Bansilal Ramnath Agarwal Charitable Trust’s

Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to University of Pune)

Structure & Syllabus of

B.Tech. (Computer Engineering)

Pattern ‘A-14’
Effective from Academic Year 2015-16

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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*Elective Group I (Theory Course)

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$\textit{Elective Group IV (Tutorial)}$

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Course Syllabi for PD Courses in TY B.Tech (Computer Engineering)

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## Program Educational Objectives (PEO)
### B.Tech (Computer Engineering)

List of Programme Education Objectives [PEO] and Programme Outcomes [PO]

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<th>PEO Focus</th>
<th>PEO Statement</th>
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<tr>
<td>PEO1</td>
<td>Preparation</td>
<td>To prepare the students as a committed technology workforce by providing them global educational platform with innovative practices resulting in computing artifacts realization</td>
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<td>PEO2</td>
<td>Core competence</td>
<td>To impart adequate mathematical and computing theory knowledge basis leading to sustainable computer engineering solutions development</td>
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<tr>
<td>PEO3</td>
<td>Breadth</td>
<td>To inculcate problem solving skills and engineering practices in students adhering to well-formed technical specifications and constraints with the help of sound methods, tools and techniques</td>
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<td>PEO4</td>
<td>Professionalism</td>
<td>To instill in the students professional and ethical practices by following effective guidelines to acquire aptitude, attitude and desire beneficial in societal context</td>
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<td>PEO5</td>
<td>Learning Environment</td>
<td>To promote aspiring students for continuing education, engineering certifications and entrepreneurship in emerging areas of computing</td>
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**List of Programme Outcomes [PO]**

Graduates will be able

<table>
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<tr>
<th>PO</th>
<th>Graduate Attributes</th>
<th>PO Statement</th>
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| P01 | GA: 1 Engineering Knowledge | 1. To apply scientific, mathematical and computing fundamentals in order to devise engineering solution for real world problems.  
2. To apply computer theory and algorithmic principles to innovatively craft solutions by context and development. |
| P02 | GA: 2 Problem Analysis    | 3. To discover and infer computing problem situations, resulting in physical model, mathematical model or graphical model depicting the overall problem.  
4. To systematize functional specifications of target computing environment by adequate consideration of technology infrastructure, boundary conditions and constraints. |
| P03 | GA: 3: Design/Development of solution | 5. To conceive well-formed design specifications and constructs demonstrating correct compositional system structure with implementation-centric considerations.  
6. To incorporate architectural styles and design patterns to assimilate new facts, information and ideas about the design. |
| P04 | GA: 4: Conduct Investigation of Complex Problem | 7. To interpret reference data and program pragmatics for analyzable experimental results derivation.  
8. To judge and relate complexity issues and levels by making use of standardized verification and validation techniques. |
| P05 | GA: 5: Modern Tool Usage | 9. To operationalize and utilize the state-of-the-art CASE tools for engineering artifacts construction.  
10. To correlate and hypothesize problems for recognizing new or unfamiliar problem patterns. |
| P06 | GA: 6 : The Engineer and Society | 11. To minimize adverse effects on the environment for their own and succeeding generations by respecting published facts and guidelines. |
| P07 | GA: 7: Environment and sustainability | 12. To consider the impact and benefits of engineering achievements in exploitation and management of technology on environment and society. |
| P08 | GA: 8 : Ethics | 13. To prepare and present engineering evidence, theory and interpretations honestly, accurately and without bias. |
| P09 | GA: 9: Individual and Team Work | 14. To demonstrate high standards of professional conduct, openness and fairness by maintaining due respect towards rights and reputation of team members and development organization. |
| P10 | GA: 10: Communication | 15. To demonstrate deep listening, learning, leadership and managerial skills to solve complex engineering problems in teams. |
| P11 | GA: 11: Lifelong Learning | 16. To become part of a valuable body of knowledge in competitive computing areas.  
17. To acquire responsible positions in government, industry and society by continuously learning and researching. |
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<tr>
<th>PO12</th>
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<td>18. To creatively devise and incorporate project-specific processes supported by rigorous standards applicable to professional engineering bodies.</td>
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## F.Y. B. Tech. Structure with effect from Academic Year 2015-16

### Module 1

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### F.Y. B. Tech. Structure with effect from Academic Year 2015-16

**Semester I – Irrespective of Module**

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**HS153xx : General Proficiency Courses as per following list**
### List of General Proficiency Courses

**FY B Tech**  
**AY 2015-16**

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CS10102:: COMPUTER PROGRAMMING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites:

Unit 1: (8+2 Hrs)


Unit 2: (8+2 Hrs)

Arrays: Concept, declaration and initialization of arrays, accessing individual elements of array. Use of arrays in sorting, searching. Concept of 2-D array (Matrix), row major and column major representation of array, address calculation for accessing the individual element.

