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| **B. Tech. CSE Course Structure for batch admitted in 2015 and onwards** | | | | | | | | | | | | | | | | | |
| **SEM** | **Courses(L-T-P)** | | | | | | | | **Lecture|Lab Course** | **Contact Hours** | | | | | | | **Credits (Semester-wise)** |
| **L** | | **T** | | **P** | | **Total** |
| 1 | Logic Building and Problem Solving using 'C' (3-1-2)5**CSE107/CSP107** | Physics-II (3-1-2)5 **PHY112** | Mathematics-1 (3-2-0)4 **MTH112** | Environment Science (2-0-0)2 **EVS103** | Manufacturing Science Lab (0-0-4)2 **EEE154** | Functional English-I (2-0-2)3 **ENG102** |  | | 5|4 | 13 | | 4 | | 10 | | 27 | **21** |
| 2 | Advanced 'C' Programming (3-0-2)4 **CSE108/CSP108** | Chemistry (3-1-2)5 **CHY105** | Mathematics-2 (3-2-0)4 **MTH113** | Physics-IV(3-1-0)4 **PHY114** | PEEE(3-1-2)5 **EEE110** | Functional English-II(2-0-2)3 **EENG102** |  | | 6|4 | 17 | | 5 | | 8 | | 31 | **25** |
| 3 | Principles of Object oriented programming using Java (3-1-2)5 **CSE214/CSP214** | Data Structure using C (3-1-2) 5 **CSE 207/CSP208** |  | Computer Organization & Architecture (3-1-0) 4 **CSE209** | Principles of Operating systems (3-1-2)5 **CSE 208/CSP208** | Economics for Engineers (3-0-0)3 **HMM208** | Term Paper - I (0-0-2) 1 **CSP 281** | | 5|3 | 15 | | 4 | | 8 | | 27 | **23** |
| 4 | JAVA Programming (3-1-2) 5 **CSE210/CSP210** | Discrete Structures (3-1-0)4 **MTH201** | Principles of Data Base Management Systems (3-1-2)5 **CSE203CSP203** | Introduction to Computer Networks (3-1-2)5 **CSE 301/CSP301** |  | Communication Practices-I (2-0-2)3 **ENG202** | Term Paper - II (0-0-2) 1 **CSP 282** | | 5|4 | 14 | | 4 | | 10 | | 28 | **23** |
| 5 | Web Development Technologies (3-1-2) 5 **CSE310/CSP310** | Departmental Elective- I /Introductory Maths\* (ONLY FOR LATERAL ENTRY STUDENTS) (3-1-0) 4 | Theory of Automata (3-1-0) 4 **CSE202** | Introduction to Design & Analysis of Algorithms (3-1-2)5 **INT303** | Software Engineering (3-1-0)4 **CSE205** | Management for Engineers (3-0-0)3 | Term Paper - III (0-0-2) 1 **CSP 381** | | 6|3 | 18 | | 5 | | 8 | | 31 | **26** |
| 6 | UNIX Programming (3-1-2) 5 **CSE311/CSP311** | Deptt Elective-II (3-1-0)4 |  | Compiler Design (3-1-2)5**CSE303** | Artificial Intelligence(3-1-2) 5 **CSE312/CSP312** | Professional Skills Enhancement (2-0-4)4 **ENG301** | Term Paper - IV (0-0-2) 1 **CSP 382** | | 5|3 | 14 | | 4 | | 10 | | 28 | **24** |
| \*\*SUMMER TRAINING(0-0-0)2 **CSE393** | | | | | | | | | | | | | | | | | **2** |
| \*\*7 | Department Elective-III (3-1-0)4 | Deptt Elective-IV (3-1-0)4 | DE-V (3-1-0)4 | Open Elective-I (4-0-0)4 | Project-I (0-0-4)2 **CSP492** | Project Management (2-0-2)3 **HMM----** |  | 5|2 | | | 15 | | 3 | | 6 | 24 | **21** |
| 8 | Advance Computer Architecture (3-0-0)3 **CSE410** | Department Elective-VI (3-0-0)3 | Open Elective-II (4-0-0)4 |  | Project-II (0-0-16)8 **CSP493** | Communication Practices-II (3-0-0)3 **ENG302** |  | 4|1 | | | 13 | | 0 | | 16 | 29 | **21** |
| ***Total Credits*** | | | | | | | |  | | | | | | | | | **186** |

\*In lieu of summer training of six week duration (2 credits) and VII semester (21 credits), the student may opt for 24 credits, industrial internship.

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|  | **Departmental Elective List For 2014 Batch Onwards** | | | | | |
|  | **DE-1** | **DE-2** | **DE-3** | **DE-4** | **DE-5** | **DE-6** |
| **Databases Stream** | 1. Computer Oriented Numerical and Statistical Techniques **CSE330**  2. Computer Based Optimization Techniques **CSE331** 3. Introduction to Mathematical & Statistical Techniques in Computer Science **CSE332** 4. Introduction to Graph Theory and its Applications **CMP 002** | 1. Soft Computing **CMP303**   2. Software Quality Management **CSE333** 3.Introduction to Cloud Computing **CSE334** | Advanced DBMS **CSE430** | Design of Data Warehouse **CSE 439** | Data Mining & Knowledge Discovery **CSE422** | Big Data Analytics CSE447 |
| **Network & Security Stream** | Advance Concepts of Computer Networks **CSE431** | Cryptography and Network Security **CMP006** | Wireless Networks **CSE443** | Distributed System Concepts & Design **CSE448** |
| **Software Engg Stream** | Software Project Management **CSE432** | Software Testing **CSE440** | Management Information Systems **CSE444** | IT Infrastructure Management **CSE449** |
| **Intelligent Systems Stream** | Neural Networks **CSE435** | Robotics and Intelligent Systems **CSE441** | Digital Image Processing **CSE445** | Natural Language Processing **CSE450** |
| **Mobile & Cloud Stream** | Android Application Development **CSE438** | Mobile Value Added Services **CSE442** | Cloud Web Services **CSE446** | Mobile Computing **CSE451** |
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TERM 1



TERM 2

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| 1 | Course Code | **CSE 108** | |
| 2 | Course Title | **Advanced concepts of C Programming** | |
| 3 | Credits | **4** | |
| 4 | Contact Hours | (3-0-2) | |
| 5 | Course Objective | To provide students with the means of writing efficient, maintainable, and portable code. | |
| 6 | Course Outcomes (CO) | On successful completion of this module students will be able to:  1. Use the variety of data types appropriate to specific programming problems.  2. Utilize the modular features of the language.  3. Create some application incorporating graphics feature of C.  4. Develop small software application in ‘C’ Language with extensive data processing and file Operations. | |
| **7** | **Prerequisite** | Students should have experience with basics of C programming. | |
| **8** | | | **Course Contents** |
| 8.01 | Unit A | **Modular Programming using functions** | |
| 8.02 | Unit A Topic 1 | Functions: Definition, Declaration/Prototyping and Calling. | |
| 8.03 | Unit A Topic 2 | Types of functions, Parameter passing: Call by value, Call by reference. | |
| 8.04 | Unit A Topic 3 | Passing and Returning Arrays from Functions, Recursive Functions. | |
| 8.05 | Unit B | **Pointers and String Manipulation** | |
| 8.06 | Unit B Topic 1 | Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic. | |
| 8.07 | Unit B Topic 2 | Arrays and pointers: Accessing array with pointer variable, Dynamic memory allocation. | |
| 8.08 | Unit B Topic 3 | String: Introduction, predefined string functions, Manipulation of text data. | |
| 8.09 | Unit C | **Pre-processor and User Defined Data Types** | |
| 8.10 | Unit C Topic 1 | Pre-processors: Types, Directives, Pre-processors Operators (#,##,\) | |
| 8.11 | Unit C Topic 2 | Macros: Types, Use, predefined Macros, Command Line Arguments. | |
| 8.12 | Unit C Topic 3 | Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, Array of structures, Passing structure in function. | |
| 8.13 | Unit D | **Operations on Data files using ‘C’ I/O** | |
| 8.14 | Unit D Topic 1 | Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, | |
| 8.15 | Unit D Topic 2 | Creating a data file, Opening and closing a data file. | |
| 8.16 | Unit D Topic 3 | Various I/O operations on data files: Storing data or records in file, adding records,  Retrieving, and updating Sequential file/random file. | |
| 8.17 | Unit E | **Graphics Programming in C** | |
| 8.18 | Unit E Topic 1 | Initialization: Graphics Drivers, Modes, Use of standard Library Function to draw pints, line, circle, ellipse, polygons. | |
| 8.19 | Unit E Topic 2 | Generating charts, graphs, filling polygon, setting colors, text | |
| 8.20 | Unit E Topic 3 | Moving an object, creating Animation. | |
| 8.21 | Lab Experiment 01 | Implementation of Top-Down approach for problem solving with the help of functions. | |
| 8.22 | Lab Experiment 02 | Demonstration of passing parameters using call by value and call by reference. | |
| 8.23 | Lab Experiment 03 | Implementation of recursive functions for various recursively defined problems. | |
| 8.24 | Lab Experiment 04 | Demonstration of pointer arithmetic and indirection operator. | |
| 8.25 | Lab Experiment 05 | Manipulation on strings (extraction, matching, concatenation) | |
| 8.26 | Lab Experiment 06 | Demonstration of conditional compilation using pre-processor directives. | |
| 8.27 | Lab Experiment 07 | Implementation of binding heterogeneous information for a single entity using structure. | |
| 8.28 | Lab Experiment 08 | Demonstrate the use of Union in memory sharing. | |
| 8.29 | Lab Experiment 09 | Create a data file to store the information about the employees of an organization. | |
| 8.30 | Lab Experiment 10 | Use of standard graphics library to draw a specific shape. | |
| 8.31 | Lab Experiment 11 | Draw a bar and Pie chart for a company data. | |
| 8.32 | Lab Experiment 12 | Write a program to animate an object with the help of graphics library. | |

TERM 3

**Applicable only for 2014 Batch**

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| 1 | Course Code | **CSE211/CSP211** |
| 2 | Course Title | **Object Oriented Programming with Java** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | The objective of this course is to inculcate among students structured software development practices using object oriented approach. |
| 6 | Course Outcomes | On successful completion of this module students will be able to  On successful completion of this module students will be able to   1. Discuss the class and object declarations and their role in software design and implementation. 2. Develop software applications using object-oriented design methodology. 3. Appreciate the object oriented programming environment. 4. Comprehend and modify object oriented programs. 5. Create professional documents about their object oriented software systems. |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction to Object Oriented Paradigm** |
| 8.02 | Unit A Topic 1 | Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity. |
| 8.03 | Unit A Topic 2 | Importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture |
| 8.04 | Unit A Topic 3 | Object Modelling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints |
| 8.05 | Unit B | **Dynamic and Functional Modelling** |
| 8.06 | Unit B Topic 1 | Dynamic Modelling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modelling concepts, a sample dynamic model. |
| 8.07 | Unit B Topic 2 | Functional Modelling: Data flow diagram, specifying operations, constraints, and a sample functional model. |
| 8.08 | Unit B Topic 3 | OMT (object modelling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD. |
| 8.09 | Unit C | **Introduction to Java** |
| 8.10 | Unit C Topic 1 | History, Features, architecture of JVM, Setting java environment, Constants, Variables, Data Types, Operators, Expressions, Decision Making, Branching, Loops, command line argument |
| 8.11 | Unit C Topic 2 | Arrays, Type conversion & casting, Input from keyboard, Classes, Objects, Methods |
| 8.12 | Unit C Topic 3 | Method overloading, Constructors, Constructors overloading, static keyword, returning and passing objects, Introducing Access Control, String handling |
| 8.13 | Unit D | **Inheritance, package and Interface** |
| 8.14 | Unit D Topic 1 | Inheritance Implementation: Multilevel Hierarchy, Overriding methods, Polymorphism, use of this and super, Constructor call in inheritance, Dynamic Method Dispatch. |
| 8.15 | Unit D Topic 2 | Abstract class and method, Final class, method and variable, Inner classes, Implementing Interface, Concept of multiple inheritance in Java, Wrapper class, |
| 8.16 | Unit D Topic 3 | Packages: User defined packages, built-in packages (java.lang package), Access modifiers, |
| 8.17 | Unit E | **Exception and Multithreading** |
| 8.18 | Unit E Topic 1 | Input/Output: Exploring java.io, File, Stream Classes: Byte Stream Classes and Character stream Classes, reading and writing in file, Serialization. |
| 8.18 | Unit E Topic 2 | Exception Handling: Introduction, try, catch, finally, throw and throws, Checked and Unchecked exceptions, User define exception, Java's Built-in Exception, Chained Exception. |
| 8.20 | Unit E Topic 3 | Multithreading: Creating single and multiple threads , Thread life cycle, Thread priorities, sleep method, Synchronization, Inter-thread Communication. |
| Note : All experiment will be conducted on IDE (for example : Eclipse/ Netbeans) | | |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1. Schildt H, “The Complete Reference JAVA2”, TMH |
| 9.2 | other references | 1. Balagurusamy E, “Programming in JAVA”, TMH. 2. Professional Java Programming:BrettSpell,WROX Publication. 3. Internet as a resource for reference |

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|  | Course Code | **CSE214/CSP214** | |
| 2 | Course Title | **Principles of Object Oriented Programming using Java** | |
| 3 | Credits | **5** | |
| 4 | Contact Hours | **3-1-2** | |
| 5 | Course Objective | The objective is to give insight of concepts & knowledge of modelling and develop the application using object oriented concept for all platforms. | |
| 6 | Course Outcomes | On successful completion of this module students will be able to:   1. Able to design model of any system using principles of modelling. 2. Setting up Java Environment and implement java’s concept in form of solution to basic problems. 3. Apply the principles of OOPs and design the robust, maintainable programs which satisfy users requirements. 4. Apply concurrent programming concept using multithreading to develop application and use of error handling. | |
| **7** | **Prerequisite** |  | |
| **8** | **Course Contents** | | |
| 8.01 | Unit A | **Introduction to Object Oriented Paradigm** | |
| 8.02 | Unit A Topic 1 | Introduction: History, The meaning of Object Orientation, Features of Java, OOPs concepts | |
| 8.03 | Unit A Topic 2 | object identity, Encapsulation, information hiding, polymorphism, inheritance | |
| 8.04 | Unit A Topic 3 | Java virtual machine, Byte Code, Architecture of JVM, Class Loader, Execution Engine, Garbage collection, | |
| 8.05 | Unit B | **Introduction to Java** | |
| 8.06 | Unit B Topic 1 | Java development Kit (JDK),Introduction to IDE for java development, Setting java environment (steps for path and CLASSPATH setting) | |
| 8.07 | Unit B Topic 2 | Constants, Variables, Data Types, Operators, Expressions, Decision Making, | |
| 8.08 | Unit B Topic 3 | Branching, Loops, command line argument | |
| 8.09 | Unit C | **Class & Object** | |
| 8.10 | Unit C Topic 1 | Arrays, Type conversion & casting, Input from keyboard, Classes, Objects, Methods | |
| 8.11 | Unit C Topic 2 | Method overloading, Constructors, Constructors overloading, static keyword, | |
| 8.12 | Unit C Topic 3 | Introducing Access Control, String handling | |
| 8.13 | Unit D | **Inheritance, package and Interface** | |
| 8.14 | Unit D Topic 1 | Inheritance Implementation: Multilevel Hierarchy, Overriding methods, Polymorphism, use of this and super, Constructor call in inheritance | |
| 8.15 | Unit D Topic 2 | Abstract class and method, Final class, method and variable, Implementing Interface, Concept of multiple inheritance in Java, Wrapper class, | |
| 8.16 | Unit D Topic 3 | Packages: User defined packages, built-in packages (java.lang package), Access modifiers, | |
| 8.17 | Unit E | **Exception and Multithreading** | |
| 8.18 | Unit E Topic 1 | Input/Output: Exploring java.io, File, Stream Classes: Byte Stream Classes and Character stream Classes, reading and writing in file | |
| 8.18 | Unit E Topic 2 | Exception Handling: Introduction, try, catch, finally, throw and throws, Checked and Unchecked exceptions, Java's Built-in Exception, Chained Exception. | |
| 8.20 | Unit E Topic 3 | Multithreading: Creating single and multiple threads , Thread life cycle, Thread priorities, sleep method. | |
| Note : All experiment will be conducted on IDE (for example : Eclipse/ Netbeans) | | | |
| 10 | **Reading Content** | | |
| 9.1 | Text book\* | | 1. Schildt H, “The Complete Reference JAVA2”, TMH |
| 9.2 | other references | | 1. Balagurusamy E, “Programming in JAVA”, TMH. 2. Professional Java Programming:BrettSpell,WROX Publication. 3. Internet as a resource for reference |

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| 1 | Course Code | **CSE 207/CSP207** |
| 2 | Course Title | **Data Structures Using C** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms. In addition, another objective of the course is to develop effective software engineering practice, emphasizing such principles as decomposition, procedural abstraction, and software reuse. |
| 6 | Course Outcomes | After completing this course satisfactorily, a student will be able to:   1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm. 2. Describe common applications for arrays, records, linked structures, stacks, queues, trees . 3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs 4. Demonstrate different methods for traversing trees . 5. Compare alternative implementations of data structures with respect to performance. |
| 7 | Prerequisite | Discrete Structures, Programming in C. |
| 8 | Course Contents | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Data Structure – Definition, Operations and Applications, Abstract Data Types, Algorithm – Definition, Complexity and Asymptotic notations, Time and Space tradeoffs. |
| 8.03 | Unit A Topic 2 | Programming Principles – The art of writing programs, Analysing programs, Recursion – Definition, Examples and implementations, Tower of Hanoi problem, Fibonacci Series and analysis of recursion. |
| 8.04 | Unit A Topic 3 | Arrays: Implementation of One Dimensional Arrays, Multidimensional Arrays, Pointer Arrays. Applications of Arrays,Address Calculation, Searching: Linear search, Binary Search, Matrix Operations, Dense and Sparse Data in Arrays. |
| 8.05 | Unit B | **Underlying Data Structures** |
| 8.06 | Unit B Topic 1 | Stacks: Definitions, Primitive operations, Application of stacks – Conversion of Infix Expression to Postfix form, Evaluation of Postfix Expressions, Recursion and Stacks. |
| 8.07 | Unit B Topic 2 | Queues: Definition, Primitive Operations, Implementation of Circular Queues, Priority Queues, Deques, Application of Queues. |
| 8.08 | Unit B Topic 3 | Linked list: Singly Linked List, Doubly Linked List, Circular Linked List  Implementation - Linked Stacks, Linked Queues. |
| 8.09 | Unit C | **Advanced Data Structures** |
| 8.10 | Unit C Topic 1 | Trees: Terminologies, Binary tree, Representation,Applications – Operations on Binary Search Trees, Binary Search Algorithm, AVL Tree. |
| 8.11 | Unit C Topic 2 | Graph: Terminology, Representation, Traversals- Depth First Search, Breadth First Search. |
| 8.12 | Unit C Topic 3 | Graph Applications – Minimum Spanning Trees – Prim’s and Kruskal’s Algorithms, Shortest Path – Dijkstra’samdFlyodWarshall’s Algorithm. |
| 8.13 | Unit D | **Sorting and Hashing** |
| 8.14 | Unit D Topic 1 | Implementation and Analysis - Bubble Sort, Merge Sort, Insertion Sort. |
| 8.15 | Unit D Topic 2 | Implementation and Analysis - Quick Sort, Tree Sort, Radix Sort |
| 8.16 | Unit D Topic 3 | Hashing: Concepts and Applications, Hash Functions, Methods of Resolving Clashes, Birthday Paradox Problem. |
| 8.13 | Unit E | **Advanced concepts** |
| 8.14 | Unit E Topic 1 | Files: Concepts, Queries - Sequential organization and Index techniques. |
| 8.15 | Unit E Topic 2 | Heaps - Basic Structure, Max Heap, Min Heap, Reheap Algorithm, Difference between Heaps and Binary Trees, Heap Sort. |
| 8.16 | Unit E Topic 3 | B Trees - Operations on a B Tree, Applications of B-trees. |
| 10 | Reading Content | |
| 9.1 | Text book\* | 1. Ellis Horowitz and SartajSahni “Fundamentals of Data Structures” Galgotia Book Source, Pvt. Ltd., 2004. 2. D. Samanta, “Classic Data Structures”, Prentice-Hall of India, Pvt. Ltd., India 2003. |
| 9.2 | Other references | 1. Robert Kruse, C.L. Tondo and Bruce Leung, “Data Structures and Program Design in C”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2007. 2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, Tata McGraw-Hill, Second edition, 2001. 3. Aaron M Tanenbaum, Moshe J Augenstein and YedidyahLangsam, "Data Structures using C and C++", Pearson Education, 2004. 4. Internet as a resource for reference |

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| 1 | Course Code | **CSE 208/CSP208** |
| 2 | Course Title | **Principles of Operating System** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | To understand the basic components, services and structure of an OS and to acquire the ability to design components of OS |
| 6 | Course Outcomes | After the successful completion of the course a student will be able to   1. Write programs for creating and using process and threads 2. Compare various CPU scheduling algorithms 3. Analyze various deadlock handling techniques 4. Design solutions to concurrency problems 5. Analyze various memory management and virtual memory techniques |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Operating System Concepts and functions, Comparison of different Operating system |
| 8.03 | Unit A Topic 2 | Types of Operating Systems (Batch, Multiprogramming , Multi Tasking , Multiprocessing, Distributed and Real Time Operating System) |
| 8.04 | Unit A Topic 3 | Operating System Structure(Monolithic, Layered and Microkernel ), Operating System Services |
| 8.05 | Unit B | **Process Synchronization** |
| 8.06 | Unit B Topic 1 | Process Concepts (PCB, Process States , Process Operations, Inter process communication) |
| 8.07 | Unit B Topic 2 | Critical Section problem & their solutions, Introduction to Semaphores |
| 8.08 | Unit B Topic 3 | Classical Problems of Synchronization(Producer Consumer Problem, Readers Writer Problem, Dining philosophers problem) |
| 8.09 | Unit C | **CPU Scheduling** |
| 8.10 | Unit C Topic 1 | Concept , Types of schedulers( Short term, Long term, Middle term), Dispatcher, Performance Criteria |
| 8.11 | Unit C Topic 2 | CPU Scheduling Algorithms( FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel feedback Queue) |
| 8.12 | Unit C Topic 3 | Deadlock concepts & Handling Techniques(Avoidance, Prevention and Detection & Recovery) |
| 8.13 | Unit D | **Memory Management** |
| 8.14 | Unit D Topic 1 | Memory Hierarchy, Memory Management Unit |
| 8.15 | Unit D Topic 2 | Paging, Segmentation |
| 8.16 | Unit D Topic 3 | Virtual memory concept, demand paging, Page replacement algorithms(FCFS, Optimal, LRU) |
| 8.17 | Unit E | **INPUT-OUTPUT Management** |
| 8.18 | Unit E Topic 1 | Input –Output interface, Modes of data transfer(Programmed, interrupt and DMA) |
| 8.19 | Unit E Topic 2 | Disk structure , Disk scheduling(FCFS,SSTF, SCAN, LOOK,C-SCAN, C-LOOK) |
| 8.20 | Unit E Topic 3 | File Concept ,File operations, File Directories , Case study of Windows Operating System |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1. Silberschatz G, *Operating System Concepts*, Wiley |
| 9.2 | other references | 1. W. Stalling, “Operating System”, Maxwell Macmillan 2. Tannenbaum A S, *Operating System Design and Implementation*, Prentice Hall India 3. Milenkovic M, *Operating System Concepts*, McGraw Hill 4. Internet as a resource for reference |

