

Annasaheb Dange College of Engineering and Technology, Ashta
Department of Computer Science & Engineering



Structure and Curriculum Contents

S.Y. B.Tech Computer Science and Engineering

SEM-III to SEM-IV

Revision - 2

Academic Year 2023-24



Annasaheb Dange College of Engineering and Technology Ashta
Department of Computer Science and Engineering



Teaching and Evaluation Scheme

S. Y. B. Tech Semester III

| Course Code | Course Name | Teaching Scheme | | | | THEORY | | | | | | | | PRACTICAL | | | | GRAND TOTAL | |
|-------------|--|-----------------|----------|-----------|-----------|--------|-----|----------|-----|-----|-------|-----|-----|-----------|-----|-----|-------|-------------|------------|
| | | | | | | ISE | | MSE+ ESE | | | Total | Min | ISE | | ESE | | Total | | Min |
| | | L | T | P | Credits | Max | Min | MSE | ESE | Min | | | Max | Min | Max | Min | | | |
| 2CSPC201 | Discrete Mathematics | 3 | 1 | - | 4 | 4C | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | - | 100 |
| 2CSPC202 | Data Structures | 3 | - | 2 | 4 | 4C | 16 | 30 | 30 | 24 | 100 | 40 | 50 | 20 | 50 | 20 | 100 | 40 | 200 |
| 2CSPC203 | Computer Organization and Architecture | 3 | - | 2 | 4 | 4C | 16 | 30 | 30 | 24 | 100 | 40 | 50 | 20 | - | - | 50 | 20 | 150 |
| 2CSPC204 | Operating System | 3 | - | 2 | 4 | 4C | 16 | 30 | 30 | 24 | 100 | 40 | 50 | 20 | - | - | 50 | 20 | 150 |
| 2CSHS205 | Psychology | 2 | - | - | 2 | 5C | 20 | - | - | - | 50 | 20 | - | - | - | - | - | - | 50 |
| 2CSPC206 | C++ Programming | 2 | - | 2 | 3 | - | - | - | - | - | - | - | 50 | 20 | 50 | 20 | 100 | 40 | 100 |
| 2CSHS207 | Constitution of India | 1 | - | - | 1 | 25 | 10 | - | - | - | 25 | 10 | - | - | - | - | - | - | 25 |
| 2CSCC208 | Aptitude and Reasoning Part – I | - | - | 2 | 1 | - | - | - | - | - | - | - | 50 | 20 | - | - | - | 20 | 50 |
| | | 17 | 1 | 10 | 23 | | | | | | | | | | | | | | |
| | Total Contact Hours | | | | 28 | | | | | | | | | | | | | | 825 |

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Teaching and Evaluation Scheme

S. Y. B. Tech Semester IV

| Course Code | Course Name | Teaching Scheme | | | | THEORY | | | | | | | | PRACTICAL | | | | GRAND TOTAL | |
|-------------|--|-----------------|----------|----------|-----------|--------|-----|----------|-----|-----|-------|-----|-----|-----------|-----|-----|-------|-------------|------------|
| | | | | | | ISE | | MSE+ ESE | | | Total | Min | ISE | | ESE | | Total | | Min |
| | | L | T | P | Credits | Max | Min | MSE | ESE | Min | | | Max | Min | Max | Min | | | |
| 2CSPC209 | Fuzzy Systems and Operational Research | 3 | 1 | - | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | - | 100 |
| 2CSPC210 | Database Engineering | 3 | - | 2 | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | 50 | 20 | 50 | 20 | 100 | 40 | 200 |
| 2CSPE2** | Professional Elective - I | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | - | 100 |
| 2CSCS215 | Minor Course - I | 2 | - | - | 2 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | - | 100 |
| 2CSHS216 | Universal Human Values | 2 | - | - | 2 | 50 | 20 | - | - | - | 50 | 20 | - | - | - | - | - | - | 50 |
| 2CSPC217 | Java Programming | 2 | - | 2 | 3 | - | - | - | - | - | - | - | 50 | 20 | 50 | 20 | 100 | 40 | 100 |
| 2CSHS218 | Environment Studies | 2 | - | - | 2 | 50 | 20 | - | - | - | 50 | 20 | - | - | - | - | - | - | 50 |
| 2CSEL219 | Innovation / Prototype | - | - | 2 | 1 | - | - | - | - | - | - | - | 50 | 20 | - | - | 50 | 20 | 50 |
| 2CSCC220 | Aptitude and Reasoning Part- II | - | - | 2 | 1 | - | - | - | - | - | - | - | 50 | 20 | - | - | 50 | 20 | 50 |
| | | 17 | 1 | 8 | 22 | | | | | | | | | | | | | | 800 |
| | Total Contact Hours | | | | 26 | | | | | | | | | | | | | | |

| Professional Elective - I | |
|---------------------------|------------------------------------|
| 2CSPE211 | Storage Networks |
| 2CSPE212 | Adhoc Networks |
| 2CSPE213 | Advanced Mobile Communication (5G) |
| 2CSPE214 | Cyber Security and Laws |

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| Class | S Y B. Tech Sem III |
| Course Code & Course Title | 2CSPC201 Discrete Mathematics |
| Prerequisite/s | Basic Mathematics |
| Teaching Scheme (Lecture/Practical/Tutorial) | 3/0/1 |
| Credits | 4 |
| Evaluation Scheme Theory: ISE/ MSE/ ESE | 40/30/30 |

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| Course Outcomes (COs) : The students will be able to: | |
| 2CSPC201_1 | Explain fundamental concepts of discrete mathematical structures like Mathematical Logic, Sets, Algebraic systems, Lattices and Graph theory in the field of Computer Science. |
| 2CSPC201_2 | Apply mathematical concepts, equivalence formulas and laws to solve the problems of mathematical logic and set theory. |
| 2CSPC201_3 | Solve problems on permutations, combinations and discrete probability using appropriate formulas. |
| 2CSPC201_4 | Apply logical equations and properties to solve problems of algebraic systems, lattices and graph theory. |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Mathematical logic: Introduction, statements and notations, Connectives – negation, conjunction, disjunction, conditional, bi-conditional, Statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives, Normal and principal normal forms, completely parenthesized infix and polish notations | 08 Hrs. |
| Unit 2 | Set theory: Basic concepts of set theory, types of operations on sets, ordered pairs, Cartesian Product, Representation of discrete structures, relation, properties of binary relations, matrix and graph representation, partition and covering of set, equivalence relation, composition, POSET and Hasse diagram, Function – types, composition of functions, Inverse function. | 07 Hrs. |
| Unit 3 | Permutations, Combinations and Discrete Probability: Permutations and Combinations: rule of sum and product, Permutations, Combinations, Discrete Probability, Conditional Probability, Bayes' Theorem | 05 Hrs. |
| Unit 4 | Algebraic systems: Semigroups and Monoids, properties and examples, Groups: Definition and examples, subgroups and homomorphism. | 05 Hrs. |
| Unit 5 | Lattices and Boolean algebra: Lattice as POSETs, definition, examples and properties, Lattice as algebraic systems, Special lattices, Boolean algebra definition and examples, Boolean functions, representation and minimization of Boolean functions. | 07 Hrs. |

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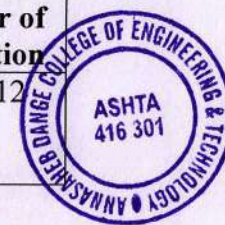


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| Unit 6 | Graph theory: Basic concepts of graph theory, Storage representation and manipulation of Graphs, PERT and related techniques. | 07 Hrs. |
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| List of Tutorial's | | |
|--------------------|---|---------------|
| Tut. No. | Title of Tutorial | Contact Hours |
| 1 | Mathematical Logic- functionally complete sets of connectives | 1 Hr |
| 2 | Mathematical Logic- statements and implications, Normal Forms | 1 Hr |
| 3 | Set Theory-basic concepts, Set Theory- Relations | 1 Hr |
| 4 | Set Theory- POSET and functions | 1 Hr |
| 5 | Permutations and Combinations | 1 Hr |
| 6 | Algebraic Systems | 1 Hr |
| 7 | Lattices | 1 Hr |
| 8 | Boolean Algebra | 1 Hr |
| 9 | Graph Theory-Basic Concepts, Storage representation | 1 Hr |
| 10 | Graph Theory-PERT and related technique | 1 Hr |

| Text Books: | | | | | |
|-------------|---|--|-------------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Discrete Mathematical Structures with application to Computer Science | J. P. Tremblay & R. Manohar | Tata MGH International | - | 2007 |
| 2 | Elements of Discrete Mathematics | C. L. Liu and D. P. Mohapatra | SiE Edition, Tata McGraw-Hill | 4 | 2013 |
| 3 | Theory of Computation | Sushilkumar Azad | Dhanpat Rai and Co. | 2 | 2005 |
| 4 | Discrete mathematical Structures | Bernard kolman, Robert Busby, S. C. Ross & Nadeemur Rehman | Person Education | 2 | 2009 |

| Reference Books: | | | | | |
|------------------|---|--|------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Discrete Mathematics and its Applications | Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/rosen) | Tata McGraw Hill | 7 | 2012 |



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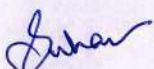
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| Reference Books: | | | | | |
|------------------|--|--|---------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 2 | Discrete Mathematics, Schaum's outlines. | Semyour Lipschutz, Marc Lipson | Tata McGraw Hill | 3 | 2012 |
| 3 | Discrete Mathematical Structures | Bernard Kolman, Robert Busby, S.C.Ross | PHI Learning Pvt Ltd | 6 | 2009 |
| 4 | Foundation of Discrete mathematics | K. D. Joshi | New Age International Ltd | 5 | 2003 |




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|--|-----------|---------------------------------|----------|
| Class | | S Y B. Tech Sem III | |
| Course Code & Course Title | | 2CSPC202 Data Structures | |
| Prerequisite/s | | Computer Programming | |
| Teaching Scheme (Lecture/Practical/Tutorial) | | 3/2/0 | |
| Credits | | 4 | |
| Evaluation Scheme: | Theory | ISE/ MSE/ ESE | 40/30/30 |
| | Practical | ISE/ ESE | 50/50 |

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| Course Outcomes (COs) : The students will be able to: | |
| 2CSPC202_1 | Describe fundamentals in data structures for solving problems using a programming language |
| 2CSPC202_2 | Explain the fundamental concepts of structuring, managing and organizing the data for solving problems using linear data structures with ADTs. |
| 2CSPC202_3 | Apply appropriate linear data structure to solve the problem using a programming language. |
| 2CSPC202_4 | Explain the fundamental concepts of structuring, managing and organizing the data for solving problems using non-linear data structures with ADTs. |
| 2CSPC202_5 | Apply appropriate non-linear data structure to solve the problem using a programming language. |
| 2CSPC202_6 | Compare and analyze different data structure algorithms and searching, sorting methods for solving problems using complexity methods. |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Basics of Data Structures: Algorithm, ADT, Space and Time Complexity, Direct and Indirect recursion, analysis of recursive functions e.g. Towers of Hanoi | 3 Hrs |
| Unit 2 | Lists Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists. | 8 Hrs |
| Unit 3 | Stack and Queue Stacks as ADT, operations, representation using static and dynamic structures, applications of stack Queue as ADT, operations, representation using static and dynamic structures, circular queue, priority queue, double ended queue. | 8 Hrs |
| Unit 4 | Searching and Sorting Techniques Linear search, binary search, Internal and External Sorts, bubble sort, selection sort, insertion sort, merge sort, quick sort, radix sort, heap sort. Hashing – Definition, hash functions, overflow, collision, Collision resolution techniques, Open addressing, Chaining. | 9 Hrs |
| Unit 5 | Trees Basic terminology, representation, binary tree, traversal methods, binary search tree, AVL search tree, Heaps- Operations and their applications, Introduction to M-way trees. | 7 Hrs |



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| Unit 6 | Graphs Basic concept of graph theory, storage representation: adjacency matrix, adjacency list, adjacency multi-lists, graph traversal techniques- BFS and DFS | 4 Hrs |
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| List of Practical's | | |
|---------------------|--|---------------|
| Expt. No. | Title of Experiment | Contact Hours |
| 1 | Programs based on array, function, pointer, structures | 2 Hrs |
| 2 | Singly Linked List | 2 Hrs |
| 3 | Doubly Linked List | 2 Hrs |
| 4 | Circular Linked List | 2 Hrs |
| 5 | Stack ADT – Static and Dynamic | 2 Hrs |
| 6 | Queue ADT – Static and Dynamic | 2 Hrs |
| 7 | Stack application, circular and double ended queue | 2 Hrs |
| 8 | Searching – Linear, Binary and Hashing | 2 Hrs |
| 9 | Sorting – Bubble, Selection, Insertion, | 2 Hrs |
| 10 | Sorting – Merge and Quick | 2 Hrs |
| 11 | Binary Search Tree, Traversal of Trees | 2 Hrs |
| 12 | Graph using adjacency list and traversal | 2 Hrs |

| Text Books: | | | | | |
|-------------|---|--|------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Data Structures- A Pseudocode Approach with C | Richard F. Gilberg and Behrouz A. Forouzon | Cengage Learning | 2 | 2004 |
| 2 | Data Structures with C Schaum's Outlines Series | S. Lipschutz | Tata McGraw-Hill | - | 2017 |
| 3 | Data Structure using C | Reema Thareja | Oxford | 2 | 2014 |

| Reference Books: | | | | | |
|------------------|-----------------------------|---|-------------------------------------|------------------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Data Structure using C | A. M. Tanenbaum, Y. Langsam, M. J. Augenstein | Prentice-Hall Of India Pvt. Limited | - | 2003 |
| 2 | Understanding Pointers in C | Yashavant Kanetkar | BPB Publication | 1 | 2009 |
| 3 | C and Data Structures | N. B. Venkateshwarlu, E. V. Prasad | S. Chand and Company | - | 2010 |
| 4 | Let Us C | Yashavant Kanetkar | BPB Publication | 15 th | 2016 |



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| Class | | S Y B. Tech Sem III | |
| Course Code & Course Title | | 2CSPC203- Computer Organization and Architecture | |
| Prerequisite/s | | -- | |
| Teaching Scheme (Lecture/Practical/Tutorial) | | 03/02/00 | |
| Credits | | 04 | |
| Evaluation Scheme: | Theory | ISE/ MSE/ ESE | 40/30/30 |
| | Practical | ISE | 50 |

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

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|------------|---|
| 2CSPC203_1 | Explain architectures of Microprocessors for demonstrating working of data, address and control bus by using its pin configuration. |
| 2CSPC203_2 | Explain the evolution of computers & computer organization basics for understanding of the components of the system with the use of the architecture diagram. |
| 2CSPC203_3 | Illustrate Control design and memory organization for designing of the memory system by using independent memory chips. |
| 2CSPC203_4 | Solve arithmetic operations, memory and parallel processing operation with the help of ALU |
| 2CSPC203_5 | Construct flowchart and Data flow diagrams for 8085 assembly language program by using proper symbols of flowchart and DFD. |
| 2CSPC203_6 | Demonstrate use of assembly language programming for 8085 microprocessor by using 8085 simulator. |

Course Contents:

| Unit No | Unit Name | Contact Hours |
|---------------|--|---------------|
| Unit 1 | 8085 Microprocessor Architecture The 8085 MPU, Microprocessor communication and bus timing, De-multiplexing address and Data bus, Generating control signals, The 8085 Architecture, and 8085 based microcomputer-machine cycles and bus timing, op-code fetch machine cycle, memory read and write machine cycle. | 06 Hrs. |
| Unit 2 | 8085 assembly language programming The 8085 programming model, instruction classification, instruction and data format, Writing and execution of assembly language program. The 8085 instruction-data transfer operations, Arithmetic operation, Flag concept and cautions, Logic operations, Branch operations. | 07 Hrs. |
| Unit 3 | Basic Computer Organization Evolution of computers - Mechanical era, Electronic computers, CPU organization, Data representations, Instruction Sets, RISC & CISC, definition, comparison and examples | 07 Hrs. |
| Unit 4 | Control Design and memory organization: Basic concepts, Hardwired control Unit, Micro-programmed control unit, Memory Technology, Memory Systems, Caches: Main features | 06Hrs. |



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| Unit 5 | Computer Arithmetic: Number representation : Signed Integers ,Fixed point numbers, Floating point numbers, Floating point arithmetic's: Floating point addition, other Floating point operations, Booth's Algorithm, IEEE Standards for Floating point representations (Single & Double Precision Format) | 07 Hrs. |
| Unit 6 | Different parallel processing architectures: Introduction to Associative memory processors, Principles of multithreading, Latency hiding techniques. | 06 Hrs. |

| List of Practical's | | |
|----------------------------|---|----------------------|
| Expt. No. | Title of Experiment | Contact Hours |
| 1 | Introduction to 8085 8-bit Microprocessor (Study Experiment) | 2 Hrs |
| 2 | Programs based on Arithmetic Operations of two 8 bit Numbers of 8085 Microprocessor. | 2 Hrs |
| 3 | Programs based on Logical Operations of 8085 Microprocessor | 2 Hrs |
| 4 | Program based on Branching Operations of 8085 Microprocessor | 2 Hrs |
| 5 | Program based on Conditional CALL and RET of 8085 Microprocessor using Simulator. | 2 Hrs |
| 6 | Program on data transfer from one Block to another block of Memory | 2 Hrs |
| 7 | Program based on interfacing between 8085 Microprocessor and I/O devices for designing interface structure. | 2 Hrs |
| 8 | Program based on Stack and subroutine of 8085 Microprocessor | 2 Hrs |
| 9 | Case study on Designing of a Memory system using Multiple Memory Independent Chips | 2 Hrs |
| 10 | Case study on Demonstration of Parallel Processors using Pipeline architectures | 2 Hrs |

| Text Books: | | | | | |
|--------------------|---|----------------------------------|----------------------|----------------|------------------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Microprocessor Architecture – programming and applications with 8085 | Ramesh Gaonkar | Penram International | | 2007 |
| 02 | The INTEL Microprocessors - Architecture, Programming and Interfacing | Barry B. Brey Seventh Edition | PHI Ltd | 8th | 2010 |
| 03 | Computer Architecture and Organization | John P Hayes | McGraw-Hill | 3 | - |
| 04 | Advanced computer architecture | Kai Hwang | McGraw-Hill | - | 2010 |