Part B: Static variables and constants in C language.

Unit 3: (8+2 Hrs)

Part B: Preprocessor and preprocessor directives: macro substitution, difference between macro and functions.

Unit 4:

Part A:


Strings: Strings as arrays, character array versus strings, reading strings, writing strings, user defined functions for string operations – copy, concatenate, length, reverse, converting case, appending, comparing two string, extracting a substring. Array of strings.

Part B: Const keyword in C, standard string library functions in string.h for string manipulation.

Unit 5:

Part A: Structures: Notion, declaration and initialization, structure variables, accessing and assigning values of the fields, "size of" operator, functions and structures, arrays of structures, nested structures, pointers and structures, passing structure to a function and returning structure from function. Dynamic memory allocation, type casting, Introduction to self referential structures, linked list as a dynamic alternative to arrays.

File Handling in C: file types, file opening modes, file handling I/O – fprintf, fscanf, fwrite, fread, fseek. File pointers. Implementing basic file operations in C.


Text Books

Reference Books

Additional Reading
Course Outcomes:

Upon completion of the course, graduates will be able to -
1. List procedural programming benefits to construct concise solutions
2. Interpret and develop naturo-visual representation of problem in hand.
3. Apply available algorithmic principles to general efficient solutions
4. Justify modular programming approach by making use of elementary as well as superior data structures.
5. Apply programming fundamentals with generic prototype.
6. Evaluate and manipulate given solutions in reengineered view
CS10302:: COMPUTER PROGRAMMING LAB

Credits: 01  

Teaching Scheme: - Laboratory  2 Hrs/Week

Prerequisites:

List of Practicals

1. Study of most important DOS/UNIX commands.

2. Write a program in C to find largest element / average of given N elements / sum / reverse of a given integer.

3. Write a program in C to implement a simple mathematical calculator

4. Write a program in C to read an integer and display each of the digits of an integer in English.

5. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

6. Write a program in C to perform Addition / Subtraction / Multiplication of two Matrices. Also determine whether the matrix is symmetric / skewed.

7. Write a program in C to carry out following operations on strings using string library Functions:
   a. Length of a string.
   b. Copy a string.
   c. Concatenation of strings.

8. Write a program in C to carry out following operations on strings without using string library functions
   a. Compare two strings.
   b. Reverse given string.
   c. To check if the given string is a palindrome or not.

9. Write a program in C to carry out following operations on strings using pointers.
   a. Length of a string.
   b. Concatenation of strings.
   c. Copy of string
   d. Compare two strings.

10. Write a C program that works with complex numbers using a structure. Perform the following operations:
    a. Reading a complex number.
b. Addition of two complex numbers.
c. Writing a complex number.
d. Multiplication of two complex numbers.

11. Write a C program to create a database of students by using array of structure and perform following operations on it.
a. Accept/modify record of student
b. Search a particular record
c. Display all records

12. Write a program in C that use both recursive and non-recursive functions to find the Factorial / GCD (greatest common divisor) of two given integers / Fibonacci series.

13. Write a program in C to sort n integers using bubble / merge sort.

14. Write a program in C to search a number in a given list using linear / binary search.

Text Books

Reference Books

Additional Reading
MODULE V
### Module V

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CS30101:: OPERATING SYSTEMS

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Data Structures and Algorithms, Computer Organization.

Unit 1:  
Introduction to OS

Part A: Introduction to OS: What is OS, Interaction of OS and hardware, Goals of OS, Basic functions of OS, OS Services, System Calls.
Types of OS: Batch, Multiprogramming, Time sharing, Parallel, Distributed & Real-time OS.
Structures of OS: Monolithic, Layered, Ringed, Virtualization-Virtual Machines, Hypervisor, Exokernels, Client-server model, Microkernels.
Shell: Linux commands and shells, shell programming, AWK programming.
Introduction to Mobile OS: Architecture & Overview of Android OS.

Part B: Overview of Linux and Windows 2000 architecture

Unit 2:  
Process Management

Threads: Multithreading models, Thread implementations – user level and kernel level threads.
Symmetric Multiprocessing.
Concurrency: Issues with concurrency, Principles of Concurrency


Unit 3:  
Scheduling and Deadlock

(8+1 Hrs)

Scheduling Algorithms: FCFS, SJF, RR, Virtual Round Robin, Priority

Multiprocessor Scheduling: Granularity, Design Issues, Process Scheduling


Part B: Thread Scheduling, Real Time Scheduling.