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| 1 | Course Code | **CSE209** |
| 2 | Course Title | **Computer Organization and Architecture** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective | To study Organization of a digital computer and design techniques for designing various components of a digital computer |
| 6 | Course Outcomes | After Successful completion of this course a student will be able to:   1. Compare and evaluate computer designs 2. Write simple micro-operations in RTL 3. Design buses 4. Design simple arithmetic circuits 5. Identify various registers and their uses 6. Write programs in simple assembly language 7. Operate **manosim**Simulator and **virtual lab** tool 8. Compare various design techniques for control unit 9. Construct and evaluate a memory system using RAM/ROM chips 10. Evaluate the performance of various memory/cache designing strategies 11. Compare various I/O techniques 12. Evaluate performance of a pipeline 13. Handle various hazards in a pipeline 14. Classify computers in various categories |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction to Computer Organization** |
| 8.02 | Unit A Topic 1 | History, Computer Organization vs. Computer Architecture, Bus: Types, Buses using multiplexers and tri-state buffers, Bus and memory transfer. |
| 8.03 | Unit A Topic 2 | Register transfer language, Micro-operations: Arithmetic ,shift and logic micro operations |
| 8.04 | Unit A Topic 3 | Adder-Subtractor- Incrementor, Arithmetic unit, Logic unit. |
| 8.05 | Unit B | **Computer Arithmetic** |
| 8.06 | Unit B Topic 1 | Representation of numbers in 1’s and 2’s complement, Addition and subtraction of signednumbers. |
| 8.07 | Unit B Topic 2 | Binary Multiplier ,Multiplication: Signed operandmultiplication, Booth algorithm |
| 8.08 | Unit B Topic 3 | Floating point representation: addition and subtraction. |
| 8.09 | Unit C | **Control Unit** |
| 8.10 | Unit C Topic 1 | Hardwire and micro programmed control unit, |
| 8.11 | Unit C Topic 2 | Micro-programming Instruction Format. |
| 8.12 | Unit C Topic 3 | Micro-programming Sequencer, Horizontal and vertical Micro-Programming. |
| 8.13 | Unit D | **Processor Organization** |
| 8.14 | Unit D Topic 1 | Instruction cycle andsub cycles (fetch and executeetc), interrupt: Types and cycle. |
| 8.15 | Unit D Topic 2 | General register organization,stackorganization |
| 8.16 | Unit D Topic 3 | Addressing modes,Instructiontypes, formats, RISC/CISC |
| 8.17 | Unit E | **Memory and I/O** |
| 8.18 | Unit E Topic 1 | RAM/ROM/Flash memory, designing memory system using RAM and ROM chips |
| 8.19 | Unit E Topic 2 | Cache memory: Memory hierarchy, performance Considerations, mapping techniques |
| 8.20 | Unit E Topic 3 | Input Output: Isolated I/O vs. memory mapped I/O, Programmed I/O, Interrupt driven I/O, DMA |
| 10 | **Reading Content** | |
| 10.1 | Text book\* | 1. “Computer system architecture”, Morris M. Mano, Prentice-Hall |
| 10.2 | other references | 1. “Computer Organization”, V. C. Hamacher et al., Mcgrew Hill 2. “Computer Organization and Architecture designing for performance” William Stallings, Pearson 3. Internet as a resource for reference |

**TERM 4**

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| 1 | Course Code | **CSE210/CSP210** |
| 2 | Course Title | **Java Programming** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | The objective of this course is to inculcate among students structured software development practices using object oriented approach. |
| 6 | Course Outcomes | On successful completion of this module students will be able to  On successful completion of this module students will be able to   1. Discuss the class and object declarations and their role in software design and implementation. 2. Develop software applications using object-oriented design methodology. 3. Appreciate the object oriented programming environment. 4. Comprehend and modify object oriented programs. 5. Create professional documents about their object oriented software systems. 6. Use object oriented paradigms and its elements. 7. Write C++ programs as per the object oriented programming practice and to professionally document all the steps involved in the exercise 8. Create objects, classes, to use operator overloading, and to understand their role in software design and implementation. 9. Use inheritance to understand C++ programs to implement inheritance. 10. Implement various kinds of inheritance and its real life applications, and to professionally document all the steps involved in the exercise. |
| **7** | **Prerequisite** | Programming Concepts and Algorithms |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **GUI Programming** |
| 8.02 | Unit A Topic 1 | Introduction to AWT: Layout managers, AWT and Swing components,Menu, Submenu, Dialog |
| 8.03 | Unit A Topic 2 | Event handling: Action Events, Mouse Events, Keyboard Events, Window Events, Listeners, The Delegation Model of Event Handling, Adapter Classes |
| 8.04 | Unit A Topic 3 | Java applet: life cycle, Implementation, event handling |
| 8.05 | Unit B | **Database Connectivity** |
| 8.06 | Unit B Topic 1 | Introduction to JDBC: JDBC API, java.sql package, JDBC Drivers and Architecture |
| 8.07 | Unit B Topic 2 | Database connectivity Implementation, Creating and Accessing Database: Creating tables, Retrieving values, Inserting, Updating and deleting records. |
| 8.08 | Unit B Topic 3 | Using Prepared statement, Callable statement, Transactions, Metadata, Handling SQL Exceptions and SQL Warning. |
| 8.09 | Unit C | **Network Programming** |
| 8.10 | Unit C Topic 1 | Sockets: Introduction, Application, TCP socket, UDP socket |
| 8.11 | Unit C Topic 2 | Socket Implementation, Client and Server sockets, data transmission over socket |
| 8.12 | Unit C Topic 3 | Introduction to RMI, RMI Architecture, Registry server, RMI server and RMI client |
| 8.13 | Unit D | **Servlets** |
| 8.14 | Unit D Topic 1 | Servlet:  Overview  and  Architecture,  Life Cycle, Servlets Interface , Javax.servlet and javax.servlet.http package, Implementing and Deploying Servlets, Exploring Develoyment Descriptor (web.xml) |
| 8.15 | Unit D Topic 2 | Handling Client HTTP Request & Server HTTP Response, Redirecting  Requests  to  Other  Resources, Initializing Parameters &ServletContext, Initializing a Servlet, |
| 8.16 | Unit D Topic 3 | Session Management, Request Dispatcher and Redirecting, Session Tracking, Cookies, Session Tracking with HttpSession, Deployment and Database connectivity with Servlet. |
| 8.17 | Unit E | **Java Server Pages (JSP)** |
| 8.18 | Unit E Topic 1 | Introduction to JSP , Life cycle of JSP, JSP API, JSP Application Design, Tomcat Server |
| 8.18 | Unit E Topic 2 | Scripting elements, scriptlet tag, expression tag, declaration tag, Implicit Objects, JSP Objects, Directive Elements, Custom tags |
| 8.20 | Unit E Topic 3 | Exception Handling, Error Pages, Action Elements, Sharing data between JSP pages- Sharing Session and Application Data, MVC in JSP, Database connectivity with JSP |
| Note : All experiment will be conducted on IDE (for example : Eclipse/ Netbeans) | | |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1. Schildt H, “The Complete Reference JAVA2”, TMH 2. Schildt H, “The Complete Reference J2EE”, TMH |
| 9.2 | other references | 1. Balagurusamy E, “Programming in JAVA”, TMH. 2. Professional Java Programming:BrettSpell,WROX Publication. 3. Internet as a resource for reference |

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| 1 | Course number | | **CSE203/CSP203** | | |
| 2 | Course Title | | **PRINCIPLES OF DATABASE MANAGEMENT SYSTEMS** | | |
| 3 | Credits | | 5 | | |
| 4 | Contact Hours (L-T-P) | | 3-1-2 | | |
| 5 | Course Objective | | Develop the ability to design, implement and manipulate databases. Introduce students to build data base management systems. Apply DBMS concepts to various examples and real life applications. | | |
| 6 | Course Outcomes | | On successful completion of this module students will be able to   1. Know the basic Database techniques & concepts. 2. Apply Knowledge of ER Modeling. 3. Build normalized data bases and understand transaction processing. 4. Handle recovery and concurrency issues. 5. Apply Database techniques in real life situation. 6. Prepare the documents including diagrams like E-R etc.& implementation of distributed system. 7. Implement and execute SQL Queries and to professionally document all the steps involved in the exercise. 8. Design relational model and integrity constants and understand to designing of relational model with integrity constants. | | |
| 7 | Outline syllabus | | | | |
| 7.01 | CSE203.A | | Unit A | | **INTRODUCTION TO DATABASES** |
| 7.02 | CSE203.A1 | | Unit A Topic 1 | | Concept & Overview of DBMS, Data Models, Database languages, Database Administrator, Database Users. |
| 7.03 | CSE203.A2 | | Unit A Topic 2 | | Three Schema architecture of DBMS, Data Models, Database Languages, Data independence and database language and interface. |
| 7.04 | CSE203.A3 | | Unit A Topic 3 | | Data definition languages, DML, Data Models, ER Diagrams |
| 7.05 | CSE203.B | | Unit B | | **RELATIONAL DATABASE LANGUAGE AND INTERFACES** |
| 7.06 | CSE203.B1 | | Unit BTopic 1 | | Structure of relational Databases, Concept of keys, Mapping Constraints, Null Values, |
| 7.07 | CSE203.B2 | | Unit BTopic 2 | | Domain Constraints, Referential Integrity Constraints. |
| 7.08 | CSE203.B3 | | Unit BTopic 3 | | Assertions Triggers, Relational algebra, Relational calculus, Domain and tuple calculus, SQL data definition queries and updates in SQL. |
| 7.09 | CSE203.C | | Unit C | | **NORMALIZATION IN DESIGN OF DATABASES** |
| 7.10 | CSE203.C1 | | Unit C Topic 1 | | Functional Dependency ,Different anomalies in designing a Database |
| 7.11 | CSE203.C2 | | Unit C Topic 2 | | Normalization using functional dependencies, 1NF, 2NF, Decomposition, Boyce+ Codd Normal Form, 3NF |
| 7.12 | CSE203.C3 | | Unit C Topic 3 | | Inclusion dependencies, loss less join decompositions |
| 7.13 | CSE203.D | | Unit D | | **TRANSACTION MANAGEMENT** |
| 7.14 | CSE203.D1 | | Unit D Topic 1 | | Transaction processing system, schedule and recoverability |
| 7.15 | CSE203.D2 | | Unit D Topic 2 | | Serializability of schedules |
| 7.16 | CSE203.D3 | | Unit D Topic 3 | | Locking Protocols, Recovery from transaction failures, deadlock handling, Time stamping protocols. |
| 7.17 | CSE203.E | | Unit E | | **DATA STORAGE AND DISTRIBUTED DATABASES** |
| 7.18 | CSE203.E1 | | Unit E Topic 1 | | Storage and File Structure, Indexing |
| 7.19 | CSE203.E2 | | Unit E Topic 2 | | Query Processing, Query Optimization. |
| 7.20 | CSE203.E3 | | Unit E Topic 3 | | Concurrency control in distributed systems. |
| 7.21 | CSE203.01 | | Lab exer 1 | | Introduction of SQL/Oracle. Classification SQL, DDL,DML. Data types of SQL/Oracle. |
| 7.22 | CSE203.02 | | Lab exer 2 | | DDL commands: CREATE, ALTER, DROP, TRUNCATE commands and Constraints. |
| 7.23 | CSE203.03 | | Lab exer 3 | | DML commands: Introduction about the INSERT, SELECT, UPDATE & DELETE command... |
| 7.24 | CSE203.04 | | Lab exer 4 | | Introduction of the Scalar functions and Aggregate functions (sum,avg,count,max,min) |
| 7.25 | CSE203.05 | | Lab exer 5 | | Introduction about the Concept Of Grouping Clauses GROUP BY, ORDER BY & GROUP BY HAVING. Briefly explain these clauses with examples. |
| 7.26 | CSE203.06 | | Lab exer 6 | | SUBQURIES. Related example of Sub- queries. |
| 7.27 | CSE203.07 | | Lab exer 7 | | JOINS (inner, outer, natural, equi join) and related example |
| 7.28 | CSE203.08 | | Lab exer 8 | | Introduction of VIEW. How to create View. Explain with example. |
| 7.29 | CSE203.09 | | Lab exer 9 | | Introduction of PL/SQL. Difference SQL v/s PL/SQL. Explain with examples. |
| 7.30 | CSE203.10 | | Lab exer 10 | | Introduction of Procedures and Functions. How to create Procedures and Functions. Explain these (Procedures,  Functions) with example. |
| 8 | Course Evaluation | | | | |
| 8.1 | Course work: 30 marks | | | | |
| 8.11 | Attendance | None | | | |
| 8.12 | Homework | 10 assignments, no weight | | | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments); 20 marks | | | |
| 8.14 | labs | Evaluation of work done on each lab turn in the lab notebook and feedback fron oral quiz about the work done that day. Zero, if the student is absent. 0.75N best marks out of N such evaluations: 10 marks | | | |
| 8.15 | Presentations | None | | | |
| 8.16 | Any other | None | | | |
| 8.2 | MTE | 20 marks | | | |
| 8.3 | End-term examination: 50 marks | | | | |
| 9 | References | | | | |
| 9.1 | Text book\* | | | 1. Korth , Silberschatz & Sudarshan, Data base Concepts, Tata McGraw-Hill | |
| 9.2 | Other references | | | 1. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc. 2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Third Edition. 3. Jeffrey D. Ullman, Jennifer Windon, A first course in Database Systems, Pearson Education. 4. Date C.J., An Introduction to Database Systems, Addison Wesley. 5. Richard T. Watson, Data Management: databases and organization, Wiley. | |

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| 1 | Course Code | **CSE 301/CSP301** |
| 2 | Course Title | **Introduction to Computer Networks** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | To study the basic concepts of computer network, its architecture, structure and functionality of different layers in a network. |
| 6 | Course Outcomes | On successful completion of this course, students will be able to:   1. Interpret the structure and organization of computer networks, reference models and various transmission media 2. Demonstrate the basic concepts of data link layer functionalities and protocols 3. Analyze the network layer design issues including multi-hop routing and congestion control algorithms. 4. Explore the transport layer concepts and protocol designs 5. Investigate the basic concepts of application layer protocol design including DNS, WWW, HTTP, FTP, Email 6. Establish the security and vulnerability issues in the computer networks. 7. Apply computer networking concepts to both technical peers and non-technical management. 8. Configure network routers and switches so that both LAN and WAN traffic successfully traverses the network. 9. Verify that a computer network has been properly configured using networking protocols. 10. Troubleshoot network problems and can successfully implement solutions.   Discern true statements from false statements as pertains to computer networking as verified by passing industry standard examinations |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Introduction to computer networks, applications and uses, classification of Networks based on topologies, geographical distribution and communication techniques, types of networks(Internet, Intranet, Extranet, VPN, value added networks) |
| 8.03 | Unit A Topic 2 | Reference models: OSI model, TCP/IP model , Overview of Connecting devices (Hub, Repeaters, Switches, Bridges, Routers, Gateways) |
| 8.04 | Unit A Topic 3 | Transmission Media- wired , wireless, Introduction to communication satellite (GEO,.MEO,LEO), Multiplexing techniques-FDM, TDM |
| 8.05 | Unit B | **Data Link Layer** |
| 8.06 | Unit B Topic 1 | Functions, Framing, Error Control-Error correction codes(Hamming code),Error Detection codes(Parity Bit, CRC) |
| 8.07 | Unit B Topic 2 | Flow Control- Stop and Wait Protocol, Sliding window –Goback N and Selective repeat(ARQ) |
| 8.08 | Unit B Topic 3 | MAC- Sub-layer Protocols: ALOHA, CSMA, CSMA/CD protocols, IEEE Standards 802.3, 802.4,802.5 |
| 8.09 | Unit C | **Network Layer** |
| 8.10 | Unit C Topic 1 | Design issues , IPV4addressing basics and Header format, CIDR, sub-netting and sub-masking |
| 8.11 | Unit C Topic 2 | Routing, optimality Principle Routing protocols-, Shortest path, flooding, distance vector routing , link state routing, introduction to hierarchical, broadcast and multicast routing |
| 8.12 | Unit C Topic 3 | Congestion control-Leaky bucket , Token Bucket, jitter control |
| 8.13 | Unit D | **Transport Layer** |
| 8.14 | Unit D Topic 1 | Need of transport layer with its services, Quality of service, connection oriented and connection less |
| 8.15 | Unit D Topic 2 | Transmission Control Protocol: Segment structure and header format, TCP Connection Management, Flow Control |
| 8.16 | Unit D Topic 3 | TCP congestion control, Internet Congestion Control Algorithm, Overview of User Datagram Protocol (UDP) |
| 8.17 | Unit E | **Application Layer** |
| 8.18 | Unit E Topic 1 | Domain Name System (DNS), HTTP, FTP, SMTP |
| 8.19 | Unit E Topic 2 | Network Security services, cryptography, Symmetric versus Asymmetric cryptographic algorithms- DES, and RSA |
| 8.20 | Unit E Topic 3 | Application of Security in Networks: steganography, watermarking, Digital signature |
| 10 | **Reading Content** | |
| 9.1 | Text book | 1. Tanenbaum, A.S.” Computer Networks”, 4th Edition, PHI |
| 9.2 | Other References | 1. Forouzan, B.., “Communication Networks”, TMH 2. W. Stallings, “Data and Computer Communication” Macmillan Press   Comer, “Internetworking with TCP/IP” PHI |

**Term 5**

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| 1 | Course Code | **CSE310/CSP310** |
| 2 | Course Title | **Web Development Technologies** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | The objective of this course is to provide a foundation of technologies and technical skills in web development.  Based upon the development of a web, this course provides an insight of computer and networking technologies, and hands on experience in web programming. |
| 6 | Course Outcomes | 1. Design and develop a simple interactive web application 2. Demonstrate the ability to design web sites utilizing multiple tools and techniques. 3. utilize entry -level system analysis and design principles to solve business problems 4. Create web pages using XML. 5. Build dynamic web pages using JavaScript 6. Apply the network programming knowledge to setup a web site |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **HTML & HTML5** |
| 8.02 | Unit A Topic 1 | HTML basic tags, various links implementation, image map, table formatting, form design. |
| 8.03 | Unit A Topic 2 | Page layout design using frame, div and span tag, iframe, embed file/object with web pages |
| 8.04 | Unit A Topic 3 | HTML5: New elements, canvas, offline webpage, HTML Media: video, audio, HTML API: geolocation, location storage |
| 8.05 | Unit B | **CSS &CSS3** |
| 8.06 | Unit B Topic 1 | Introduction, syntax, selector: class and id, text formatting, margin, align, pseudo-class, pseudo-element |
| 8.07 | Unit B Topic 2 | Positioning, background formatting, Navigation bar, and image gallery. |
| 8.08 | Unit B Topic 3 | CSS3: Introduction, colors, text formatting, fonts formatting, Background formatting, 2D transform, animation |
| 8.09 | Unit C | **Java script &Jquery** |
| 8.10 | Unit C Topic 1 | Introduction, syntax, comment, statement, variable, operators, Conditional statements, looping statements |
| 8.11 | Unit C Topic 2 | Functions, object, events, Accessing form elemets, validating form elements, exception and error handling, js navigator, popup windows, cookies. |
| 8.12 | Unit C Topic 3 | JQuery: Introduction, syntax, selector, events, Jquery effect: hide/show, fade, slide, animate and stop. |
| 8.13 | Unit D | **XML** |
| 8.14 | Unit D Topic 1 | Introduction, syntax, well form XML document, DTD, schema |
| 8.15 | Unit D Topic 2 | XML Processors/Parser: DOM and SAX |
| 8.16 | Unit D Topic 3 | XML Technology: xlink, xpath, xpointer, xslt, displaying XML file data into HTML file |
| 8.17 | Unit E | **PHP** |
| 8.18 | Unit E Topic 1 | Introduction to open source tools for PHP application development: wordpress, drupal, joomla, introduction to PHP, syntax, variables, operators |
| 8.19 | Unit E Topic 2 | Conditional statement, iterative statements, array, function, handling form data, sending mail |
| 8.20 | Unit E Topic 3 | File handling, session management, error and exception handling, PHP-ODBC connectivity. |
|  | **Reading Content** | |
| 9.1 | Text book\* | 1. Ivan Bayross,”HTML,DHTML, JavaScript, Perl & CGI”, BPB Publication 2. Rick Delorme,” Programming in HTML5 with JavaScript and CSS3”, Microsoft |
| 9.2 | other references | 1. Burdman, “Collaborative Web Development” Addison Wesley. 2. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY. 3. Steven Holzner,“PHP: The Complete Reference”, TataMcGraw Hill Publication 4. Internet as a resource for reference |

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| 1 | Course No. | **CSE 202** | |
| 2 | Course Title | **THEORY OF AUTOMATA** | |
| 3 | Credits | **4** | |
| 4 | Contact Hours | **3-1-0** | |
| 5 | Course Objective | To have an introductory knowledge of automata designing of DF and NDFA, formal language theory and computation. | |
| 6 | Course Outcomes | After Successful completion of this course, the student shall be able to:   1. Use the concept of Automata and related terminology 2. Design DFA and NDFA and conversion from NDFA to DFA, 3. Construct finite automata without output and with output 4. Implement regular expression and grammar corresponding to DFA and vice-versa, 5. Design Push down Automata from Context Free Language or Grammar and vice-versa 6. Design Turing Machine for computational problems,   Develop a clear understanding of un-decidability | |
| 7 | Outline syllabus: | | |
| 7.01 | Unit A |  | **Finite Automata** |
| 7.02 | Unit A Topic 1 |  | Introduction to languages, Kleene closures, Finite Automata (FA), Transition graph, Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA). |
| 7.03 | Unit A Topic 2 |  | Equivalence of NDFA and DFA, Construction of DFA from NFA and optimization of Finite Automata. |
| 7.04 | Unit A Topic 3 |  | Applications and Limitation of FA. (FAT tool). |
| 7.05 | Unit B |  | **Regular Expression and Finite Automata** |
| 7.06 | Unit B Topic 1 |  | Regular Expression, Finite Automata with null move, Regular Expression to Finite Automata. |
| 7.07 | Unit B Topic 2 |  | Arden Theorem, Pumping Lemma for regular expressions. |
| 7.08 | Unit B Topic 3 |  | FA with output: Moore machine, Mealy machine and Equivalence. |
| 7.09 | Unit C |  | **REGULAR & CONTEXT FREE LANGUAGE** |
| 7.10 | Unit C Topic 1 |  | Defining grammar, Chomsky hierarchy of Languages and Grammar. Ambiguous to Unambiguous CFG. |
| 7.11 | Unit C Topic 2 |  | Simplification of CFGs. |
| 7.12 | Unit C Topic 3 |  | Normal forms for CFGs, Pumping lemma for CFLs. |
| 7.13 | Unit D |  | **PUSH DOWN AUTOMATA** |
| 7.14 | Unit D Topic 1 |  | Description and definition of PDA and Non-Deterministic PDA, Working of PDA. |
| 7.15 | Unit D Topic 2 |  | Acceptance of a string by PDA with final state and with Null store. Two stack PDA. |
| 7.16 | Unit D Topic 3 |  | Conversion of PDA into CFG, Conversion of CFG into PDA. |
| 7.17 | Unit E |  | **TURING MACHINE** |
| 7.18 | Unit E Topic 1 |  | Turing machines (TM): Basic model, definition and representation, Language acceptance by TM. |
| 7.19 | Unit E Topic 2 |  | Turing machine as a computational machine, Halting problem of TM, Universal TM (Visual Turing machine). |
| 7.20 | Unit E Topic 3 |  | Modifications in TM, Undecidability of Post correspondence problem, Church’s Thesis, Godel Numbering. |
| 9 | References | | |
| 9.1 | Text book | 1. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science(Automata, Languages and Computation)”, PHI | |
| 9.2 | Other references | 1. Peter Linz, “Formal Languages and Auomata”, Narosa Publishing House 2. Hopcroft, Ullman, “Introduction to Automata Theory, Language and Computation”, Narosa Publishing House 3. Internet as a resource for reference | |