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| Reference Books: | | | | | |
|------------------|--|-----------------------------|-------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Microcomputer system – The 8086/8088 family | Liu & Gibson | PHI | 1st | 2001 |
| 02 | Advanced microprocessors & peripherals | A K Ray & K M Bhurchandi | Tata McGrawHill | 2nd | 2012 |
| 03 | Computer Architecture | Behrooz Parhami | Oxford University Press | 1 | 2006 |
| 04 | Computer Architecture and parallel processing | Kai Hwang and Faye A Briggs | McGraw-Hill | - | 1985 |
| 05 | Computer Systems Organization and Architecture | John D. Carpinelli | PEARSON Education | 3 | 2008 |



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| Class | | S Y B. Tech Sem III | |
| Course Code & Course Title | | 2CSPC204 Operating System | |
| Prerequisite/s | | Computer Programming | |
| Teaching Scheme (Lecture/Practical/Tutorial) | | 03/00/02 | |
| Credits | | 04 | |
| Evaluation Scheme: | Theory | ISE/ MSE/ ESE | 40/30/30 |
| | Practical | ISE | 50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC204_1 | Explain basic concepts of operating system and their structures to compare various operating systems using various OS parameters. |
| 2CSPC204_2 | Analyze issues related to process scheduling and resource management with the help of different scheduling algorithm. |
| 2CSPC204_3 | Develop appropriate solution to solve critical section problem by using accurate operating system algorithm |
| 2CSPC204_4 | Use deadlock handling and Memory management techniques with suitable method to handle a deadlock and memory management. |
| 2CSPC204_5 | Analyze the performance of the various page replacements and Scheduling Algorithms for efficient resource management |
| 2CSPC204_6 | Proficiently Develop and debug, C programs for different operating system concepts on linux platforms |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Overview Introduction to Operating Systems, Operating System structure, Types of Operating Systems, Operating System Services, Views of Operating System, System calls, Types of system Calls, System programs, Kernel-Types of kernel, Overview of Linux and Android OS | 06 Hrs. |
| Unit 2 | Process Management Process concept: Basic concepts, Process States, Process Control Block, Context switch, Operations on processes, Inter-process communication, Threads Process Scheduling: Scheduling criteria, Types of Scheduler, Scheduling algorithms, Multiple-Processor scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling | 08 Hrs. |
| Unit 3 | Process Synchronization Background, the critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of Synchronization, Monitor | 06 Hrs. |
| Unit 4 | Deadlock | 05 Hrs. |



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| | System model, deadlock characterization, methods for handling deadlocks, deadlock preventions, deadlock avoidance, deadlock detection, deadlock recovery. | |
| Unit 5 | Memory Management Memory Management Strategies: Background, swapping, contiguous memory allocation, paging, structure of the page table, Segmentation. Virtual Memory Management: Background, demand paging, copy-on-write, page replacement, Thrashing | 08 Hrs. |
| Unit 6 | File System & I/O Subsystem File System: File concept, access methods, Directory and disk structure, Disk Scheduling, file-system mounting, file sharing, protection, Overview of I/O system, I/O hardware, Application I/O interface, Kernel I/O subsystem. | 06 Hrs. |

| List of Practical's | | |
|---------------------|---|---------------|
| Expt. No. | Title of Experiment | Contact Hours |
| 1 | Installation of various Operating System. | 2 Hrs |
| 2 | Demonstration of basics of UNIX utility commands. | 2 Hrs |
| 3 | Demonstration of File and Directory management Commands | 2 Hrs |
| 4 | Demonstration of various File access and permission Commands | 2 Hrs |
| 5 | Program based on CPU Scheduling Algorithms. | 2 Hrs |
| 6 | Program to simulate producer-consumer problem using semaphores. | 2 Hrs |
| 7 | Program based on Bankers algorithm for Deadlock Avoidance. | 2 Hrs |
| 8 | Program to simulate Paging technique of memory management. | 2 Hrs |
| 9 | Program based on Page Replacement Policies. | 2 Hrs |
| 10 | Program based on Disk scheduling. | 2 Hrs |
| 11 | Program based on various I/O System calls of UNIX operating System. | 2 Hrs |

| Text Books: | | | | | |
|-------------|--|-----------------------|------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1. | Operating System Concepts Gagne | Silberschatz, Galvin, | John Wiley | 8 | 2009 |
| 2. | Operating Systems - A Concept Based approach | Dhananjay M Dhamdhare | Tata McGraw Hill | 3 | 2007 |



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| 3. | Understanding Operating System | Flynn,(Thomson) | Ann McHoes& Ida M. | 6 | 2014 |
| 4. | Operating Systems: Principles and Practice | Thomas Anderson and Michael Dahlin | Recursive Books | 1 | 2012 |

| Reference Books: | | | | | |
|------------------|--|------------------|-------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | The design of Unix Operating System | Maurice J. Bach | (PHI) | 1 | 2006 |
| 02 | A practical Guide to Linux commands, Editors and shell programming | Mark G. Sobell | Pearson Education India | 3 | 2013 |
| 03 | Operating Systems concepts and design | Milan Milenkovic | TMGH | 2 | 2001 |



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|---|-----------------------------|
| Class | S.Y B. Tech, Sem. III |
| Course Code and Course Title | 2CSHS205, Psychology |
| Prerequisite/s | - |
| Teaching Scheme: Lecture/Tutorial/Practical | 2/0/0 |
| Credits | 02 |
| Evaluation Scheme Theory : ISE | 50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSHS205_1 | Identify types of emotions, domains of emotional intelligence and their effects on individual and group behaviour for fostering empathy and positive relationships. |
| 2CSHS205_2 | Explain human behaviour, cognition, and emotions by psychological theories in real-life scenarios and contexts. |
| 2CSHS205_3 | Discuss effective time management strategies to overcome time-related challenges. |
| 2CSHS205_4 | Interpret psychological factors that contribute procrastination to recognize the situational triggers. |
| 2CSHS205_5 | Apply the A-B-C model to manage stress for well-being. |

| Course Contents: | | Hrs. |
|-------------------------|---|----------------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Psychology – Definition of Psychology, Different fields of Psychology, Introduction and Need of psychology | 2 Hrs |
| Unit 2 | Emotional Intelligence (EI) (Part one)– Role of Emotions, Types of Emotions, Emotions/ stress and performance | 4 Hrs |
| Unit 3 | Emotional Intelligence (EI) (Part Two)– Definition of Emotional Intelligence, Key signs of emotional Intelligence, How EI helps students, Marshmallow Experiment, Five domains of Emotional Intelligence | 6 Hrs |
| Unit 4 | Time Management– Definition of Time Management, Need and importance of Time management for an individual, Effective steps/ strategies of Time Management, Obstacles of Time Management | 4 Hrs |
| Unit 5 | Procrastination – Definition of Procrastination, Types of Procrastination excuses , How to work on excuses, Why Do People Procrastinate?, Procrastination Cycle, Challenging Your assumptions, techniques to beat Procrastination | 5 Hrs |
| Unit 6 | Stress Management – Definition of Stress, A-B-C model for Stress, Identifying Stressful Thoughts and identifying cognitive distortions, Restructuring, Behavioural Coping Strategies | 5 Hrs |

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| Text Books: | | | | | |
|-------------|--|--|--|---------|-----------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Organizational Behaviour- An Evidence-Based Approach | Fred Luthan | McGraw-Hill/Irwin | 12th | 2011 |
| 2 | Essentials of Organizational Behaviour | Stephen P. Robbins Timothy A. Judge Katherine E. Breward | Pearson | - | 2018 |
| 3 | Essentials of organizational Behaviour | Stephen P. Robbins | Prentice Hall | 7th | 2002 |
| 4 | Understanding and Managing Organizational Behaviour | Jennifer M. George Gareth R. Jones | Pearson | 6th | 2012 |
| 4 | Emotional Intelligence at Work A Professional Guide | Dalip Singh | Response Books A division of Sage Publications | 3rd | 2006 |



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| Class | SY B. Tech, Sem. III |
| Course Code and Course Title | 2CSPC206 – C++ Programming |
| Prerequisite/s | Computer Programming |
| Teaching Scheme: Lecture/Tutorial/Practical | 02/00/02 |
| Credits | 03 |
| Evaluation Scheme Practical : ISE / ESE | 50/50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC206_1 | Apply the concept of class, object, array, pointers inheritance and polymorphism to solve mathematical problems using Turbo C++, Dev C++. |
| 2CSPC206_2 | Make use of the various library utilities and advanced features like Template, STL to execute and handle multiple programs using Turbo C++, Dev C++. |
| 2CSPC206_3 | Demonstrate Stream I/O and File I/O to perform read and write operations using Turbo C++, Dev C++. |
| 2CSPC206_4 | Evaluate the compile time and run time error by using appropriate syntax |
| 2CSPC206_5 | Develop application to solve real world problems by using C++ programming language |

| Course Contents: | | |
|-------------------------|---|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Fundamentals of Object Oriented Programming The Origins of C++, C++ key words, Abstraction, Encapsulation, Polymorphism, Inheritance, Constructors & Destructors, Classes & Objects - Relation of Classes, Friend Functions, Friend Classes, Inline Functions, Parameterized constructors, Scope resolution operators, Passing objects to functions, nested classes, and local classes. | 05 Hrs. |
| Unit 2 | Arrays & Pointers Arrays, Arrays of different data types, Arrays of objects Pointers: declaring and initializing pointers, indirection Operators, Pointers to Objects, this pointer, Pointers Vs Arrays, accessing Arrays using pointers, Arrays of Pointers, Function pointers Memory Management: new and delete | 06 Hrs. |
| Unit 3 | Inheritance: Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hybrid Inheritance, hierarchical Inheritance, | 03 Hrs. |
| Unit 4 | Polymorphism- Function Overloading, Operator Overloading, Virtual base classes. Virtual functions, Pure virtual function, Abstract classes, Early vs Late binding. | 03 Hrs. |
| Unit 5 | File and Streams: Overview of C++ Stream classes, String I/O, Character I/O, Object I/O, I/O with multiple objects, File pointers and redirections. Exception Handling: Fundamentals, Handling derived class exceptions, exception handling options, catching, throwing. | 06 Hrs. |



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| Unit 6 | <p>Templates: Generic classes, Generic functions, Applying generic functions, type name & export keyword, power of templates. Namespace fundamentals,</p> <p>Standard Template Library: STL containers, STL algorithms, STL iterative & C++ streams, Run-Time Type ID (RTTI)</p> | 05 Hrs. |
|---------------|--|---------|

| List of Practical's | | |
|----------------------------|---|---------------|
| Expt. No. | Title of Experiment | Contact Hours |
| 1 | Implement student grading system using class and object concept in C++. | 2 Hrs |
| 2 | Implement concept of Constructor & Destructor. (Create Object Dynamically) | 2 Hrs |
| 3 | Implement Function Overloading and Constructor Overloading concept. | 2 Hrs |
| 4 | Implement program for unary and binary Operator Overloading. | 2 Hrs |
| 5 | Implement Multilevel and Multiple Inheritance concept. | 2 Hrs |
| 6 | Implement program for Hierarchical and Hybrid Inheritance. | 2 Hrs |
| 7 | Implement Friend Function and Friend Class concept in C++ | 2 Hrs |
| 8 | Implement Virtual Function and Virtual Class concept in C++ | 2 Hrs |
| 9 | Implement of student database using concept of File Handling. (Read Write Operations) | 2 Hrs |
| 10 | Implement concept of Exception Handling. | 2 Hrs |
| 11 | Implement concept of bubble sort and selection sort algorithm using Function Template | 2 Hrs |
| 12 | Implement Stack and Queue using Class Template. | 2 Hrs |

| Text Books: | | | | | |
|--------------------|------------------------------------|-------------------|-------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | The Complete Reference: C++ | Herbert Schildt, | Tata McGraw-Hill, | 4 | 2010 |
| 02 | C++ Programming with language | Bjarne Stroustrup | AT & T | 4 | 2013 |
| 03 | Programming with C++ | E Balagurusammy | TMGH | 4 | 2010 |
| 04 | Object oriented programming in C++ | Rajesh K Shukla | Willey | 1 | 2008 |




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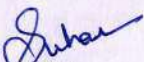

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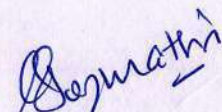

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| Reference Books: | | | | | |
|------------------|--|-------------------|-----------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Object Oriented Programming in Turbo C++ | Robert Lafore | Galgotia | 4 | 2010 |
| 02 | C++ Programming | John Thomas Berry | PHI | 2 | 1992 |
| 03 | Programming with C++ | D. Ravichandran, | TMGH | 3 | 2011 |
| 04 | Test your C++ Skills | Yashwant Kanetkar | BPB | 1 | 2010 |




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|-----------------------------------|--|
| Class | S.Y.B. Tech, Sem.- III |
| Course Code and Course Title | 2CSHS207, Constitution of India |
| Prerequisite/s | -- |
| Teaching Scheme: Lecture/Tutorial | 01 / 00 |
| Credits | 01 |
| Evaluation Scheme Theory : ISE | 25 |

Course Outcomes (COs):After successful completion of this course, the student will be able to:

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| 2CSHS207_1 | Explain the meaning, important acts and history related to Indian constitution. |
| 2CSHS207_2 | Illustrate the features of Indian constitution and interpretation of Preamble. |
| 2CSHS207_3 | Interpret fundamental rights and duties of the Indian Citizen to inculcate morality and their social responsibilities. |
| 2CSHS207_4 | Identify different laws and regulations based upon Information Acts. |
| 2CSHS207_5 | Distinguish the functioning of Indian parliamentary system and legislative system at the centre and state level. |

| Course Contents: | | Hrs |
|------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Constitution: Basic Structure Meaning of the constitution law and constitutionalism, Historical perspective of the constitution of India, Government of India Act of 1935 and Indian Independence Act of 1947. | 02 |
| Unit 2 | Making of Indian Constitution : Enforcement of the Constitution, Meaning and importance of Constitution, Making of Indian Constitution – Sources, Salient features of Indian Constitution, Preamble. | 02 |
| Unit 3 | Fundamental Rights: Fundamental Rights – Features and characteristics, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. | 03 |
| Unit 4 | Fundamental Duties: Directive Principles-Definition and Meaning, 42 nd Constitutional Amendment Act, List and Importance of Fundamental Duties. | 02 |
| Unit 5 | Regulation to Information : Introduction, Right to Information Act:2005, Information Technology Act 2000, Electronic Governance in India, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Limitations of an Information Technology Act | 02 |



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| Unit 6 | Government of The Union and States: President of India – Election and Powers, Prime Minister of India - Election and Powers, Lok Sabha - Structure, Rajyasabha – Structure, Governor of State, Chief Minister and Council of Ministers in a state. | 02 |
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| Text Books: | | | | | |
|--------------------|---|----------------|---------------------------------|----------------|------------------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Indian Polity | M.Laxmikanth | Mc Graw Hill Publications Delhi | 7 | 2023 |
| 2 | The Constitution of India | P.M. Bakshi | Lexis Nexis | 19 | 2023 |
| 3 | Introduction to the Constitution of India | Durga Das Basu | Lexis Nexis | 26 | 2022 |
| 4 | Governance in India | M. Laxmikanth | Mc Graw Hill Publications Delhi | 3 | 2021 |

| Reference Books: | | | | | |
|-------------------------|----------------------------------|---------------|---------------------------------|----------------|------------------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Constitution of India | V.N.Shukla | EBC | 14 | 2022 |
| 2 | The Constitutional Law of India, | J.N. Pandey | Allahabad; Central Law Agency | 59 | 2022 |
| 3 | Constitution of India | V.N.Tripathi | Premier Publishing Company | 9 | 2021 |
| 4 | India's Constitution | M.V.Pylee | S. Chand Publications New Delhi | 18 | 2020 |



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|---|---|
| Class | S Y B. Tech Sem III |
| Course Code & Course Title | 2CSCC208-Aptitude and Reasoning Part-I |
| Prerequisite/s | - |
| Teaching Scheme (Lecture/Practical/Tutorial) | 0/2/0 |
| Credits | 01 |
| Evaluation Scheme Practical: ISE | 50 |