Unit 4: (8+1 Hrs)
Memory Management


Virtual Memory: Concepts, VM with Paging, Page Table Structure, Inverted Page Table, Translation Lookaside Buffer, VM with Segmentation.

OS policies for Virtual Memory: Fetch, Placement, Replacement, Resident Set management, Cleaning Policy, Load Control.


Part B: VM with combined paging and segmentation, Working Set Model.

Unit 5: (8+1 Hrs)
I/O and File Management


Disk Scheduling: FCFS, SCAN, C-SCAN, SSTF.


File System: Structure, Implementation, Memory mapped files, Special Purpose File Systems

Case study: Process Management, Concurrency, Scheduling, Memory Management, I/O Management, File Management(VFS) in LINUX

Part B: Organization of I/O functions, Disk Caches.
Text Books

Reference Books

Additional Reading

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Identify the mechanisms and strategies of an Operating System in order to solve real world problems. (scheduling, deadlock, paging, disk scheduling)
2. Develop solutions based on Operating system concepts in various contexts. (classical problems & all algorithms)
3. Automate the administrative tasks by means of modern tools in Operating System. (shell, AWK)
4. Examine the functions of a contemporary Operating system with respect to convenience, efficiency and the ability to evolve. (All function of OS)
5. Engage in a team towards development of a prototype Operating System. (lab)
6. Construct solutions to real world problems by applying the standard techniques used by Operating Systems for similar issues. (all numerics)
CS30116:: COMPUTER NETWORKS

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Data Communication.

Unit 1: (8+1 Hrs)
Introduction to Computer Networks and Logical Link Control

Part B: Point-to-Point Protocol (PPP), MPLS, Bridges, Gateways, Network Cables

Unit 2: (8+1 Hrs)
Medium Access Control

Part B: Gigabit Ethernet, Layer-II Switch and Bluetooth

Unit 3: (9+2 Hrs)
Network Layer

Part B: Broadcast and Multicast routing, Routing for mobile hosts, IGMP, Mobile IP, VLAN

Unit 4: (8+1 Hrs)
Transport Layer


Part B: Real Time Streaming Protocol RTSP, RTP, RTCP

Unit 5: (7+1 Hrs)

Application Layer

Part A: Domain Name System (DNS), Naming and Address Schemes, DNS servers, E-mail: MIME, SMTP and POP3. Remote login, File Transfer Protocol (FTP), SNMP, DHCP and BOOTP. CDN, Working of Bit Torrent, Cloud computing: Architectures and working principle.


Text Books

Reference Books

Additional Reading

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Interpret topological network architectures and essential components to design it.
2. Estimate reliability issues based on error control, flow control and pipelining by using bandwidth, latency, throughput and efficiency.
3. Uniformly demonstrate LAN behavior utilizing network architecture, protocols, and
network components.
4. Design client server based applications using sockets.
5. Demonstrate data flow between peer to peer in an IP network using Application,
   Transport and Network Layer Protocols.
CS30105:: THEORY OF COMPUTATION

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Data Structures.

Unit 1:  
Automata Theory


Part B: FA with output: Moore and Mealy machine.

Unit 2:  
Regular Expressions (RE) and Languages

Part 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, Non Regular Languages, Pumping Lemma for regular Languages, Myhill-Nerode theorem, Closure properties of Regular Languages, Applications of RE: Regular expressions in Unix, GREP utilities of Unix, Lexical analysis and finding patterns in text.

Part B: Decision properties of Regular Languages.

Unit 3:  
Context Free Grammars (CFG) and Push Down Automata(PDA)

Part A: Context Free Grammars: Definition, Examples, Derivation, Languages of Grammar, Derivation trees, Ambiguity in Grammar, Ambiguous and 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), Chomsky Hierarchy. Pumping lemma for CFLs

Push Down Automata: Description and definition, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, CFG to PDA construction (with proof). Equivalence of PDA and CFG (without proof).

Part B: Regular grammars, left linear and right linear regular grammars, regular grammar and finite automata.

Unit 4:  
(7+1 Hrs)
Introduction to Turing Machines

Part A: Turing Machines: Basic model, definition and representation, Instantaneous Description, Language acceptance by TM. Robustness of Turing Machine model and equivalence with various variants: Two-way/One-way infinite tape TM, multi-tape TM, non-deterministic TM, TM as enumerator. Recursive and Recursively Enumerable languages and their closure properties.