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| 1 | Course Code | **INT303/INT353** |
| 2 | Course Title | **Introduction To Design And Analysis Of Algorithms** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | The objective of this course is to teach student about the techniques for designing algorithms and provide an ability to compare and analyze various algorithms. |
| 6 | Course Outcomes | After completion of this course, the student shall be able to :   1. Apply and analyze the complexity of certain divide and conquer, greedy, dynamic programming and backtracking algorithms. 2. Analyze the criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution. 3. Modify any existing data structure to create new operations. 4. Apply backtracking and branch and bound techniques to deal with some hard problems. 5. Establish the classes P, NP, and NP-Complete problems and be able to prove that a certain problem is NP-Complete.   Analyze the working of string matching algorithms. |
| 7 | Prerequisite | Data Structures, Programming in C |
| 8 | Course Contents | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Algorithm design paradigms- Motivation, Concept of algorithmic efficiency, Run time analysis of algorithms, Growth of Functions. |
| 8.03 | Unit A Topic 2 | Asymptotic Notations, Recurrences relation, Divide-and-conquer: Analysis and Structure of divide-and-conquer algorithms |
| 8.04 | Unit A Topic 3 | Divide-and-conquer examples- Binary search, Quick sort, Merge sort, Strassen’s Multiplication, Medians and Order Statics. |
| 8.05 | Unit B | **Dynamic Programming** |
| 8.06 | Unit B Topic 1 | Overview, Difference between dynamic programming and divide and conquer |
| 8.07 | Unit B Topic 2 | Applications and analysis: Matrix Chain Multiplication, 0/1 Knapsack Problem. |
| 8.08 | Unit B Topic 3 | Applications and analysis: Longest Common sub-sequence, Optimal Binary Search Tree |
| 8.09 | Unit C | **Greedy Method** |
| 8.10 | Unit C Topic 1 | Overview of the Greedy paradigm, Analysis and example of exact optimization solution - Minimum Spanning Trees – Kruskal’s and Prims Algorithms |
| 8.11 | Unit C Topic 2 | Fractional Knapsack problem, Single source shortest paths, Task Scheduling Problem. |
| 8.12 | Unit C Topic 3 | Overview and analysis of Backtracking & Branch and Bound: N-Queens problem and Sum of subsets. |
| 8.13 | Unit D | **Advanced Data Structures** |
| 8.14 | Unit D Topic 1 | Red-Black Trees-Definition, Applications, Insertion and deletion of elements in RB-Tree. |
| 8.15 | Unit D Topic 2 | B-Trees- Definitions, Applications, Inserting/ Deleting in B-Trees. |
| 8.16 | Unit D Topic 3 | Data Structure for Disjoint Sets-Definition, Operations, Applications in Kruskal’s algorithm. |
| 8.17 | Unit E | **Selected Topics** |
| 8.18 | Unit E Topic 1 | Introduction to NP Complete and NP Hard Problems, Examples. |
| 8.19 | Unit E Topic 2 | Amortized Analysis, Approximation Algorithms – Travelling Sales Person Problem and Vertex Cover Problem. |
| 8.20 | Unit E Topic 3 | Randomized Algorithms, String Matching Algorithms – Naïve String Matching Algorithm, Robin Karp Algorithm. |
| 10 | Reading Content | |
| 9.1 | Text book\* | Cormen et al., “Introduction of Computer Algorithm”, Prentice Hall India. |
| 9.2 | Other references | 1. Sahni et al., “Fundamentals of Computer Algorithms”, Galgotia Publications. 2. Hopcroft A, The Design And Analysis Computer Algorithms, Addison Wesley. 3. Internet as a resource for reference |

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| 1 | Course Code | **CSE205** |
| 2 | Course Title | **SOFTWARE ENGINEERING** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective | The objective of this course is to provide fundamental knowledge of software engineering, and make student aware of best software engineering practices, and contemporary software engineering tools. |
| 6 | Course Outcomes | After successful completion of this course students should be able to:  1. Illustrate software characteristics.  2. Implement different software development methodologies.  3. Perform requirement gathering in requirement analysis.  4. Conduct all aspects of software development process.  5. Design UML diagrams/DFD/ER diagrams for development of a software. |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **INTRODUCTION TO SOFTWARE ENGINEERING AND PROCESS MODELS** |
| 8.02 | Unit A Topic 1 | Significance challenges and Software Myths in software engineering. |
| 8.03 | Unit A Topic 2 | Software Development Methodologies: Waterfall model, prototyping model, Incremental model, Spiral model. |
| 8.04 | Unit A Topic 3 | Agility, Agile Process models: Extreme Programming (XP), Adaptive Software Development (ASD), Scrum. |
| 8.05 | Unit B | **SOFTWARE REQUIREMENT ENGINEERING** |
| 8.06 | Unit B Topic 1 | Requirement Elicitation: Interviews, Brain Storming Sessions, Quality Function Deployment. |
| 8.07 | Unit B Topic 2 | Functional & Non Functional Requirements, Known Requirements, Unknown Requirements, Undreamt Requirement. |
| 8.08 | Unit B Topic 3 | Requirement Documentation: Characteristics of SRS, Document SRS according to IEEE standards. |
| 8.09 | Unit C | **SOFTWARE DESIGN** |
| 8.10 | Unit C Topic 1 | Fundamental concepts of software design: Data Flow Diagrams, Coupling and Cohesion measures and types. |
| 8.11 | Unit C Topic 2 | Introduction to UML and Designing a UML concept. Introduction to UML Diagrams (**Using Rational Rose tool**) |
| 8.12 | Unit C Topic 3 | Implementing UML scenario in programming environment. |
| 8.13 | Unit D | **SOFTWARE IMPLEMENTATION AND TESTING** |
| 8.14 | Unit D Topic 1 | Fundamental of testing, Some Terminologies: Error, Mistake, Bug, Fault and Failure. |
| 8.15 | Unit D Topic 2 | Acceptance Testing, Alpha Testing, Beta Testing, Levels of testing: Unit Testing, Integration Testing, System Testing. |
| 8.16 | Unit D Topic 3 | White Box Testing, Black Box Testing, Verification and Validation, Debugging Process and Approaches |
| 8.17 | Unit E | **QUALITY MANAGEMENT** |
| 8.18 | Unit E Topic 1 | Quality Concepts: Quality, Quality Control, Cost of Quality, Software Quality Assurance. |
| 8.19 | Unit E Topic 2 | Software Reliability: Measures of Reliability and Availability, Software Safety, Statistical Software Quality Assurance: Six Sigma For Software Engineering. |
| 8.20 | Unit E Topic 3 | The ISO 9000 Quality Standards, Capability Maturity Model, The Software Quality Assurance Plan. |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1.Pressman R S, Software Engineering: A Practitioners Approach, McGraw Hill. |
| 9.2 | other references | 1. Datta S, Software Engineering: Concepts and Applications, Oxford University Press, 2010.  2.Sommerville, Ian. “Software Engineering”, Pearson(Latest Ed).  3.Schaum’s Series, “Software Engineering” TMH.  4. Internet as a resource for reference |

**DE I**

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| 1 | Course Code | **CSE331** |
| 2 | Course Title | **Computer Based Optimization Techniques** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective | * To create a congenial environment that promotes learning, growth and imparts ability to work with inter-disciplinary groups in professional and industry. |
| 6 | Course Outcomes | 1. Explain the organization of basic computer , its design   and the design of control unit.   1. Demonstrate the working of central processing unit and   RISC and CISC Architecture.   1. Describe the operations and language f the register   transfer, micro operations and input- output  organization.   1. Understand the organization of memory and memory   management hardware.   1. Elaborate advanced concepts of computer architecture,   Parallel Processing, interprocessor communication and  synchronization |
| 7 | Prerequisite |  |
| 8 | Course Contents | |
| 8.01 | Unit A | **Preliminaries: Inventory Models and Replacement problems** |
| 8.02 | Unit A Topic 1 | Inventory models –various costs-deterministic inventory models, Single period inventory model with shortest cost. |
| 8.03 | Unit A Topic 2 | Stochastic models, Application of inventory models, Economic lot sizes-price breaks. |
| 8.04 | Unit A Topic 3 | Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure- group replacement-stochastic nature underlying the failure phenomenon. |
| 8.05 | Unit B | **Linear Programming Problems (LPP**) |
| 8.06 | Unit B Topic 1 | Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method. |
| 8.07 | Unit B Topic 2 | Artificial Variable Method, Two Phase Method, Charnes’ Big-M Method, Sensitivity Analysis. |
| 8.08 | Unit B Topic 3 | Revised Simplex Method, Duality, Dual Simplex Method. |
| 8.09 | Unit C | **Integer Linear Programming and Transportation Problems** |
| 8.10 | Unit C Topic 1 | Integer Linear Programming Problems, MixedInteger Linear Programming Problems, Cutting Plane Method.Branch and Bound Method, 0-1 integer linear programming problem. |
| 8.11 | Unit C Topic 2 | **Transportation Problems:** Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP. |
| 8.12 | Unit C Topic 3 | Different Methods for Obtaining Initial Basic Feasible Solutions - Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel’s Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution. **Assignment Problems:** Definition, Hungarian Method for AP. |
| 8.13 | Unit D | **Non-Linear Programming (NLP) and Dynamic Programming** |
| 8.14 | Unit D Topic 1 | **Introduction to NLP:** Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe’s Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points. |
| 8.15 | Unit D Topic 2 | **Dynamic Programming:** Bellman’s Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages. |
| 8.16 | Unit D Topic 3 | Solution of linear programming problems as a Dynamic Programming problem |
| 8.17 | Unit E | **Queuing Theory** |
| 8.18 | Unit E Topic 1 | Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution. |
| 8.19 | Unit E Topic 2 | Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations. |
| 8.20 | Unit E Topic 3 | Distribution of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues. |
| 10 | Reading Content | |
| 9.1 | Text book\* | 1. Taha, H.A, ”Operations Research – An Introduction”, Macmillian |
| 9.2 | Other references | 1. Hiller, F.S., G.J. Lieberman, ” Introduction to Operations Research”, Holden-Day 2. Harvey M. Wagner, “Principles of Operations Rsearch with Applications to Managerial Decisions”, Prentice Hall of India Pvt. Ltd. 3. Swarup K etal, “Operation Research”, S. Chand. 4. Internet as a resource for reference |

**DE-I**

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| 1 | Course Code | **CSE330** |
| 2 | Course Title | Computer Oriented Numerical and Statistical Techniques |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective | To know about various types of Errors, Calculate the error correction and get actual root of the equation. Understand different methods of solution of the equations and compare them. Student will be made aware of different numerical and statistical methods which are used in engineering field, with emphasis on how to prepare program for different methods. |
| 6 | Course Outcomes | After learning the course the students should be able to:  1. Solve system of linear equations.  2. Understand various methods of modeling.  3. Apply Mathematical Modeling and for Engineering Problem Solving. 4. Solve Mathematical Equations by various methods.  5. Find Best Curve fitting for given data.  6. Apply Numerical Integration.  7. Solve Differential Equations.  8. Understand Statistical Methods for Data Analysis and sampling techniques.  9. Write programs for various numerical and statistical methods |
| **7** | **Prerequisite** | Essential prerequisite for this course is a solid knowledge in linear algebra and calculus. |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Computer Arithmetic Errors in Calculations** |
| 8.02 | Unit A Topic 1 | Floating Point Numbers, IEEE standards for floating point number representations, Floating Point Arithmetic |
| 8.03 | Unit A Topic 2 | Approximations and errors: Significant figures, accuracy and precision,Errors, Round-off and truncation errors, error propagation, Error in a series approximation. |
| 8.04 | Unit A Topic 3 | Roots of Equations: Mathematical background, Bisection, RegulaFalsi, Neuton-Raphson method, Secant method, Computer Algorithms of these methods. |
| 8.05 | Unit B | **Interpolation and Curve Fitting** |
| 8.06 | Unit B Topic 1 | **Interpolation**: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations,Relationship in various difference operators. |
| 8.07 | Unit B Topic 2 | Piecewise Linear Interpolation, Cubic Spline Interpolation, Chebshev Polynomial Approximations. |
| 8.08 | Unit B Topic 3 | **Curve fitting**: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least SquaresMethods, Gram-Schmidt Process of Orthogonalization. |
| 8.09 | Unit C | **Differentiation and Integration** |
| 8.10 | Unit C Topic 1 | **Differentiation**: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation. |
| 8.11 | Unit C Topic 2 | **Integration**: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods |
| 8.12 | Unit C Topic 3 | Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and RadauIntegrationMethod. |
| 8.13 | Unit D | **Algebraic and Differential Equations** |
| 8.14 | Unit D Topic 1 | **Solution of Simultaneous Linear Algebraic Equations:**Guass Elimination Method, ill ConditionedSystems, Condition Number, Successive Over Relaxation Method, Rate of Convergence. |
| 8.15 | Unit D Topic 2 | **Solution of Ordinary Differential Equations:** Single Step Methods-Runge-Kutta Second Order, ThirdOrder and Fourth Order Methods |
| 8.16 | Unit D Topic 3 | **Solution of Ordinary Differential Equations:**Multi Step Method-Predictor- Corrector Method. |
| 8.17 | Unit E | **Statistical Techniques** |
| 8.18 | Unit E Topic 1 | Statistical Techniques: Frequency distributions, Data analysis, Expectations and moments |
| 8.18 | Unit E Topic 2 | Co-relation and regression, Trend analysis, Seasonal effects, Cyclical Fluctuation, Moving average, MSE. |
| 8.20 | Unit E Topic 3 | Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level ofSignificance, Test involving Normal Distribution. |
|  | | |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1. Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain, 6/e, New Age International Publishers. |
| 9.2 | other references | 1. Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley, 7/e, Pearson. 2. Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel, 4/e, TMH. 3. Internet as a resource for reference |

**DE-I**

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| 1 | Course number | **CSE332** | |
| 2 | Course Title | **Introduction to Mathematical & Statistical Techniques in Computer Science** | |
| 3 | Credits | 4 | |
| 4 | Contact Hours  (L-T-P) | 3-1-0 | |
| 5 | Course Objective | This emphasizes concepts in probability, while 608 builds on those concepts to build statistical theory. STAT 608 topics include point and interval estimation, hypothesis testing, large sample results in estimation and testing, decision theory, Bayesian methods, and analysis of discrete data. Other areas may include nonparametric methods, sequential methods, regression, and analysis of variance. | |
| 6 | Course Outcomes | After learning the course the students should be able to:  1. Solve system of linear equations.  2. Understand various methods of modeling.  3. Apply Mathematical Modeling and for Engineering Problem Solving. 4. Solve Mathematical Equations by various methods.  5. Find Best Curve fitting for given data.  6. Apply Numerical Integration.  7. Solve Differential Equations. | |
| 7 | Outline syllabus | | |
| 7.01 | Unit A |  | **Introduction, Computational Errors and their Analysis.** |
| 7.02 | Unit A Topic 1 |  | Accuracy of numbers, Errors in Numerical Computations, Big endian and little endian computers, Error Tolerance. |
| 7.03 | Unit A Topic 2 |  | Floating Point Representations of Numbers (Single precision, double precision and extended precision). |
| 7.04 | Unit A Topic 3 |  | Algebraic&Transcendental Equations: Order of convergence of iterative and bisection methods. |
| 7.05 | Unit B |  | **Algorithmic Optimization** |
| 7.06 | Unit B Topic 1 |  | Assumptions for interpolation, errors in polynomial interpolation, finite differences, difference operators and their relationship. |
| 7.07 | Unit B Topic 2 |  | Numerical differentiation and integration, Trapezoidal and Simpson’s rules, |
| 7.08 | Unit B Topic 3 |  | Numerical solution of ordinary differential equations, Euler’s method. |
| 7.09 | Unit C |  | **VectorCalculus** |
| 7.10 | Unit C Topic 1 |  | Scalar functions of several variables, Partial derivatives and differentiability, gradient vector, vector fields. |
| 7.11 | Unit C Topic 2 |  | Linear Systems, Orthogonality, Eigenvalues & Eigenvectors: Vector spaces, Systems of linear equations, Orthogonality, Eigenvalues & Eigenvectors. |
| 7.12 | Unit C Topic 3 |  | QR decomposition & Singular value decomposition and their uses. |
| 7.13 | Unit D |  | **Spectral Methods** |
| 7.14 | Unit D Topic 1 |  | Time Series Analysis and application areas. |
| 7.15 | Unit D Topic 2 |  | Fourier Analysis: DFT and FFT and applications in Computer Science. |
| 7.16 | Unit D Topic 3 |  | Wavelet Analysis: wavelet transform and their applications in knowledge discovery & exploratory data analysis. |
| 7.17 | Unit E |  | **Curve Fitting** |
| 7.18 | Unit E Topic 1 |  | Curve fitting: Principle of least squares, Fitting of following curves: y=aebx, y=axb, y=abx. |
| 7.19 | Unit E Topic 2 |  | Techniques for statistical quality control: Control Charts for Variables, Control Charts for Attributes. |
| 7.20 | Unit E Topic 3 |  | Null hypothesis, alternative hypothesis,level of significance, test statistic, p value, z value and statistical significance. |
| 9.1 | Text book | 1. M. Goyal, “Computer Based Numerical & Statistical Techniques”, Infinity Science Press, LLC, MA, USA. | |
| 9.2 | Other References | 1. Matheus Grasselli andDimitryPelinovsky, “Numerical Mathematics”, Jones and Bartlet Publishers, USA. 2. Lars Elden, “Matrix Methods in Data Mining and Pattern Recognition”, SIAM (Society for Industrial and Applied Mathematics), USA. 3. Internet as a resource for reference | |

**DE-I**

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| 1 | Course number | | **CMP002** | | |
| 2 | Course Title | | **INTRODUCTION TO GRAPH THEORY AND ITS APPLICATIONS** | | |
| 3 | Credits | | 4 | | |
| 4 | Contact Hours (L-T-P) | | 3-1-0 | | |
| 5 | Course Objective | | The objective of the course is to teach students the basic graph theory concepts and their applications in computer science. | | |
| 6 | Course Outcomes | | After successful completion of the course students will be able to   1. demonstrate some of the most important notions of graph theory and develop their skill in solving basic exercises 2. understand the basic concepts of graphs, directed graphs, and weighted graphs 3. interpret the fundamentals of graphs and trees and to relate them with the use in computer science applications 4. apply shortest path algorithm to solve the classical problems like Chinese Postman Problem, TSP etc. 5. explore a graph with the help of matrices and to find a minimal spanning tree for a given weighted graph 6. apply graph-theoretic algorithms and methods used in computer science 7. develop efficient graph-theoretic algorithms (mathematically) 8. explore the applications of colouring problem of graph theory | | |
| 7 | Outline syllabus | | | | |
| 7.1 | CMP002.A | | Unit A | | **INTRODUCTION TO GRAPH THEORY** |
| 7.2 | CMP002.A1 | | Unit A Topic 1 | | Theoretical concepts of Graph Theory, Fundamental types of graphs, Applications in various areas |
| 7.3 | CMP002.A2 | | Unit A Topic 2 | | Properties of graphs and various operations on graphs |
| 7.4 | CMP002.A3 | | Unit A Topic 3 | | Special types of graphs (Hamiltonian, Euler ), their importance and properties |
| 7.5 | CMP002.B | | Unit B | | **TREES** |
| 7.6 | CMP002.B1 | | Unit B Topic 1 | | Fundamentals of trees and their types, properties |
| 7.7 | CMP002.B2 | | Unit B Topic 2 | | Binary trees and their properties, importance of binary trees in data structure (searching algorithms) |
| 7.8 | CMP002.B3 | | Unit B Topic 3 | | fundamental circuits, spanning trees, algorithms to find spanning trees in a weighted graph (Kruskal & Prim) |
| 7.9 | CMP002.C | | Unit C | | **CUT SETS** |
| 7.10 | CMP002.C1 | | Unit C Topic 1 | | Cut sets and their properties, Relation between cut-set and fundamental circuit in a graph, Concept of connectivity and separability |
| 7.11 | CMP002.C2 | | Unit C Topic 2 | | Concept of Planar graphs with introduction to Kuratowski’s non-planar graphs, Proof of Euler’s formula |
| 7.12 | CMP002.C3 | | Unit C Topic 3 | | Detection of planarity , geometric duals of graph, Discussion on criterion of planarity, thickness & Crossings |
| 7.13 | CMP002.D | | Unit D | | **MATRIX REPRESENTATION OF GRAPHS** |
| 7.14 | CMP002.D1 | | Unit D Topic 1 | | Matrix representation of graphs, incidence matrix A(G), sub matrices of A(G), circuit matrix, fundamental circuit matrix |
| 7.15 | CMP002.D2 | | Unit D Topic 2 | | Cut set matrix in a graph, fundamental cut set matrix, path matrix. Finding Rank of different matrices |
| 7.16 | CMP002.D3 | | Unit D Topic 3 | | Relationship among Af, Bf, and Cf  and its deduction , Adjacency matrix representation of a graph and its various properties |
| 7.17 | CMP002.E | | Unit E | | **COLORING OF GRAPHS AND DIRECTED GRAPHS** |
| 7.18 | CMP002.E1 | | Unit E Topic 1 | | Concept of proper coloring of vertices of a graph, chromatic number , Chromatic partitioning, Chromatic polynomial, finding chromatic polynomial of a given graph with Decomposition Theorem |
| 7.19 | CMP002.E2 | | Unit E Topic 2 | | Matching, Covering, their importance and applications, Five color problem and its proof |
| 7.20 | CMP002.E3 | | Unit E Topic 3 | | Introduction to directed graphs and their various types, directed paths and connectedness in directed graphs, Euler digraphs. |
| 8 | Course Evaluation | | | | |
| 8.1 | Course work: 30 marks | | | | |
| 8.11 | Attendance | None | | | |
| 8.12 | Homework | 10 assignments, no weight | | | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | | | |
| 8.14 | Projects | None | | | |
| 8.15 | Presentations | None | | | |
| 8.16 | Any other |  | | | |
| 8.2 | MTE | One, 20 marks | | | |
| 8.3 | End-term examination: 50 marks | | | | |
| 9 | References | | | | |
| 9.1 | Text book\* | | | 1. Deo, N, *Graph* *theory with applications to Engineering and Computer Science*, Prentice Hall India | |
| 9.2 | Other references | | | 1. Wilson R J, *Introduction to Graph Theory*, Pearson Education 2. Harary, F, *Graph Theory*, Narosa 3. Bondy & Murthy, *Graph theory and application*. Addison Wesley | |