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| Course Outcomes (COs) : The students will be able to: | |
| 2CSCC208_1 | Solve problems based on Vedic Mathematics, Calendar, Average, Age, |
| 2CSCC208_2 | Solve problems based on Speed Time distance and equations |
| 2CSCC208_3 | Solve problems based on Blood Relations, Directions, Time Rate Work, Pipes and Tanks, Percentage, Profit and Loss |
| 2CSCC208_4 | Solve Problems based on Spot the Error and Jumbled Para |

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| Course Contents: | | |
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Vedic Mathematics, Calendar | 4 Hrs |
| Unit 2 | Average, Ages | 4 Hrs |
| Unit 3 | Speed Time Distance, Equations | 4 Hrs |
| Unit 4 | Blood Relations, Directions, Time Rate Work, Pipes and Tanks | 4 Hrs |
| Unit 5 | Percentage, Profit and Loss | 4 Hrs |
| Unit 6 | Spot the Error, Jumbled Para | 4 Hrs |
| | Self-Study Module | 6 Hrs |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|-------------|-----------|---------|-----------------|
| 1 | R.S. Agarwal (Quantitative aptitude) | R.S.Agarwal | S Chand | - | 2019 |
| 2 | R.S. Agarwal (Verbal & Non-verbal Reasoning) | R.S.Agarwal | S Chand | - | 2010 |
| 3 | Wren & Martin (Verbal, Grammar) | P.C.Wren | S Chand | - | 2017 |

Reference Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|--------------------|-------------|---------|-----------------|
| 1 | APTIPEDIA (Quantitative, Logical, Verbal Aptitude) | Face | Wiley | - | 2017 |
| 2 | Wiley (Quantitative Aptitude) | P.A.Anand | Maestro | - | 2015 |
| 3 | Arun Sharma (Verbal Ability) | Meenakshi Upadhyay | McGraw Hill | - | 2020 |



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| Class | S. Y. B. Tech., Sem.-IV |
| Course Code and Course Title | 2CSPC209-Fuzzy Systems and Operational Research |
| Prerequisite/s | - |
| Teaching Scheme: Lecture/Tutorial | 3/1 |
| Credits: | 04 |
| Evaluation Scheme: Theory | 40 / 30/ 30 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC209_1 | Construct different fuzzy sets using basic definitions of fuzzy sets. |
| 2CSPC209_2 | Use the extension principle on fuzzy numbers/sets to develop arithmetic operations. |
| 2CSPC209_3 | Make use of concept of Game Theory to solve the engineering problems. |
| 2CSPC209_4 | Solve different types of assignment problems by using different techniques. |
| 2CSPC209_5 | Solve problems in probability theory using distributions and test of hypothesis |

| Course Contents: | | |
|-------------------------|---|---------------|
| Unit No. | Name of the Unit | Contact Hours |
| Unit 1 | Introduction to Fuzzy sets. 1.1 Basic concepts of Fuzzy Sets 1.2 Crisp Set and Fuzzy Set 1.3 Membership Functions 1.4 Basic operations on fuzzy sets 1.5 Properties of fuzzy sets. | 07 Hrs. |
| Unit 2 | Fuzzy Arithmetic 2.1 Fuzzy Numbers 2.2 Fuzzy Cardinality 2.3 Operations on Fuzzy Numbers 2.4 Fuzzy Equations of Type $A + X = B$ and $A.X = B$. | 07 Hrs. |
| Unit 3 | Game Theory 3.1 Introduction, Two Person Zero Sum Game 3.2 Maximin-Minimax Principle 3.2 Algebraic Method and Arithmetic Method 3.3 Dominance Principle 3.4 Sub-Game Method 3.5 Graphical Method | 06 Hrs. |
| Unit 4 | Assignment Problems 4.1 Introduction, Definition 4.2 Hungarian method of solving balanced assignment problems 4.3 Hungarian method of solving unbalanced assignment problems 4.4 Maximisation in Assignment Problem, Traveling salesmen problem. | 07 Hrs. |
| Unit 5 | Probability Distribution 5.1 Random variable 5.2 Binomial Distribution 5.3 Poisson Distribution 5.4 Normal Distribution. | 06 Hrs. |



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| Unit 6 | Statistical Interference- Test of Hypothesis 6.1 Sampling distributions 6.2 Testing of Hypothesis 6.3 Level of Significance 6.4 Testing of Significance for large sample 6.5 Testing of Significance for small sample: Students t-distribution and Chi- Square Test | 06 Hrs. |
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| List of Tutorials | |
|--------------------------|--|
| Sr. No. | Title of Tutorials |
| 1 | Introduction to Fuzzy sets -I |
| 2 | Introduction to Fuzzy sets -II |
| 3 | Fuzzy Arithmetic - I |
| 4 | Fuzzy Arithmetic - II |
| 5 | Game Theory |
| 6 | Assignment Problems |
| 7 | Probability Distribution |
| 8 | Statistical Interference- Test of Hypothesis |

| Text Books: | | | | | |
|--------------------|---|----------------------------|------------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Higher Engineering Mathematics | Dr. B. S Grewal | Khanna Publishers | 44 | 2018 |
| 02 | A Text Book of Engineering Mathematics (For Unit 1) | N. P. Bali, Manish Goyal | Laxmi Publications(P) Ltd | 8 | 2011 |
| 03 | Advanced Engineering Mathematics | H. K. Dass | S. Chand | 22 | 2018 |
| 04 | Fuzzy Sets & Fuzzy Logic Theory and Applications (For Unit 2&3) | George J. Klir and Bo Yuan | PHI Learning Private Limited | - | 2013 |

| Reference Books: | | | | | |
|-------------------------|---|---------------------|-------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Probability and Statistics for Computer Science | James L. Johnson | Wiley Publication | 1 | 2008 |
| 02 | Probability and Statistics for Engineers | Dr. J. Ravichandran | Wiley Publication | 1 | 2012 |
| 03 | Advanced Engineering Mathematics | Erwin Kreyszig | Wiley Publication | 9 | 2013 |
| 04 | Fuzzy Logic with Engineering Applications | Timothy J. Ross | Wiley Publication | 3 | 2013 |



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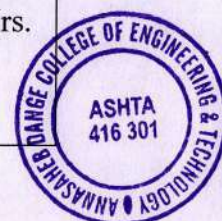
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|--|--------------------------------------|---------------|----------|
| Class | S Y B. Tech. Sem IV | | |
| Course Code and Course Title | 2CSPC210 Database Engineering | | |
| Prerequisite/s | - | | |
| Teaching Scheme (Lecture/Practical/Tutorial) | 03/00/02 | | |
| Credits | 04 | | |
| Evaluation Scheme: | Theory | ISE/ MSE/ ESE | 40/30/30 |
| | Practical | ISE | 50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC210_1 | Design an ER diagram and relational schema to solve given problem using integrity constraints and normalization techniques. |
| 2CSPC210_2 | Apply the concepts of database system, conceptual database design, relational algebra, SQL, normalization to solve the given problems through designing the database. |
| 2CSPC210_3 | Apply concepts transaction processing and concurrency control to improve the security and system performance using transaction management, concurrency control and recovery techniques. |
| 2CSPC210_4 | Demonstrate concepts of indexing, concurrency protocols and recovery algorithms to solve real world problems using DBMS concepts. |
| 2CSPC210_5 | Identify and Formulate the queries to perform the create, delete, extract and update operations on the database using structured query language. |
| 2CSPC210_6 | Adapt professional skills and ethical practices to provide a reliable solution for defined real world problem through participating in team activities. |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | <p>Introduction to databases and ER Model</p> <p>Introduction: General introduction to database systems, its advantages and applications, View of Database – Levels of data abstraction, Data models, Database languages, Database System Architecture, Database users and Administrator</p> <p>ER Model: Entity set, Entity types, attributes, Notations, Relationship sets, Relationship types, Keys- super key, candidate key, primary key, Extended Features of ER Model-Generalization, Specialization and aggregation</p> | 6 Hrs. |
| Unit 2 | <p>Relational Model and SQL Relational Model:</p> <p>Structure of Relational Database, Reduction of ER model into Relational schemas, Schema-instance distinction, Referential integrity and foreign keys, Pure languages, Relational algebra, Example queries</p> <p>SQL: Introduction to SQL, Data definition statements with constraints, Insert, Update and Delete, Set Operations, Aggregate functions group by and having clauses, Nested Queries, Views, Complex Queries, Joins.</p> | 9 Hrs. |



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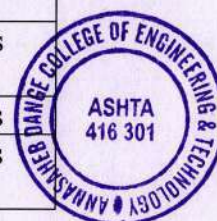
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| Unit 3 | Functional Dependency and Normalization Importance of a good schema design, Motivation for normal forms, Atomic domains and 1NF, Dependency theory - functional dependencies, Closure of a set of FD's, Definitions of 2NF, 3NF and BCNF, Decomposition algorithms and desirable properties of them, Multivalued dependencies and 4NF, Join dependencies and definition of 5NF. | 5 Hrs. |
| Unit 4 | Data Storage & Indexing File organization, Organization of records in files, Data Dictionary, Database Buffer Indexing: Concept, Ordered Indices-Primary, Secondary, Multilevel, B+ Tree Index, Hashing, Hash Indices, Dynamic hashing, Multiple key access, Bitmap Indices | 6 Hrs. |
| Unit 5 | Transaction Management & Concurrency Control Transaction Processing: Concept, ACID properties, Transaction states, Storage Structure, Implementation of atomicity, isolation and durability, Serializability, Testing of Serializability. Concurrency Control: Lock-based protocols, Timestamp - based Protocols, Validation -based Protocols, Multiple Granularities, Deadlock handling. | 7 Hrs. |
| Unit 6 | Recovery System Failure classification, Storage structure, Implementation of stable storage, Recovery and Atomicity, Log based recovery, Checkpoints, Shadow Paging, Buffer Management in crash recovery. | 6 Hrs. |

| Course Contents: | | |
|------------------|---|---------------|
| Expt. No. | Title of Experiment | Contact Hours |
| 1 | Drawing an E-R Diagram for any organization. | 2 Hrs |
| 2 | Converting E-R diagram into Relational Tables. | 2 Hrs |
| 3 | Installation and Demonstration of DBMS Oracle / MySQL / SQL Server / PostgreSQL etc. | 2 Hrs |
| 4 | Study and Implementation of Data Definition Language (DDL) Queries (e.g. create, alter and drop tables). | 2 Hrs |
| 5 | Study and Implementation of Data Manipulation Language (DML) Queries (e.g. insert, delete, update and select statements). | 2 Hrs |
| 6 | Study and Implementation of Basic SQL SELECT statement for displaying / extracting data from single table or multiple tables. | 2 Hrs |
| 7 | Study and implementation of SQL constructs for aggregating data, use of group by, having clauses. | 2 Hrs |
| 8 | Study and implementation of nested sub-queries, complex queries, views and Joins. | 2 Hrs |
| 9 | Study and Implementation of Triggers. | 2 Hrs |
| 10 | Study and Implementation of Functions and Stored Procedures. | 2 Hrs |
| 11 | Implementation of Database connectivity with object oriented language (Java). | 2 Hrs |
| 12 | Few aspects of authorization such as creating and managing users, roles, granting and revoking of privileges etc. | 2 Hrs |
| 13 | Creating Indices for the tables, implementing static hashing. | 2 Hrs |
| 14 | Study and Implementation of Transaction processing and concurrency control techniques. | 2 Hrs |



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| Text Books: | | | | | |
|-------------|--|---|---------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Database system concepts | A. Silberschatz, H.F. Korth, S.Sudarsha | McGraw Hill Education | 6 | 2011 |
| 02 | Database Systems- A practical approach to Design, Implementation | Thomos Connolly, Carolyn Begg | Pearson Education. | 4 | 2009 |
| 03 | Database Systems – Design, Implementation and Management | Rob & Coronel | Thomson Course Technology | 5 | 2008 |
| 04 | Database Management Systems | Raghu Ram Krishnan | McGraw Hill | 3 | 2002 |

| Reference Books: | | | | | |
|------------------|---|--|-----------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Fundamentals of Database Systems | Ramez Elmasri and Shamkant Navathe | Pearson Education | 4 | 2007 |
| 02 | Database Systems: Design, Implementation and management | Peter Rof, Carlos Coronel | Cengage Learning | 7 | 2014 |
| 03 | Principles of Database Systems | J. D. Ullman | Galgotia publications | 1 | 2011 |
| 04 | SQL: A Complete Reference | <u>Alexis Leon,</u> <u>Mathews</u> <u>Leon</u> | McGraw Hill Education | 1 | 2002 |



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|-----------------------------------|-----------------------------------|
| Class | S Y B.Tech, Sem. IV |
| Course Code and Course Title | 2CSPE211- Storage Networks |
| Prerequisite/s | 2CSPC106, 2CSPC204 |
| Teaching Scheme :Lecture/Tutorial | 03/00 |
| Credits | 03 |
| Evaluation Scheme: ISE/MSE/ESE | 40/30/30 |

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| Course Outcomes(COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPE211_1 | Apply different technique to evaluate performance of storage system using disk performance laws |
| 2CSPE211_2 | Analyze different intelligent storage system to create professional storage environment based on all the components. |
| 2CSPE211_3 | Distinguish Storage network technologies for its appropriate application using different topologies and protocols |
| 2CSPE211_4 | Compare virtualization techniques for its practical application using various parameters. |
| 2CSPE211_5 | Select backup & recovery process of storage network by considering business continuity aspects |
| 2CSPE211_6 | Comprehend replication process of storage system considering security aspects |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Introduction to information storage and Storage System Environment Evolution of storage technology and architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle, Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Laws Governing Disk Performance, Logical Components of Host, Application Requirements and Disk Performance. | 06 Hrs |
| Unit 2 | Intelligent Storage System Components of Intelligent Storage System, Intelligent Storage Array. Direct attached Storage–types, benefits and limitation, Disk drive Interface, Introduction to parallel SCSI, SCSI command model. RAID - Implementation of RAID, RAID array components, RAID levels, Hot Spares | 05 Hrs |



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| Unit 3 | Storage Area Network and Network Attached Storage SAN–Evolution, Components of SAN, Fibre Channel Protocol Stack Links, ports and topologies, Fiber Channel SAN–Point to Point topology, Fabric topology, Arbitrated Loop Topology. NAS- Local File Systems ,Network File System and File Servers, Benefits of NAS, NAS file I/O, Components of NAS, NAS Implementations, NAS File sharing Protocols, NAS/I/O Operations, Factors affecting NAS Performance. | 09 Hrs |
| Unit 4 | Storage Virtualization Definition of Storage Virtualization; Implementation Considerations; Storage virtualization on Block and file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in network. | 05 Hrs |
| Unit 5 | Business Continuity, Backup and Recovery Introduction, Information Availability, Cause of Information unavailability, Measuring information Availability, Consequences of downtime, BC terminology, BC planning lifecycle, Failure Analysis, BC Technology Solutions, Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topology, Backup in NAS environment, Backup Technologies | 09 Hrs |
| Unit 6 | Replication and Storage Security Local Replication, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations. Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking. | 05 Hrs |

| Text Books: | | | | | |
|--------------------|--|---|------------------------|----------------|------------------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Information Storage and Management | G. Somasudaram | EMC Education Services | 1 | 2010 |
| 2 | Storage Networks Explained | Ulf Troppen, Rainer Erkens, Wolfgang Müller | (Wiley India Edition) | 1 | 2008 |
| 3 | Storage Networks- The Complete Reference | Robert Spalding | Tata McGraw Hill | 1 | 2003 |
| 4 | Storage Network Management and Retrieval | Vaishali D.Khairnar, NilimaM. Dongre | Wiley | 1 | 2016 |



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| Reference Books: | | | | | |
|------------------|---|-----------------------------------|-------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Storage Networking Fundamentals: An Introduction to Storage Devices, Subsystems, Applications, Management ,and File Systems | Marc Farley | Cisco Press | 1 | 2005 |
| 2 | Information Storage and Retrieval | R. Korfhage | Wiley | 1 | 1997 |
| 3 | Storage Area Network Essentials :A Complete Guide to Understanding and Implementing SANs | Richard Barker and Paul Massiglia | Wiley | 1 | 2001 |
| 4 | Using SANs and NAS | W. Curtis Preston, | O'Reilly | 1 | 2002 |



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|-----------------------------------|---------------------------------|
| Class | S.Y. B. Tech., Sem.-IV |
| Course Code and Course Title | 2CSPE212 -Adhoc Networks |
| Prerequisite` | 2CSPC106-Computer Networks |
| Teaching Scheme: Lecture/Tutorial | 03/00 |
| Credits | 03 |
| Evaluation Scheme: ISE/MSE/ESE | 40/30/30 |

Course Outcomes (COs) :After successful completion of this course, the students will be able to:

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| 2CSPE212_1 | Describe the unique issues in ad-hoc/sensor networks to share network resources effectively using ad hoc wireless network. |
| 2CSPE212_2 | Interpret the operations and performance of various MAC layer protocols for wireless ad-hoc/sensor networks to solve the hidden terminal problem. |
| 2CSPE212_3 | Compare and analyze types of routing protocols used for unicast and multicast routing using route optimization techniques. |
| 2CSPE212_4 | Identify appropriate protocol for multicast routing to Examine security measures present at different level using reference model of multicast routing protocols. |
| 2CSPE212_5 | Analyze energy consumption and management to ensure quality of service for real time applications. |

| Course Contents: | | Hrs. |
|------------------|---|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit1 | Introduction to Ad-hoc wireless networks: Cellular and Ad Hoc wireless networks, Applications, Issues in Ad Hoc wireless networks, Ad hoc wireless Internet. Introduction to vehicular ad hoc networks and its applications. | 05 Hrs. |
| Unit2 | MAC Protocols for Ad-hoc wireless networks Introduction, Issues in designing MAC protocol, Design goals of MAC protocol, Classification of MAC protocols, Contention based protocols :- MACAW, Busy Tone Multiple Access, MACA-By Invitation, Media Access with Reduced Handshake. | 07 Hrs. |
| Unit3 | Routing protocols for Ad-hoc wireless networks Introduction, Issues in designing a routing protocol for ad hoc wireless networks, Classification of routing protocols, Table driven protocols :- DSDV, WRP, CGSR; On-Demand :- DSR, AODV, LAR, ABR, SSA, Hybrid routing protocols:-ZRP, ZHLS. | 08 Hrs. |
| Unit4 | Multicast Routing in Ad hoc wireless networks Introduction, Issues in designing a multicast routing protocol, Operation of multicast routing protocols, An architecture reference model for multicast routing protocols, Classification of multicast routing protocols, Tree-based Multicast Routing Protocols:- BEMR, MZRP, ABAM | 07 Hrs. |



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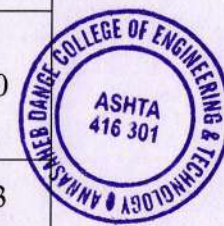
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| | MAODV; Mesh-based multicast routing protocols:- ODMRP, DCM, NSMP, CAMP. | |
| Unit5 | Transport layer and security protocols for ad hoc wireless networks Introduction, Design issues and goals, Classification of transport layer solutions, TCP over ad hoc wireless networks: - TCP-F, Ad Hoc TCP, Split TCP; Security in ad hoc wireless networks: - Network security requirements, Issues and challenges in security provisioning, Network security attacks, Secure routing protocol - SAR, Security-Aware AODV Protocol | 07 Hrs. |
| Unit6 | Quality of service & Energy Management: - Introduction, Issues and challenges, Need, Classification of QoS solutions and energy management scheme, QoS framework – INSIGNIA, System Power Management schemes | 05 Hrs. |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|---|---------------------|---------|-----------------|
| 01 | Ad Hoc wireless Networks – Architecture and Protocols | C.S.R.Murthy & B.S. Manoj | Pearson Education | 11 | 2012 |
| 02 | Ad Hoc Networking | Charles E. Perkins | Pearson Education | 3 | 2011 |
| 03 | Mobile AD HOC Networking, Student Edition | Stefano Basagni, Marco Conti, Silvia Giordano, Ivan Stojmenovic | Pearson Publication | 1 | 2010 |
| 04 | The Handbook of Ad Hoc Wireless Networks | Mohammad Ilyas Florida Atlantic University Boca Raton, Florida | CRC Press LLC | 1 | 2003 |

Reference Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|--|---|---------------------|---------|-----------------|
| 01 | Ad Hoc Wireless Networks – A communication Theoretic perspective | O.K.Tonguz & G.Ferrari | Wiley India | 1 | 2013 |
| 02 | Introduction to Wireless and Mobile Systems | Dharma Prakash Agrawal & Qing-An Zeng | CENGAGE Learning | 3 | 2012 |
| 03 | Mobile AD HOC Networking, Student Edition | Stefano Basagni, Marco Conti, Silvia Giordano, Ivan Stojmenovic | Pearson Publication | 1 | 2010 |
| 04 | The Handbook of Ad Hoc Wireless Networks | Mohammad Ilyas Florida Atlantic | CRC Press LLC | 1 | 2003 |



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|-----------------------------------|---|
| Class | S.Y. B. Tech., Sem.-IV |
| Course Code and Course Title | 2CSPE213-Advanced Mobile Communications (5G) |
| Prerequisite | 2CSPC106-Computer Networks |
| Teaching Scheme: Lecture/Tutorial | 03/00 |
| Credits | 03 |
| Evaluation Scheme: ISE/MSE/ESE | 40/30/30 |

Course Outcomes (COs) :After successful completion of this course, the students will be able to:

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| 2CSPE213_1 | Explain the channel models of 5G and the use cases for 5G for LTE and UMTS using existing RAT's (Radio Access Technology). |
| 2CSPE213_2 | Apply theories of MIMO in 5G and its techniques for controlling and managing network functions using RF management strategies. |
| 2CSPE213_3 | Explain 5G architecture, its components and functional criteria to control and manage network functions by creating end-to-end virtual networks. |
| 2CSPE213_4 | Analyze device to device (D2D) communication and standardization for effective resource management using cellular frequencies. |
| 2CSPE213_5 | Distinguish functioning of 5G radio access technologies for interference management, mobility management and security issues in 5G through policy-based security management |

| Course Contents: | | Hrs. |
|------------------|---|----------------|
| Unit1 | 5G channel modelling Modeling requirements and scenarios, Channel model requirements, Propagation scenarios, Relaying multi-hop and cooperative communications: Principles of relaying, fundamentals of relaying, Cognitive radio: Architecture, spectrum sensing, Software Defined Radio (SDR). | 06 Hrs. |
| Unit2 | Multiple-input multiple-output (MIMO) systems Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems. Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing. | 07 Hrs. |
| Unit3 | 5G architecture Introduction, NFV and SDN, Basics about RAN architecture, High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Functional split criteria, Functional split alternatives, Functional optimization for specific applications, Integration of LTE and new air interface to fulfill 5G Requirements, Enhanced Multi-RAT coordination features, Physical architecture and 5G deployment. | 07 Hrs. |
| Unit4 | Device-to-device (D2D) communications D2D: from 4G to 5G, D2D standardization: 4G LTE D2D, D2D in 5G: research challenges, Radio resource management for mobile broadband D2D, RRM techniques for mobile broadband D2D, RRM and system design for D2D, 5G D2D RRM concept: an example, Multi-hop D2D | 07 Hrs. |



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| | communications for proximity and emergency, services, National security and public safety requirements in 3GPP and METIS, Device discovery without and with network assistance | |
| Unit5 | The 5G radio-access technologies Access design principles for multi-user communications, Orthogonal multiple-access systems, Spread spectrum multiple access systems, Capacity limits of multiple-access methods, Sparse code multiple access (SCMA), Interleave division multiple access (IDMA), Radio access for dense deployments, OFDM numerology for small-cell deployments, Small-cell sub-frame structure, Radio access for V2X communication, Medium access control for nodes on the move, Radio access for massive machine type communication. | 07 Hrs. |
| Unit6 | Interference management, mobility management, and security for 5G Network deployment types, Ultra-dense network or densification, Moving networks, Heterogeneous networks, Interference management in 5G, Interference management in UDN, Interference management for moving relay nodes, Interference cancelation, mobility management in 5G, User equipment controlled versus network-controlled handover, Mobility Management in heterogeneous 5G networks. | 05 Hrs. |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|--|----------------------------|---------|-----------------|
| 01 | Fundamentals of 5G Mobile Networks | Jonathan Rodriguez | Wiley | 1 | 2010 |
| 02 | 5G Mobile and Wireless Communications Technology | Afif Osseiran, Jose F. Monserrat, Patrick Marsch | Cambridge University Press | 2 | 2011 |
| 03 | 5G NR: The Next Generation Wireless Access Technology | Erik Dahlman, Stefan Parkvall, Johan Sko'ld | Elsevier | 1 | 2016 |

Reference Books:

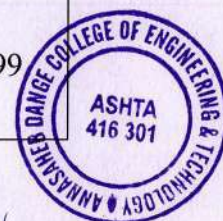
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|--|---|-----------------------------|---------|-----------------|
| 01 | Essentials of LTE and LTE-A | Amitabha Ghosh and Rapeepat Ratasuk | Cambridge University Press. | 1 | 2011 |
| 02 | Principles of Mobile Communication | Gordon L. Stuber, | KLUWER ACADEMIC PUBLISHERS | 2 | 2002 |
| 03 | Smart Antennas for Wireless Communications | Joseph C. Liberti, Theodore S. Rappaport, | Prentice Hall PTR | 1 | 1999 |

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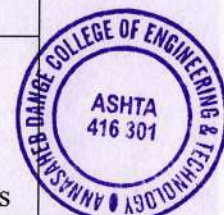
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| Class | S.Y. B. Tech., Sem.-IV |
| Course Code and Course Title | 2CSPE214 -Cyber Security and Laws |
| Prerequisite | Computer Networks, Operating System |
| Teaching Scheme: Lecture/Tutorial | 03/00 |
| Credits | 03 |
| Evaluation Scheme: ISE /MSE/ESE | 40/30/30 |

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| Course Outcomes (COs) : At the end of this course, the students will be able to | |
| 2CSPE214_1 | Explain concepts of cyber security and classify different cyber-attacks. |
| 2CSPE214_2 | Describe different cyber security safeguards including intrusion detection and prevention and firewalls |
| 2CSPE214_3 | Illustrate different web services, applications and related cyber-attacks and crimes. |
| 2CSPE214_4 | Analyze different types of possible attacks in a real-world cyber world Scenario. |
| 2CSPE214_5 | Apply the scientific method to cyber forensics and ethical Hacking. |

| Course Contents | | |
|------------------------|--|----------------------|
| Unit | Unit Name | Contact Hours |
| 1 | <p>Introduction to Cyber Security: Basics of Cyber Crimes</p> <p>Overview of Cyber Space/World- Cyber Crime/Offense, Cyber Defense, Cyber Warfare, Cyber terrorism, Cyber Espionage, Recent Cyber Crime Cases, Impact on Society, Reasons for Commission of Cyber Crimes</p> <p>Vulnerabilities and Threats - Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Poor Cyber Security Awareness.</p> <p>Attacks - SQL Injections, Cross-site scripting, Virus dissemination, Logic bombs, Denial-of- Service attack, Phishing, Computer vandalism, Email bombing and spamming, Web jacking, Cyber stalking, Data diddling, Identity Theft and Credit Card Fraud, Salami slicing attack, Cybersquatting, Software Piracy</p> <p>Internet Governance – What is it? Actors, Challenges and Constraints, Need for a Comprehensive Cyber Security Policy, Need for an International convention on Cyberspace.</p> | 7 Hrs |
| 2 | <p>Vulnerabilities and Cyber Security Safeguards</p> <p>Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Authentication and Remote Access - User,</p> | 6 Hrs |



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| | <p>Group, and Role Management - Password Policies - Single Sign-On - Security Controls and Permissions - Preventing Data Loss or Theft - The Remote Access Process - Remote Access Methods. Intrusion Detection Systems- IDS Overview - Network-Based IDSs - Host-Based IDSs- Intrusion Prevention Systems - Honeypots and Honey nets – Tools, Firewalls – Types, Security policy, Threat Management.</p> | |
| 3 | <p>Cybercrimes and Cyber Security Prevention of Cybercrimes and Legal Perspectives Preventing Cyber Crime – Password Protection – Get Safe Online – Cyber Security Guidance for Business, Smartphone security Guidelines, Safe browsing guidelines for social networking sites, Operational and Organizational Security Policies, Procedures, Standards, and Guidelines - Cyber Security Awareness and Training, counter cyber security initiatives in India, Introduction to Cyber Laws- E-Commerce and E-Governance, Need of Cyber laws- The Indian context, Certifying Authority and Controller, Offences under IT Act 2000, Digital signature and the Indian IT Act, Computer Offences and its penalty under IT Act 2000, Amendments in Indian IT Act 2008, Intellectual Property Rights in Cyberspace</p> | 7 Hrs |
| 4 | <p>Securing Web Application, Services and Servers Threats to web assets, Overview of Web services, Basic security for HTTP Applications and Services Basic Authentication, Transport Layer Security, Server Authentication, Mutual Authentication, Application to REST Services GSS-API Negotiated Security, Basic Security for SOAP Services- SOAP-based Web Services, WS-Security Overview, Usage of WS- Security Identity Management and Web Services Security Assertion Markup Language, Advanced HTTP Security, Authorization Patterns, Security Considerations- Avoiding Common Errors, Challenges.</p> | 7 Hrs |
| 5 | <p>Digital Forensics: Introduction to Digital Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Handling Preliminary Investigations, Forensics Investigation Process, Controlling an Investigation, Conducting disk-based analysis, Investigating Information hiding, Collecting Network based Evidence, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management, Introduction to ISO 27001:2013</p> | 6 Hrs |

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| 6 | <p>Ethical hacking Terminology Types of hacking technologies, phases of ethical hacking, Foot Printing, Social Engineering, Scanning and enumeration, Understanding the password hacking techniques, Session hijacking, Google Hacking, Windows Hacking, Linux Hacking, Email hacking, Proxy & Packet Filtering, Sniffer, Incident handling and response.</p> | 6 Hrs |
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| Text Books | | | | | |
|------------|---------------------------------------|--------------------------------------|-----------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Cyber Security | Nina Godbole & Sunit Belapure | Wiley India | 1 | 2011 |
| 2 | Cyber Space and Cyber Security | George K. Kostopoulous | CRC Press | 1 | 2013 |
| 03 | Computer Forensics and Investigations | Nelson Phillips and Enfinger Steuart | Cengage Learning, New Delhi | 1 | 2009 |
| 04 | Hacking Exposed Web Application | J. Scambray, Vincent Liu, Caleb Sima | McGraw-Hill Education | 3 | 2010 |

| Reference Books | | | | | |
|-----------------|------------------------------------|-----------------------------------|------------------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Cyber Security Essentials | J. Graham, R. Howard, Ryan Olson, | CRC Press, Taylor An Auerbach Book | 1 | 2010 |
| 2 | Computer Forensics and Cyber Crime | Marjie T. Britz | Pearson | 3 | 2013 |
| 3 | Cyber Law Simplified | Vivek Sood | TMH | 1 | 2002 |
| 4 | Cryptography and Security | CK Shyamala et el., | Wiley India Pvt. Ltd | 4 | 2018 |



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| Class | S.Y. B. Tech, Sem. IV |
| Course Code and Course Title | 2CSCS215- Software Engineering |
| Prerequisite/s | -- |
| Teaching Scheme: Lecture/Tutorial/Practical | 02/00/00 |
| Credits | 02 |
| Evaluation Scheme Theory: ISE/ MSE/ ESE | 40/30/30 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSCS215_1 | Design a solution to solve a given problem of SDLC using different software engineering models |
| 2CSCS215_2 | Build software requirement specifications and project plan for any software through proper analyzing the problem statement. |
| 2CSCS215_3 | Develop a software system design to solve a given problem using structured or function-oriented design methodology. |
| 2CSCS215_4 | Test the functioning of given application to check correctness of code using test cases. |
| 2CSCS215_5 | Identify appropriate standard for a given process to maintain software reliability and quality using quality standards like ISO 9000, CMM etc. |

| Course Contents: | | |
|-------------------------|---|-------------|
| Unit No. | Unit Name | Contact Hrs |
| Unit 1 | Software Processes and Agile Methodology Software Process, Software Development Process Models, Agile software development - Agile methods, Plan-driven and agile development, Extreme programming, Scrum and Scaling agile methods, CI/CD, and DevOps practices. | 05 Hrs |
| Unit 2 | Software Requirements Analysis and Specification Software Requirement, Problem Analysis, Requirements Specification, Functional Specification with Use Cases, validation. | 04 Hrs |
| Unit 3 | Planning a Software Project Process Planning, Effort Estimation, Project Scheduling and Staffing, Software Configuration Management Plan, Quality Plan, Risk Analysis & Management. | 04 Hrs |
| Unit 4 | Function Oriented Design Design Principles, Module-Level Concepts, Design Notation and Specification, Structured Design Methodology | 05 Hrs |
| Unit 5 | Coding and Testing Programming Principles and Guidelines, Coding Process, Testing Fundamentals, Black-Box Testing, White-Box Testing. | 04 Hrs |

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| Unit 6 | Software Reliability and Quality Management Software Reliability, Software Quality, Software Quality Management System, ISO 9000, SEI CMM | 04 Hrs |
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| Text Books: | | | | | |
|--------------------|---|----------------|-------------------|----------------|------------------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | An integrated approach to S/W engineering | Pankaj Jalote | Narosa Publishers | 3 | 2011 |
| 2 | Fundamentals of Software Engineering | Rajib Mall | PHI | 3 | 2009 |
| 3 | Software Engineering | Jawadekar W.S. | TMGH | 7 | 2007 |

| Reference Books: | | | | | |
|-------------------------|---|-------------------|---------------------------------|----------------|------------------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Software Engineering | Ian Sommerville | Pearson | 10 | 2016 |
| 2 | Software Engineering: Practitioner's Approach | Roger S. Pressman | McGraw Hill | 7 | 2010 |
| 3 | Software Engineering principles and practices | Rohit Khurana | Vikas Publishing House Pvt. ltd | 2 | 2010 |



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| Class | S Y B. Tech Sem IV |
| Course Code and Course Title | 2CSHS216 Universal Human Values |
| Prerequisite/s | -- |
| Teaching Scheme: Lecture/Tutorial/Practical | 02/00/00 |
| Credits | 02 |
| Evaluation Scheme: ISE | 50 |