Part B: Comparison between Finite Automata, Push Down Automata, and Turing Machines.

Unit 5: (6+1 Hrs)

Introduction to Undecidability


Part B: Hilbert’s tenth problem, undecidability of tiling problem

Text Books

Reference Books

Additional Reading

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. To infer the applicability of various automata theoretic models for recognizing formal languages.
2. To discriminate the expressive powers of various automata theoretic and formal language theoretic computational models.
3. To illustrate significance of non determinism pertaining to expressive powers of various automata theoretic models.

4. To comprehend general purpose powers and computability issues related to state machines and grammars.

5. To explain the relevance of Church-Turing thesis, and the computational equivalence of Turing machine model with the general purpose computers.

6. To grasp the theoretical limit of computation (independent of software or hardware used) via the concept of undecidability.
CS3113: Microprocessors and Microcontroller

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Microprocessors and Interfacings.

Unit 1: (8+1 Hrs)
Introduction to Pentium microprocessor

Part A: Historical evolution of 80286, 386, 486 processors. Pentium features and Architectures, Pentium Real mode, Pentium RISC features, Pentium super-scalar architecture - Pipelining, Instruction paring rules, Branch prediction, Instruction and Data caches. The Floating point Unit features & data types.

Part B: Pipelining stages.

Unit 2: (8+1 Hrs)
BUS cycles and Memory organization


Part B: Pentium Instruction Set.

Unit 3: (8+1 Hrs)
Microcontroller


Part B: Programmer’s model

Unit 4: (8+1 Hrs)
Microcontroller I/O interfacing


Part B: Design of Delay Routine using Hardware timers.

Unit 5: (8+1 Hrs)
Protected Mode Architecture of Pentium

**Part A:** Introduction, segmentation, support registers, related instructions, descriptors, memory management through segmentation, logical to linear address translations, protection by segmentation, privilege-level, protection, related instructions, inter-privilege level, transfer control, Paging-support registers, related data structures, linear to physical address translation, TLB, page level protection.

**Part B:** Programming of Protected mode

**Text Books**

**Reference Books**
1. ARM data Sheet.
2. Intel data Sheet.

**Course Outcomes:**
Upon completion of the course, graduates will be able to -
1. Describe the Structure and Internal Architecture of Pentium Processor and Microcontroller.
2. Develop simple Programs.
3. Utilize the Structures to effectively solve Computing Problems.
5. Design Effective Automation Solutions.
6. Lead Team to deliver Effective Designs.
CS31115:: ADVANCED DATA STRUCTURES

Credits: 02
Teaching Scheme: - Theory 2 Hrs/Week

Prerequisites: Data Structures

Unit 1: (6+1 Hrs)
Hashing

Part B: Alternate hash functions (mid-square, folding, digit analysis), Double Hashing

Unit 2: (7+1 Hrs)
Priority Queue and Advance Heaps

Part B: Comparative study of different priority queue implementations using – binary heaps, leftist trees, binomial heaps, Fibonacci heaps with respect to the following operations – insert, delete, find-min, extract-min, decrease-key, meld

Unit 3: (6+1 Hrs)
Advanced Binary Search Trees

Part B: Insertion and Deletion in B Trees and B+ Trees.

Unit 4: (6+1 Hrs)
Digital Search Structures

Part B: Space required and alternative node structures for a Trie.
Unit 5: 
(7+1 Hrs)

Data structures for Disjoint Sets and Linear Programming


**Part A:** Linear Programming duality

**Text Books**

**Course Outcomes:**

Upon completion of the course, graduates will be able to -

1. Demonstrate memory efficient solution in order to apply basic principle of programming perspective.
2. Analyze complexity issues for space and time bound scaled objective for programming solution.
3. Infer memory utilization with modularization useful for programming pragmatics.
4. Verify and narrate test condition in employing debugging technique to assist problem solving.
5. Elaborate on unrecognizable well organized problems based on realizable solutions.
6. Contribute breadth of modularization in order to understand and implement realistic solution.
CS30101:: OPERATING SYSTEMS

Credits: 01  
Teaching Scheme: -  Tutorial 1 Hr/Week

Prerequisites:: Data Structures and Algorithms, Computer Organization.