**Term 6**

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| 1 | Course Code | **CSE311/CSP311** | |
| 2 | Course Title | **Unix Programming** | |
| 3 | Credits | **5** | |
| 4 | Contact Hours | **3-1-2** | |
| 5 | Course Objective | Introduces the UNIX/Linux operating system, including: task scheduling and management, memory management, input/output processing, internal and external commands, shell configuration, and shell customization. Explores the use of operating system utilities such as text editors, electronic mail, file management, scripting, and C/C++ compilers | |
| 6 | Course Outcomes | On completion of this course the student should be able to:   1. Identify and use UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and    develop shell scripts to perform more complex tasks. 2. Effectively use the UNIX/Linux system to accomplish typical personal, office, technical, and software development tasks. 3. Monitor system performance and network activities. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files. 4. Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines. | |
| 7 | **Prerequisite: Operating System** | | |
| 8 | Course Contents | | |
| 8.01 | **Unit A** |  | **Introduction** |
| 8.02 | Unit A Topic 1 |  | Introduction to Unix, Unix architecture, Features of Unix, Internal & External Commands, Basic unix commands: pwd, cd, mkdir, rmdir, ls, help, man, whatis |
| 8.03 | Unit A Topic 2 |  | General purpose utilities: cal, date, echo, printf, bc, script, passwd, who, uname, tty, stty , Process basics: PID, PPID, ps, process states, zombies, foreground and background processes, nice, kill. |
| 8.04 | Unit A Topic 3 |  | Unix file system, file permission, file handling commands: cat, touch, cp, rm, mv, more/less, lp, wc, cmp, diff, comm.,dos2unix & unix2dos, gzip&gunzip, zip & unzip, tar |
| 8.05 | **Unit B** |  | **Introduction to shell** |
| 8.06 | Unit B Topic 1 |  | Shell & types of shell( Bourne family & its derivatives, c shell & its derivative tcsh ), shell’s interpretive cycle, wild cards, meta characters, escaping & quoting |
| 8.07 | Unit B Topic 2 |  | Redirection, command substitution, single quotes & double quotes, In line command editing |
| 8.08 | Unit B Topic 3 |  | Shell/Environment customization, predefined variables, aliases, command substitution. |
| 8.09 | **Unit C** |  | **Filters** |
| 8.10 | Unit C Topic 1 |  | Piping |
| 8.11 | Unit C Topic 2 |  | Simple filters: pr, head, tail, cut, paste, sort, nl, tr |
| 8.12 | Unit C Topic 3 |  | Concatenation of files, grep, egrep |
| 8.13 | **Unit D** |  | **Awk and Vi editor** |
| 8.14 | Unit D Topic 1 |  | Simple awk filtering, splitting a line into fields, printf, comparison operators, number processing |
| 8.15 | Unit D Topic 2 |  | Variables, built-in variables, arrays, associative (Hash) arrays, functions, if statement, looping with for & while. |
| 8.16 | Unit D Topic 3 |  | vi basics, input mode, saving text & quitting, navigation, text editing ( cut, copy, paste, delete, undo ), searching for a pattern, substitution- search & replace (:s) |
| 8.17 | **Unit E** |  | **Shell programming** |
| 8.18 | Unit E Topic 1 |  | Shell scripts, execution of shell scripts, using command line arguments |
| 8.19 | Unit E Topic 2 |  | exit & exit status of command, logical Operators && and || ,if conditional, using test and [ ] to evaluate expressions |
| 8.20 | Unit E Topic 3 |  | The case conditional, expr: computation & string handling, while & for loop |
| 9.1 | Text book\* | | 1. Unix and shell programming by Richard F. Gilberg and Behrouz A. forouzan |
| 9.2 | Other references | | 1. Unix Shell programming by Stephen G. Kochan and Patric Wood  2. Sumitabha Das, “Unix Concepts and Applications”, Tata McGraw Hill.  3. Internet as a resource for reference |

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| 1 | Course Code | **CSE 303/CSP303** |
| 2 | Course Title | **Compiler Design** |
| 3 | Credits | **5** |
| 4 | Contact Hours | **3-1-2** |
| 5 | Course Objective | 1. To provide students with an overview of the issues that arise in Compiler construction as well as to throw light upon the significant theoretical developments and tools that are deep rooted into computer science. 2. To introduce the major phases of Compiler construction and also its theoretical aspects including regular expressions, context-free grammars, Finite Automata etc. |
| 6 | Course Outcomes | After the successful completion of this course, students will be able to :   1. Employ formal attributed grammars for specifying the syntax and semantics of programming languages. 2. Apply regular patterns and grammars. (ABET program outcomes a and j) 3. Comprehend the working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation. 4. Implement parsing and translation techniques for automation of computing tasks. 5. Design and write a complex programming project. (ABET program outcomes c and k) |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Introduction to Compiler, Phases and passes, Bootstrapping, Cross-Compiler |
| 8.03 | Unit A Topic 2 | Finite state machines and regular expressions and their applications to lexical analysis |
| 8.04 | Unit A Topic 3 | lexical-analyzer generator, LEX-compiler Lexical Phase errors |
| 8.05 | Unit B | **Parsing Techniques** |
| 8.06 | Unit B Topic 1 | The syntactic specification of programming languages: Context free grammars, derivation and parse trees. |
| 8.07 | Unit B Topic 2 | Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers.  Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables |
| 8.08 | Unit B Topic 3 | Constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars. YACC. Syntactic phase errors and semantic errors. |
| 8.09 | Unit C | **Syntax Directed Translations And Intermediate Code Generation** |
| 8.10 | Unit C Topic 1 | Syntax directed definition, Construction of syntax trees, syntax directed translation scheme |
| 8.11 | Unit C Topic 2 | Variants of Syntax Trees, Three Address Codes |
| 8.12 | Unit C Topic 3 | Translation of Expression, Type Checking and control flow. |
| 8.13 | Unit D | **Symbol table** |
| 8.14 | Unit D Topic 1 | Data structure for symbols tables, representing scope information. |
| 8.15 | Unit D Topic 2 | Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. |
| 8.16 | Unit D Topic 3 | Run Time Storage Management |
| 8.17 | Unit E | **Code Generation And Optimization** |
| 8.18 | Unit E Topic 1 | Sources of Optimization of basic blocks and flow graphs |
| 8.19 | Unit E Topic 2 | Basic Blocks, Flow graphs, DAG |
| 8.20 | Unit E Topic 3 | Global Data Flow Analysis |
| 10 | Reading Content | |
| 9.1 | Text book\* | 1. Aho, Sethi, Ulman, compilers Principles, Techniques, and Tools, Pearson Education, 2003 |
| 9.2 | other references | 1. Lauden, Principles of Compiler Construction. 2. D. M. *Dhamdhere Compiler* Construction--Principles and Practice, Macmillan India, 3. Internet as a resource for reference |

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| 1 | Course number | **CSE312/CSP312** |
| 2 | Course Title | **ARTIFICIAL INTELLIGENCE** |
| 3 | Credits | 5 |
| 4 | Contact Hours | 3-1-2 |
| 5 | Course Objective | The objective of the course is to introduce basic fundamental concepts in Artificial Intelligence (AI), with a practical approach in understanding them. To visualize the scope of AI and its role in futuristic development. |
| 6 | Course Outcomes | On successful completion of this module students will be able to   * distinguish between AI and non-AI solution, * apply AI techniques in problem solving, * analyse the best search technique and implement it in real-life applications * explore the scope of AI in various application domains |
| 7 | Outline syllabus | |
| 7.01 | CSE428.A | **INTRODUCTION TO AI** |
| 7.02 | CSE428.A1 | Foundation of AI, Goals of AI, History and AI course line |
| 7.03 | CSE428.A2 | Introduction to Intelligent Agents; Environment; Structure of Agent |
| 7.04 | CSE428.A3 | AI Solutions Vs Conventional Solutions; a philosophical approach; a practical approach |
| 7.05 | CSE428.B | **PROBLEM SOLVING AGENTS** |
| 7.06 | CSE428.B1 | Problem solving using Search Techniques; Problems; Solutions; Optimality |
| 7.07 | CSE428.B2 | Informed Search Strategies; Greedy Best-First; A\* Search; Heuristic Functions |
| 7.08 | CSE428.B3 | Uninformed Search Strategies; BFS; DFS; DLS; UCS; IDFS; BDS |
| 7.09 | CSE428.C | **KNOWLEDGE & REASONING** |
| 7.10 | CSE428.C1 | Knowledge-Based Agents; Logic; First-Order Logic; Syntax-Semantics in FOL; Simple usage; |
| 7.11 | CSE428.C2 | Inference Procedure; Inference in FOL; Reduction; Inference Rules; |
| 7.12 | CSE428.C3 | Forward Chaining; Backward Chaining; Resolution |
| 7.13 | CSE428.D | **LEARNING** |
| 7.14 | CSE428.D1 | Common Sense Vs Learning; Components; Representations; Feedback |
| 7.15 | CSE428.D2 | Learning Types: Supervised; Unsupervised; Reinforcement Learnings |
| 7.16 | CSE428.D3 | Artificial Neural Networks: Introduction, types of networks; Single Layer and Multi-Layer n/w. |
| 7.17 | CSE428.E | **APPLICATIONS** |
| 7.18 | CSE428.E1 | AI Present & Future; application case studies on NLP, Image Processing; |
| 7.19 | CSE428.E2 | Robotics – Hardware; Vision; Navigation based case studies; |
| 7.20 | CSE428.E3 | Ambient Intelligence case studies; |
| 8 | Course Evaluation | |
| 8.1 | Course work: 30 marks | |
| 8.11 | Attendance | 100% |
| 8.12 | Homework | Assignments (4) |
| 8.13 | Quizzes | 5 |
| 8.14 | Projects | Optional |
| 8.15 | Presentations |  |
| 8.16 | Any other | Posters (optional) |
| 8.2 | MTE | One, 20 marks |
| 8.3 | End-term examination: 50 marks | |
| 9 | References | |
| 9.1 | Text book\* | 1. Rich E& Knight K, Artificial Intelligence, Tata McGraw Hill, Edition 3. |
| 9.2 | other references | 1. Russell S &Norvig P, *Artificial Intelligence: A Modern Approach*, Prentice Hall 2. Dan W. Patterson, Artificial Intelligence & Expert Systems, Pearson Education with Prentice Hall India. Indian Edition. |

**DE-II**

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| 1 | Course No. | | **CMP303** | |
| 2 | Course Title | | **INTRODUCTION TO SOFT COMPUTING** | |
| 3 | Credits | | 4 | |
| 4 | Contact Hours (L-T-P) | | 3-1-0 | |
| 5 | Course Objective | | To introduce to students soft computing theories, techniques and tools those are frequently required for understanding and developing the exploratory data analysis techniques, and knowledge discovery and intelligent systems. | |
| 6 | Course Outcomes | | After Successful completion of this course the student will be able to:   1. analyze basic mathematical/statistical methods 2. synthesize the importance of ambiguities, uncertainties, vagueness and inexactness in modelling the real life situation. 3. solve problems involving ambiguities, uncertainties, vagueness and inexactness 4. increase ability to understand implementation platforms of soft computing aspects 5. develop a small software systems using soft computing method. 6. develop problem definition, requirements analysis, design, implementations, test cases. 7. use at least one soft computing software package like MATLAB. 8. implementation of soft computing techniques at application level | |
| 7 | Outline syllabus: | | | |
| 7.01 | CMP303.A | | Unit A | **PROBABILITY AND STATISTICS** |
| 7.02 | CMP303.A1 | | Unit A Topic 1 | Introduction to probability and statistics |
| 7.03 | CMP303.A2 | | Unit A Topic 2 | Regression analysis |
| 7.04 | CMP303.A3 | | Unit A Topic 3 | Distance & Similarity measures, and Clustering and Decision functions. |
| 7.05 | CMP303.B | | Unit B | **FUZZY THEORY** |
| 7.06 | CMP303.B1 | | Unit B Topic 1 | Fuzzy sets and fuzzy relations |
| 7.07 | CMP303.B2 | | Unit B Topic 2 | Fuzzification and defuzzification |
| 7.08 | CMP303.B3 | | Unit B Topic 3 | Introduction to fuzzy logic (**Matlab Fuzzy logic toolbox**) |
| 7.09 | CMP303.C | | Unit C | **INTRODUCTION TO NEURAL NETWORKS** |
| 7.10 | CMP303.C1 | | Unit C Topic 1 | Basic concepts |
| 7.11 | CMP303.C2 | | Unit C Topic 2 | Supervised and Unsupervised learning (**Matlab Neural network tool box**) |
| 7.12 | CMP303.C3 | | Unit C Topic 3 | Back propagation networks - Kohonen'sself organizing map. |
| 7.13 | CMP303.D | | Unit D | **INTRODUCTION TO GENETIC ALGORITHM AND GENETIC PROGRAMMING** |
| 7.14 | CMP303.D1 | | Unit D Topic 1 | Basic concepts and operations |
| 7.15 | CMP303.D2 | | Unit D Topic 2 | classification of genetic algorithms |
| 7.16 | CMP303.D3 | | Unit D Topic 3 | Applications of genetic algorithms. (**Matlab Genetic algorithm tool box)** |
| 7.17 | CMP303.E | | Unit E | **APPLICATIONS OF SOFT COMPUTING** |
| 7.18 | CMP303.E1 | | Unit E Topic 1 | Elementary applications in image processing, |
| 7.19 | CMP303.E2 | | Unit E Topic 2 | Pattern recognition |
| 7.20 | CMP303.E3 | | Unit E Topic 3 | Designing control systems |
| 8 | Course Evaluation | | | |
| 8.1 | Course work: 30 marks | | | |
| 8.11 | Attendance | None | | |
| 8.12 | Homework | 10 assignments, no weight | | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | | |
| 8.14 | Projects | None | | |
| 8.15 | Presentations | None | | |
| 8.16 | Any other |  | | |
| 8.2 | MTE | One, 20 marks | | |
| 8.3 | End-term examination: 50 marks | | | |
| 9 | References | | | |
| 9.1 | Text book | | 1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall. 2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, | |
| 9.2 | Other references | | 1. LaureneFausett, "Fundamentals of Neural Networks", Prentice Hall,. 2. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall,USA. | |

**DE-II**

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| --- | --- | --- | --- | --- | --- | --- |
| 1 | Course number | **CSE333** | | | | |
| 2 | Course Title | **SOFTWARE QUALITY MANAGEMENT** | | | | |
| 3 | Credits | 4 | | | | |
| 4 | Contact Hours (L-T-P) | 3-1-0 | | | | |
| 5 | Course Objective | This course aims to equip students with the knowledge and techniques of professional practices in software processes and activities. It prepares students to manage the development of high quality software using proven techniques and established standards in software quality management. | | | | |
| 6 | Course Outcomes | On successful completion of this module students will be able to   1. Understand SQA activities of the SDLC 2. To describe procedures and work instructions in software organizations 3. To learn about standards and certifications 4. apply quality assurance tools & techniques in their project | | | | |
| 7 | Outline syllabus | | | | | |
| 7.01 | CSE203.A | | Unit A | | | **SOFTWARE QUALITY ENGINEERING** |
| 7.02 | CSE203.A1 | | Unit A Topic 1 | | | Concepts Of Quality,Hierarchical Modeling, Quality Models , Quality Criteria And Its Interrelation |
| 7.03 | CSE203.A2 | | Unit A Topic 2 | | | Fundamentals Of Software Quality Improvement, Concepts of Quality Improvement |
| 7.04 | CSE203.A3 | | Unit A Topic 3 | | | Concepts Of Process Maturity ,Improving Process Maturity. |
| 7.05 | CSE203.B | | Unit B | | | **DEVELOPMENTS IN MEASURING QUALITY** |
| 7.06 | CSE203.B1 | | Unit B Topic 1 | | | Selecting Quality Goals And Measures, Principles Of Measurement , Measures And Metrics |
| 7.07 | CSE203.B2 | | Unit B Topic 2 | | | Quality Function Deployment, Goal/Question/Measure Paradigm , Quality Characteristics Tree |
| 7.08 | CSE203.B3 | | Unit B Topic 3 | | | The FURPS Model And FURPS+ – Gilb Approach – Quality Prompts |
| 7.09 | CSE203.C | | Unit C | | | **Software Quality Assurance:** |
| 7.10 | CSE203.C1 | | Unit C Topic 1 | | | The philosophy of assurance, the meaning of quality, the relationship of assurance to the software life cycle |
| 7.11 | CSE203.C2 | | Unit C Topic 2 | | | SQA techniques. Tailoring the Software Quality Assurance Program: Management review process, technical review process, walkthrough |
| 7.12 | CSE203.C3 | | Unit C Topic 3 | | | software inspection process, configuration audits, document verification. |
| 7.13 | CSE203.D | | Unit D | | | **QUALITY MANAGEMENT SYSTEM** |
| 7.14 | CSE203.D1 | | Unit D Topic 1 | | | Elements of QMS , Rayleigh model framework |
| 7.15 | CSE203.D2 | | Unit D Topic 2 | | | Reliability Growth models for QMS |
| 7.16 | CSE203.D3 | | Unit D Topic 3 | | | Complexity metrics and models, Customer satisfaction analysis |
| 7.17 | CSE203.E | | Unit E | | | **QUALITY STANDARDS** |
| 7.18 | CSE203.E1 | | Unit E Topic 1 | | | Quality management standards, Need for standards, ISO 9000 Series |
| 7.19 | CSE203.E2 | | Unit E Topic 2 | | | Capability Maturity Models-CMM and CMMI, CASE tools, |
| 7.20 | CSE203.E3 | | Unit E Topic 3 | | | Bootstrap methodology, ISO/IEC 15504, Six Sigma Concept for Software Quality. |
| 8 | Course Evaluation | | | | | |
| 8.1 | Course work | | 30 marks | | | |
| 8.11 | Attendance | | None | | | |
| 8.12 | Homework | | 10 assignments, No weight | | | |
| 8.13 | Quizzes | | 7 best quizzes (based on assignments); 20 marks | | | |
| 8.14 | Labs | | NA | | | |
| 8.15 | Presentations | | None | | | |
| 8.16 | Any other | | None | | | |
| 8.2 | MTE | | 20 marks | | | |
| 8.3 | ETE | | | 50 marks | | |
| 9 | References | | | | | |
| 9.1 | Text book\* | | | | 1. Allan C. Gillies, “Software Quality: Theory and Management”, Thomson Learning, 2003 2. Brian Hambling, “Managing Software Quality”, Tata McGraw Hill | |
| 9.2 | Other references | | | | 1. Roger S. Pressman, “Software Engineering-A Practitioner’s Approach”, McGraw Hill pub.2010. 2. Daniel Galin, “Software Quality Assurance: From Theory to Implementation”,Pearson Addison-Wesley, 2012. 3. Kamna Malik, Praveen Choudhary, Software Quality - A Practitioner’s Approach, Tata McGraw Hill (1999) | |

**DE-II**

**Term 7**

**DE-III**

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| 1 | Course number | **CSE432** | |
| 2 | Course Title | **SOFTWARE PROJECT MANAGEMENT** | |
| 3 | Credits | 4 | |
| 4 | Contact Hours (L-T-P) | (3-1-0) | |
| 5 | Course Objective | To provide fundamental skills of software Project management emphasising on issues & hurdles associated with delivering successful projects, so as to make student aware of best project management practices, and contemporary software engineering tools. | |
| 6 | Course Outcomes | After successful completion of this course students should be able to:  1. Establish the process of software project management and its applications.  2. Evaluate a project & to develop the scope of work.  3. Provide accurate cost estimates and plan the various activities.  4. Develop Software projects according to quality standards. | |
| 7 | Outline syllabus: | | |
| 7.01 | CSE427.A | Unit A | **INTRODUCTION** |
| 7.02 | CSE427.A1 | Unit A Topic 1 | Introduction to software project management, Stages of Software Project Management ,software projects versus other types of project |
| 7.03 | CSE427.A2 | Unit A Topic 2 | Categorization of software projects, Stake holders, setting objectives, WBS,PBS |
| 7.04 | CSE427.A3 | Unit A Topic 3 | Management control, Business case, Project success and failures, Software  Tools for Project Management. |
| 7.05 | CSE427.B | Unit B | **PLANNING PHASE** |
| 7.06 | CSE427.B1 | Unit B Topic 1 | Introduction to project planning, types of project plan, elements, purpose of project plan |
| 7.07 | CSE427.B2 | Unit B Topic 2 | Step-wise project planning. |
| 7.08 | CSE427.B3 | Unit B Topic 3 | Development Lifecycle models: waterfall, Spiral, Iterative, incremental, v-shaped. |
| 7.09 | CSE427.C | Unit C | **PROJECT SCHEDULING** |
| 7.10 | CSE427.C1 | Unit C Topic 1 | Time management, Project Activity Definition, Activity sequencing, Activity Duration estimates |
| 7.11 | CSE427.C2 | Unit C Topic 2 | Project network, Project networking Models |
| 7.12 | CSE427.C3 | Unit C Topic 3 | CPM and PERT |
| 7.13 | CSE427.D | Unit D | **PROJECT COST ESTIMATION & PROJECT EVALUATION** |
| 7.14 | CSE427.D1 | Unit D Topic 1 | Importance and principles of Cost management, Cost Estimation Process, Earned value analysis |
| 7.15 | CSE427.D2 | Unit D Topic 2 | Software sizing: LOC, Function points, Cost Estimation Methods. |
| 7.16 | CSE427.D3 | Unit D Topic 3 | COCOMO, NPV, ROI, Payback, IRR. |
| 7.17 | CSE427.E | Unit E | **QUALITY PROJECT MANAGEMENT** |
| 7.18 | CSE427.E1 | Unit E Topic 1 | Introduction to quality project management, Phases |
| 7.19 | CSE427.E2 | Unit E Topic 2 | SICMM: Structure of CMM, Five maturity levels |
| 7.20 | CSE427.E3 | Unit E Topic 3 | Software process Framework for the CMM |
| 8 | Course Evaluation | | |
| 8.1 | Course work: 30 marks | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | 10 Assignment (no Marks) | |
| 8.13 | Quizzes | 7 best quiz (20 marks) | |
| 8.14 | Projects | None | |
| 8.15 | Presentations | 10 marks | |
| 8.16 | Any other | None | |
| 8.2 | MTE | 20 marks | |
| 8.3 | End-term examination: 50 marks | | |
| 9 | References | | |
| 9.1 | Text book | 1. Kathy Schwalbe, “Information Technology Project Management” International Student Ed. THOMSON Course Technology 2. Cottrell M. and Hughes B., "Software Project Management", 5th Edition, The McGraw-Hill Companies. | |
| 9.2 | other references | 1. Manish Kumar JHA “Software Project Management” 3rd Edition, Dhanpat Rai and Co. 2. QuantumPM, “Microsoft Office Project Server 2003 Unleashed”, Pearson Education India. 3. Robert T. Futrell, Donald F. Shafer and Linda I Shafer, “Quality Software Project” Pearson India. | |

**DE-III**

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| --- | --- | --- | --- | --- | --- | --- |
| 1 | Course Code | | **CSE-431** | | | |
| 2 | Course Title | | **Advance Computer Networks** | | | |
| 3 | Credits | | 3-1-0 | | | |
| 4 | Contact Hours | | (L-T-P) | | | |
| 5 | Course Objective | | This course is to provide students with an overview of the advanced concepts and fundamentals of data communication and computer networks. | | | |
| 6 | Course Outcomes (CO)  (Max of 4) | | On successful completion of this module students will be able to:   1. Understand and building the skills of subnetting and routing mechanisms. 2. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation. | | | |
| **7** | **Prerequisite** | | **Computer Networks** | | | |
| **8** | **Course Contents** | | | | | |
| 8.01 | Unit A | **Introduction** | | | | |
| 8.02 | Unit A Topic 1 | Overview of fundamental Concepts of Computer Network and Their architecture | | | | |
| 8.03 | Unit A Topic 2 | ATM: Introduction, Physical Layer, ATM Layer, ATM Adaptation Layer | | | | |
| 8.04 | Unit A Topic 3 | Frame Relay | | | | |
| 8.05 | Unit B | **Mobile Networks** | | | | |
| 8.06 | Unit B Topic 1 | Mobile telephone system: 1G, 2G, 3G | | | | |
| 8.07 | Unit B Topic 2 | Wireless communication basics, architecture, mobility management | | | | |
| 8.08 | Unit B Topic 3 | Bluetooth (802.15.1), Wi-Fi (802.11), WiMAX (802.16) | | | | |
| 8.09 | Unit C | **Network Layer** | | | | |
| 8.10 | Unit C Topic 1 | CIDR –Introduction , CIDR addressing, CIDR address blocks , supernetting , subnetting ,NAT, | | | | |
| 8.11 | Unit C Topic 2 | ARP, RARP, ICMP, IGMP | | | | |
| 8.12 | Unit C Topic 3 | HDLC, PPP | | | | |
| 8.13 | Unit D | **Routing** | | | | |
| 8.14 | Unit D Topic 1 | Routing architecture , Multicast routing Protocol | | | | |
| 8.15 | Unit D Topic 2 | Routing protocols in Wireless LAN: DSDV, WRP, AODV, DSR | | | | |
| 8.16 | Unit D Topic 3 | Routing Algorithms in wired LAN: RIP, OSPF | | | | |
| 8.17 | Unit E | **Security** | | | | |
| 8.18 | Unit E Topic 1 | Security issues in wired and wireless networks | | | | |
| 8.19 | Unit E Topic 2 | IPSEC, Firewall | | | | |
| 8.20 | Unit E Topic 3 | Wireless Security:- 802.11, Bluetooth | | | | |
| 9 |  |  | | |  |  |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignment | -- | | | -- | -- |
| 9.13 | Quizzes | 10 | | | -- | -- |
| 9.14 | Projects | Yes | | | -- | -- |
| 9.15 | Presentations | -- | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 30 | 40 |
| 10 | **Reading Content** | | | | | |
| 9.1 | Text book\* | | | 1. Forouzan, B.., “Communication Networks”, TMH | | |
| 9.2 | other references | | | 1. W. Stallings, “Data and Computer Communication” Macmillan Press   Comer, “Internetworking with TCP/IP” PHI   1. Tanenbaum, A.S.” Computer Networks”, 4th Edition, PHI | | |

