-7224-650-1, 2006 Edition.



CS42306:: NETWORK SECURITY

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- Able to analyze the packets.
- To understand the various attacks.
- To able to do encryption and decryption.
- Mapping with PEOs: IV, V, (i).

List of Practical

1. Study of DoS, DDOS attack.
2. Study of antivirus tool.
3. Demonstrate: SQL injection, Cross-site scripting, buffer overflow.
4. Implement packet sniffer.
5. Demonstrate: ARP spoofing, IP spoofing.
6. Implementation of DES.
7. Implementation of RSA.
8. Comparison of encryption time and decryption of RSA, DES, ECC.
9. Implementation of Diffie-Hellman key exchange algorithm.
10. Implement Hash algorithm.
11. Implementation of email security using PGP.
12. Kerberos simulation.



Text Books

1. “Network Security and Cryptography”, by Bernard Menezes, Cengage Learning, 2010, ISBN 81-315-1349-1, 1st Edition.
2. “Cryptography and Network Security-Principles and Practices” by William Stallings, Pearson Education, 2006, ISBN 81-7758-774-9, 4th Edition.

Reference Books

1. “Computer Security: Art and Science”, by Matt Bishop, Pearson Education, 2002, ISBN 0201440997, 1st Edition.
2. “Network security, private communication in a public world”, by Charlie Kaufman, Radia Perlman and mike speciner, Prentice Hall, 2002, ISBN 9780130460196, 2nd Edition.

Additional Reading

1. “Security architecture, design deployment and operations”, by Christopher M. King, Curtis Patton and RSA press, McGraw-Hill, 2001, ISBN 0072133856, 1st Edition.
2. ‘INSIDE NETWORK Perimeter Security’ by Stephen northcatt, leny zeltser, et al, Pearson Education Asia, ISBN 8178087618, 1st Edition.



CS42310:: MULTIMEDIA SYSTEMS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To implement basic concepts of computer graphics.
- To implement algorithms to draw various graphics primitives.
- To implement 2-D and 3-D transformations.
- To implement applications of multimedia
- Mapping with PEOs: II, III, (c).

List of Practical

1. Write a code in c to read the contents of any .bmp file and display image.
2. Write a menu Driven program
 - a) Create, edit .Voc file and convert into .Wav file format
 - b) Create, edit .Wav file and convert it to .Voc file format.
3. Create an animation using 3-D Max
4. Create an animation using Flash
5. Write a tool to create presentation slide with audio & video effects
6. Using VRML generate anyone virtual scene
 1. Coffee House
 2. Building Model
 3. Garden Model
7. Implement Edge Detection Algorithm on any Image
8. Implement arithmetic coding technique on any image.
9. Implement JPEG-.DCT compression Technique.



Text Books

1. "Principles of Multimedia", Ranjan Parekh, TMH, ISBN 0-07-058833-3
2. "Fundamentals of Multimedia", Li Ze-Nian, Drew Mark S., Pearson Education, 2004, ISBN 81-297-0438-2

Reference Books

1. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8
2. "Data Compression Book", Mark Nelson, 2nd edition, M&T Books ISBN 1-55851-434-1 541

Additional Reading

1. "Flash 8 Bible", Robert Reinhardt, Snow Dowd, Macromedia,ISBN:9788126507375
2. "Foundation AS Animation: Making Things Move!", Keith Peters, Friends of ED publication, ISBN: 1590595181
3. "3ds max Animation and Visual Effects Techniques", Sanford Kennedy, 2nd edition, Charles River Media, ISBN:9788177224924

**CS47308:: PROJECT STAGE 3****Credits:** 06**Teaching Scheme:** - Practical 8Hrs/Week**Aim**

This course addresses the issues associated with the successful management of a software development project. The course emphasizes project life cycle phases requirement engineering, system analysis and system design. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and their career. The Project Work can lead to:

- a. Transform existing systems into conceptual models.
- b. Transform conceptual models into determinable models.
- c. Use determinable models to obtain system specifications.
- d. Select optimum specifications and create physical models.
- e. Apply the results from physical models to create real target systems.

Objectives

1. To provide an understanding of the project planning process and problem scoping
2. To define roles and work with cross functional teams
3. To establish clear project objectives and milestones
4. To create effective and deliverable project plans
5. To perform rigorous analysis and design activities for solution planning
6. To select appropriate technology for implementation and testing
7. Mapping with PEOs: III, IV, (f).

Overview of the Course:

1. The Student Project Group will prepare a detailed Project Report consisting Semester I Preliminary Project document along with Detailed System Design Document, Implementation and Testing Document with conclusion and future scope of the Project Work. All the documents indicated will have a prescribed format. The Project Report ideally should consist of following documents : (Exceptions may be there based on the nature of the project, especially if some of the following documents are not applicable to a particular project as determined by the project guide, coordinator and head of department).

Sr.	Project Item
1	Project Cover Front Page
2	Project Completion Certificate [Institute]
3	Project Completion Letter



	[In case of Sponsored Projects]
4	Acknowledgments
5	Table of Contents
6	List of Figures
7	List of Tables
8	Project Synopsis [Problem Background, Existing System Details, Proposed Solution]
9	Feasibility Study Report
10	Project Plan
11	System Requirement Specification
12	System Analysis Document: UML Use Case Diagrams
13	System Analysis Document: UML Sequence Diagrams
14	System Analysis Document: UML State Diagrams
15	System Design Document with Module Specifications
16	System Implementation
17	System Testing and Experimental Findings
18	Conclusion
19	References

2. The Project Work will be assessed jointly by a panel of examiners consisting faculty and industry experts. The Project Groups will deliver the presentation and demonstration of the Project Work which will be assessed by the panel.
3. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work and overall development effort taken by the candidates.

Note:

The student needs to design and develop solution for the identified technological problem in the area of Computer Engineering or Information Technology of their choice. The Project Implementation needs to be completed using best possible use of available technologies as applicable to deal with the complexity of the project. The Project Group will prepare a detailed report of the project work which will be approved by the concerned faculty member. The Project Report need to be submitted both in Hard form and Soft form in CD. The Soft Copy of the Project Report must accompany other project deliverables as well.

**Assessment Scheme**

Sr. No.	Content	Marks
1	System Requirement Specification	05
2	Feasibility Study	05
3	System Analysis	10
4	System Design	10
5	System Implementation	25
6	System Testing	25
7	Presentation of the Project Work	20

Outcomes:

Upon completion of the course, the students will be to:

1. Identify major issues in complex situations; and know how to prepare alternative solutions and make decisions.
2. Becoming aware of the need to think and act in an entrepreneurial manner by developing the ability to: critically and creatively understand innovations and development, work independently and collaboratively.