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. Implement the solution for Reader-Writer problem using Threads and Semaphores/Mutex.
5. Implement the solution for Producer-Consumer (Bounded Buffer) problem using Threads and Semaphore/Mutex.
6. Implement the solution for Dining-Philosopher problem using Threads and Semaphore.
7. Implementation of resource allocation graph (RAG).
8. Implement the solution for Banker’s Algorithm for deadlock avoidance.
9. 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 (Preemptive and Non-Preemptive)
   c. Priority (Preemptive and Non-Preemptive)
   d. Round Robin
10. Calculate the number of page faults for a reference string for the following page
replacement algorithms:
   a. Optimal
   b. FIFO
   c. LRU

11. Calculate the total distance traversed by the disk arm to satisfy the pending requests for the following disk scheduling algorithms:
   a. FCFS
   b. SSTF
   c. SCAN
   d. C-SCAN

Text Books

Reference Books

Additional Reading:
CS31215:: ADVANCED DATA STRUCTURES

Credits: 01  Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Data Structures

List of Contents

1. Example to indicate the limitations of static hashing and how it is addressed using dynamic hashing
2. Implement an application that uses bloom filter
3. Improve the performance of Dijkstra’s shortest path algorithm using Fibonacci heaps
4. Implement a binomial heap and compare its amortized complexity with binary heap
5. Implement a data store using Red Black trees as the underlying data structure
6. Implement an application that makes use of a prefix tree (trie) – address book, spell checker, auto completion etc.
7. Implement a solution for LCS problem (Longest Common Subsequence) using suffix trees
8. Improve the performance of Kruskal’s MST algorithm using disjoint set data structure
9. Write a program to solve a linear programming problem using simplex algorithm
10. Simulate a real-world application (search engine, file system, etc.) using one or more advanced data structures.

Text Books

Reference Books
CS30303:: OPERATING SYSTEMS

Credits: 01
Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Data Structures and Algorithms, Computer Organization

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

Text Books

Reference Books

Additional Reading
CS30316:: Computer Networks

Credits: 01                    Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Data Communication

List of Practical

1. Set up a small network of 2 to 4 computers using Hub/Switch. It includes installation of LAN Cards, Preparation of Cables, Assigning IP addresses and sharing C drive.

2. File Transfer using PC To PC Communication.


4. Studying Linux and Windows network commands. [ ping, pathping, ipconfig/ifconfig, arp, netstat, nbtstat, nslookup, route, traceroute/tracert, nmap, etc]

5. Program for calculating CRC using Modulo-2 and Polynomial methods.

6. Simulate the sliding window protocols Go Back N and Selective Repeat.

7. File Transfer between two computers using TCP sockets.

8. Multiuser chat application using UDP sockets.

9. To create TCP/IP packet using standard TCP/IP include files and send it to other machine

10. Program to find active and passive ports on nearby host using sockets.

12. Installing and configuring DHCP server for Linux/Windows.

Text Books

Reference Books

Additional Reading
CS31313:: Microprocessors & Microcontrollers

Credits: 01

Teaching Scheme: -Laboratory 2 Hrs/Week

Prerequisites: Microprocessor and Interfacings

List of Practical

Group A- Pentium
1. Write an ALP to simulate TYPE command using PSP.
2. Write an ALP to simulate COPY command using PSP.
3. Write an ALP to do the Following
   a) Capture MSW
   b) Display and Analyse Contents of GDTR IDTR LDTR
4. Write an ALP / in line code for displaying boot record of hard disk.
5. Write a Program to Demonstrate Code Cache Design
6. Write ALP for DPMI.
7. Write ALP for Mouse interface.
8. Study of Pentium motherboard.
9. Write ALP to implement multitasking using Pentium programming.

Group B- ARM-7
1. Write a program to interface Switch and LED.
2. Write a program to interface Timer.
3. Write a program to interface LCD.
4. Write a program to interface serial port.
5. Write a program to interface ADC.
6. Write a program to interface Stepper motor.

Text Books

Reference Books
1. Intel data sheet.
2. DOS data manual.
CS37401::MINI PROJECT

Credits: 02

Guidelines:
The Student has to select a project in group based on a topic of interest from any of
the subjects offered in current Semester. Periodically the implementation will be evaluated
by the guide.

Evaluation is done in two stages. In the first review the internal Guide evaluates the project
against 40% of the implementation of work. At the end of semester each group will be
evaluated by externally Guide from Industry based on their Presentation, completeness of
Project implementation and report artifact.