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| Course Outcomes (COs): Upon successful completion of this course, the student will be able to: | |
| 2CSHS216_1 | Integrate the process of self-exploration to achieve Harmony in the human being's based on Holistic perspective of value education. |
| 2CSHS216_2 | Understand Harmony in human being, family, society and nature /existence, based on methods to fulfil human aspiration. |
| 2CSHS216_3 | Apply the human values for maintaining the relationships with oneself and others using the principals of harmony. |
| 2CSHS216_4 | Adopt the methods of maintaining harmony with the society, nature, and its existence by utilizing the human order systems. |

| Course Contents: | | |
|-------------------------|--|---------------|
| Sr. No. | Unit Name | Contact Hours |
| Unit 1 | Introduction to Value Education Introduction , Need, Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration —what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation - as the process for self-exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding , Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. | 4 Hrs |
| Unit 2 | Understanding Happiness and Prosperity Understanding Happiness and Prosperity correctly, Prevailing sources of happiness , Prosperity and its implications Method to fulfil the human aspirations: understanding and living in harmony at various levels. | 4 Hrs |
| Unit 3 | Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer) Understanding the characteristics and activities of ‘I’ and harmony in ‘I’ | 6 Hrs |



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| | Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health. | |
| Unit 4 | Understanding Harmony in the Family - Harmony in Human-Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; Peer Pressure the Concerns and its Resolution the other salient values in relationship. | 7 Hrs |
| Unit 5 | Understanding Harmony in the Society Understanding the harmony in society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Human order systems and dimensions. | 4 Hrs |
| Unit 6 | Understanding Harmony in the Nature and Existence Understanding the harmony in the Nature, Inter-connectedness and mutual fulfilment among the four orders of nature, recyclability and self-regulation in nature. | 3 Hrs |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|--|------------------------------------|-----------------------|---------|-----------------|
| 1 | Understanding Human Being, Nature and Existence Comprehensively | UHV Team | UHV | 1 | 2022 |
| 2 | A Foundation Course in Human Values and Professional Ethics | R. R. Gaur, R Asthana, G P Bagaria | Excel Books | 2 | 2019 |
| 3 | Teachers' Manual for A Foundation Course in Human Values and Professional Ethics | R. R. Gaur, R Asthana, G P Bagaria | Excel Books | 2 | 2019 |
| 4 | Human Values | A.N Tripathy | New Age International | 2 | 2006 |



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| Reference Books: | | | | | |
|------------------|---|------------------------------------|-----------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | A Foundation Course in Human Values and Professional Ethics | R.R. Gaur, R. Sangal, G.P. Bagaria | Excel Books | 3 | 2010 |
| 2 | Indian Ethos and Modern Management: Amalgam of the Best of the Ideas from the East and the West | B.L. Bajpai | New Royal Book | 1 | 2004 |
| 3 | Small Is Beautiful | E. F. Schumacher. | Hartley & Marks | 1 | 1999 |
| 4 | An Introduction to Ethics | William Lilly | Allied | 1 | 1967 |



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| Class | S. Y. B. Tech, Sem. IV |
| Course Code & Course Title | 2CSPC217- JAVA Programming |
| Prerequisite/s | C++ Programming |
| Teaching Scheme (Lecture/Practical/Tutorial) | 02/02/00 |
| Credits | 03 |
| Evaluation Scheme Practical : ISE/ESE | 50/50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC217_1 | Apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve mathematical problems using JDK |
| 2CSPC217_2 | Apply the concept of multithreading, I/O operations, exception and networking to execute and handle multiple programs by using JDK |
| 2CSPC217_3 | Design and Develop GUI application with database connectivity by using the concept of Swing and Applet |
| 2CSPC217_4 | Evaluate the compile time and run time error by using appropriate syntax |
| 2CSPC217_5 | Design and develop application to solve real world problems by using java language |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No. | Unit Name | Contact Hours |
| Unit 1 | <p>Fundamental Programming in Java Object-Oriented Programming Concepts, JVM, JIT Compiler, Byte Code,, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Arrays- Jagged Array.</p> <p>Objects and Classes: Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Creating and using objects, Access Modifiers, Static Fields and Methods, this keyword.</p> | 04 Hrs |
| Unit 2 | <p>Inheritance, Interface and Packaging Inheritance: Definition, Types of Inheritance, Polymorphism, Overriding and Hiding Methods, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, finalization and garbage collection. Interfaces: Defining an Interface, Implementing an Interface Packages: Class importing, Creating a Package, Naming a Package, Using Package Members,</p> | 05 Hrs |
| Unit 3 | <p>Exception and I/O Streams Exception: Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, finally clause, I/O Streams: Byte Stream – InputStream, OutputStream, FileInputStream, FileOutputStream, Character Streams</p> | 04 Hrs. |
| Unit 4 | <p>Graphical User Interfaces using Swing: Introduction to the Swing, Swing features, Swing Top Level Containers- Creating a Frame, Positioning a Frame, Displaying Information in a Panel, The Model-View-Controller Design Pattern, The JComponent Class – JLabel, JTextField, JButton etc. Layout Management: Border Layout, Flow Layout, Grid Layout</p> | 05 Hrs. |



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| | Event Handling: Basics of Event Handling, The AWT Event Hierarchy, Key Events, Mouse Events | |
| Unit 5 | Networking and Multithreading Multithreading: Processes and Threads, Runnable Interface and Thread Class, Defining and Starting a Thread, Thread States, Thread Properties, Networking: Overview of Networking, Networking Basics, Reading from and Writing to a URL Connection, Sockets, Reading from and Writing to a Socket. | 04 Hrs. |
| Unit 6 | Collection and Database Programming Collections: Collection Interfaces, Concrete Collections- List, Queue, Set, Map, the Collections Framework. Database Programming: The Design of JDBC, The SQL, Basic JDBC Programming Concepts, Query Execution, Result Sets | 04 Hrs |

| Course Contents: | | |
|------------------|--|---------------|
| Expt. No. | Title of Experiment | Contact Hours |
| 1. | Program based on concept of Class and Object. | 2 Hrs |
| 2. | Program based on concept of Inheritance like single inheritance, multilevel inheritance, hierarchical inheritance etc. | 2 Hrs |
| 3. | Program based on Multiple inheritances using Interface. | 2 Hrs |
| 4. | Program based on concept of Package and sub packages | 2 Hrs |
| 5. | Program based on concept of Exception and custom exception | 2 Hrs |
| 6. | Program based on concept of file read and write operation. | 2 Hrs |
| 7. | Program based on development of GUI using Swing. | 2 Hrs |
| 8. | Program based on development of GUI using Layout Management. | 2 Hrs |
| 9. | Program based on threading concept. | 2 Hrs |
| 10. | Program based on Socket programming for Client-Server. | 2 Hrs |
| 11. | Program based on Collection in java | 2 Hrs |
| 12. | Program based on Database Connectivity. | 2 Hrs |

| Text Books: | | | | | |
|-------------|---|--------------------|-----------------|---------|-----------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Core Java- Volume I and II Fundamentals | Cay Horstmann | Pearson | 8th | 2011 |
| 2 | Let Us Java | Yashavant Kanetkar | BPB Publication | 3rd | 2017 |



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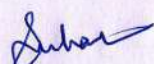
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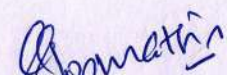
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| Reference Books: | | | | | |
|------------------|---|--------------------------------------|----------------|---------|-----------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Java 2 Complete Reference | Herbert Schildt | TMGH | 9th | 2014 |
| 2 | JAVA HOW TO PROGRAM | Deitel Paul , Deitel Harvey | PHI Learning | 10th | 2016 |
| 3 | Thinking in Java | Bruce Eckel | Prentice Hall | 4th | 2006 |
| 4 | A Programmer's guide to JAVA SCJP Certification | Khaleed Mughal and Rolf W. Rasmussen | Addison Wesley | 3rd | 2008 |




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|------------------------------|---------------------------------------|
| Class | S. Y. B. Tech, Sem IV |
| Course Code and Course Title | 2CSHS218-Environmental Studies |
| Prerequisite/s | -- |
| Teaching Scheme: Lecture | 02 |
| Credits | 02 |
| Evaluation Scheme: ISE | 50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSHS218_1 | Comprehend the concepts and principles of sustainable development and its importance in environmental preservation. |
| 2CSHS218_2 | Explain ethical and legal responsibility of an engineer and his role in effective implementation of sustainable activities through EIA and EMS in the corporate sector. |
| 2CSHS218_3 | Predict impact of contemporary issues (Population Explosion, Climate change, Environmental pollution) on the environment. |
| 2CSHS218_4 | Classify and analyze different types of environmental pollution, understand their causes and effects, and propose control measures |
| 2CSHS218_5 | Prepare a technical report highlighting importance of environment in human life by using techniques like survey, case studies, mini project. |

| Course Contents: | | |
|-------------------------|---|------|
| Unit No. | Unit Name | Hrs. |
| Unit 1 | Introduction to Environment and concept of Sustainable development: Natural and Built Environment, Environmental Education: Definition, Scope, Objectives and importance. Components of the Environment: Atmosphere, Hydrosphere, Lithosphere and Biosphere. Biological Diversity: Introduction, Values of biodiversity, Threats to biodiversity, Conservation of biodiversity. Sustainable development goals, pillars of sustainable development. | 4 |
| Unit 2 | Energy and Natural Resources Energy Scenario: Future projections of Energy Demand, Utilization of various Energy Sources, Conventional Energy Sources and Non- Conventional Energy Sources, Urban problems related to energy. Natural Resources: Food, Water, Forest, Geological, Equitable Use of Resources for Sustainable lifestyle. Concept of life cycle analysis, Case studies. | 5 |
| Unit 3 | Introduction to global environmental issues, Impact of modernization Climate change: Global warming, Ozone depletion, Acid Rain etc. Environmental Impact: Impact of Modern agriculture on the Environment, Impact of Mining on the Environment, Impact of Large dams on the Environment. Environmental pollution: Air, Water, Soil, Noise, Marine, classification of pollutants, their causes, effects and control measures. Case studies. | 4 |
| Unit 4 | Environmental Pollution Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste Management: Causes, effects and control measures of urban and industrial wastes. E waste management. Role of an individual in prevention of pollution. | |
| Unit 5 | Environmental Management and Legislation | 4 |



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| | Environmental ethics: Introduction, Ethical responsibility, issues and possible solutions. Environmental Management: Introduction to Environmental Impact Assessment, Environmental Management System: ISO 14001 Standard, Environmental Auditing, National and International Environmental protection agencies pertaining to Environmental Protection. Introduction to Environmental Legislation. | |
| Unit 6 | Cleaner technology: Consumerism and Waste Products, Green buildings, Green products, Minimization of Hazardous Products, Reuse of Waste, By-products, Rainwater Harvesting, Translocation of trees. Some Success Stories. Role of Information Technology in Environment protection. | 4 |

| Text Books | | | | | |
|------------|---|-----------------|-------------------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Environmental Studies | Anindita Basak | PEARSON | 1 | 2017 |
| 02 | Environmental Studies | N.K Uberoi, | Excel Books Publications New Delhi, | 1 | 2005. |
| 03 | Environmental Studies from crisis to cure | R. Rajagopalan, | Oxford university press, | 2 | 2011 |

| Reference Books / Handbooks | | | | | |
|-----------------------------|---|--|---|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Environmental Science: A Global Concern | William Cunningham and Barbara Woodworth Saigo | WCB/McGraw Hill publication | 5 | 1999 |
| 02 | Peter. H. Raven, Linda. R. Berg, George. B. Johnson | Environment | McGraw Hill publication | 2 | 1998 |
| 03 | “Adaptive Environmental Management | Catherine Allan & George H. Stanley (Editors), | Springer Publications. | -- | 2009. |
| 04 | Elements of Environmental Science and Engineering | P. Meenakshi | Prentice Hall of India Private Limited, New Delhi | - | 2006 |



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|---|---------------------------------------|
| Class | S Y B. Tech Sem IV |
| Course Code & Course Title | 2CSCC219-Innovation/ Prototype |
| Prerequisite/s | - |
| Teaching Scheme (Lecture/Practical/Tutorial) | 0/2/0 |
| Credits | 1 |
| Evaluation Scheme: ISE | 50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSCC219_1 | Conduct solitary or group research as part of the planning and defining of a creative industry project that aims to deliver an original result |
| 2CSCC219_2 | Present a project proposal that focuses on a strategy for implementing an invention, and choose and implement suitable procedures for gathering and analysing information and research data in a Creative Industry setting |
| 2CSCC219_3 | Develop and explain, within a practise or discipline, practical, theoretical, and entrepreneurial understandings and concepts for delivering or igniting innovation in a Creative Industry setting. |
| 2CSCC219_4 | Appreciate the importance of acquiring and using analytical and critical thinking abilities when solving problems or looking for chances to innovate. |
| 2CSCC219_5 | Apply management techniques suitable for masters-level research in solitary, group, or trans disciplinary project operation and realisation. |

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| Course Contents: |
| In the context of the Creative Industry, this course offers the fundamental skills for planning the development of an idea. Theoretical, critical, analytical, technical, and artistic aspects of the project will be outlined in a proposal plan that students will create for the realisation of a project or concept. In order to create new works, products, or outcomes that aim to be innovative, students are encouraged to bring ideas as well as actual industry experience. |



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|---|---|
| Class | S Y B. Tech Sem IV |
| Course Code & Course Title | 2CSCC220-Aptitude and Reasoning Part- II |
| Prerequisite/s | 2CSCC208- Aptitude and Reasoning Part- I |
| Teaching Scheme (Lecture/Practical/Tutorial) | 0/2/0 |
| Credits | 1 |
| Evaluation Scheme: ISE | 50 |

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| Course Outcomes (COs) : The students will be able to: | |
| 2CSCC220_1 | Solve problems based on HCF, LCM, Interest, Clock, Cubes and Puzzles |
| 2CSCC220_2 | Solve problems based on Coding and Decoding, Seating Arrangements and Venn diagrams. |
| 2CSCC220_3 | Solve problems based on Ratio Proportion, Partnership, Allegation, Divisibility and Number Theory |
| 2CSCC220_4 | Demonstrate presentations using concepts delivered on confidence building and time management skills. |

| | | |
|-------------------------|---|----------------------|
| Course Contents: | | |
| Unit No | Unit Name | Contact Hours |
| Unit 1 | HCF LCM, Simple Interest, Compound Interest | 4 Hrs |
| Unit 2 | Coding- Decoding, Seating Arrangement Venn Diagrams | 4 Hrs |
| Unit 3 | Clocks, Cubes, Puzzles, | 4 Hrs |
| Unit 4 | Ratio Proportion, Partnership | 4 Hrs |
| Unit 5 | Confidence Building, Time Management | 4 Hrs |
| Unit 6 | Allegation, Divisibility and Number Theory | 4 Hrs |
| | Self-Study Module | 6 Hrs |

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|--------------------|---|---------------|------------------|----------------|------------------------|
| Text Books: | | | | | |
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | R.S. Agarwal (Quantitative aptitude) | R.S.Agarwal | S Chand | - | 2019 |
| 2 | R.S. Agarwal (Verbal & Non-verbal Reasoning) | R.S.Agarwal | S Chand | - | 2010 |
| 3 | Wren & Martin (Verbal, Grammar) | P.C.Wren | S Chand | - | 2017 |

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|-------------------------|---|--------------------|------------------|----------------|------------------------|
| Reference Books: | | | | | |
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | APTIPEDIA (Quantitative, Logical, Verbal Aptitude) | Face | Wiley | - | 2017 |
| 2 | Wiley (Quantitative Aptitude) | P.A.Anand | Maestro | - | 2015 |
| 3 | Arun Sharma (Verbal Ability) | Meenakshi Upadhyay | McGraw Hill | - | 2020 |



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Annasaheb Dange College of Engineering and Technology,
Ashta

Department of Computer Science & Engineering



Annasaheb Dange College of Engineering and Technology, Ashta
(An Autonomous Institute affiliated to Shivaji University, Kolhapur.)