**DE-III**

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| 1 | Course Code | | **CSE435** | | | |
| 2 | Course Title | | **Neural Networks** | | | |
| 3 | Credits | | 4 | | | |
| 4 | Contact Hours | | 3-1-0 | | | |
| 5 | Course Objective | | To introduce neural computational paradigm for critical & implementable understanding for pattern based problem areas. | | | |
| 6 | Course Outcomes (CO) | | On successful completion of this module students will be able to:   1. develop a MLP neural network for small scale problems 2. design the radial basis function to obtain biological feasibility and set neural network 3. evaluate the applicability of ANN solution for a given problem | | | |
| **7** | **Prerequisite** | |  | | | |
| **8** | **Course Contents** | | | | | |
| 8.01 | Unit A | | **Introduction** | | | |
| 8.02 | Unit A Topic 1 | | Biological Significance | | | |
| 8.03 | Unit A Topic 2 | | Neuron & its functionalities | | | |
| 8.04 | Unit A Topic 3 | | Components of Artificial Neural Network | | | |
| 8.05 | Unit B | | **Learning** | | | |
| 8.06 | Unit B Topic 1 | | Learning Rule & Learning Paradigms | | | |
| 8.07 | Unit B Topic 2 | | Training & Testing in learning | | | |
| 8.08 | Unit B Topic 3 | | Analysis: Learning Curve & Error Measurement | | | |
| 8.09 | Unit C | | **Perceptron** | | | |
| 8.10 | Unit C Topic 1 | | Perceptron, Layers, Convergence Theorem | | | |
| 8.11 | Unit C Topic 2 | | Activation Function, Weight Initialization | | | |
| 8.12 | Unit C Topic 3 | | Backpropagation, Delta Learning Rule | | | |
| 8.13 | Unit D | | **Radial Basis Networks** | | | |
| 8.14 | Unit D Topic 1 | | Components & Structure | | | |
| 8.15 | Unit D Topic 2 | | Training & Testing | | | |
| 8.16 | Unit D Topic 3 | | Enhancements in Radial Basis Networks | | | |
| 8.17 | Unit E | | **Applications & Case Studies using MATLAB** | | | |
| 8.18 | Unit E Topic 1 | | Various practical applications of Artificial Neural Networks | | | |
| 8.19 | Unit E Topic 2 | | PNN development & verifications using image dataset for pattern detection | | | |
| 8.20 | Unit E Topic 3 | | RBFNN development using medical imagining dataset for pattern detection | | | |
| 9 | **Course Evaluation** | | | | | |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignments | 3 | | | -- | -- |
| 9.13 | Quizzes | -- | | | -- | -- |
| 9.14 | Project | One | | | -- | -- |
| 9.15 | Presentations | One | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 20 | 50 |
| 10 | **Reading Content** | | | | | |
| 10.1 | Text book\* | | | 1. David Kriesel, 2007, *A Brief Introduction to Neural Networks*, available at <http://www.dkriesel.com> | | |
| 10.2 | other references | | |  | | |

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| 1 | Course Code | **CSE438** |
| 2 | Course Title | **Android application development** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective |  |
| 6 | Course Outcomes |  |
| **7** | **Prerequisite** | **Knowledge of java programming** |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction to Android** |
| 8.02 | Unit A Topic 1 | Android architecture, Feature of android, Limitation of mobile devices |
| 8.03 | Unit A Topic 2 | Configuration of android SDK, Activity life cycle, AVD manager |
| 8.04 | Unit A Topic 3 | Generation of APK file for android project, Test run of application on device |
| 8.05 | Unit B | **Android UI Components** |
| 8.06 | Unit B Topic 1 | Layouts-Linear layout, Relative layout, Table layout, Frame layout |
| 8.07 | Unit B Topic 2 | Event delegation model, Type of Event Listeners, Onclick, OnLongClick, OnFocusChanged, OnKeyUp, OnKeyDown |
| 8.08 | Unit B Topic 3 | Button, TextView, EditTextView, Label, List, Radio Button, Checkbox, date picker |
| 8.09 | Unit C | **Notification and Intents** |
| 8.10 | Unit C Topic 1 | Type of notification, Toast notification, status bar notification and alert notification |
| 8.11 | Unit C Topic 2 | Concept of intent, configuration of intent, Intent filters |
| 8.12 | Unit C Topic 3 | Creating Menu, Option Menu, Context Menu, Popup Menu |
| 8.13 | Unit D | **Working with SQL Lite** |
| 8.14 | Unit D Topic 1 | Introduction to SQLite databse, Steps for connecting application with database. |
| 8.15 | Unit D Topic 2 | Fetch and update data in database from application, |
| 8.16 | Unit D Topic 3 | Cursor and content value, opening and closing database |
| 8.17 | Unit E | **Sensor Device** |
| 8.18 | Unit E Topic 1 | Sensor Manager, Sensor Framework, Types of Sensors Accelerometer, Gyroscope, Proximity Sensor, Orientation, Light Sensor |
| 8.19 | Unit E Topic 2 | Detect availability of sensor, Fetch data from sensors on frequent basis, |
| 8.20 | Unit E Topic 3 | Development of compass application with help of gyroscope sensor |
| 9 | **Course Evaluation** | |
| 10 | **Reading Content** | |
| 10.1 | Text book\* | 1. Android Application Development, Wrox publication |
| 10.2 | other references | 1. Android UI Fundamentals : Develop and Design 2. Internet as a resource for reference |

**DE-IV**

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| 1 | Course Code | | **CSE439** | | | |
| 2 | Course Title | | **Design of Data warehouse** | | | |
| 3 | Credits | | 3-1-0 | | | |
| 4 | Contact Hours | | (L-T-P) | | | |
| 5 | Course Objective | | Students should be able to learn about how to design data warehouse models using appropriate schemas to meet business objectives. | | | |
| 6 | Course Outcomes (CO)  (Max of 4) | | On successful completion of this module students will be able to:  Design a data mart or data warehouse for any organization | | | |
| **7** | **Prerequisite** | | Knowledge of DBMS is essential | | | |
| **8** | **Course Content** | | | | | |
| 8.01 | Unit A | | **Introduction to Data warehouse** | | | |
| 8.02 | Unit A Topic 1 | | Overview, Definition, Data WarehousingComponents,Data Marking, | | | |
| 8.03 | Unit A Topic 2 | | Three-tier Data Warehouse Architecture, Data warehouse logical design,  Data warehouse physical design | | | |
|  | Unit A Topic 3 | | Steps for the design and construction of Data Warehouses,Design  Techniques. | | | |
| 8.05 | Unit B | | **Data Warehouse Process and Technology** | | | |
| 8.06 | Unit B Topic 1 | | WarehousingStrategy,Warehousemanagement and Support Processes | | | |
| 8.07 | Unit B Topic 2 | | Data warehousing technologies and implementations | | | |
| 8.08 | Unit B Topic 3 | | Building a Data Warehouse, Warehouse Database | | | |
| 8.09 | Unit C | | **Model Development** | | | |
| 8.10 | Unit C Topic 1 | | Understanding business model, Developing the model | | | |
| 8.11 | Unit C Topic 2 | | Creating and maintaining keys, Data warehouse Technology Model | | | |
| 8.12 | Unit C Topic 3 | | Modelling Hierarchies, Modelling Transactions | | | |
| 8.13 | Unit D | | **Data Warehouse Optimization** | | | |
| 8.14 | Unit D Topic 1 | | Optimizing the development Process | | | |
| 8.15 | Unit D Topic 2 | | Optimizing the Database | | | |
| 8.16 | Unit D Topic 3 | | Optimizing the System Model | | | |
| 8.17 | Unit E | | **Operation and Management** | | | |
| 8.18 | Unit E Topic 1 | | Maintaining Model | | | |
| 8.19 | Unit E Topic 2 | | Deploying the Relational Solution | | | |
| 8.20 | Unit E Topic 3 | | Comparison of Data warehouse Methodologies | | | |
| 9 | **Course Evaluation** | | | | | |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignment | Yes | | | -- | -- |
| 9.13 | Quizzes | yes | | | -- | -- |
| 9.14 | Projects | Yes | | | -- | -- |
| 9.15 | Presentations | Yes | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 30 | 40 |
| 10 | **Reading Content** | | | | | |
| 9.1 | Text book\* | | | 1. Claudia Imhoff, “Mastering Data warehouse Design”, Wiley Publication | | |
| 9.2 | Other references | | | 1. William H.Inmon, “Building the Data Warehouse”, Wiley Publication | | |

**DE-IV**

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| --- | --- | --- |
| 1 | Course Code | **CMP006** |
| 2 | Course Title | **Cryptography and Network Security** |
| 3 | Credits | **3** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective |  |
| 6 | Course Outcomes |  |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction & symmetric Key Cryptography** |
| 8.02 | Unit A Topic 1 | Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security |
| 8.03 | Unit A Topic 2 | Classical encryption techniques- Substitution Cipher(Mono-alphabetic, Poly-alphabetic), Transposition cipher, Stegnography |
| 8.04 | Unit A Topic 3 | Block Cipher- Encryption Principles, DES and its variants, strength of DES |
| 8.05 | Unit B | **Mathematics of Cryptography** |
| 8.06 | Unit B Topic 1 | Eucledian, Extended Eucledian Algorithm, EuilersTotient Function , Ferment little Theorem, Eulers theorem |
| 8.07 | Unit B Topic 2 | Primality Testing-Miller Rabin test, Chinese Remainder Theorem |
| 8.08 | Unit B Topic 3 | Exponential- square and multiply method, Discrete Logarithm |
| 8.09 | Unit C | **Asymmetric Cryptography & Key Exchange** |
| 8.10 | Unit C Topic 1 | Public Key cryptography-RSA, Cryptanalysis of RSA |
| 8.11 | Unit C Topic 2 | Elgamal cryptography, Elliptic Curve cryptography |
| 8.12 | Unit C Topic 3 | Key Management and distribution : KDC, Diffie Hellman Key Exchange |
| 8.13 | Unit D | **Digital signatures** |
| 8.14 | Unit D Topic 1 | User Authentication protocol- Kerberos |
| 8.15 | Unit D Topic 2 | Digital Signature –RSA, Elgamal, DSS |
| 8.16 | Unit D Topic 3 | Data integrity algorithms-Hash Functions, MD5, SHA-512 |
| 8.17 | Unit E | **Security** |
| 8.18 | Unit E Topic 1 | Security at Application layer-Email Architecture, S/MIME, PGP-Scenarios, key rings |
| 8.19 | Unit E Topic 2 | Security at Transport layer-SSL( Services, Protocols) |
| 8.20 | Unit E Topic 3 | Security at Network layer-IPSec(Modes, Security Protocols-AH, ESP, Services provided by IPSEC) |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1. Stallings, W., “Cryptography and Network Security – Principles and Practices”, Prentice Hall of India, Fourth Edition. |
| 9.2 | other references | 1. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001. 2. Behrouz A. Forouzan, “Cryptography And Network Security”- McGraw Hill 3. Internet as a resource for reference |

**DE-IV**

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| 1 | Course Code | **CSE441** |
| 2 | Course Title | **Robotics &Intelligent Systems** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective |  |
| 6 | Course Outcomes (CO) |  |
| **7** | **Prerequisite** | **Logic Building & Problem Solving, Discrete maths and Mathematics-2** |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Introduction, History of Robotics. |
| 8.03 | Unit A Topic 2 | Types of Sensors (Tactile, Range Finders, GPS, IMU, Position Encoders). |
| 8.04 | Unit A Topic 3 | Mapping: Metric Maps, Topological Maps, hybrids |
| 8.05 | Unit B | **Sensor Vision** |
| 8.06 | Unit B Topic 1 | Sensor (Vision), Visibility Graphs, |
| 8.07 | Unit B Topic 2 | Bug Algorithm |
| 8.08 | Unit B Topic 3 | Potential Fields |
| 8.09 | Unit C | **Actuators. Locomotion. Manipulators.** |
| 8.10 | Unit C Topic 1 | Actuators. Locomotion. Manipulators. |
| 8.11 | Unit C Topic 2 | Semantic hierarchy of spatial representations. |
| 8.12 | Unit C Topic 3 | Configuration Space, PRMs, Subsumption (reactive) architecture. |
| 8.09 | Unit D | **Control theory** |
| 8.10 | Unit D Topic 1 | Control Theory. Plant and Sensor Mode. |
| 8.11 | Unit D Topic 2 | Coverage, Multi-Robot Coverage |
| 8.12 | Unit D Topic 3 | State Estimation, Dead reckoning, Landmarks, |
| 8.09 | Unit E | **Filtering** |
| 8.10 | Unit E Topic 1 | Localization |
| 8.11 | Unit E Topic 2 | Bayesian Filtering, Particle Filters, Kalman Filters, SLAM |
| 8.12 | Unit E Topic 3 | Underwater Robot |
| 9 |  | |
| 10 |  | |
| 9.1 | Text book\* | 1. *Computational Principles of Mobile Robotics* by Gregory Dudek and Michael Jenkin, Second Edition |
| 9.2 | other references | 1. <http://www.princeton.edu/~stengel/RISVirText.html> 2. Internet as a resource for reference |

**DE-IV**

**CSE-442 Mobile Value Added Services (3-1-0)**

Total Lecture Hours: 40

**Unit –I 7 hrs**

Introduction to Mobile VAS: Introduction to Java Concepts – JDBC Concepts, Regular Expressions using

JAVA, Introduction to UML Notation – UML diagrams, USECASE, TESTCASE, Introduction to Mobile VAS –

Definition, Characteristics, Mobile VAS in India

**Unit –II 8 hrs**

Short Message Service: Introduction to SMS – Definition, Basic Concepts of SMS, SMS Architecture –

Components of Architecture, SMS Protocols, Gateways, Gateway Architecture, SMS Applications – SMS

Based Applications – Creation, Examples, Pros and Cons, SMS Billing Models – Standard and Premium

billing models, SMS charges, SMS short codes, Premium SMS

**Unit –III 7 hrs**

Multimedia Messaging Service: Introduction – MMS Definition, MMS Use Cases, MMS Architecture,

Interfaces, Protocols, MMS Handling, MMS message – format, SMIL, MMS Applications, billings

**Unit -IV 10 hrs**

Voice Applications: Voice and IVR Services, Voice and IVR Applications, IVR – Definition, Architecture,

Media Server Platforms, Example Architectures, Voice Services Billing. Voice XML: Voice XML Overview,

Motivation for Speech Applications, Strength and Limitations of Voice XML Applications, Voice XML

Architecture, Voice XML Features, Voice XML Elements, Grammars, Voice XML Examples

**Unit -V 8 hrs**

Content Based Services: CMS – Definition, Users, CMS Architecture, CMS Platforms, MCMS –

Content Based Mobile Services, Mobile Content, Content Ingestion, DRM – Digital Asset Management,

DRM, Subscriber Management, Storefront/UI, CMS Billing, Reporting, Marketing Tools

**Text Book:**

1. Mobile Messaging Technologies and Services: SMS, EMS, and MMS by Gwenaël Le Bodic, John Wiley

and Sons, 2005

**Reference Books:**

1. Voice application development with Voice XML by Rick Beasley, John, O’Reilly

2. Next generation wireless applications: creating mobile applications in a Web by Paul Golding

3. Short Message Service (SMS): The Creation of Personal Global Text Messaging by Friedhelm

Hillebrand, John Wiley & Sons, 2010

**DE-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | Course number | | | CSE440 | |
| 2 | Course Title | | | SOFTWARE TESTING | |
| 3 | Credits | | | 4 | |
| 4 | Contact Hours (L-T-P) | | | 3-1-0 | |
| 5 | Course Objective | | | The primary objective of this course is to introduce and instruct software testing and Quality assurance concepts, strategies, and techniques in order to develop a total understanding of the testing process and how it impacts the software project. | |
| 6 | Course Outcomes | | | On successful completion of this module students will be able to   1. Perform functional and non-functional testing 2. Design test case and make test case report 3. Locate bugs and analyze their impact 4. Perform control flow and data flow testing 5. Memorize how to effectively plan your tests, communicate the bugs you find, and measure your success as a software tester 6. Assess various test automation tools available in market and choose appropriate tool for kinds of testing | |
| 7 | Outline syllabus | | | | |
| 7.01 | CAP707.A | | | Unit A | Introduction |
| 7.02 | CAP707.A1 | | | Unit A Topic 1 | Human and errors, Testing Objectives, Principles of Testing, Behaviour and Correctness, Debugging and its techniques |
| 7.03 | CAP707.A2 | | | Unit A Topic 2 | Software metrics, Software Testing Life Cycle, Testing activities and Levels, Testing myths and facts |
| 7.04 | CAP707.A3 | | | Unit A Topic 3 | Testing exit criteria, Bug defect life cycle, White Box and Black Box Testing |
| 7.05 | CAP707.B | | | Unit B | Unit Testing |
| 7.06 | CAP707.B1 | | | Unit B Topic 1 | Concept of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing |
| 7.07 | CAP707.B2 | | | Unit B Topic 2 | Control Flow Testing: Overview of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph |
| 7.08 | CAP707.B3 | | | Unit B Topic 3 | Path Selection Criteria, Regression testing , Agile testing |
| 7.09 | CAP707.C | | | Unit C | Data Flow & Performance testing |
| 7.10 | CAP707.C1 | | | Unit C Topic 1 | Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms |
| 7.11 | CAP707.C2 | | | Unit C Topic 2 | Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria |
| 7.12 | CAP707.C3 | | | Unit C Topic 3 | Integration Testing: Integration Testing, Integration Techniques , Performance testing: Stress , Load , Volume |
| 7.13 | CAP707.D | | | Unit D | Functional Testing |
| 7.14 | CAP707.D1 | | | Unit D Topic 1 | Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition |
| 7.15 | CAP707.D2 | | | Unit D Topic 2 | Test case designing – Test cases, Test case format, Test case designing, Acceptance testing and criteria |
| 7.16 | CAP707.D3 | | | Unit D Topic 3 | Automation testing**:** Need for automation , categorization of Testing tools, Selection of testing tools, Guidelines for automated testing, Overview of commercial testing tools |
| 7.17 | CAP707.E | | | Unit E | Controlling and Monitoring |
| 7.18 | CAP707.E1 | | | Unit E Topic 1 | Test metrics and measurements –project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM |
| 7.19 | CAP707.E2 | | | Unit E Topic 2 | Types of reviews – Developing a review program – Components of Review Plans– Reporting |
| 7.20 | CAP707.E3 | | | Unit E Topic 3 | Review Results. – evaluating software quality – defect prevention – testing maturity model |
| 8 | Course Evaluation | | | | |
| 8.1 | Course work: 30 marks | | | | |
| 8.11 | Attendance | None | | | |
| 8.12 | Homework | 10 assignments, no weight | | | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | | | |
| 8.14 | Projects | None | | | |
| 8.15 | Presentations | None | | | |
| 8.16 | Any other |  | | | |
| 8.2 | MTE | One, 20 marks | | | |
| 8.3 | End-term examination: 50 marks | | | | |
| 9 | References | | | | |
| 9.1 | Text book | | 1. SagarNaik&PiyuTripathy, “Software Testing and Quality Assurance: Theory and Practice”, Wiley. | | |
| 9.2 | Other references | | 1. Naresh Chauhan, “Software Testing : Principles and practices”, Oxford university press 2. Boris Beizer, “Software Testing Techniques”, Dreamtech Press 3. K.K. Aggrawal and Yogesh Singh, “ Software Engineering” New Age International Publication | | |

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| --- | --- | --- |
| 1 | Course Code | **CSE OE** |
| 2 | Course Title | **.NET Framework** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **4-0-0** |
| 5 | Course Objective | .NET framework and its runtime environment. Major aspects of C# language Object oriented features such as classes, inheritance, interfaces and polymorphism. New features that are unique to c# such as properties, indexers, delegates, events and namespaces |
| 6 | Course Outcomes | To learn the basics of .net Frame work and C# language   1. To learn C# elements and OOPS concepts To learn interface and inheritance concepts in C# language 2. To learn fundamentals of window application programming and create a window application 3. To develop web applications and learn advanced |
| **7** | **Prerequisite** | Basic knowledge of object-oriented programming. |
| **8** | **Course Contents** | |
| 8.01 | Unit A | The philosophy of .NET |
| 8.02 | Unit A Topic 1 | Building blocks of .NET Platform (CLR, CTS, CLS), Multilayered Architecture in .NET |
| 8.03 | Unit A Topic 2 | Components of .NET framework, Role of Common Intermediate Language |
| 8.04 | Unit A Topic 3 | Understanding Common Type System, Common Language Specification and Common Language Runtime, Advantage and requirement of .NET |
| 8.05 | Unit B | **Core C# Programming** |
| 8.06 | Unit B Topic 1 | Variable declaration and initialization ,Data Types , the new operator, Data Type class hierarchy, Data type conversions, operators |
| 8.07 | Unit B Topic 2 | for Loop, foreach Loop, while and do while Loop,if/else statement, switch statement |
| 8.08 | Unit B Topic 3 | Methods and Parameter modifier ,C# Arrays, Enum, Structures, Understanding value type and reference type |
| 8.09 | Unit C | **Object-Oriented Programming with C#** |
| 8.10 | Unit C Topic 1 | Introduction to C# class Type, Constructors, Static Keyword, C# accesses modifier |
| 8.11 | Unit C Topic 2 | Inheritance, Polymorphism, Interfaces, Operator Overloading |
| 8.12 | Unit C Topic 3 | Delegates, Events, Errors and Exceptions Handling |
| 8.13 | Unit D | **Introduction to ADO.NET** |
| 8.14 | Unit D Topic 1 | A high-level Definition of ADO.NET, ADO.Net architecture, ADO.NET data Providers, ADO.NET namespaces |
| 8.15 | Unit D Topic 2 | The Connected Layer: Connection Objects, ConnectionStringBuilder Objects, Command Objects, Working with Data Readers, Adding connection, insert, delete, update and select logic, working with parameterized command objects |
| 8.16 | Unit D Topic 3 | The Disconnected Layer: Dataset, Datacolumns, DataRows, DataTables, Data Adaptors, DataGridView |
| 8.17 | Unit E | **Introduction to ASP.NET** |
| 8.18 | Unit E Topic 1 | HTTP Request/Response Cycle, Introduction to IIS, ASP.NET development web server |
| 8.19 | Unit E Topic 2 | ASP.NET IDE, Creation of web forms using controls, Client side scripting, Post back to web server |
| 8.20 | Unit E Topic 3 | ASP.NET state Management Techniques: Session, Cookies |
| 10 | **Reading Content** | |
| 10.1 | Text book\* | 1. Andrew W. Troelsen , *C# and the .NET Platform*,Apress |
| 10.2 | other references | 1. Balagurusamy E, *Programming in C#*, Tata McGraw Hill 2. Anthony Jones , .net Framework , Tata McGraw Hill 3. Internet as a resource for reference |