Course Outcomes
Upon completion of the course, graduates will be able to -
1. Recognize essential & dominant area of technology for achievable artifacts over
rapid period of time.
2. Acquire rapid application development cycle involving prototyping to learn adequate
technological environments.
3. Concisely formulate specific problem in drafted specification format.
4. Devise data dictionaries and solution design with sufficient details.
5. Demonstrate the crafted solutions to user community with a lean learning curve.
6. Validate newer dimension of extendable and scalable nature of the problem solution
crafting.
CS37301::SEMINAR

Credits: 02
Teaching Scheme: - Lab 2 Hrs/Week

Guidelines:
Seminar is a course requirement wherein under the guidance of a faculty member a student is expected to do an in-depth study in a specialized area by doing literature survey, understanding different aspects of the problem and arriving at a status report in that area. Students are expected to choose a topic in CSE based on current trends or industry practices. While doing a seminar, the student is expected to learn investigation methodologies, study relevant research papers, correlate work of various authors/researchers critically, study concepts, techniques, prevailing results etc., analyze it and present a seminar report. Evaluation will be based on relevance of topic, understanding of the problem, literature Survey, presentation, communication skills, answering queries and reporting or documenting procedure.

Course Outcomes:
Upon completion of the course, graduates will be able to -

1. Scope and visibly identify technological trade off in computer engineering leading to significant topics.
2. Conduct a thorough literature survey of identify technical topic.
3. Present technical topic in written form with technical report or document
4. Communicate effectively technical topic in verbal form with suitable demonstration
5. Access real world problem scenarios in computer engineering.
6. Demonstrate skills and competences with an awareness of technical standardization.
CS37302::PROJECT STAGE I

Credits: 02

Guidelines:

Aim
This course addresses the issues associated with the successful management of a 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 working with peers to create desired outcomes. The Project Work can lead to:

a. Transform existing Ideas 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.

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 based on a Fresh Idea or Implementation of a Theoretical Problem – meaning that there is not a known Solution to the design problem Or Create a Better Solution.
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 , 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. 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.

Assessment Scheme

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<th>Sr. No.</th>
<th>Content</th>
<th>Marks</th>
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<td>Concept</td>
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<td>2</td>
<td>System Requirement Specification</td>
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<td>3</td>
<td>System Analysis</td>
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<td>4</td>
<td>System Design Block Diagram</td>
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<tr>
<td>5</td>
<td>Presentation of the Project Work</td>
<td>10</td>
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Course Outcomes:
Upon completion of the course, graduates will be able to -

1. Identify Real World Problems
2. Apply Computing Solutions to Real World Problems
3. Construct a Solution Model to Real World Problem
4. Select Design Pattern to Best approach the Solution.
5. Lay Down rules to Minimise Adverse Impact of Design Implementation
6. Adapt to changing Technological and Human resource advances.

Note:
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:

<table>
<thead>
<tr>
<th>Computer Networks</th>
<th>Image Processing</th>
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<tbody>
<tr>
<td>Operating Systems</td>
<td>Artificial intelligence</td>
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<td>Network Security</td>
<td>Expert Systems</td>
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<td>Digital Signal Processing</td>
<td>Object Oriented Systems</td>
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<tr>
<td>Systems Programming</td>
<td>Modeling and Design</td>
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<td>Real Time Systems</td>
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<td>Embedded systems</td>
<td>Storage Management</td>
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<td>Cluster Computing</td>
<td>Client-Server Computing</td>
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<td>Mobile &amp; Wireless Communications</td>
<td>Cloud Computing</td>
</tr>
<tr>
<td>Multimedia Systems</td>
<td>Protocol Engineering</td>
</tr>
</tbody>
</table>
Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Core Java.

List of Practical

1. Design a java application to demonstrate the use Java revision, anonymous inner classes, file handling, GUI, event handling, debugging using IDE.

2. Design a java application to demonstrate use of Multithreading, concurrency, synchronous and asynchronous callbacks, ThreadPools using ExecutorService.

3. Design a java application to demonstrate use of Collections and generics.

4. Design a java database application using multithreading and concurrency control.

5. Design a java application to demonstrate use of Servlets and JSP.

6. Design a client-server application demonstrating the use of Java I/O using sockets with GUI for configurations.

7. Design a java RMI application.

8. Designing a java application to demonstrate use of Web Services - REST and SOAP.

9. Design a java application to demonstrate dynamic invocation using reflection.

Reference Books


Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Select the advanced features of java in solving a complex problem.
2. Implement appropriate exception handling in code.
3. Choose the appropriate advanced java features depending on problem statement.
4. Practice an IDE like Eclipse or Netbeans for quicker coding/debugging.
5. Produce reusable and extensible design to minimise rework.
6. Construct the solution by breaking the complex problem into smaller problems.
CS33312: PIC Microcontroller

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Microprocessor, x86, x86 Interfacing Chips.