Structure and Curriculum

(Revision 2)

COMPUTER SCIENCE AND ENGINEERING

T.Y. B.Tech CSE

SEM-V to SEM-VI

(Academic Year 2024-25)



Annasaheb Dange College of Engineering and Technology Ashta
Department of Computer Science and Engineering
 Teaching and Evaluation Scheme



T. Y. B. Tech Semester V

| Course Code | Course Name | Teaching Scheme | | | | THEORY | | | | | | | PRACTICAL | | | | GRAND TOTAL | | |
|-------------|-----------------------------------|-----------------|---|---|---------|--------|-----|----------|-----|-----|-------|-----|-----------|-----|-----|-------|-------------|-----|-----|
| | | | | | | ISE | | MSE+ ESE | | | Total | Min | ISE | ESE | | Total | | Min | |
| | | L | T | P | Credits | Max | Min | MSE | ESE | Min | | | | Max | Min | | | | |
| 2ILOE*** | Open Elective - I | 3 | - | - | 3 | 50 | 20 | - | - | - | 50 | 20 | - | - | - | - | - | 50 | |
| 2CSPC301 | Theory of Computation | 3 | 1 | - | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 | |
| 2CSPC302 | Design and Analysis of Algorithms | 3 | - | 2 | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | 50 | 50 | 20 | 100 | 40 | 200 | |
| 2CSCS303 | Minor Course - II | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 | |
| 2CSPE3** | Professional Elective - II | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 | |
| 2CSHS307 | Entrepreneurship | - | - | 2 | 1 | - | - | - | - | - | - | - | 25 | - | - | 25 | 10 | 25 | |
| 2CSVS308 | Python Programming | 2 | - | 2 | 3 | - | - | - | - | - | - | - | 50 | 50 | 20 | 100 | 40 | 100 | |
| 2CSEL309 | Industrial Training/ Internship | - | - | - | 1 | - | - | - | - | - | - | - | 50 | - | - | 50 | 20 | 50 | |
| 2CSCC310 | Aptitude and Reasoning Part - III | - | - | 2 | 1 | - | - | - | - | - | - | - | 50 | - | - | 50 | 20 | 50 | |
| | | 17 | - | 8 | 23 | | | | | | | | | | | | | | |
| | Total Contact Hours | | | | 26 | | | | | | | | | | | | | | 775 |

| Professional Elective - II | |
|----------------------------|--------------------------|
| 2CSPE304 | Advanced Database System |
| 2CSPE305 | Internet of Things |
| 2CSPE306 | Real Time Systems |

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Teaching and Evaluation Scheme

T. Y. B. Tech Semester VI

| Course Code | Course Name | Teaching Scheme | | | | THEORY | | | | | | PRACTICAL | | | | GRAND TOTAL | | |
|-------------|----------------------------------|-----------------|---|----|---------|--------|-----|----------|-----|-----|-------|-----------|-----|-----|-----|-------------|-------|-----|
| | | | | | | ISE | | MSE+ ESE | | | Total | Min | ISE | ESE | | | Total | Min |
| | | L | T | F | Credits | Max | Min | MSE | ESE | Min | | | | Max | Min | | | |
| 2ILOE** | Open Elective - II | 3 | - | - | 3 | 50 | 20 | - | - | - | 50 | 20 | - | - | - | - | - | 50 |
| 2CSPC311 | System Programming and Compilers | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 |
| 2CSPC312 | Software Engineering | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 |
| 2CSPC313 | Machine Learning | 3 | - | 2 | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | 50 | 50 | 20 | 100 | 40 | 200 |
| 2CSCS314 | Minor Course - III | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 |
| 2CSVS315 | Web Programming | 2 | - | 2 | 3 | - | - | - | - | - | - | - | 50 | 50 | 20 | 100 | 40 | 100 |
| 2CSEL316 | Mini Project | - | - | 4 | 2 | - | - | - | - | - | - | - | 50 | - | - | 50 | 20 | 50 |
| 2CSCC317 | Aptitude and Reasoning Part – IV | - | - | 2 | 1 | - | - | - | - | - | - | - | 50 | - | - | 50 | 20 | 50 |
| | | 17 | 0 | 10 | 22 | | | | | | | | | | | | | |
| | Total Contact Hours | | | | 27 | | | | | | | | | | | | | 750 |



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Department of Computer Science and Engineering



Teaching and Evaluation Scheme

Final Year. B. Tech Semester VII

| Course Code | Course Name | Teaching Scheme | | | | THEORY | | | | | | PRACTICAL | | | | GRAND TOTAL | | | |
|-------------|----------------------------------|-----------------|---|----|---------|--------|-----|----------|-----|-----|-------|-----------|-----|-----|-----|-------------|-------|-----|-----|
| | | | | | | ISE | | MSE+ ESE | | | Total | Min | ISE | ESE | | | Total | Min | |
| | | L | T | P | Credits | Max | Min | MSE | ESE | Min | | | | Max | Min | | | | |
| 2ILOE** | Open Elective - III | 2 | - | - | 2 | 50 | 20 | - | - | - | 50 | 20 | - | - | - | - | - | - | 50 |
| 2CSPC401 | Information and Network Security | 3 | - | 2 | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | 50 | - | - | 50 | 20 | 150 | |
| 2CSPC402 | Distributed and Cloud Computing | 3 | - | 2 | 4 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | 50 | - | - | 50 | 20 | 150 | |
| 2CSCS403 | Minor Course - IV | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 | |
| 2CSHS404 | Project Management and Finance | 2 | - | - | 2 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 50 | |
| 2CSPE4** | Professional Elective- III | 2 | - | 2 | 3 | - | - | - | - | - | - | - | 50 | 50 | 20 | 100 | 40 | 100 | |
| 2CSEL409 | Project | - | - | 8 | 4 | - | - | - | - | - | - | - | 50 | 50 | 20 | 100 | 40 | 100 | |
| | | 15 | 0 | 14 | 22 | | | | | | | | | | | | | | |
| | Total Contact Hours | | | | 29 | | | | | | | | | | | | | | 700 |

| Professional Elective - III | |
|-----------------------------|--|
| 2CSPE451 | Open Source Technologies |
| 2CSPE452 | Digital Image Processing |
| 2CSPE453 | High Performance Computing |
| 2CSPE454 | Software Testing and Quality Assurance |



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Department of Computer Science and Engineering



Teaching and Evaluation Scheme

Final Year B. Tech Semester VIII

| Course Code | Course Name | Teaching Scheme | | | | THEORY | | | | | | PRACTICAL | | | | GRAND TOTAL | | | |
|-------------|----------------------------|-----------------------|---|---|---------|--------|-----|----------|-----|-----|-------|-----------|-----|-----|-----|-------------|-------|-----|------------|
| | | | | | | ISE | | MSE+ ESE | | | Total | Min | ISE | ESE | | | Total | Min | |
| | | L | T | P | Credits | Max | Min | MSE | ESE | Min | | | | Max | Min | | | | |
| 2CSPE4** | Professional Elective - IV | 3 | - | - | 3 | 40 | 16 | 30 | 30 | 24 | 100 | 40 | - | - | - | - | - | 100 | |
| 2CSVS4** | VSEC Elective Lab | 1 | - | 2 | 2 | - | - | - | - | - | - | - | 50 | 50 | 20 | 100 | 40 | 100 | |
| 2CSCS416 | Minor Project | - | - | - | 3 | - | - | - | - | - | - | - | 50 | - | - | 50 | 20 | 50 | |
| 2CSEL417 | Internship | - | - | - | 10 | - | - | - | - | - | - | - | 50 | 50 | 20 | 100 | 40 | 100 | |
| | | 4 | 0 | 2 | 18 | | | | | | | | | | | | | | |
| | Total Contact Hours | 6 + Internship | | | | | | | | | | | | | | | | | 350 |

| Professional Elective - IV | |
|----------------------------|-----------------------------|
| 2CSPE405 | Big Data Analytics |
| 2CSPE406 | Natural Language Processing |
| 2CSPE407 | Block Chain Technologies |

| Vocational and Skill Course Elective | |
|--------------------------------------|-------------------------------|
| 2CSVS458 | Augmented and Virtual Reality |
| 2CSVS459 | Deep Learning |
| 2CSVS460 | DevOps |
| 2CSVS461 | UI/ UX Design |

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| Class | T Y B. Tech Sem V |
| Course Code & Course Title | 2CSPC301 Theory of Computation |
| Prerequisite/s | 2CSBS201 Discrete Mathematics |
| Teaching Scheme (Lecture/Tutorial) | 03/01 |
| Credits | 04 |
| Evaluation Scheme: ISE/MSE/ESE | 40/30/30 |

Course Outcomes (COs) : The students will be able to:

| | |
|------------|--|
| 2CSPC301_1 | Construct regular expressions for given regular language. |
| 2CSPC301_2 | Build finite state systems as per the requirement and transform them into different types of finite state systems. |
| 2CSPC301_3 | Evaluate the design of context free grammars for various languages using derivation strategies. |
| 2CSPC301_4 | Design pushdown automata, its connection with context-free grammars and formulate conversion between them. |
| 2CSPC301_5 | Construct various Turing machines for different kinds of formal languages and illustrate their variants. |

Course Contents:

| Unit No. | Unit Name | Contact Hours |
|----------|--|---------------|
| Unit 1 | Mathematical Induction, Regular Languages & Finite Automata Proofs and Types of Proofs, Definition & types of grammars & languages, Regular expressions and corresponding regular languages, examples and applications, unions, intersection & complements of regular languages, Finite automata-definition and representation, Non-deterministic F.A., NFA with null transitions, Equivalence of FA's, NFA's and NFA's with null transitions. | 10 Hrs |
| Unit 2 | Kleene's Theorem Part I & II statements and proofs, minimum state of FA for a regular language, minimizing number of states in Finite Automata | 3 Hrs |
| Unit 3 | Grammars and Languages Derivation and ambiguity, Union, Concatenation and *'s of CFLs, eliminating production & unit productions from CFG, Eliminating useless variables from a context Free Grammar, CNF Notation. | 7 Hrs |
| Unit 4 | Push Down Automata Definition, Deterministic PDA & types of acceptance, Equivalence of CFG's & PDA's. Parsing Top Down Parsing, Bottom up Parsing | 8 Hrs |

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| Unit 5 | Turing Machines Models of computation, definition of Turing Machine as Language acceptors, combining Turing Machines, Computing a function with a TM, Variants in TM – Doubly Infinite Tapes, Non-Deterministic and Universal TM. | 8 Hrs |
| Unit 6 | Undecidability and Introduction to Complexity Theory Decidability properties of RL and CFL, Undecidability, Introduction to Complexity Theory | 3 Hrs |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|--|---|--------------------------|---------|-----------------|
| 1 | Introduction to languages & theory of computations | John C. Martin | Tata McGraw Hill Edition | 3rd | 2007 |
| 2 | Introduction to Automata Theory, Languages and computation | John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman | Pearson Edition | 3rd | 2006 |
| 3 | Introduction to theory of computations | Michael Sipser | Cengage Learning | 3rd | 2012 |
| 4 | Theory of Computation- A problem solving Approach | Kavi Mahesh | Wiley india | 1st | 2005 |

Reference Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|--|--|----------------------------|---------|-----------------|
| 1 | Discrete Mathematical Structures with applications to computer science | J.P. Trembley & R. Manohar | Tata McGraw Hill Edition | - | 1997 |
| 2 | Elements of the Theory of Computation | Harry Lewis, Christos H. Papadimitriou | Prentice-Hall Publications | 2nd | 1997 |
| 3 | Theory of Computation | Vivek Kulkarni | Oxford University Press | 1st | 2013 |



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|---|------------------|---|----------|
| Class | | T Y B. Tech Sem V | |
| Course Code & Course Title | | 2CSPC302 Design and Analysis of Algorithms | |
| Prerequisite/s | | 2CSPC202 Data Structures | |
| Teaching Scheme (Lecture/Practical/Tutorial) | | 3/0/2 | |
| Credits | | 4 | |
| Evaluation Scheme: | Theory | ISE/ MSE/ ESE | 40/30/30 |
| | Practical | ISE/ ESE | 50/50 |

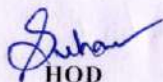
Course Outcomes (COs):

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

| | |
|------------|---|
| 2CSPC302_1 | Design efficient algorithms for moderately difficult computational problems, using various algorithm design techniques such as divide and conquer, dynamic programming, greedy method |
| 2CSPC302_2 | Apply algorithmic design paradigms to solve given problem. |
| 2CSPC302_3 | Choose appropriate data structures and algorithm to solve given problem. |
| 2CSPC302_4 | Analyze performance of given algorithm. |

Course Contents:

| | | |
|---------------|---|----------------|
| Unit 1 | Divide and Conquer Method Recurrence Equations and their solution, Randomized Algorithms, The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, Selection, Convex Hull. | 07 Hrs. |
| Unit 2 | The Greedy Method The general method, Knapsack problem, Job sequencing with deadlines, minimum cost spanning trees, Prim's and Kruskal's Algorithms, Optimal storage on tapes, Graph coloring problem, Single source shortest path. | 06 Hrs. |
| Unit 3 | Dynamic Programming The general method, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Sales person problem. | 07 Hrs. |
| Unit 4 | Basic Traversal and Search Techniques Techniques for Graphs, AND/OR graphs, Connected components and Spanning Trees, Biconnected components and depth first search | 07 Hrs. |
| Unit 5 | Backtracking and Infeasibility Backtracking: The general method, 8-queen problem, sum of subsets, Hamiltonian Cycle, Graph Coloring Infeasibility: P and NP-classes, NP-hard problems | 07 Hrs. |
| Unit 6 | Parallel Computational models PRAM, MESH, HYPERCUBE - Fundamental Algorithms, Optimal parallel algorithms | 05 Hrs. |


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| 1 | Programs based on Finding the maximum and minimum using iterative version and divide & conquer method. Compare the time complexity of both. |
| 2 | Program based on Convex Hull. |
| 3 | Program based on general method of Greedy Method. |
| 4 | Program based on Greedy Method. |
| 5 | Program based on minimum-cost spanning trees. |
| 6 | Program based on General method of Dynamic Programming. |
| 7 | Program based on Dynamic Programming. |
| 8 | Program based on general method of backtracking. |
| 9 | Program based on backtracking. |
| 10 | Program based on AND/OR graph. |
| 11 | Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. |
| 12 | Compare & analyze algorithms for real time applications |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|-------------------------------------|---|-------------------|---------|-----------------|
| 01 | Fundamentals of Computer Algorithms | Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaram | University Press | 2 | 2008 |
| 02 | Introduction to Algorithms | Thomas Cormen, Charles Leiserson, Ronald Rivest, Clifford Stein | PHI | 3 | 2009 |
| 03 | Algorithms in a Nutshell | G. T. Heineman, G. Pollice, S. Selkow | O'Reilly | 1 | 2008 |
| 04 | Fundamentals of algorithms | G. Brassard, P. Bratley | Pearson Education | 1 | 2015 |

Reference Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|-----------------------------|-------------------|---------|-----------------|
| 01 | The Design and Analysis of Algorithms | Aho, Hopcraft and Ullman | Pearson Education | 1 | 2000 |
| 02 | Algorithms | Kenneth Berman, Jerome Paul | CENAGE Learning | 1 | 2010 |
| 03 | Algorithms | Robert S., Kevin W. | Pearson Education | 4 | 2014 |
| 04 | Introduction to Design and Analysis of Algorithms | Anany Levitin | Pearson Education | 1 | 2008 |

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|--|-------------------------------|
| Class | T Y B. Tech. Sem V |
| Course Code and Course Title | 2CSCS303 Database Engineering |
| Prerequisite/s | - |
| Teaching Scheme (Lecture/Practical/Tutorial) | 03/00/00 |
| Credits | 03 |
| Evaluation Scheme Theory: ISE/ MSE/ ESE | 40/30/30 |

| | |
|---|---|
| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSCS303_1 | Design an ER diagram and relational schema to solve given problem using integrity constraints. |
| 2CSCS303_2 | Apply the concepts of database system, conceptual database design, relational algebra, SQL, normalization to solve the given problems through designing the database. |
| 2CSCS303_3 | Apply the concepts of transaction processing and concurrency control to improve the security and system performance. |
| 2CSCS303_4 | Demonstrate the concepts of indexing and file organization to solve real world problems. |
| 2CSCS303_5 | Analyze various techniques for crash recovery in database systems, including failure classification, stable storage implementation and recovery mechanisms. |

| Course Contents: | | |
|-------------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | <p>Introduction to databases and ER Model Introduction: General introduction to database systems, its advantages and applications, View of Database – Levels of data abstraction, Data models, Database languages, Database System Architecture, Database users and Administrator, No SQL, Mongo DB ER Model: Entity set, Entity types, attributes, Notations, Relationship sets, Relationship types, Keys- super key, candidate key, primary key, Extended Features of ER Model-Generalization, Specialization and aggregation</p> | 6 Hrs. |
| Unit 2 | <p>Relational Model and SQL Relational Model: Structure of Relational Database, Reduction of ER model into Relational schemas, Schema-instance distinction, Referential integrity and foreign keys, Pure languages, Relational algebra, Example queries SQL: Introduction to SQL, Data definition statements with constraints, Insert, Update and Delete, Set Operations, Aggregate functions group by and having Clauses, Nested Queries, Views, Complex Queries, Joins.</p> | 9 Hrs. |

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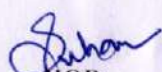


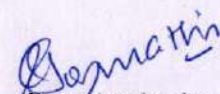
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| Unit 3 | <p>Functional Dependency and Normalization Importance of a good schema design, Motivation for normal forms, Atomic domains and 1NF, Dependency theory - functional dependencies, Closure of a set of FD's, Definitions of 2NF, 3NF and BCNF, Decomposition algorithms and desirable properties of them, Multivalued dependencies and 4NF, Join dependencies and definition of 5NF.</p> | 5 Hrs. |
| Unit 4 | <p>Data Storage & Indexing File organization, Organization of records in files, Data Dictionary, Database Buffer Indexing: Concept, Ordered Indices-Primary, Secondary, Multilevel, B+ Tree Index, Hashing, Hash Indices, Dynamic hashing, Multiple key access, Bitmap Indices</p> | 6 Hrs. |
| Unit 5 | <p>Transaction Management & Concurrency Control Transaction Processing: Concept, ACID properties, Transaction states, Storage Structure, Implementation of atomicity, isolation and durability, Serializability, Testing of Serializability. Concurrency Control: Lock-based protocols, Timestamp - based Protocols, Validation -based Protocols, Multiple Granularities, Deadlock handling.</p> | 7 Hrs. |
| Unit 6 | <p>Recovery System Failure classification, Storage structure, Implementation of stable storage, Recovery and Atomicity, Log based recovery, Checkpoints, Shadow Paging, and Buffer Management in crash recovery.</p> | 6 Hrs. |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|---|---------------------------|---------|-----------------|
| 01 | Database system concepts | A. Silberschatz, H.F. Korth, S.Sudarsha | McGraw Hill Education | 6 | 2011 |
| 02 | Database Systems-practical approach to Design, Implementation | A Thomos Connolly, Carolyn Begg | Pearson Education. | 4 | 2009 |
| 03 | Database Systems Design, Implementation and Management | Rob & Coronel | Thomson Course Technology | 5 | 2008 |
| 04 | Database Management Systems | Raghu Ram Krishnan | McGraw Hill | 3 | 2002 |