DE II

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| 1 | Course number |  | | |
| 2 | Course Title | **Introduction to Cloud Computing** | | |
| 3 | Credits | **4** | | |
| 4 | Contact Hours | **3-1-0** | | |
| 5 | Course Objective | This introductory course on Cloud computing will teach both the fundamental concepts of how and why Cloud systems works, as well as Cloud technologies that manifest these concepts. | | |
| 6 | Course Outcomes | At the end of the course, students will have achieved the following learning objectives.   1. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing. 2. Characterize the distinctions between Infrastructure, Platform and Software as a Service (IaaS, PaaS, SaaS) abstractions, and Public and Private Clouds, and analyze their advantages and disadvantages. 3. Examine the design of task and data parallel distributed algorithms for Clouds and use them to construct Cloud applications. Demonstrate the use of Map-Reduce, Vertex-Centric and Continuous Dataflow programming models.. | | |
| 7 | Outline syllabus | | | |
| 7.01 | Unit A |  | **Introduction** |
| 7.02 | Unit A Topic 1 |  | Introduction to distributed systems and cloud computing |
| 7.03 | Unit A Topic 2 |  | Cloud architectures: SaaS, PaaS, IaaS. |
| 7.04 | Unit A Topic 3 |  | End-to-end system design. Networks and protocol stacks. |
| 7.05 | Unit B |  | **Remote Procedure Call** |
| 7.06 | Unit B Topic 1 |  | Client-server computing. Sockets and remote procedure call. |
| 7.07 | Unit B Topic 2 |  | RMI, CORBA. |
| 7.08 | Unit B Topic 3 |  | Storage in the Cloud: Google file system. |
| 7.09 | Unit C |  | **Cloud Services** |
| 7.10 | Unit C Topic 1 |  | Web services and REST. Example: Amazon S3. |
| 7.11 | Unit C Topic 2 |  | The JAX-RS API, Persistent cloud services. |
| 7.12 | Unit C Topic 3 |  | Three-tier middleware. JEE APIs. Google App Engine. |
| 7.13 | Unit D |  | **Sockets** |
| 7.14 | Unit D Topic 1 |  | Message queues and message brokers. |
| 7.15 | Unit D Topic 2 |  | JMS and Atmosphere. Web sockets |
| 7.16 | Unit D Topic 3 |  | Distributed snapshots. |
| 7.17 | Unit E |  | **Applications** |
| 7.18 | Unit E Topic 1 |  | Batch cloud computing: MapReduce and Hadoop. |
| 7.19 | Unit E Topic 2 |  | Applications in NoSQL data stores, Applications to scientific data Mining techniques. |
| 7.20 | Unit E Topic 3 |  | Popular Cloud Computing Systems from Google, Microsoft & IBM. |
| 9.1 | Text book | Dominic Duggan, Enterprise Software Architecture and Design, Willy Publication, 2013. | | |
| 9.2 | Other references | 1. Distributed and Cloud Computing, 1st edition, Morgan Kaufmann, 2011. 2. Greg Schulz, “Cloud and Virtual Data Storage Networking”, Auerbach Publications [ISBN: 978-1439851739], 2011. 3. Marty Poniatowski, “Foundations of Green IT” Prentice Hall; 1 edition, 2009. 4. 5. EMC, “Information Storage and Management” Wiley; 2 edition,2012. 5. Internet as a resource for reference | | |

DE III

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| 1 | Course Code | | **CSE-008** | | | |
| 2 | Course Title | | **Advance Concepts of Computer Networks** | | | |
| 3 | Credits | | **3** | | | |
| 4 | Contact Hours | | **3-0-0** | | | |
| 5 | Course Objective | | To study the basic concepts of computer network, its architecture, structure and functionality of different layers in a network. | | | |
| 6 | Course Outcomes | | After successful completion of this course students should be to   1. Analyze the concepts and protocols of switching in computer networks 2. Identify the various connecting devices used in computer network 3. Explore the concepts of data link protocols and IEEE standards 4. Investigate the concept of Internet Protocols including tunnelling, fragmentation. 5. Illustrate the transport layer concepts and protocol design including connection oriented and connection-less models and techniques to provide reliable data delivery and algorithms for congestion control and flow control. 6. Interpret the basic concepts of application layer protocol design including DNS, HTTPs, FTP, and POP3. | | | |
| **7** | **Prerequisite** | |  | | | |
| **8** | **Course Contents** | | | | | |
| 8.01 | Unit A | **Introduction** | | | | |
| 8.02 | Unit A Topic 1 | Overview of fundamental Concepts of Computer Network and their structure and architecture | | | | |
| 8.03 | Unit A Topic 2 | ATM: Introduction, Physical Layer, ATM Layer, ATM Adaptation Layer | | | | |
| 8.04 | Unit A Topic 3 | Frame Relay | | | | |
| 8.05 | Unit B | **Mobile Networks** | | | | |
| 8.06 | Unit B Topic 1 | The Mobile telephone systems: 1G, 2G, 3G | | | | |
| 8.07 | Unit B Topic 2 | Wireless communication (IEEE 802.11) basics, architecture, Physical layer, MAC sub layer Protocols and frame structure | | | | |
| 8.08 | Unit B Topic 3 | Bluetooth (802.15.1), Wi-Fi (802.11), WiMAX (802.16) and their comparisons | | | | |
| 8.09 | Unit C | **Network and Transport Layer** | | | | |
| 8.10 | Unit C Topic 1 | IPv4 sub-netting, CIDR : super-netting , IPv6 and NAT | | | | |
| 8.11 | Unit C Topic 2 | ARP, RARP, ICMP, IGMP | | | | |
| 8.12 | Unit C Topic 3 | Transport Layer in Wired LAN (Stream Control Transmission Protocol SCTP) and Wireless Networks | | | | |
| 8.13 | Unit D | **Routing** | | | | |
| 8.14 | Unit D Topic 1 | Routing Algorithms in wired LAN: RIP, OSPF | | | | |
| 8.15 | Unit D Topic 2 | Routing protocols in Wireless LAN: DSDV, WRP, AODV, DSR | | | | |
| 8.16 | Unit D Topic 3 | Internetworking devices: Advance concepts | | | | |
| 8.17 | Unit E | **Security** | | | | |
| 8.18 | Unit E Topic 1 | Security issues in wired and wireless networks | | | | |
| 8.19 | Unit E Topic 2 | IPSec, Firewall | | | | |
| 8.20 | Unit E Topic 3 | Wireless Security:- 802.11, Bluetooth | | | | |
| 9 |  |  | | |  |  |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignment | -- | | | -- | -- |
| 9.13 | Quizzes | 10 | | | -- | -- |
| 9.14 | Projects | Yes | | | -- | -- |
| 9.15 | Presentations | -- | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 30 | 40 |
| 10 | **Reading Content** | | | | | |
| 9.1 | Text book\* | | | 1. Tanenbaum, A.S., “Computer Networks”, 4th Edition, PHI | | |
| 9.2 | other references | | | 1. Fourozan, B. “ Data Communication and Networking”, TMH 2. Internet as a resource for reference | | |

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| 1 | Course Code | **CSE-009** |
| 2 | Course Title | **Android application development** |
| 3 | Credits | **3** |
| 4 | Contact Hours | **3-0-0** |
| 5 | Course Objective |  |
| 6 | Course Outcomes | 1. Design Hardware interfaces for mobile devices 2. Apply UML for mobile applications design 3. Use XML for Mobile Computing |
| **7** | **Prerequisite** | **Knowledge of java programming** |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction to Android** |
| 8.02 | Unit A Topic 1 | Android architecture, Feature of android, Limitation of mobile devices |
| 8.03 | Unit A Topic 2 | Configuration of android SDK, Activity life cycle, AVD manager |
| 8.04 | Unit A Topic 3 | Generation of APK file for android project, Test run of application on device |
| 8.05 | Unit B | **Android UI Components** |
| 8.06 | Unit B Topic 1 | Layouts-Linear layout, Relative layout, Table layout, Frame layout |
| 8.07 | Unit B Topic 2 | Event delegation model, Type of Event Listeners, Onclick, OnLongClick, OnFocusChanged, OnKeyUp, OnKeyDown |
| 8.08 | Unit B Topic 3 | Button, TextView, EditTextView, Label, List, Radio Button, Checkbox, date picker |
| 8.09 | Unit C | **Notification and Intents** |
| 8.10 | Unit C Topic 1 | Type of notification, Toast notification, status bar notification and alert notification |
| 8.11 | Unit C Topic 2 | Concept of intent, configuration of intent, Intent filters |
| 8.12 | Unit C Topic 3 | Creating Menu, Option Menu, Context Menu, Popup Menu |
| 8.13 | Unit D | **Working with SQL Lite** |
| 8.14 | Unit D Topic 1 | Introduction to SQLite databse, Steps for connecting application with database. |
| 8.15 | Unit D Topic 2 | Fetch and update data in database from application, |
| 8.16 | Unit D Topic 3 | Cursor and content value, opening and closing database |
| 8.17 | Unit E | **Sensor Device** |
| 8.18 | Unit E Topic 1 | Sensor Manager, Sensor Framework, Types of Sensors Accelerometer, Gyroscope, Proximity Sensor, Orientation, Light Sensor |
| 8.19 | Unit E Topic 2 | Detect availability of sensor, Fetch data from sensors on frequent basis, |
| 8.20 | Unit E Topic 3 | Development of compass application with help of gyroscope sensor |
| 9 | **Course Evaluation** | |
| 10 | **Reading Content** | |
| 10.1 | Text book\* | 1. Android Application Development, Wrox publication |
| 10.2 | other references | 1. Android UI Fundamentals : Develop and Design 2. Internet as a resource for reference |

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| --- | --- | --- | --- |
| 1 | Course number | **CSE 323** | |
| 2 | Course Title | **Advanced Database Management Systems** | |
| 3 | Credits | **3** | |
| 4 | Contact Hours | **3-0-0** | |
| 5 | Course Objective | Develop the ability to design, implement and manipulate databases. Introduce students to build data base management systems. Apply DBMS concepts to various examples and real life applications. | |
| 6 | Course Outcomes | On successful completion of this module students will be able to   1. Implement and execute SQL Queries and to professionally document all the steps involved in the experiment. 2. Design relational model with integrity constants. 3. Write and execute procedures using SQL. 4. Build normalized data bases. 5. Improve the performance of slow running database. | |
| 7 | Outline syllabus | | |
| 7.01 | **Unit A** |  | **INTRODUCTION TO DATABASES AND ER DIAGRAM** |
| 7.02 | Unit A Topic 1 |  | Concept & Overview of DBMS, Data Models, Database languages, Database Users and Admin. |
| 7.03 | Unit A Topic 2 |  | Three Schema architecture of DBMS Data Models, Schema – Star and Snowflake |
| 7.04 | Unit A Topic 3 |  | ER Diagrams, Databases, Concept of keys (Primary, Foreign, Candidate, Super), Mapping Constraints |
| 7.05 | **Unit B** |  | **DATABASE LANGUAGE & INTEGRATION SERVICES** |
| 7.06 | Unit B Topic 1 |  | DDL and DML commands, Null Values, Domain Constraints, Referential Integrity Constraints, Views, Stored Procedures, Functions (**SQL**) |
| 7.07 | Unit B Topic 2 |  | Triggers, Cursors, sub-queries, Nested-queries (**SQL**) |
| 7.08 | Unit B Topic 3 |  | Used Cases for Integration Services, DTS Package |
| 7.09 | **Unit C** |  | **ANAMOLIES IN DATABASES** |
| 7.10 | Unit C Topic 1 |  | Insert-Update-Delete anomalies in Databases |
| 7.11 | Unit C Topic 2 |  | Normalization Process for 1NF, 2NF, BCNF, 3NF, 4NF (MVD), 5NF (JD) |
| 7.12 | Unit C Topic 3 |  | Temporal Databases, Active Databases, Object Oriented Databases |
| 7.13 | **Unit D** |  | **ANALYSIS SERVICES – Cubes** |
| 7.14 | Unit D Topic 1 |  | Analysis Services–(Cubes) KPI, Dimensions, |
| 7.15 | Unit D Topic 2 |  | Slow Changing dimensions, Aggregates |
| 7.16 | Unit D Topic 3 |  | Difference in OLAP and OLTP, OLAP Cubes |
| 7.17 | **Unit E** |  | **DATABASES AND PERFORMANCE TUNING** |
| 7.18 | Unit E Topic 1 |  | Temporary Tables, Indexing and Hashing (**SQL**) |
| 7.19 | Unit E Topic 2 |  | Query Processing, Query Optimization, |
| 7.20 | Unit E Topic 3 |  | Data Fragmentation–(Horizontal Vs Vertical), Pivot, Delta Queries. |
| 9.1 | Text book\* | | 1. Korth , Silberschatz&Sudarshan, Data base Concepts, Tata McGraw-Hill |
| 9.2 | Other references | | 1. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc. 2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Third Edition. 3. Jeffrey D. Ullman, Jennifer Windon, A first course in Database Systems, Pearson Education. 4. Date C.J., An Introduction to Database Systems, Addison Wesley. 5. Richard T. Watson, Data Management: databases and organization, Wiley. 6. Internet as a resource for reference |

DE III

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| --- | --- | --- | --- |
| 1 | Course number | **CSE432** | |
| 2 | Course Title | **SOFTWARE PROJECT MANAGEMENT** | |
| 3 | Credits | 4 | |
| 4 | Contact Hours  (L-T-P) | (3-1-0) | |
| 5 | Course Objective | To provide fundamental skills of software Project management emphasising on issues & hurdles associated with delivering successful projects, so as to make student aware of best project management practices, and contemporary software engineering tools. | |
| 6 | Course Outcomes | After successful completion of this course students should be able to:  1. Establish the process of software project management and its applications.  2. Evaluate a project & to develop the scope of work.  3. Provide accurate cost estimates and plan the various activities.  4. Develop Software projects according to quality standards. | |
| 7 | Outline syllabus: | | |
| 7.01 | CSE427.A | Unit A | **INTRODUCTION** |
| 7.02 | CSE427.A1 | Unit A Topic 1 | Introduction to software project management, Stages of Software Project Management ,software projects versus other types of project |
| 7.03 | CSE427.A2 | Unit A Topic 2 | Categorization of software projects, Stake holders, setting objectives, WBS,PBS |
| 7.04 | CSE427.A3 | Unit A Topic 3 | Management control, Business case, Project success and failures, Software  Tools for Project Management. |
| 7.05 | CSE427.B | Unit B | **PLANNING PHASE** |
| 7.06 | CSE427.B1 | Unit B Topic 1 | Introduction to project planning, types of project plan, elements, purpose of project plan |
| 7.07 | CSE427.B2 | Unit B Topic 2 | Step-wise project planning. |
| 7.08 | CSE427.B3 | Unit B Topic 3 | Development Lifecycle models: waterfall, Spiral, Iterative, incremental, v-shaped. |
| 7.09 | CSE427.C | Unit C | **PROJECT SCHEDULING** |
| 7.10 | CSE427.C1 | Unit C Topic 1 | Time management, Project Activity Definition, Activity sequencing, Activity Duration estimates |
| 7.11 | CSE427.C2 | Unit C Topic 2 | Project network, Project networking Models |
| 7.12 | CSE427.C3 | Unit C Topic 3 | CPM and PERT |
| 7.13 | CSE427.D | Unit D | **PROJECT COST ESTIMATION & PROJECT EVALUATION** |
| 7.14 | CSE427.D1 | Unit D Topic 1 | Importance and principles of Cost management, Cost Estimation Process, Earned value analysis |
| 7.15 | CSE427.D2 | Unit D Topic 2 | Software sizing: LOC, Function points, Cost Estimation Methods. |
| 7.16 | CSE427.D3 | Unit D Topic 3 | COCOMO, NPV, ROI, Payback, IRR. |
| 7.17 | CSE427.E | Unit E | **QUALITY PROJECT MANAGEMENT** |
| 7.18 | CSE427.E1 | Unit E Topic 1 | Introduction to quality project management, Phases |
| 7.19 | CSE427.E2 | Unit E Topic 2 | SICMM: Structure of CMM, Five maturity levels |
| 7.20 | CSE427.E3 | Unit E Topic 3 | Software process Framework for the CMM |
| 8 | Course Evaluation | | |
| 8.1 | Course work: 30 marks | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | 10 Assignment (no Marks) | |
| 8.13 | Quizzes | 7 best quiz (20 marks) | |
| 8.14 | Projects | None | |
| 8.15 | Presentations | 10 marks | |
| 8.16 | Any other | None | |
| 8.2 | MTE | 20 marks | |
| 8.3 | End-term examination: 50 marks | | |
| 9 | References | | |
| 9.1 | Text book | 1. Kathy Schwalbe, “Information Technology Project Management” International Student Ed. THOMSON Course Technology 2. Cottrell M. and Hughes B., "Software Project Management", 5th Edition, The McGraw-Hill Companies. | |
| 9.2 | other references | 1. Manish Kumar JHA “Software Project Management” 3rd Edition, Dhanpat Rai and Co. 2. QuantumPM, “Microsoft Office Project Server 2003 Unleashed”, Pearson Education India. 3. Robert T. Futrell, Donald F. Shafer and Linda I Shafer, “Quality Software Project” Pearson India.   http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Soft%20Engg/New\_index1.html  http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-355j-software-engineering-concepts-fall-2005/lecture-notes/ | |

DE III

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| 1 | Course Code | | **CSE435** | | | |
| 2 | Course Title | | **Neural Networks** | | | |
| 3 | Credits | | 4 | | | |
| 4 | Contact Hours | | 3-1-0 | | | |
| 5 | Course Objective | | To introduce neural computational paradigm for critical & implementable understanding for pattern based problem areas. | | | |
| 6 | Course Outcomes (CO) | | On successful completion of this module students will be able to:   1. develop a MLP neural network for small scale problems 2. design the radial basis function to obtain biological feasibility and set neural network 3. evaluate the applicability of ANN solution for a given problem | | | |
| **7** | **Prerequisite** | |  | | | |
| **8** | **Course Contents** | | | | | |
| 8.01 | Unit A | | **Introduction** | | | |
| 8.02 | Unit A Topic 1 | | Biological Significance | | | |
| 8.03 | Unit A Topic 2 | | Neuron & its functionalities | | | |
| 8.04 | Unit A Topic 3 | | Components of Artificial Neural Network | | | |
| 8.05 | Unit B | | **Learning** | | | |
| 8.06 | Unit B Topic 1 | | Learning Rule & Learning Paradigms | | | |
| 8.07 | Unit B Topic 2 | | Training & Testing in learning | | | |
| 8.08 | Unit B Topic 3 | | Analysis: Learning Curve & Error Measurement | | | |
| 8.09 | Unit C | | **Perceptron** | | | |
| 8.10 | Unit C Topic 1 | | Perceptron, Layers, Convergence Theorem | | | |
| 8.11 | Unit C Topic 2 | | Activation Function, Weight Initialization | | | |
| 8.12 | Unit C Topic 3 | | Backpropagation, Delta Learning Rule | | | |
| 8.13 | Unit D | | **Radial Basis Networks** | | | |
| 8.14 | Unit D Topic 1 | | Components & Structure | | | |
| 8.15 | Unit D Topic 2 | | Training & Testing | | | |
| 8.16 | Unit D Topic 3 | | Enhancements in Radial Basis Networks | | | |
| 8.17 | Unit E | | **Applications & Case Studies using MATLAB** | | | |
| 8.18 | Unit E Topic 1 | | Various practical applications of Artificial Neural Networks | | | |
| 8.19 | Unit E Topic 2 | | PNN development & verifications using image dataset for pattern detection | | | |
| 8.20 | Unit E Topic 3 | | RBFNN development using medical imagining dataset for pattern detection | | | |
| 9 | **Course Evaluation** | | | | | |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignments | 3 | | | -- | -- |
| 9.13 | Quizzes | -- | | | -- | -- |
| 9.14 | Project | One | | | -- | -- |
| 9.15 | Presentations | One | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 20 | 50 |
| 10 | **Reading Content** | | | | | |
| 10.1 | Text book\* | | | 1. David Kriesel, 2007, *A Brief Introduction to Neural Networks*, available at <http://www.dkriesel.com> | | |
| 10.2 | other references | | | 1. A | | |

DE IV

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| 1 | Course Code | **CMP 006** |
| 2 | Course Title | **Cryptography and Network Security** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective | To provide students with an overview of the security issues that arise during data communication in computer networks which are the basic building blocks of different organizations throughout world. |
| 6 | Course Outcomes | After the successful completion of this course, students will be able to :   1. Analyze the conventional ciphers and stenographic technique which are basically designed to maintain confidentiality. 2. Compare the algorithms developed in modern cryptographic era. (ABET program outcomes a and j) 3. Establish the mathematical background of the ciphers proposed in symmetric and asymmetric key cryptography. 4. Comprehend the working knowledge of the ciphers & protocols during data communication. 5. Apply concepts and techniques that s/he has learned in this course in designing secured computer networks & communication between them. |
| **7** | **Prerequisite** |  |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security |
| 8.03 | Unit A Topic 2 | Classical encryption techniques- Substitution Cipher(Mono-alphabetic, Poly-alphabetic), Transposition cipher, Stegnography |
| 8.04 | Unit A Topic 3 | Block Cipher- Encryption Principles, DES and its variants, strength of DES |
| 8.05 | Unit B | **Mathematics of Cryptography** |
| 8.06 | Unit B Topic 1 | Eucledian, Extended Eucledian Algorithm, EuilersTotient Function , Ferment little Theorem, Eulers theorem |
| 8.07 | Unit B Topic 2 | Principles of Pseudo Number Generators, Primality Testing-Miller Rabin test, Chinese Remainder Theorem |
| 8.08 | Unit B Topic 3 | Exponential- square and multiply method, Discrete Logarithm |
| 8.09 | Unit C | **Asymmetric Cryptography & Key Exchange** |
| 8.10 | Unit C Topic 1 | Public Key cryptography-RSA, Cryptanalysis of RSA |
| 8.11 | Unit C Topic 2 | Elgamal cryptography, Elliptic Curve cryptography |
| 8.12 | Unit C Topic 3 | Key Management and distribution : KDC, Diffie Hellman Key Exchange |
| 8.13 | Unit D | **Digital signatures** |
| 8.14 | Unit D Topic 1 | User Authentication protocol- Kerberos |
| 8.15 | Unit D Topic 2 | Digital Signature –RSA, Elgamal, DSS |
| 8.16 | Unit D Topic 3 | Data integrity algorithms-Hash Functions, MD5, SHA-512 |
| 8.17 | Unit E | **Security** |
| 8.18 | Unit E Topic 1 | Security at Application layer-Email Architecture, S/MIME, PGP(Scenarios, key rings, PGP Certificates), Types of Firewalls. |
| 8.19 | Unit E Topic 2 | Security at Transport layer-SSL( Services, Protocols) |
| 8.20 | Unit E Topic 3 | Security at Network layer-IPSec(Modes, Security Protocols-AH, ESP, Services provided by IPSEC) |
| 10 | **Reading Content** | |
| 9.1 | Text book\* | 1. Stallings, W., “Cryptography and Network Security – Principles and Practices”, Prentice Hall of India, Fourth Edition. |
| 9.2 | other references | 1. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001. 2. Behrouz A. Forouzan, “Cryptography And Network Security”- McGraw Hill 3. Internet as a resource for reference |