List of Practical

1. Assignment on Program Compilation and Burning into Microcontroller.
2. Assignment on Input Output.
3. Assignment on Interrupt.
4. Assignment on LED.
5. Assignment on Timer.
6. Assignment on LCD.
7. Assignment on UART.
8. Assignment on Write and Read from EEPROM.
9. Assignment on ADC.
10. Assignment on PWM.
11. Assignment on Stepper Motor.

Text Books

1. Data Sheet www.microchip.com
2. Hitachi Data Sheet on LCD HD 44780

Reference Books

1. Microchip 18F45xx

Course Outcomes:

Upon completion of the course, graduates will be able to –

2. Utilize the Structures to effectively solve Computing Problems.
3. Design system interconnects for effective throughput.
4. Validate design outputs using standards test equipment.
5. Design Effective Automation Solutions.
6. Cooperate with diverse Teams for delivering automation Solution.
CS33313:: MOBILE APPLICATION DEVELOPMENT

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Java.

List of Practical

1. Download, Install and Configure Eclipse IDE with Android Development Tools (ADT) plug-ins and Android SDK or Android Studio or Net Beans with Android plugin.

2. Building Simple User Interface using UI Widgets such as Buttons, Text Fields and View.

3. Design an android based application using content provider.

4. Develop an android based application to implement the sequential and random file operation.

5. Develop an android based application to create simple embedded database for the student attendance and find defaulters in the class using SQLite.

6. Design an android based application to demonstrate GPS services using Google map.

7. Design an android based application to implement HTTP operations for internet communication.

8. Design an android based application to implement chat application using socket programming.

9. Design an android based application to take a snapshot by using the Camera in your mobile. Save the snapshot in the image or video format. Use Camera Media API provided Android.

10. Mini Project.

Text Books


Reference Books


Course Outcomes:

Upon completion of the course, graduates will be able to
1. Use embedded database SQLite, Flat files and Multi Media files.
2. Display the current location of a device using google map.
3. Develop the user interface.
4. Choose suitable software tools and APIs for the development of Mobile Application
5. Design and deploy mobile application using software development environment
6. Demonstrate internet based application.
CS33306:: ETHICAL HACKING AND NETWORK DEFENSE

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Fundamentals of IT, Networking, Microsoft OS, LINUX or UNIX operating systems.

List of Practical
1. Study of different type of attacks
2. Study of Ethical hacking, types of hacking, different phases involved in hacking.
3. Study of skills to become ethical hacker.
4. Study of spoofing techniques
5. Study of password cracking techniques
7. Study of spyware technology
8. Study of types of viruses, antivirus techniques and virus detection mechanism
9. Study of Sniffing techniques and tools.
10. Study of Flooding attacks like MAC flooding, SYN flooding etc.
11. Study of Session Hijacking and prevention of session hijacking.
12. Web based password cracking techniques
14. Study of Physical security.

Text Books
Michael T Simpson – “Ethical Hacking and Network Defense”.

Course Outcomes
Upon completion of the course, the students will be able to:

1. Analyze nature and type of attack.

2. Establish type of attack on a given system.

3. Simulate different types of attacks using tools.
4. Differentiate between the type of communication services used for attack.

5. Design a secure system for protection from the various attacks by determining the need of security from various departments of an organization.

6. Estimate future needs of security for a system by researching current environment on a continuous basis for the benefit of society.
CS33310: SPRING FRAMEWORK

Credits: 01            Teaching Scheme: Laboratory 2 Hrs/Week

Prerequisites: Java, JSP, Servlets

List of Practical

1. Assignment on Spring Environment Setup.
2. Assignment on Spring Hello World Example.
3. Assignment on Spring IOC Container.
4. Assignment on Spring Bean Scopes, Spring Bean Life Cycle.
5. Assignment on Spring Bean Post Processors.
6. Assignment on Spring Dependency Injection, Spring Injecting Inner Beans, Spring Injecting Collection, Spring Beans Auto-Wiring.
7. Assignment on Spring Annotation Based Configuration, Spring Java Based Configuration.
8. Assignment on Event Handling in Spring.
9. Assignment on Spring AOP Assignments.
10. Assignment on Spring JDBC assignments.
11. Assignment on Spring Web-MVC Assignments.

Text Books

1. *Spring Recipes – A problem solution approach* by Gary Mak, Josh Long and Daniel Rubio.
2. *Professional Java Development with the Spring Framework*, by Rod Johnson

Reference Books

1. *Pro Spring 3.0* by Clarence Ho, Rob Harrop.

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Analyze Real world problems using Spring Framework Architecture, MVC
model, Aspect Oriented Programming (AOP) and Event Handling in Web Architecture.