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| Reference Books: | | | | | |
|------------------|---|------------------------------------|-----------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Fundamentals of Database Systems | Ramez Elmasri and Shamkant Navathe | Pearson Education | 4 | 2007 |
| 02 | Database Systems: Design, Implementation and management | Peter Rof, Carlos Coronel | Cengage Learning | 7 | 2014 |
| 03 | Principles of Database Systems | J. D. Ullman | Galgotia publications | 1 | 2011 |
| 04 | SQL: A Complete Reference | Alexis Leon, Mathews Leon | McGraw Hill Education | 1 | 2002 |



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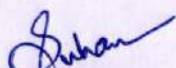
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|------------------------------------|-----------------------------------|
| Class | T. Y. B. Tech, Sem. V |
| Course Code & Course Title | 2CSPE304-Advanced Database System |
| Prerequisite/s | 2CSPC210- Database Engineering |
| Teaching Scheme: Theory | 03 Hours |
| Credits | 03 |
| Evaluation Scheme: ISE / MSE / ESE | 40/30/30 |

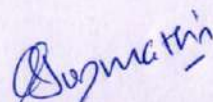
Course Outcomes (COs): Upon successful completion of this course, student will be able to:

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|------------|--|
| 2CSPE304_1 | Evaluate modeling and development methods in Object-Relational Databases by using database schemas. |
| 2CSPE304_2 | Apply knowledge based on the need, issues, design and application for both parallel and Distributed databases. |
| 2CSPE304_3 | Compare different transaction processing monitors and make use of different transactions like long duration, real time transactions etc. based on situation. |
| 2CSPE304_4 | Apply PL/SQL, NoSQL and OLAP queries on various databases. |
| 2CSPE304_5 | Design OLAP database or data ware house for real time applications. |

Course Contents:

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|---------------|--|---------|
| Unit 1 | Object and Object Relational Databases Concepts for Object Databases: Object Identity - Object structure - Type Constructors - Encapsulation of Operations - Methods - Persistence - Type and Class Hierarchies - Inheritance - Complex Objects - Object Database Standards, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational. | 06 Hrs. |
| Unit 2 | Parallel and Distributed Databases Database System Architectures: Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types, Parallel Databases: I/O Parallelism, Inter and Intra Query Parallelism, Inter and Intra operation Parallelism, Design of Parallel Systems, Distributed Database Concepts - Distributed Data Storage, Commit Protocols, Concurrency Control, Distributed Query Processing | 08 Hrs. |


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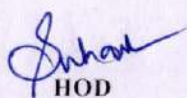

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| Unit 4 | Database Security and Advanced SQL Discretionary Access Control, Mandatory Access Control, Audit Trails in Databases, Statistical Databases, PL SQL- A Basic introduction, Functions and Procedure, Packages, Synonyms, Database Links, Embedded SQL and Dynamic SQL | 07 Hrs. |
| Unit 5 | NoSQL The NoSQL – Introduction, Difference between SQL and NoSQL, List of NoSQL Databases, Characteristics of NoSQL MongoDB - Advantages, Installation, Data Model of MongoDB, Creating database, Drop Database, Create collection, Drop collection - Data types, Insert document, Update document, Query document, Delete document, Sorting records, Indexing, Aggregation | 06 Hrs. |
| Unit 6 | Data Warehouse and OLAP Data Warehousing, Creating and maintaining a warehouse. OLAP: Multidimensional data Model, Star Schemas, OLAP Queries, Database design for OLAP, Implementation Techniques for OLAP Bitmap Indexes, Join Indexes, Views and decision support, Top N Queries, Online Aggregation. | 07 Hrs. |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|--|-----------------------|---------|-----------------|
| 1 | Database System Concepts | A. Silberschatz, H. F. Korth, S. Sudarshan | McGraw Hill Education | 7 | 2019 |
| 2 | Database Systems - A Practical Approach to Design, Implementation | Thomos Connolly, Carolyn Begg | Pearson Education | 6 | 2019 |
| 3 | Getting Started with NoSQL | Gaurav Vaish | Packet | 1 | 2013 |
| 4 | Database Management Systems | Raghu Ram Krishnan | McGraw Hill | 3 | 2014 |


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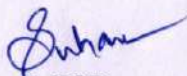

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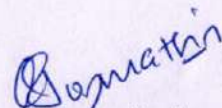

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| Reference Books: | | | | | |
|------------------|---|-----------------------------------|-----------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Fundamentals of Database Systems | Ramez Elmari and Shamkant Navathe | Pearson Education | 7 | 2017 |
| 2 | Database Systems: Design, Implementation and Management | PeterRof, Carlos Coronel | Cenage Learning | 13 | 2018 |
| 3 | Principals of Database Systems | J. D. Ullman | Galgotia Publications | 1 | 2011 |
| 4 | Sql: A Complete Reference | Alexis Leon | McGraw Hill Education | 1 | 2007 |


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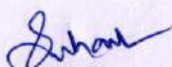

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| Class | T Y B. Tech Sem V |
| Course Code & Course Title | 2CSPE305- Internet of Things |
| Prerequisite/s | 2CSPC111 Computer Networks |
| Teaching Scheme (Lecture/Practical/Tutorial) | 3/0/0 |
| Credits | 03 |
| Evaluation Scheme: ISE/ MSE /ESE | 40/ 30/ 30 |

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| Course Outcomes (COs): | |
| Upon successful completion of the course, the students will be able to: | |
| 2CSPE305_1 | Interpret the impact and challenges posed by IOT networks leading to new architectural models. |
| 2CSPE305_2 | Analyze and select Relevant sensors used in IOT applications. |
| 2CSPE305_3 | Design a portable IOT application using equivalent boards and relevant protocols. |
| 2CSPE305_4 | Infer the role of data analysis and security in IOT. |
| 2CSPE305_5 | Design a Cloud based IOT applications. |

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| Course Contents: | | |
| Unit 1 | Introduction to the Internet of Things (IoT) Introduction and Definition of Internet of Things, Application areas of IOT, Introduction to the Industrial Revolution: Overview of Industrial Revolutions, Things in IOT, IOT stack, Enabling Technologies, IOT challenges, IOT levels, Cyber physical System versus IOT, Wireless Sensor Networks versus IOT. | 05 Hrs. |
| Unit 2 | Introduction to Sensors, Microcontrollers, and Their Interfacing Introduction to Sensor Interfacing, Types of Sensors, Controlling Sensors through web pages, Microcontroller. | 06 Hrs. |
| Unit 3 | IoT Software and Platforms Features and Characteristics of IoT Platforms: Device Management, Data Management, Analytics, Security; Open-source and Commercial IoT Platforms: Arduino IoT, AWS IoT, Microsoft Azure IoT, Google Cloud IoT; IoT Operating Systems: Difference between IoT OS and general-purpose OS, Contiki, TinyOS; Protocols For IOT Messaging and Transport Protocols: MQTT, COAP, XMPP and DDS protocols, Bluetooth Low Energy, Light Fidelity(Li-Fi) Addressing and Identification: Introduction, IPv4, IPv6, IPv6-A quick Overview: IPv6 vs IPv4, Legacy of IPv4 Devices, Switching over to IPv6, IPv5, URI. | 09 Hrs. |


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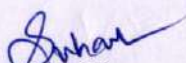


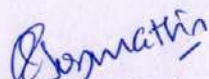
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| Unit 4 | Application Building with IOT Introduction: IFTTT, IFTTT versus Other Cloud Services, Smart Perishable tracking with IOT sensors, Smart Healthcare, Smart Inflight Lavatory Maintenance with IOT, IOT Based Application to Monitor Water Quality, Smart Warehouse Monitoring, Smart Retail- IOT Possibilities in the Retail Sector, Prevention of Drowsiness of Drivers by IOT-Based Smart Driver Assistance Systems, System to Measure Collision Impact in an Accident with IOT, Integrated Vehicle Health Management; Application of Industrial IOT (IIOT). | 06 Hrs. |
| Unit 5 | Data Analytics- Visualizing the power Data from IOT Introduction, Data Analysis, Introduction to Machine learning IoT Data & Analytics Data Types: Structured, unstructured, time series data in IoT; Data Storage: Edge vs. cloud, database types for IoT data; Big Data & IoT: Challenges & opportunities; Basic Data Processing: Filtering, cleaning, visualization for insight; Introduction to Machine Learning: Concepts and Roles in IoT | 07 Hrs. |
| Unit 6 | IoT Security, Challenges, & Future Data Security in IoT Networks: Importance of Security and Privacy in IoT. Encryption; IoT Security Vulnerabilities: Threats and Vulnerabilities in IoT Ecosystems - Malware, DDoS Attacks, Data Breaches; Securing IoT Networks and Devices: Authentication, encryption, access control, Identity and Access Management (IAM) in IoT Systems; Regulatory and Ethical Considerations: Data privacy, responsible use of IoT; Emerging Trends: AI and IoT, Edge Computing, 5G's impact, Smart City; The Future of IoT: Predictions and potential for disruption. | 06 Hrs. |

Textbooks:

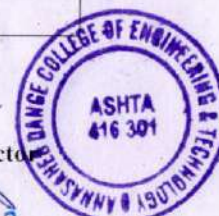
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|---|-------------------------|-------------|-----------------|
| 01 | Internet of Things (IoT): Principles, Paradigms and Applications of IoT | Dr Kamlesh Lakhwani, Dr Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran | BPB Publications, India | 1st edition | 2020 |
| 02 | Internet Of Things | Shriram K Vasudevan , Abhishek S Nagarjan, RMD Sundaram | Wiley Publications | 2nd Edition | 2020 |
| 04 | Designing the Internet of Things | Adrian McEwen, hakim Cassimally | Wiley | Reprint | 2015 |
| 05 | The Internet of Things, Connecting Objects to the Web | Hakima Chaouchi | Wiley Publications | 1st edition | 2010 |


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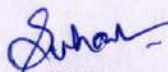

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| Reference Books: | | | | | |
|------------------|--|--|--|--------------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 02 | The Internet of Things: Key Applications and Protocols | Olivier Hersent, David Boswarthick, Omar Elloumi | ISBN 978-1119-99435-0, Wiley Publications. | 2nd | 2012 |
| 03 | Internet of Things, A Hands on Approach | Arshdeep Bahga, Vijay Madiseti | University Press, | 1st edition. | 2015 |
| 04 | "Sensors Handbook", | Sabrie Soloman, | McGraw Hill, | 2nd edition | 2015 |


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| Class | T. Y. B. Tech Semester V |
| Course Code & Course Title | 2CSPE306 Real Time System |
| Prerequisites | 2CSPC103-Data Communication 2CSPC111 -Computer Networks 2CSPC203 -Computer Organization and Architecture 2CSPC204-Operating Systems, 2CSPC210-Database Engineering |
| Teaching Scheme (Lecture/Practical/Tutorial/) | 03/00/00 |
| Credits | 03 |
| Evaluation Scheme: ISE/ MSE/ ESE | 40/30/30 |

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| Course Outcomes (COs) After successfully completion of course students will be able to: | |
| 2CSPE306_1 | Explain the working principles of RTS with various application |
| 2CSPE306_2 | Apply various application Tools and Technology on RTS |
| 2CSPE306_3 | Analyze the performance of Real-time system using different RTS concepts & models |
| 2CSPE306_4 | Evaluate the performance of Real-time system |

Course Contents:

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| Unit1 | Historical background: Elements of a Computer Control System, RTS- Definition, Characteristics of RTS, Classification of Real-time Systems, Classification of Programs, Time Constraints. Hardware: Basic Architecture, Hardware Interfacing, Central Processing Unit, Memory, System Software, Input, Output and other relevant devices. | 7Hrs. |
| Unit2 | Real-Time Operating System: Hardware, Software, Real-Time Kernels, Theoretical Foundation of Real-Time Operating System, Scheduling, Inter Task Communication and synchronization, IPC-RPC, System Services for Application Programs, Memory Management, Real Time Garbage Collection. | 7Hrs. |
| Unit3 | Design of RTS- General Introduction: Introduction, Specification Document, Preliminary Design. Single-Program Approach, Foreground/Background System. RTS Development Methodologies: Introduction, Yow-don Methodology, Ward and Mellor Method, Hately and Pirbhai Method. | 7 Hrs. |
| Unit4 | Real Time databases: Overview, Characteristics, Frame work, Data Streams, Stream Processing, Application, Business Use Case for RT DB, Technical Use Case for RT DB, Time Series DB, ETL, Tools: Hazecast, No SQL, SQL Lite, Redis, Firebase, Apache Kafka, Rethink DB. | 7 Hrs. |

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| Unit5 | Application of RTOS: Overview and Architecture of RTLinux, LynxOS, Features of Deos(DDC-1) and embOS, and Overview of Other Popular RTOS. Example: Video Conferencing, Automation, Air traffic controllers, Multimedia Systems, Virtual Class(Zoom & Google Meet), On-line TLP, Robotics, Aviation, Signal and System, Control systems, Medical industry, Online Gaming, QNX, VxWorks, and VOIP. | 7 Hrs. |
| Unit6 | CASE STUDY: Linux POSIX system, RTLinux/RTAI, Vxworks, Process States, Inter-task communication mechanism, D2D Communication, Linux Scheduling, YouTube, twister, VMware, Online Gaming. | 7 Hrs. |

Text books

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|--------------------|-------------------|-------------------------|-----------------|
| 1 | Real time system design and analysis | Phillip Laplante | Wiley India | Edition | 2004 |
| 2 | Embedded Real-Time Systems: Concepts, | Dr.K.V.K. K.Prasad | Dreamtech Press | New Edition | 2015 |
| 3 | Real-Time Systems: Theory and Practice, | Rajib Mall, | Pearson, | 1 st Edition | 2006 |
| 4 | Real Time Systems | Jane W.S. Liu, | Pearson Education | 1 st Edition | 2000 |

Reference Books

| | | | | | |
|---|--|---------------------------|---------------------------|-------|------|
| 1 | Embedded and Real Time Operating Systems | Wang K.C. | Springer | First | 2017 |
| 2 | Building a Real Time Operating System | Colin Walls | Newnes | First | 2019 |
| 3 | Real-Time Systems | C.M.Krishna, Kang G.Shin, | McGraw-Hill International | Third | 2010 |
| 4 | Real-Time Systems, Design Principles for Distributed | Kopetz, Heimann | Springer | Third | 2002 |

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| Class | T.Y B.Tech., Sem - V |
| Course Code and Course Name | 2CSHS307 - Entrepreneurship |
| Prerequisite | NIL |
| Teaching Scheme: Lecture/Tutorial/Practical | 2/00/00 |
| Credits | 01 |
| Evaluation Scheme: ISE | 25 |

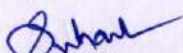
Course Outcomes (CO's):

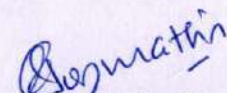
After successful completion of this course, the student will be able to,

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| 2CSHS307_1 | Identify and evaluate potential business opportunities in the engineering domain. |
| 2CSHS307_2 | Conduct market research and analyze the competitive landscape. |
| 2CSHS307_3 | Craft a comprehensive business plan, including financial projections. |
| 2CSHS307_4 | Understand the fundamentals of marketing, sales, and operations for engineering ventures. |
| 2CSHS307_5 | Pitch their business ideas to potential investors. |
| 2CSHS307_6 | Grasp the legal and ethical considerations of starting a business. |

Course Contents:

1. The Entrepreneurial Ecosystem
2. Idea Identification and Prototyping
3. Testing, Validation and Commercialization
4. Market Analysis and Competitive Landscape
5. Legal Procedure to setup an Startup Business
6. Understanding Finance Basics
7. Business Planning and Development
8. Marketing and Sustainability
9. Pitching and Fundraising
10. Startup Case Studies


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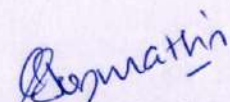


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Reference Materials:

1. <https://www.startupindia.gov.in/content/sih/en/international/go-to-marketguide/indian-startup-ecosystem.html>
2. https://www.startupindia.gov.in/content/sih/en/learning-and-development_v2.html
3. https://onlinecourses.nptel.ac.in/noc24_mg93/preview


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| Class | T.Y. B. Tech. Semester-V |
| Course Code and Course Title | 2CSVS308, Python Programming |
| Prerequisite/s | 2CSPC206, 2CSPC217 |
| Teaching Scheme: Lecture/Tutorial/Practical | 02/00/02 |
| Credits | 03 |
| Evaluation Scheme (Practical): ISE / ESE | 50/50 |