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| **1** | **Course Code** | **CSE 441** |
| 2 | Course Title | **Robotics &Intelligent Systems** |
| 3 | Credits | **4** |
| 4 | Contact Hours | **3-1-0** |
| 5 | Course Objective | The objectives of the course are to provide an introductory understanding of robotics and intelligent sensors. |
| 6 | Course Outcomes (CO) | On completion of this course, the student will be able to  model robot manipulators and mobile robots;   1. solve an inverse kinematics problem and plan a robot trajectory; 2. design and analyze robot controllers by using appropriate methods; 3. design basic robot intelligent sensor systems including static system learning (kinematics) and dynamic learning; 4. intelligent course recognition. |
| **7** | **Prerequisite** | **Logic Building & Problem Solving, Discrete maths and Mathematics-2** |
| **8** | **Course Contents** | |
| 8.01 | Unit A | **Introduction** |
| 8.02 | Unit A Topic 1 | Introduction, History of Robotics. |
| 8.03 | Unit A Topic 2 | Types of Sensors (Tactile, Range Finders, GPS, IMU, Position Encoders). |
| 8.04 | Unit A Topic 3 | Mapping: Metric Maps, Topological Maps, hybrids |
| 8.05 | Unit B | **Sensor Vision** |
| 8.06 | Unit B Topic 1 | Sensor (Vision), Visibility Graphs, |
| 8.07 | Unit B Topic 2 | Bug Algorithm |
| 8.08 | Unit B Topic 3 | Potential Fields |
| 8.09 | Unit C | **Actuators. Locomotion. Manipulators.** |
| 8.10 | Unit C Topic 1 | Actuators. Locomotion. Manipulators. |
| 8.11 | Unit C Topic 2 | Semantic hierarchy of spatial representations. |
| 8.12 | Unit C Topic 3 | Configuration Space, PRMs, Subsumption (reactive) architecture. |
| 8.09 | Unit D | **Control theory** |
| 8.10 | Unit D Topic 1 | Control Theory. Plant and Sensor Mode. |
| 8.11 | Unit D Topic 2 | Coverage, Multi-Robot Coverage |
| 8.12 | Unit D Topic 3 | State Estimation, Dead reckoning, Landmarks, |
| 8.09 | Unit E | **Filtering** |
| 8.10 | Unit E Topic 1 | Localization |
| 8.11 | Unit E Topic 2 | Bayesian Filtering, Particle Filters, Kalman Filters, SLAM |
| 8.12 | Unit E Topic 3 | Underwater Robot |
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| 10 |  | |
| 9.1 | Text book\* | 1. *Computational Principles of Mobile Robotics* by Gregory Dudek and Michael Jenkin, Second Edition |
| 9.2 | other references | 1. <http://www.princeton.edu/~stengel/RISVirText.html> 2. Internet as a resource for reference |

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| 1 | Course Code | | **CSE439** | | | |
| 2 | Course Title | | **Design of Data warehouse** | | | |
| 3 | Credits | | 3-1-0 | | | |
| 4 | Contact Hours | | (L-T-P) | | | |
| 5 | Course Objective | | Students should be able to learn about how to design data warehouse models using appropriate schemas to meet business objectives. | | | |
| 6 | Course Outcomes (CO)  (Max of 4) | | On successful completion of this module students will be able to:  Design a data mart or data warehouse for any organization | | | |
| **7** | **Prerequisite** | | Knowledge of DBMS is essential | | | |
| **8** | **Course Content** | | | | | |
| 8.01 | Unit A | | **Introduction to Data warehouse** | | | |
| 8.02 | Unit A Topic 1 | | Overview, Definition, Data WarehousingComponents,Data Marking, | | | |
| 8.03 | Unit A Topic 2 | | Three-tier Data Warehouse Architecture, Data warehouse logical design,  Data warehouse physical design | | | |
|  | Unit A Topic 3 | | Steps for the design and construction of Data Warehouses,Design  Techniques. | | | |
| 8.05 | Unit B | | **Data Warehouse Process and Technology** | | | |
| 8.06 | Unit B Topic 1 | | WarehousingStrategy,Warehousemanagement and Support Processes | | | |
| 8.07 | Unit B Topic 2 | | Data warehousing technologies and implementations | | | |
| 8.08 | Unit B Topic 3 | | Building a Data Warehouse, Warehouse Database | | | |
| 8.09 | Unit C | | **Model Development** | | | |
| 8.10 | Unit C Topic 1 | | Understanding business model, Developing the model | | | |
| 8.11 | Unit C Topic 2 | | Creating and maintaining keys, Data warehouse Technology Model | | | |
| 8.12 | Unit C Topic 3 | | Modelling Hierarchies, Modelling Transactions | | | |
| 8.13 | Unit D | | **Data Warehouse Optimization** | | | |
| 8.14 | Unit D Topic 1 | | Optimizing the development Process | | | |
| 8.15 | Unit D Topic 2 | | Optimizing the Database | | | |
| 8.16 | Unit D Topic 3 | | Optimizing the System Model | | | |
| 8.17 | Unit E | | **Operation and Management** | | | |
| 8.18 | Unit E Topic 1 | | Maintaining Model | | | |
| 8.19 | Unit E Topic 2 | | Deploying the Relational Solution | | | |
| 8.20 | Unit E Topic 3 | | Comparison of Data warehouse Methodologies | | | |
| 9 | **Course Evaluation** | | | | | |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignment | Yes | | | -- | -- |
| 9.13 | Quizzes | yes | | | -- | -- |
| 9.14 | Projects | Yes | | | -- | -- |
| 9.15 | Presentations | Yes | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 30 | 40 |
| 10 | **Reading Content** | | | | | |
| 9.1 | Text book\* | | | 1. Claudia Imhoff, “Mastering Data warehouse Design”, Wiley Publication | | |
| 9.2 | Other references | | | 1. William H.Inmon, “Building the Data Warehouse”, Wiley Publication | | |

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| 1 | Course number | | | CSE440 | |
| 2 | Course Title | | | SOFTWARE TESTING | |
| 3 | Credits | | | 4 | |
| 4 | Contact Hours (L-T-P) | | | 3-1-0 | |
| 5 | Course Objective | | | The primary objective of this course is to introduce and instruct software testing and Quality assurance concepts, strategies, and techniques in order to develop a total understanding of the testing process and how it impacts the software project. | |
| 6 | Course Outcomes | | | On successful completion of this module students will be able to   1. Perform functional and non-functional testing 2. Design test case and make test case report 3. Locate bugs and analyze their impact 4. Perform control flow and data flow testing 5. Memorize how to effectively plan your tests, communicate the bugs you find, and measure your success as a software tester 6. Assess various test automation tools available in market and choose appropriate tool for kinds of testing | |
| 7 | Outline syllabus | | | | |
| 7.01 | CAP707.A | | | Unit A | Introduction |
| 7.02 | CAP707.A1 | | | Unit A Topic 1 | Human and errors, Testing Objectives, Principles of Testing, Behaviour and Correctness, Debugging and its techniques |
| 7.03 | CAP707.A2 | | | Unit A Topic 2 | Software metrics, Software Testing Life Cycle, Testing activities and Levels, Testing myths and facts |
| 7.04 | CAP707.A3 | | | Unit A Topic 3 | Testing exit criteria, Bug defect life cycle, White Box and Black Box Testing |
| 7.05 | CAP707.B | | | Unit B | Unit Testing |
| 7.06 | CAP707.B1 | | | Unit B Topic 1 | Concept of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing |
| 7.07 | CAP707.B2 | | | Unit B Topic 2 | Control Flow Testing: Overview of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph |
| 7.08 | CAP707.B3 | | | Unit B Topic 3 | Path Selection Criteria, Regression testing , Agile testing |
| 7.09 | CAP707.C | | | Unit C | Data Flow & Performance testing |
| 7.10 | CAP707.C1 | | | Unit C Topic 1 | Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms |
| 7.11 | CAP707.C2 | | | Unit C Topic 2 | Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria |
| 7.12 | CAP707.C3 | | | Unit C Topic 3 | Integration Testing: Integration Testing, Integration Techniques , Performance testing: Stress , Load , Volume |
| 7.13 | CAP707.D | | | Unit D | Functional Testing |
| 7.14 | CAP707.D1 | | | Unit D Topic 1 | Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition |
| 7.15 | CAP707.D2 | | | Unit D Topic 2 | Test case designing – Test cases, Test case format, Test case designing, Acceptance testing and criteria |
| 7.16 | CAP707.D3 | | | Unit D Topic 3 | Automation testing**:** Need for automation , categorization of Testing tools, Selection of testing tools, Guidelines for automated testing, Overview of commercial testing tools |
| 7.17 | CAP707.E | | | Unit E | Controlling and Monitoring |
| 7.18 | CAP707.E1 | | | Unit E Topic 1 | Test metrics and measurements –project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM |
| 7.19 | CAP707.E2 | | | Unit E Topic 2 | Types of reviews – Developing a review program – Components of Review Plans– Reporting |
| 7.20 | CAP707.E3 | | | Unit E Topic 3 | Review Results. – evaluating software quality – defect prevention – testing maturity model |
| 8 | Course Evaluation | | | | |
| 8.1 | Course work: 30 marks | | | | |
| 8.11 | Attendance | None | | | |
| 8.12 | Homework | 10 assignments, no weight | | | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | | | |
| 8.14 | Projects | None | | | |
| 8.15 | Presentations | None | | | |
| 8.16 | Any other |  | | | |
| 8.2 | MTE | One, 20 marks | | | |
| 8.3 | End-term examination: 50 marks | | | | |
| 9 | References | | | | |
| 9.1 | Text book | | 1. SagarNaik&PiyuTripathy, “Software Testing and Quality Assurance: Theory and Practice”, Wiley. | | |
| 9.2 | Other references | | 1. Naresh Chauhan, “Software Testing : Principles and practices”, Oxford university press 2. Boris Beizer, “Software Testing Techniques”, Dreamtech Press 3. K.K. Aggrawal and Yogesh Singh, “ Software Engineering” New Age International Publication | | |

**CSE-442 Mobile Value Added Services (3-1-0)**

Total Lecture Hours: 40

**Unit –I 7 hrs**

Introduction to Mobile VAS: Introduction to Java Concepts – JDBC Concepts, Regular Expressions using

JAVA, Introduction to UML Notation – UML diagrams, USECASE, TESTCASE, Introduction to Mobile VAS –

Definition, Characteristics, Mobile VAS in India

**Unit –II 8 hrs**

Short Message Service: Introduction to SMS – Definition, Basic Concepts of SMS, SMS Architecture –

Components of Architecture, SMS Protocols, Gateways, Gateway Architecture, SMS Applications – SMS

Based Applications – Creation, Examples, Pros and Cons, SMS Billing Models – Standard and Premium

billing models, SMS charges, SMS short codes, Premium SMS

**Unit –III 7 hrs**

Multimedia Messaging Service: Introduction – MMS Definition, MMS Use Cases, MMS Architecture,

Interfaces, Protocols, MMS Handling, MMS message – format, SMIL, MMS Applications, billings

**Unit -IV 10 hrs**

Voice Applications: Voice and IVR Services, Voice and IVR Applications, IVR – Definition, Architecture,

Media Server Platforms, Example Architectures, Voice Services Billing. Voice XML: Voice XML Overview,

Motivation for Speech Applications, Strength and Limitations of Voice XML Applications, Voice XML

Architecture, Voice XML Features, Voice XML Elements, Grammars, Voice XML Examples

**Unit -V 8 hrs**

Content Based Services: CMS – Definition, Users, CMS Architecture, CMS Platforms, MCMS –

Content Based Mobile Services, Mobile Content, Content Ingestion, DRM – Digital Asset Management,

DRM, Subscriber Management, Storefront/UI, CMS Billing, Reporting, Marketing Tools

**Text Book:**

1. Mobile Messaging Technologies and Services: SMS, EMS, and MMS by Gwenaël Le Bodic, John Wiley

and Sons, 2005

**Reference Books:**

1. Voice application development with Voice XML by Rick Beasley, John, O’Reilly

2. Next generation wireless applications: creating mobile applications in a Web by Paul Golding

3. Short Message Service (SMS): The Creation of Personal Global Text Messaging by Friedhelm

Hillebrand, John Wiley & Sons, 2010

DE V

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| 1 | Course No. | **CSE422** | |
| 2 | Course Title | **DATA MINING AND KNOWLEDGE DISCOVERY** | |
| 3 | Credits | 4 | |
| 4 | Contact Hours (L-T-P) | (3-1-0) | |
| 5 | Course Objective | To understand the concept of data warehouse with it’s conceptual, logical and physical design and become familiar with popular technologies like OLAP and Data Mining. | |
| 6 | Course Outcomes | After the successful completion of this course, the students will be able to   1. use fundamental concepts and techniques of data mining. 2. analyse the architectural concepts of data warehouse. 3. demonstrate the design of the data warehouse for real world applications. 4. practice the efficient use of data warehouse in the data mining applications. 5. evaluate methodological issues underlying the effective application of data mining. 6. investigate the different issues related to data warehousing and data mining. 7. explain the different data mining tasks and their common real world applications. | |
| 7 | Outline syllabus: | | |
| 7.01 | CSE422.A | **Unit A** | **INTRODUCTION TO DATA MINING** |
| 7.02 | CSE422.A1 | Unit A Topic 1 | Evolution of Data mining and introductory concepts |
| 7.03 | CSE422.A2 | Unit A Topic 2 | Data Mining Functionalities and Techniques |
| 7.04 | CSE422.A3 | Unit A Topic 3 | Integration of Data Mining with a Database or Data warehouse, Major issues in data mining |
| 7.05 | CSE422.B | **Unit B** | **DATA PRE-PROCESSING** |
| 7.06 | CSE422.B1 | Unit B Topic 1 | Descriptive Data Summarization |
| 7.07 | CSE422.B2 | Unit B Topic 2 | Data Cleaning , Integration and Transformation |
| 7.08 | CSE422.B3 | Unit B Topic 3 | Data Reduction, Discretization and Concept Hierarchy Generation |
| 7.09 | CSE422.C | **Unit C** | **DATA WAREHOUSE AND OLAP TECHNOLOGY** |
| 7.10 | CSE422.C1 | Unit C Topic 1 | Multidimensional view of Data model, Architecture of Data Warehouse |
| 7.11 | CSE422.C2 | Unit C Topic 2 | Data Warehouse Implementation |
| 7.12 | CSE422.C3 | Unit C Topic 3 | Data Cube Computation and Generalization |
| 7.13 | CSE422.D | **Unit D** | **MINING FREQUENT PATTERNS ,ASSOCIATION, CORRELATION** |
| 7.14 | CSE422.D1 | Unit D Topic 1 | Efficient and Scalable Frequent Itemset Mining Methods |
| 7.15 | CSE422.D2 | Unit D Topic 2 | Mining various kinds of Association rules and correlation Analysis |
| 7.16 | CSE422.D3 | Unit D Topic 3 | Classification & Prediction |
| 7.17 | CSE422.E | **Unit E** | **CLUSTER ANALYSIS** |
| 7.18 | CSE422.E1 | Unit E Topic 1 | Basic concepts of cluster Analysis, Partitioning Methods |
| 7.19 | CSE422.E2 | Unit E Topic 2 | Hierarchical and Density based Clustering Methods |
| 7.20 | CSE422.E3 | Unit E Topic 3 | Application and trends in data mining |
| 8 | Course Evaluation | | |
| 8.1 | Course work: 30 marks | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | 10 assignments, no weight | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | |
| 8.14 | Projects | None | |
| 8.15 | Presentations | None | |
| 8.16 | Any other |  | |
| 8.2 | MTE | One, 20 marks | |
| 8.3 | End-term examination: 50 marks | | |
| 9 | References | | |
| 9.1 | Text book | 1. Han, Kamber, *Data Mining Concepts and Techniques*, Morgan Kaufmann | |
| 9.2 | Other references | 1. Golfarelli,  *Data Warehouse Design: Modern Principles and Methodologies*, Tata McGraw Hill 2. M.H. Dunham, *Data Mining Introductory and Advanced Topics*, Pearson Education. | |

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| 1 | Course No. | CSE443 | |
| 2 | Course Title | WIRELESS NETWORKS | |
| 3 | Credit | 4 | |
| 4 | Contact Hours | 3-1-0 (L-T-P) | |
| 5 | Course Objective | To enable students to understand the basic concepts of wireless networks specially MANETs and Sensor networks and apply these concepts for designing, evaluating and comparing wireless networks | |
| 6 | Course Outcomes | After successful completion of the course a student should be able to   1. Use the fundamental concepts of the course a student should be able to 2. Differentiate between various type of wireless networks 3. Configure wireless router 4. Differentiate between infrastructure and infrastructure less networks 5. Compare between various MAC, routing and MAC protocols for MANETs using NS2 6. Analyze energy management issue in MANETs 7. Analyze basic issues in sensor networks 8. Compare various MAC and routing protocols in sensor networks 9. Use various tools for sensor networks 10. Establish a sensor networks | |
|  |  |  |  |
| 7.01 | CSE443.A | Unit A | **FUNDAMENTAL OF WIRELESS NETWORKS** |
| 7.02 | CSE443.A1 | Unit A Topic 1 | Basic Networking Concepts |
| 7.03 | CSE443.A2 | Unit A Topic 2 | Wireless LANs and PANs: Bluetooth, 802.11, and Hiper LAN |
| 7.04 | CSE443.A3 | Unit A Topic 3 | Wireless internet, mobile ip (wi-fi routers) |
| 7.05 | CSE443.B | Unit B | **INTRODUCTION TO MANETs** |
| 7.06 | CSE443.B1 | Unit B Topic 1 | Overview of MANETs |
| 7.07 | CSE443.B2 | Unit B Topic 2 | Cellular vs. Ad-hoc networks, issues and challenges |
| 7.08 | CSE443.B3 | Unit B Topic 3 | MAC protocols for ad-hoc networks |
| 7.09 | CSE443.C | Unit C | **CHALLENGES IN MANETs** |
| 7.10 | CSE443.C1 | Unit C Topic 1 | Routing protocols for ad-hoc networks, DSR/AODV etc. (NS2) |
| 7.11 | CSE443.C2 | Unit C Topic 2 | Transport protocols for ad-hoc networks |
| 7.12 | CSE443.C3 | Unit C Topic 3 | Energy Management in Ad-Hoc Wireless Networks |
| 7.13 | CSE443.D | Unit D | **SENSOR NETWORKS** |
| 7.14 | CSE443.D1 | Unit D Topic 1 | Introduction, Applications and Issues |
| 7.15 | CSE443.D2 | Unit D Topic 2 | Networking Sensors, MAC protocols and Routing protocols |
| 7.16 | CSE443.D3 | Unit D Topic 3 | Infrastructure Establishment Issues |
| 7.17 | CSE443.E | Unit E | **CHALLENGES IN SENSOR NETWORKS** |
| 7.18 | CSE443.E1 | Unit E Topic 1 | Tasking and control in sensor networks |
| 7.19 | CSE443.E2 | Unit E Topic 2 | Sensor network plat forms and tools, emerging trends in sensor networks **(SENSE)** |
| 7.20 | CSE443.E3 | Unit E Topic 3 | Establishing sensor network using Zigbee, |
| 7.21 | CSE443.E4 | Unit E Topic 4 | Enabling Technologies For Wireless Sensor Networks. |
| 8 | Course Evaluation | | |
| 8.1 | Course Work: 30 marks | | |
| 8.2 | MTE | One, 20 percent | |
| 8.3 | End-term examination: 50 percent | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | Three best out of 4 assignments: 20 marks | |
| 8.13 | Quizzes | Two 30-minutes surprise quizzes in lecture hours: 10 marks | |
| 8.14 | Project | None | |
| 8.15 | Presentation | None | |
| 8.16 | Any Other | None | |
| 9 | References | | |
| 9.1 | Text Book | 1. Ad Hoc Wireless Networks: Architectures and Protocols. C. Siva Ram Murthy, Prentice Hall PTR. 2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao and Leonidas Guibas, Publisher: Morgan Kaufmann. | |
| 9.2 | Other Refrences | 1. Ad-hoc networks and sensor networks: Theory and Applications, D.D. Marios, D.P. Agarwal World Scientific. | |

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| 1 | Course number | **CSE444** | |
| 2 | Course Title | **Management Information System** | |
| 3 | Credits | 4 | |
| 4 | Contact Hours  (L-T-P) | (3-1-0) | |
| 5 | Course Objective | Information Systems (IS) enables new approaches to improve efficiency and efficacy of business models. This course will equip the students with understanding of role, advantages and components of an Information System. The objective of the course is to help students integrate their learning from functional areas, decision making process in an organization and role of Information Systems to have a vintage point in this competitive world. | |
| 6 | Course Outcomes | After successful completion of this course students should be able to:   1. Choose the best organisational structure depending upon the requirement. 2. Design a decision making system based on information available 3. Develop the system with available resources | |
| 7 | Outline syllabus: | | |
| 7.01 | CSE444.A | Unit A | **INTRODUCTION** |
| 7.02 | CSE444.A1 | Unit A Topic 1 | Introduction to Information Systems, information, types of information |
| 7.03 | CSE444.A2 | Unit A Topic 2 | Role of data and information, Organization structures |
| 7.04 | CSE444.A3 | Unit A Topic 3 | Business Process, Systems Approach |
| 7.05 | CSE444.B | Unit B | **ARCHITECTURE & DESIGN OF IS** |
| 7.06 | CSE444.B1 | Unit B Topic 1 | Architecture, development and maintenance of Information Systems |
| 7.07 | CSE444.B2 | Unit B Topic 2 | Centralized and Decentralized Information Systems |
| 7.08 | CSE444.B3 | Unit B Topic 3 | Factors of success and failure, value and risk of IS |
| 7.09 | CSE444.C | Unit C | **TYPES OF IS** |
| 7.10 | CSE444.C1 | Unit C Topic 1 | Resources and components of Information System, integration and automation of business functions and developing business models |
| 7.11 | CSE444.C2 | Unit C Topic 2 | Role and advantages of Transaction Processing System, Management Information System, Expert Systems |
| 7.12 | CSE444.C3 | Unit C Topic 3 | Artificial Intelligence, Executive Support Systems and Strategic Information Systems |
| 7.13 | CSE444.D | Unit D | **DECISION MAKING PROCESS** |
| 7.14 | CSE444.D1 | Unit D Topic 1 | Programmed and Non- Programmed decisions |
| 7.15 | CSE444.D2 | Unit D Topic 2 | Decision Support Systems |
| 7.16 | CSE444.D3 | Unit D Topic 3 | Models and approaches to DSS |
| 7.17 | CSE444.E | Unit E | **INTRODUCTION TO SAD AND ENTERPRISE MANAGEMENT TECHNOLOGIES** |
| 7.18 | CSE444.E1 | Unit E Topic 1 | System Analysis and Design |
| 7.19 | CSE444.E2 | Unit E Topic 2 | Models and Approaches of Systems Development |
| 7.20 | CSE444.E3 | Unit E Topic 3 | Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and Ecommerce |
| 8 | Course Evaluation | | |
| 8.1 | Course work: 30 marks | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | 10 Assignment (no Marks) | |
| 8.13 | Quizzes | 7 best quiz (20 marks) | |
| 8.14 | Projects | None | |
| 8.15 | Presentations | 10 marks | |
| 8.16 | Any other | None | |
| 8.2 | MTE | 20 marks | |
| 8.3 | End-term examination: 50 marks | | |
| 9 | References | | |
| 9.1 | Text book | 1. Management Information Systems, Effy OZ, Thomson Leaning/Vikas Publications. 2. Management Information Systems, James A. O’Brein, Tata McGraw-Hill | |
| 9.2 | other references | 1. Management Information System, W.S Jawadekar, Tata Mc Graw Hill Publication. 2. Management Information System, David Kroenke, Tata Mc Graw Hill Publication. 3. MIS: Management Perspective, D.P. Goyal, Macmillan Business Books. 4. MIS and Corporate Communications, Raj K. Wadwha, Jimmy Dawar, P. Bhaskara Rao, Kanishka Publishers. 5. MIS: Managing the digital firm, Kenneth C. Landon, Jane P. Landon, Pearson Education. | |