2. Construct formalized design patterns to effectively implement Java Enterprise Application lifecycle.

3. Create application using Spring Tool Suite, Software project management and comprehension tool like Maven.

4. Demonstrate that the business rules and validations are implemented in shorter time using this framework.

5. Acquire skills to work on real time projects in industry.

6. Use pre-built framework for rapid application development using Spring Framework MVC Applications.
CS33311: STRUTS FRAMEWORK

Credits: 01  
Teaching Scheme: - Laboratory  2 Hrs/Week

Prerequisites: Java, JSP, Servlets

List of Practical
1. Building a Simple Struts Application
2. Struts validator framework
3. Setup validator framework in Struts
4. Struts validator Framework
5. Using the validator framework in struts
6. Validator framework work in Struts
7. Sing validator framework work in struts
8. Using the validator Framework
9. Fixed Value check using struts validator framework
10. Struts 2 double validator
11. Struts 2 Date validator
12. Client Side Address Validation in Struts
13. Struts 2 RequiredString validator
14. Struts 2 E-mail Validator
15. XML files used in Validator Framework?
16. struts - Framework
17. Struts 2 Validation (Int Validator)
18. Struts 2 Url Validator
19. Validation using validator-rules.xml – Struts

Text Books
1. "Jakarta Strus Live" by Rick Hightower published by SourceBeat.

Reference Books

Course Outcomes:

Upon completion of the course, graduates will be able to -

4. Demonstrate that the business rules and validations are implemented in shorter time using this framework.
5. Acquire skills to work on real time projects in industry.
6. Incorporate best practices for building applications with Struts.
CS33314:: PROBLEM SOLVING AND PROGRAMMING

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Data structures.

List of Practical

1. Data structure review (stack, queue, linked list).

2. Graph searching techniques (DFS, BFS, IDDFS etc.) and applications of graph searching in problems in programming competition.

3. Advanced data structures union-find (including optimized algorithms like path compression), segment trees, interval trees, augmented data structures and their applications.

4. String searching algorithms.

5. Dancing links to speed up backtracking


Text Books


Reference Books


Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Apply and practice logical ability to solve the problems.
2. Modularize the problems into small modules and then convert them into algorithms
3. Analyze algorithms and determine their time complexity.
4. Trace and code recursive programs.
5. Choose appropriate problem solving technique
6. Verify and validate the correctness of the algorithm.
CS33315:: BIG DATA TECHNOLOGIES

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Programming Skills

List of Practical

1. Study of Hadoop 1 / Hadoop 2 (YARN)
2. Study of hadoop distributed file system (HDFS)
3. Manipulation of data on HDFS
4. Learning Map Reduce Programming
5. Word count problem using Map Reduce Programming
6. Hands-on over Pig
7. Hands-on over Hive
8. Introduction to Hbas

Text Books

2. "Programming Pig", Allen Gates, O'Reilly

Reference Books

1. “Programming Hive”, Dean Wampler, O'Reilly
2. “HBase: The Definitive Guide”, Lars George, O'Reilly

Additional Reading

1. "Hadoop In Action", Chuck Lam, Manning Publication

Course Outcomes:

Upon completion of the course, graduates will be able to -

1. Illustrate architecture of Hadoop
2. Break down a computing problem into multiple parallel tasks
3. Explain Hadoop Ecosystem
4. Organise input data to handle it using HDFS
5. Apply map reduce programming technique to address real world problems
6. Adapt to upcoming technologies for management of complex big data problems
CS33307:: MATLAB

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites:

List of Practical (Any Ten)

1. Introduction to MATLAB, MATLAB Elements & Simple Programs and debugging concepts.

2. Write a Matlab Program for functions.

3. Write a Matlab Programs by using IF Then Else, Case, Statement, for Loop, While loop.

4. Write a Matlab Program for 2-D graph.

5. Write a Matlab Program for 3-D graph.

6. Write a Matlab Program for various Image operations.

7. Write a Matlab Program for Animations.

8. Study of MATLAB debugging commands.

9. Write a Matlab Program to create GUI.

10. Write a Matlab Program to simulate a simple circuit.

11. Write a Matlab Program to create Movie.

12. Write MATLAB Program to read sound file and adjust its parameters.

13. Write MATLAB Program to read .avi file.
Text Books

Reference Books

Course Outcomes:
Upon completion of the course, graduates will be able to -

1. Solve Mathematical equations.
2. Design GUI by using MATLAB.
3. Construct Combinational circuit.
4. Validate design outputs using standards test equipments.
5. Develop animation programs by using MATLAB.
6. Perform various operations on Image.