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| 1 | Course number | **CSE445** | | |
| 2 | Course Title | **DIGITAL IMAGE PROCESSING** | | |
| 3 | Credits | 4 | | |
| 4 | Contact Hours (L-T-P) | 3-1-0 | | |
| 5 | Course Objective | To study the basic concepts of digital image processing techniques to enhance and restore images, identifying the objects using segmentation techniques and image compression techniques | | |
| 6 | Course Outcomes | On successful completion of this course, students will be able to:   1. Illustrate the concept of digital image, basic steps in image processing, tools used in image processing and how image is digitized (sampled and quantized), different distance measures. 2. Use various image enhancement techniques to improve images for further processing. 3. Analyze the various low pass and high pass filters used to smooth and sharpen the digital images. 4. Interpret the colour image models and how to process the color images. 5. Use the various noise models and techniques to restore noisy images through various noise removal filers 6. Utilize the image compression techniques to reduce the storage space for images for fast communication and processing. 7. Compare the segmentation techniques used to identify the objects of interest in the images. 8. Apply the image representation techniques like chain coding, polygon approximation etc. | | |
| 7 | Outline syllabus: | | | |
| 7.01 | CSE325.A | Unit A | **DIGITAL IMAGE FUNDAMENTALS** | |
| 7.02 | CSE325.A1 | Unit A Topic 1 | Digital image representation, fundamental steps in image processing, elements of image processing systems | |
| 7.03 | CSE325.A2 | Unit A Topic 2 | Elements of visual perception, a simple image model, sampling and quantization | |
| 7.04 | CSE325.A3 | Unit A Topic 3 | Neighbours of a pixel, connectivity, distance measures, imaging geometry, perspective transformations, stereo imaging | |
| 7.05 | CSE325.B | Unit B | **IMAGE ENHANCEMENT** | |
| 7.06 | CSE325.B1 | Unit B Topic 1 | Enhancement by point processing, image negatives, contrast stretching, histogram processing, histogram equalization, histogram specification, image subtraction, image averaging | |
| 7.07 | CSE325.B2 | Unit B Topic 2 | Spatial filtering, smoothing filters - mean, median, sharpening filters - high pass spatial filtering, high-boost filtering, derivative filters | |
| 7.08 | CSE325.B3 | Unit B Topic 3 | Color image processing: color models, pseudo-color image processing | |
| 7.09 | CSE325.C | Unit C | **IMAGE RESTORATION AND COMPRESSION** | |
| 7.10 | CSE325.C1 | Unit C Topic 1 | Noise models, degradation model, algebraic approach to restoration | |
| 7.11 | CSE325.C2 | Unit C Topic 2 | Inverse filtering, wiener filter, constrained least square restoration, Interactive restoration, restoration in spatial domain | |
| 7.12 | CSE325.C3 | Unit C Topic 3 | Coding redundancy, Inter-pixel redundancy and psycho visual redundancy, Image compression models, Error free comparison, Lossy compression, Image compression standards | |
| 7.13 | CSE325.D | Unit D | **IMAGE SEGMENTATION** | |
| 7.14 | CSE325.D1 | Unit D Topic 1 | Definition, characteristics of segmentation, detection of discontinuities | |
| 7.15 | CSE325.D2 | Unit D Topic 2 | Thresholding, pixel based segmentation method, region based segmentation methods – segmentation by pixel aggregation, segmentation by sub region aggregation | |
| 7.16 | CSE325.D3 | Unit D Topic 3 | Histogram based segmentation, spilt and merge technique | |
| 7.17 | CSE325.E | Unit E | **IMAGE REPRESENTATION AND DESCRIPTION** | |
| 7.18 | CSE325.E1 | Unit E Topic 1 | Representation schemes like chain coding, Polygonal approximation, Signatures | |
| 7.19 | CSE325.E2 | Unit E Topic 2 | Boundary Segments, skeleton of region, boundary descriptors, region descriptors | |
| 7.20 | CSE325.E3 | Unit E Topic 3 | Morphology: Dilation and erosion, opening and closing, hit-or-miss transform, region filling | |
| 8 | Course Evaluation | | |
| 8.1 | Course work: 30 marks | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | 10 assignments, no weight | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | |
| 8.14 | Projects | None | |
| 8.15 | Presentations | None | |
| 8.16 | Any other |  | |
| 8.2 | MTE | One, 20 marks | |
| 8.3 | End-term examination: 50 marks | | |
| 9 | References | | | |
| 9.1 | Text Book | 1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson Reprint, 2001. | | |
| 9.2 | Other References | 2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall of India, 2001.  3. William K. Pratt, “Digital Image Processing”, Wiley-Interscience publication, Second Ed., 1991.  4. Rosefield Kak, “Digital Picture Processing”,  5. Image processing, Analysis, and Machine vision by Milan Sonka vaclan Halavac Roger Boyle, Vikas Publishing House. | | |

**CSE-446 Cloud Web Services(3-1-0)4**

**Unit 1**

**Overview of cloud computing** : What is a cloud, Definition of cloud , Definition of cloud ,characteristics of cloud ,Why use clouds, How clouds are changing , How clouds are changing , Driving factors towards cloud, Comparing grid with cloud and other computing systems, workload patterns for the cloud,

**Unit 2**

**Cloud computing concepts:**

Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services, and automation in cloud computing, Management: Desktops in the Cloud, Security

**Unit 3**

**Cloud service delivery:**

Cloud service , Cloud service model architectures, Infrastructure as a service (IaaS) architecture, Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS) , Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost to install versus , Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.

**Unit 4**

**Cloud deployment & Security:**

Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment. Cloud security reference model, How security gets integrated, Cloud security, Understanding security risks, Principal security dangers to cloud computing, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches, Reducing cloud security, Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity,

**Unit 5**

**Security in cloud & Applications:**

IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

**Readings Suggested /Books**

1. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles and paradigms, 2011

2. Michael Miller, Cloud Computing, 2008.

3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies, 2009.

4. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud Computing: A practical Approach, McGraw Hill, 2010.

5. Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011. 6. Borko Furht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer, 2010.

**TERM 6**

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| 1 | Course Code | CSE412 |
| 2 | Course Title | **Advance Computer Architecture** |
| 3 | Credits | **3** |
| 4 | Contact Hours | **3-0-0** |
| 5 | Course Objective | To understand the various aspects of the architecture of a computer and to categorize and compare the performance of various types of sequential and parallel computers |
| 6 | Course Outcomes | After the successful completion of this course the student will be able to:   1. Differentiate between various architectures 2. Compare the performance of computer systems 3. Design instruction set of a computer 4. Design an instruction pipeline 5. Evaluate the performance of an instruction pipeline 6. Categorize the computers 7. Explore parallelism in programs   Analyse the performance of multi-processor and multi core systems |
|  | Outline syllabus: | |
| 7.01 | Unit A | **Memory Hierarchy** | |
| 7.02 | Unit A Topic 1 | Memory Hierarchy, Cache Organization, | |
| 7.03 | Unit A Topic 2 | Techniques to reduce the cache misses,cache penalties, cache hit times, Effect of Main memory Bandwidth, effect of bus – width | |
| 7.04 | Unit A Topic 3 | , memory access time, virtual memory, Amdahl’s Law | |
| 7.05 | Unit B | **Pipelining** | |
| 7.06 | Unit B Topic 1 | Review of Pipelining , Examples of some pipeline in modern processors, | |
| 7.07 | Unit B Topic 2 | Pipeline Hazards, data Hazards, control hazards, Techniques to handle Hazard , | |
| 7.08 | Unit B Topic 3 | Performance improvement with pipelines and effect of hazards on the performance. | |
| 7.09 | Unit C | **VECTOR AND ARRAY PROCESSORS** | |
| 7.10 | Unit C Topic 1 | Flynn’s classification, SIMD/MISD/MIMD, Feng’s classification, | |
| 7.11 | Unit C Topic 2 | Array processors, comparisons with vector processor , example of array processor such as MMX technology. | |
| 7.12 | Unit C Topic 3 | Vector Processors- Use and effectiveness , memory to memory architecture , vector register architecture, vector length, and stride issue, compiler effectiveness in vector processors. | |
| 7.13 | Unit D | **Addressing modes and Instructions Set & RISC** | |
| 7.14 | Unit D Topic 1 | RISC architectures , addressing modes , instruction formats, | |
| 7.15 | Unit D Topic 2 | Effect of simplification on the performance | |
| 7.16 | Unit D Topic 3 | Example processors such as MIPS, PA-RISC, SPARC, Power PC etc. | |
| 7.17 | Unit E | **MULTI PROCESSOR SYSTEMS** | |
| 7.18 | Unit E Topic 1 | MIMD Multi processor systems, Centralized shared architecture, distributed shared memory architecture, | |
| 7.19 | Unit E Topic 2 | Synchronization and memory consistency models, message passing architecture , compiler issues, | |
| 7.20 | Unit E Topic 3 | Data Flow architectures , Interconnection Networks | |
| 9 | **Reading Content** | |
| 9.1 | Text book | 1.  Advanced Computer Architecture, Kai Hwang, Mc Graw Hill,       Computer |
| 9.2 | Other references | 1.       Computer Organization and Architecture ( TMH WBUT series), Ghosh & Pal , TMH 2.       Computer  Architecture A quantitative approach, Henssey, Peterson, Morgan Kaufman.  3. Internet as a resource for reference |

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| 1 | Course Code | | **CSE447** | | | |
| 2 | Course Title | | **Big Data Analytics** | | | |
| 3 | Credits | | 3 | | | |
| 4 | Contact Hours | | 3-0-0 | | | |
| 5 | Course Objective | | Students should be able to learn about analytics techniques to handle the big datathrough hadoop framework. | | | |
| 6 | Course Outcomes (CO)  (Max of 4) | | On successful completion of this module students will be able to:   1. Explore the fundamental concepts of Big Data analysis 2. Identify and successfully apply appropriate techniques and tools to solve actual Big Data problems (derive value from vast data sets) 3. Examine the distributed and parallel computing and its application for big data analysis 4. Analyzehow to dealwith huge amount of data and propose scalable solutions | | | |
| **7** | **Prerequisite** | | Knowledge of DBMS, Data Mining is essential | | | |
| **8** | **Course Contents** | | | | | |
| 8.01 | Unit A | | **Introduction to Big Data** | | | |
| 8.02 | Unit A Topic 1 | | Introduction to Big Data, challenges of conventional systems | | | |
| 8.03 | Unit A Topic 2 | | Evolution of analytic scalability | | | |
| 8.04 | Unit A Topic 3 | | Modern data analytic tools | | | |
| 8.05 | Unit B | | **Modelling techniques** | | | |
| 8.06 | Unit B Topic 1 | | Mining frequent itemsets, Apriori algorithm, Handling large data sets in main memory | | | |
| 8.07 | Unit B Topic 2 | | Clustering techniques, clustering for parallelism | | | |
| 8.08 | Unit B Topic 3 | | Classification and Prediction: Decision Tree induction, Developing models using Decision Tree Algorithms | | | |
| 8.09 | Unit C | | **Frameworks** | | | |
| 8.10 | Unit C Topic 1 | | Overview of Hadoop, Hadoop Distributed File System, HDFS design and architecture | | | |
| 8.11 | Unit C Topic 2 | | Hadoop Map reduce Framework, HBASE | | | |
| 8.12 | Unit C Topic 3 | | Interacting HDFS using HIVE, sample programs in HIVE-PIG | | | |
| 8.13 | Unit D | | **Data Analysis and mining data streams** | | | |
| 8.14 | Unit D Topic 1 | | Regression modelling, Rule Induction | | | |
| 8.15 | Unit D Topic 2 | | Fuzzy decision trees and neural networks | | | |
| 8.16 | Unit D Topic 3 | | Introduction to streams concepts, Real time analytics platform, case studies | | | |
| 8.17 | Unit E | | **Visualization** | | | |
| 8.18 | Unit E Topic 1 | | Visual data analysis techniques, Interaction techniques | | | |
| 8.19 | Unit E Topic 2 | | Analytics using statistical packages, association intelligence from unstructured information | | | |
| 8.20 | Unit E Topic 3 | | Text analytics, industry challenges and application of analytics | | | |
| 9 | **Course Evaluation** | | | | | |
|  |  | Continuous Assessment | | | Mid-Term Examination | End-Term Examination |
| 9.11 | Attendance | Mandatory | | | Mandatory | 75% |
| 9.12 | Assignment | Yes | | | -- | -- |
| 9.13 | Quizzes | yes | | | -- | -- |
| 9.14 | Projects | Yes | | | -- | -- |
| 9.15 | Presentations | Yes | | | -- | -- |
| 9.16 | Exam | -- | | | Yes | Yes |
| 9.17 | Total Marks | 30 | | | 30 | 40 |
| 10 | **Reading Content** | | | | | |
| 9.1 | Text book\* | | | 1. Bill Franks, “Taming the big data tidalwave:finding opportunities in huge data streams with advanced analytics”, John Wiley & Sons,2012 | | |
| 9.2 | Other references | | | 1. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”,Cambridge University Press,2012 2. Michael Berthold,David J.Hand, “Intelligent Data Analysis”,Springer2007 3. JiwaeiHan,MichelineKamber, “ Data Mining Concepts and Techniques”,Second Edition,Elsevier,Reprinted 2008 | | |

**CSE-448 Distributed System Concepts &Design (3-0-0)**

**Unit-1**

Introduction: Concurrency, No Global Clock, Independent failures,Resource sharing and web challenges, Challenges:Heterogeneity, openness, security, scalability, failure handling, transparency, System Models: Design Requirements, Fundamental Models,Failure Model and security model

**Unit-2 Theoretical Foundation**

Limitation of distributed systems: Lamport's logical Clocks (limitations Lamport's Logical Clock), Vector clockCasual Ordering of messages: Birman-schiper-stepheson protocol, Schiper-Eggli-Sandoz Protocol, Global State: Chandy-Lamport's Global state recording Algorithm, Termination Detection,Huang's Termination Detection Algorithm

**Unit-3 Mutual Exclusion**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, Requirements, Performance evaluation ,Non-Token based algorithm: Lamport' s algorithm, The Ricart-Agarwal Algorithm, Maekawa's AlgorithmToken based algorithms: Suzuki-Kasami's Broadcast Algorithm, Raymond's tree based algorithm

**Unit-4 Distributed Deadlock**

System Models: Deadlock handling strategies, Issues in deadlock detection and resolution ,Centralized deadlock detection: Ho-Ramamurthy One phase Algorithm, Ho-Ramamurthy Two-Phase Algorithm, Distributed Deadlock detection Algorithm: Obermarck's Path pushing Algorithm, Chandy-Misra-Haas Edge chasing Algorithm

**Unit-5 Agreement Protocol & Security**

Agreement Protocols: Classification, Solution to Byzanitine agreement problem, Applications, Security: Conventional & Modern cryptography, Authentication ,Case Study: The kerberos System

**Text Book:**

1. Advance concepts in Operating systems” Singhal-Shivaratri, Tata-McGraw Hill

**Reference Book:**

1. Distributed Systems Concepts and Design”, Coulouris, Pearson Education
2. Distributed Operating System, A.S. Taneanbaum, V.Steen, Pearson Education

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| 1 | Course No. | **CSE 450** | |
| 2 | Course Title | **Natural Language Processing** | |
| 3 | Credits | 4 | |
| 4 | Contact Hours (L-T-P) | 3-1-0 | |
| 5 | Course Objective | To study the behaviour of natural languages and mathematically represent the principles of natural languages for the purpose of processing using several algorithms designed for it. | |
| 6 | Course Outcomes | After Successful completion of the course a student will be able to | |
|  | Outline syllabus: | | |
| 7.01 |  | Unit A | **Introduction & Information Theory** |
| 7.02 |  | Unit A Topic 1 | **Introduction :**The Ambiguity of Language: Why NLP Is Difficult, Language and cognition as probabilistic phenomena, |
| 7.03 |  | Unit A Topic 2 | **Lexical resources:** Word counts, Zipf’s laws, Collocations, Concordances, |
| 7.04 |  | Unit A Topic 3 | **Essential Information Theory**: Entropy, Joint entropy and conditional entropy, Mutual information, The noisy channel model, Relative entropy or Kullback-Leibler divergence, The relation to language: Cross entropy, The entropy of English, Perplexity |
| 7.05 |  | Unit B | **Linguistic Essentials & Corpus** |
| 7.06 |  | Unit B Topic 1 | **Linguistic Essentials:**  Parts of Speech and Morphology, Nouns pronouns, Determiners and adjectives, Verbs, Phrase structure |
| 7.07 |  | Unit B Topic 2 | **Corpus-Based Work:** Corpora, Tokenization: What is a word? ,Morphology, Sentences, Marked-up Data, Markup schemes, Grammatical tagging |
| 7.08 |  | Unit B Topic 3 | **Statistical Inference: n -gram Models over Sparse Data** : Bins: Forming Equivalence Classes , Statistical Estimators, Combining Estimators |
| 7.09 |  | Unit C | **Words** |
| 7.10 |  | Unit C Topic 1 | **Word Sense Disambiguation:** Methodological Preliminaries, Supervised Disambiguation, Unsupervised Disambiguation |
| 7.11 |  | Unit C Topic 2 | **Lexical Acquisition :**Evaluation Measures, Verb Subcategorization, Attachment Ambiguity, Semantic Similarity |
| 7.12 |  | Unit C Topic 3 | **Markov Models :** Hidden Markov Models, Why use HMMs?, Finding the probability of an observation, Finding the best state sequence, The third problem: Parameter estimation, HMMs: Implementation, Properties, and Variants |
| 7.13 |  | Unit D | **Grammar** |
| 7.14 |  | Unit D Topic 1 | **Part-of-Speech Tagging :** The Information Sources in Tagging, Markov Model Taggers, Hidden Markov Model Taggers, Accuracy and Uses of Taggers |
| 7.15 |  | Unit D Topic 2 | **Probabilistic Context Free Grammars:** Features of PCFGs, The Probability of a String, Problems with the Inside-Outside Algorithm |
| 7.16 |  | Unit D Topic 3 | **Probabilistic Parsing:** Parsing for disambiguation, Treebanks, Parsing models vs. language models, Weakening the independence assumptions of PCFGs, Tree probabilities and derivational probabilities, Phrase structure grammars and dependency grammars, Evaluation |
| 7.17 |  | Unit E | **Applications & Techniques** |
| 7.18 |  | Unit E Topic 1 | **Text Categorization Techniques:**  DecisionTrees, Maximum Entropy Modeling, Perceptrons, **k** Nearest Neighbor Classification |
| 7.19 |  | Unit E Topic 2 | **Statistical Alignment and Machine Translation:** Text Alignment, Word Alignment, Statistical Machine Translation |
| 7.20 |  | Unit E Topic 3 | **Information Retrival:** Common design features of IR systems , Evaluation measures, The probability ranking principle (PRP), The Vector Space Model |
| 8 | Course Evaluation | | |
| 8.1 | Course work: 30 marks | | |
| 8.11 | Attendance | None | |
| 8.12 | Homework | 10 assignments, no weight | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | |
| 8.14 | Projects | None | |
| 8.15 | Presentations | None | |
| 8.16 | Any other |  | |
| 8.2 | MTE | One, 20 marks | |
| 8.3 | End-term examination: 50 marks | | |
| 9 | References | | |
| 9.1 | Text book | 1. FoundationsofStatisticalNaturalLanguageProcessing , Christopher D. Manning  HinrichSchiitze, The MIT PressCambridge, MassachusettsLondon, England | |
| 9.2 | Other references | 1. Speech and Language ProcessingAn Introduction to Natural Language Processing,Computational Linguistics, and Speech Recognition, Daniel Jurafsky, James H. Martin, PEARSON Prentice Hall  2. Statistical Machine Translation, Philipp Koehn, Cambridge University Press  3. Machine Translation, Pushpak Bhattacharya, CRC Press | |

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| 1 | Course number | | **CSE451** | | |
| 2 | Course Title | | **MOBILE COMPUTING** | | |
| 3 | Credits | | 3 | | |
| 4 | Contact Hours (L-T-P) | | 3-0-0 | | |
| 5 | Course Objective | | The objective of the course is to impart knowledge of mobile and wireless computing systems and techniques | | |
| 6 | Course Outcomes | | On successful completion of this module students will be able to:   |  | | --- | | 1. synthesize the basic concepts and principles in mobile computing. 2. analyze the concept of wireless, mobile and sensor networks. 3. synthesize the structure and components for mobile IP and mobility Management. 4. develop algorithms for allocation estimations based on different positioning techniques and platforms. 5. develop and maintain a Wireless LAN 6. identify the important issues and concerns on security and privacy. 7. design and develop mobile applications. | | | |
| 7 | Outline syllabus | | | | |
| 7.01 | CSE327.A | | Unit A | | **INTRODUCTION** |
| 7.02 | CSE327.A1 | | Unit A Topic 1 | | [Wireless transmission](http://www.indiastudychannel.com/resources/33365-IT-MOBILE-COMPUTING-Syllabus-Anna-university.aspx) , Frequencies for radio transmission |
| 7.03 | CSE327.A2 | | Unit A Topic 2 | | Signals , Antennas , Signal Propagation , Multiplexing, Modulations |
| 7.04 | CSE327.A3 | | Unit A Topic 3 | | [Spread spectrum](http://www.indiastudychannel.com/resources/33365-IT-MOBILE-COMPUTING-Syllabus-Anna-university.aspx), MAC, SDMA , FDMA , TDMA , CDMA , Cellular Wireless Networks |
| 7.05 | CSE327.B | | Unit B | | **TELECOMMUNICATION NETWORKS** |
| 7.06 | CSE327.B1 | | Unit B Topic 1 | | GSM: Mobile services, System architecture, [Radio interface](http://www.indiastudychannel.com/resources/69044-MOBILE-COMPUTING-Syllabus-Jntu-II-year-MCA-IV.aspx), Protocols |
| 7.07 | CSE327.B2 | | Unit B Topic 2 | | Localization and calling, Handover, Security |
| 7.08 | CSE327.B3 | | Unit B Topic 3 | | General Packet Radio Service (GPRS): GPRS Architecture, GPRS network nodes, |
| 7.09 | CSE327.C | | Unit C | | **WIRELESS LANS** |
| 7.10 | CSE327.C1 | | Unit C Topic 1 | | Introduction to IEEE 802.11b/g/n |
| 7.11 | CSE327.C2 | | Unit C Topic 2 | | Bluetooth technologies and architecture. |
| 7.12 | CSE327.C3 | | Unit C Topic 3 | | HIPERLAN, WML programming |
| 7.13 | CSE327.D | | Unit D | | **MOBILE NETWORK LAYER** |
| 7.14 | CSE327.D1 | | Unit D Topic 1 | | Mobile IP Goals, Entities, IP packet Delivery Agent Advertisement and Discovery, Registration. |
| 7.15 | CSE327.D2 | | Unit D Topic 2 | | Hidden and exposed terminal problems ,Routing protocols classification, |
| 7.16 | CSE327.D3 | | Unit D Topic 3 | | DSDV, DSR, AODV **,** Security |
| 7.17 | CSE327.E | | Unit E | | **Mobile Transport Layer & Wireless Application Protocol** |
| 7.18 | CSE327.E1 | | Unit E Topic 1 | | Traditional TCP, Indirect TCP, |
| 7.19 | CSE327.E2 | | Unit E Topic 2 | | Snooping TCP, Mobile TCP |
| 7.20 | CSE327.E3 | | Unit E Topic 3 | | WAP: Protocols, Architecture |
| 8 | Course Evaluation | | | | |
| 8.1 | Course work: 30 marks | | | | |
| 8.11 | Attendance | none | | | |
| 8.12 | Homework | 10 assignments, no weight | | | |
| 8.13 | Quizzes | 7 best quizzes (based on assignments) in tutorial hours; 30 marks | | | |
| 8.14 | Projects | none | | | |
| 8.15 | Presentations | none | | | |
| 8.16 | Any other |  | | | |
| 8.2 | MTE | One, 20 marks | | | |
| 8.3 | End-term examination: 50 marks | | | | |
| 9 | References | | | | |
| 9.1 | Text book\* | | | 1. JochenSchiller : Mobile Communication, Pearson Education. 2. U. Hansman and L. Merck : Principles of Mobile Computing”, 2nd Ed., Springer | |
| 9.2 | other references | | | 1. A. S. Tanenbaum. : Computer Networks, 4th Ed., Pearson Education.  2. D. Milojicic, F. Douglis. : Mobility Processes, Computers and Agents”,  Addison Wesley   1. D.B. Lange and M. Oshima : Programming and Deploying Java Mobile Agents with Aglets, Addison Wesley. | |
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