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| Course Outcomes (COs): Upon successful completion of this course, the student will be able to: | |
| 2CSVS308_1 | Apply fundamental concepts of python to solve mathematical and engineering problem. |
| 2CSVS308_2 | Implement various object-oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve real world problems using python. |
| 2CSVS308_3 | Apply the concepts of files and exception handling to resolve runtime errors for I/O Operations. |
| 2CSVS308_4 | Apply the concepts of reusability by using modules, packages, and libraries |
| 2CSVS308_5 | Develop a GUI application for web scrapping using Beautifulsoup. |

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| Course Contents: | | |
| Unit 1 | Introduction to Python Programming Introduction to Python: History, features, and applications; Setting up Python environment: Installing Python, IDEs (e.g., VSCode, Anaconda, PyCharm); Basic syntax and data types: Variables, numbers, strings, lists, tuples, dictionaries; Basic input/output operations | 04 Hrs. |
| Unit 2 | Flow control, Functions Conditional statements: if, elif, else; Loops: for loop, while loop, nested loops; Control flow statements: break, continue; Functions: Defining functions, parameters, return statement; Scope and lifetime of variables | 04 Hrs. |
| Unit 3 | Data Structures and File Handling Lists: Operations, methods, slicing; Tuples and sets: Properties, operations; Dictionaries: Creating, accessing, modifying; File handling: Opening, reading, writing, and closing files; Exception handling: try, except, finally blocks | 05 Hrs |

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| Unit 4 | Object-Oriented Programming in Python Introduction to object-oriented programming (OOP) concepts; Classes and objects: Defining classes, creating objects; Encapsulation, inheritance, and polymorphism; Method overriding and overloading; Special methods (dunder methods): <code>__init__</code> , <code>__str__</code> , <code>__repr__</code> | 04 Hrs. |
| Unit 5 | Modules, Packages, and Libraries Understanding modules and packages; Importing modules and packages; Standard libraries: <code>os</code> , <code>sys</code> , <code>math</code> , <code>random</code> , <code>datetime</code> ; Third-party libraries: NumPy, Pandas, Matplotlib; Exploring documentation and using external libraries | 05 Hrs. |
| Unit 6 | Advanced Topics and Applications Regular expressions: Syntax, patterns, <code>re</code> module; Lambda functions and <code>map</code> , <code>filter</code> , <code>reduce</code> functions; List comprehensions and generator expressions; Introduction to GUI programming with Tkinter; Introduction to web scraping with BeautifulSoup | 04Hrs. |

Text Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|---|-------------------------|------------------------------------|---------|-----------------|
| 01 | Introduction to computing and Problem Solving with Python | Jeeva Jose and SojanLal | Khanna Book Publishing Co. (P) Ltd | 1 | 2016 |
| 02 | Programming Python | Mark Lutz | O'reilly | 2 | 2001 |

Reference Books:

| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
|--------|--|---------------|-----------|---------|-----------------|
| 01 | Introducing Python Modern Computing in Simple Packages | Lubanovic Bil | O'reilly | 1st | 2014 |

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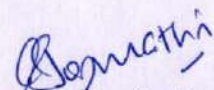


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| Class | T.Y. B. Tech. Semester-V |
| Course Code and Course Title | Industrial Training / Internship 2CSEL309 |
| Prerequisite/s | -- |
| Teaching Scheme: Lecture/Tutorial/Practical | -- |
| Credits | 01 |
| Evaluation Scheme: ISE | 50 |

Course Contents:

- Ideally, students shall pursue their industrial training/internship during semester break after 4th semester/6th semester of their course.
- Students shall submit their report and present themselves to share their outcome at the start of the 5th semester/ 7th semester. it will be assessed by respective dept coordinator and HOD.
- Student shall expose themselves to industrial environment (viz. various organizations, structure, departments, processes, products and services and their applications along with relevant aspects of quality control which cannot be simulated in the classroom) for application of existing engineering knowledge in industrial situations
- Student shall grab to learn and sharpen the real time technical and managerial skills required for professional career
- Students shall understand the social, environmental, economic and administrative considerations that influence the working environment
- Student shall understand the engineer's responsibilities and ethics at the organization
- Student shall get acquainted with the working styles of industries at different hierarchy and learn to work in a team
- Expected to gain experience in all types of professional communications (viz. pre internship applications, during internships people skills, technical skills and documentation skills , post internship reports/projects writing skills)
- Students shall identify the linkages of future job/research opportunities to into the same/similar industry.
- Student shall ensure that they will do stipend-based internship/or unpaid industrial training.


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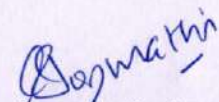
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|---|---|
| Class | T.Y. B. Tech. Semester-V |
| Course Code and Course Title | 2CSCC310 Aptitude and Reasoning Part-III |
| Prerequisite/s | 2CSCC208,2CSCC220 |
| Teaching Scheme: Lecture/Tutorial /Practical | 2/00/00 |
| Credits | 01 |
| Evaluation Scheme: ISE / ESE | 50 |

| | |
|---|---|
| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSCC310_1 | Solve problem based on basic and advance Permutation and Combination |
| 2CSCC310_2 | Solve problem based on Probability, Application of Probability, Cubes, Dices, cube painting and Syllogism |
| 2CSCC310_3 | Solve problem based on Mensuration 3D, Circle & Triangle |
| 2CSCC310_4 | Demonstrate on Resume writing skill, closed, advanced grammar, Synonyms and Antonyms |

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|-------------------------|--|----------------|
| Course Contents: | | |
| Unit 1 | <ul style="list-style-type: none"> • Basic Permutation and Combination • Advance Permutation and Combination | 04 Hrs. |
| Unit 2 | <ul style="list-style-type: none"> • Probability • Application of Probability | 04 Hrs. |
| Unit 3 | <ul style="list-style-type: none"> • Cubes, Dices & cube painting • Syllogism | 04 Hrs. |
| Unit 4 | <ul style="list-style-type: none"> • Mensuration 3D • Circle & Triangle | 04 Hrs. |
| Unit 5 | <ul style="list-style-type: none"> • Resume writing & resume making • Interview Techniques | 04 Hrs. |
| Unit 6 | <ul style="list-style-type: none"> • Closed Test & advanced Grammar • Synonyms & Antonyms | 04 Hrs. |


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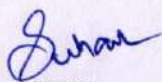

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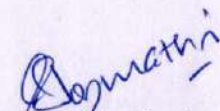

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| Text Books: | | | | | |
|-------------|---|--------------|-----------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | R.S. Agarwal | R.S. Agarwal | S Chand | | 2019 |
| 02 | R.S. Agarwal (Verbal & Non-verbal Reasoning) | R.S. Agarwal | S Chand | | 2010 |
| 03 | Wren & Martin(Verbal, Grammar) | P.C.Wren | S Chand | | 2017 |


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|--|---|
| Class | T. Y. B. Tech, Sem. VI |
| Course Code and Course Title | 2CSPC311- System Programming and Compilers |
| Prerequisite/s | 2CSPC204 – Operating System 2CSPC203- Computer Organization and Architecture |
| Teaching Scheme: Lecture/Practical/Tutorial | 3/0/0 |
| Credits | 03 |
| Evaluation Scheme: ISE / MSE/ ESE | 40/30/30 |

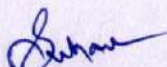
Course Outcomes (COs):

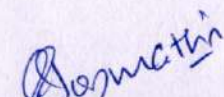
Upon successful completion of this course, the student will be able to:

| | |
|------------|---|
| 2CSPC311_1 | Design an assembler and macro pre-processor using fundamentals of language processing |
| 2CSPC311_2 | Analyze the functionalities of interpreters, linkers, and loaders |
| 2CSPC311_3 | Apply finite automata implications for designing lexical analyser generator. |
| 2CSPC311_4 | Judge the efficiency of parsing algorithms for a given problem |
| 2CSPC311_5 | Appraise various code optimization and code generation techniques |


Course Contents:

| | | |
|---------------|---|----------------|
| Unit 1 | Language Processors Introduction, language processing activities, Fundamentals of language processing, Toy Compiler, Fundamentals of language Specifications | 06 Hrs. |
| Unit 2 | Assemblers and macro pre-processor Elements of assembly language programming, a simple assembly scheme, pass structure of assemblers, design of a two pass assembler Macro definition and call, Macro Expansion, Nested macro calls, Advanced macro facilities, Design of macro pre-processor | 10 Hrs. |
| Unit 3 | Interpreters, Linkers and Loaders Interpreters, Relocation and linking concepts, design of a linker, Selfrelocating programs, linking for overlays, functions of loaders, Different loading schemes: Relocating loader, Direct Linking Loader, Dynamic linking and loading | 05 Hrs. |
| Unit 4 | Introduction to Compiling Compilers, Phases of a compiler, Compiler construction tools Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyzer generator. | 07Hrs. |


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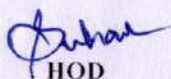

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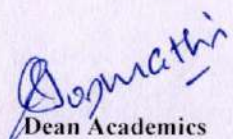


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|---------------|---|----------------|
| Unit 5 | Syntax Analysis Role of Parser, Top- down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers models, Syntax directed definitions | 10 Hrs. |
| Unit 6 | Code Generation Code Optimizing transformations, Issues in design of Code Generation, target language, addresses in target code, Basic blocks and flow graph, optimization of basic blocks, A simple code generator | 04 Hrs. |

| Text Books: | | | | | |
|--------------------|--|-------------------------------------|---------------------|----------------|------------------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | System Programming | D M Dhamdhere | Tata McGraw-Hill | First Reprint | 2011 |
| 02 | System Programming and Operating System | D M Dhamdhere | Tata McGraw-Hill | 2 | 2006 |
| 03 | Compilers - Principles, Techniques and Tools | A.V. Aho, R. Shethi and J.D. Ullman | Pearson Education | 1 | 1999 |
| 04 | Crafting A Compiler with C | Charles Fischer, Richard LeBlanc | Pearson Publication | 1 | 2007 |

| Reference Books: | | | | | |
|-------------------------|---|------------------|-------------------------|----------------|------------------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Compiler Construction-Principles and Practices | Kenneth C.Louden | Vikas Publication House | 1 | 2003 |
| 02 | Compiler Construction using Java, Javacc and Yacc | A. J. DosReis | Wiley | 1 | 2015 |
| 03 | System Programming | J. J. Donovan | Tata McGraw-Hill | 1 | 2001 |
| 04 | Writing compilers and Interpreters | Ronald Mak | Wiley | 3 | 2015 |


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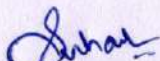

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| Class | T.Y. B. Tech Sem VI |
| Course Code & Course Title | 2CSPC312- Software Engineering |
| Prerequisite/s | -- |
| Teaching Scheme (Lecture/Practical/Tutorial) | 3/0/0 |
| Credits | 03 |
| Evaluation Scheme Theory: ISE/ MSE/ ESE | 40/30/30 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC312_1 | Design a solution to solve a given problem of SDLC using different software engineering models. |
| 2CSPC312_2 | Build a software requirement specification documents and project plan for any software by analyzing the problem statement. |
| 2CSPC312_3 | Develop a software system design to solve a given problem using structured or function-oriented design methodology. |
| 2CSPC312_4 | Test the functioning of given application to check correctness of code using test cases. |
| 2CSPC312_5 | Illustrate appropriate standard for a given process to maintain software reliability and quality using quality standards like ISO 9000, CMM etc. |

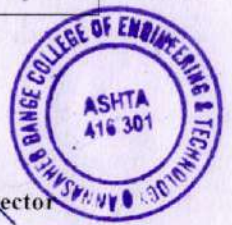
| Course Contents: | | |
|-------------------------|---|-------------|
| Unit No. | Unit Name | Contact Hrs |
| Unit 1 | Software Processes and Agile Methodology Software Process, Software Development Process Models, Agile software development - Agile methods, Plan-driven and agile development, Extreme programming, Scrum and Scaling agile methods, CI/CD, and DevOps practices. | 08 Hrs |
| Unit 2 | Software Requirements Analysis and Specification Software Requirement, Problem Analysis, Requirements Specification, Functional Specification with Use Cases, validation. | 06 Hrs |
| Unit 3 | Planning a Software Project Process Planning, Effort Estimation, Project Scheduling and Staffing, Software Configuration Management Plan, Quality Plan, Risk Analysis & Management. | 06 Hrs |
| Unit 4 | Object and Function Oriented Design Object-oriented concepts, Overview of UML, Design Principles, Module-Level Concepts, Design Notation and Specification, Structured Design Methodology | 07 Hrs |


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| Unit 5 | Coding and Testing Programming Principles and Guidelines, Coding Process, Testing Fundamentals, Black-Box Testing, White-Box Testing. | 06 Hrs |
| Unit 6 | Software Reliability and Quality Management Software Reliability, Software Quality, Software Quality Management System, ISO 9000, SEI-CMM. | 06 Hrs |

| Text Books: | | | | | |
|-------------|---|---------------|-------------------|---------|-----------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | An Integrated Approach to S/W Engineering | Pankaj Jalote | Narosa Publishers | 3rd | 2011 |
| 2 | Fundamentals of Software Engineering | Rajib Mall | PHI | 3rd | 2014 |
| 3 | Software Engineering | Jawadkar W.S. | TMGH | 5th | 2007 |

| Reference Books: | | | | | |
|------------------|---|-------------------|---------------------------------|---------|-----------------|
| Sr. No. | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Software Engineering | Ian Sommerville | Pearson | 10th | 2016 |
| 2 | Software Engineering: Practitioner's Approach | Roger S. Pressman | McGraw Hill | 9th | 2023 |
| 3 | Software Engineering Principles and Practices | Rohit Khuran | Vikas Publishing House Pvt. Ltd | 2nd | 2010 |

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|---|--|
| Class | T.Y. B. Tech Sem VI |
| Course Code & Course Title | 2CSPC313 Machine Learning |
| Prerequisite/s | 2CSPC201 Discrete mathematics 2CSVS308 Python Programming |
| Teaching Scheme (Lecture/Practical/Tutorial) | 03/00/02 |
| Credits | 04 |
| Evaluation Scheme Theory : ISE/MSE/ESE: | 40/30/30 |
| Evaluation Scheme Practical: ISE/ESE | 50/50 |

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|---|---|
| Course Outcomes (COs) : | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSPC313_1 | Apply various machine learning algorithms to real-world datasets for solving classification, regression, and clustering problems. |
| 2CSPC313_2 | Demonstrate the working of various machine learning algorithms using mathematical justifications |
| 2CSPC313_3 | Analyze the strengths and weaknesses of different machine learning algorithms for specific types of problems and datasets. |
| 2CSPC313_4 | Evaluate machine learning model using appropriate metrics and perform hyper parameter tuning to improve performance. |

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|-------------------------|--|----------------|
| Course Contents: | | |
| Unit 1 | Introduction Introduction to Machine Learning, Applications, History of machine learning, Types of Learning, Hypothesis space, Inductive Bias, Data Partitioning Methods, Performance evaluation | 06 Hrs. |
| Unit 2 | Regression and Decision Trees Types of Regression - Simple, Multiple, Linear, Non-linear, Gradient Descent and Normal Equations, Polynomial Regression, Logistic Regression, Regularization. Decision Tree representation - ID3 algorithm, Issues | 07 Hrs. |
| Unit 3 | Instance Based Learning and Feature Selection k-nearest neighbor, Distance weighted nearest neighbor algorithm, Curse of Dimensionality, Feature selection - filter methods, wrapper methods, Feature extraction - PCA | 07 Hrs. |
| Unit 4 | Probability and Bayes Learning Probability Concepts, Bayes Theorem, MAP Hypothesis, Bayes Optimal Classifier, Naive Bayes Classifier, Bayesian Network | 05 Hrs. |

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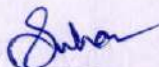


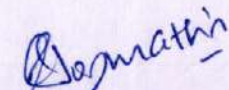
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|---------------|--|----------------|
| Unit 5 | Support Vector Machines and Neural Network Introduction to support Vector Machine, Linear SVM, Non-linear SVM, Kernel Functions, Multi-class SVMs Introduction to neural network, Perceptron, Perceptron Learning, Multilayer neural network, back propagation, Introduction to deep neural network | 08 Hrs. |
| Unit 6 | Clustering, Recommender Systems and Ensemble Learning Introduction to clustering, k-means clustering, Hierarchical Clustering, Recommender Systems - Content based, collaborative filtering, Introduction to ensemble learning, Bagging and boosting, Random Forest Algorithm | 06 Hrs. |

List of Experiments

| | |
|----|--|
| 1 | Program based on Numpy and pandas |
| 2 | Implementation of simple linear regression using scikit-learn. |
| 3 | Implementation of Logistic Regression for classification |
| 4 | Build the Decision Tree Model for given problem statement (Use ID3 Algorithm) - Use Pen and Paper |
| 5 | Implementation of decision tree classifier in python. Use of scikit-learn for various functionalities. |
| 6 | Problem solving - Naive Bayes classifier. |
| 7 | Implementation of Naive Bayes classifier in python. Use of scikit-learn for various functionalities. |
| 8 | Implementation of &-NN algorithm in python. Use of scikit-learn for various functionalities. |
| 9 | Implementation of ^-means Clustering. |
| 10 | Implementation of SVM for classification. |
| 11 | Program based on neural network |


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| Text Books: | | | | | |
|------------------|---|---------------------------------------|--------------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Machine Learning | Tom Mitchell | McGraw-Hill | 1 | 1997 |
| 02 | Introduction to Machine Learning | Ethem Alpaydin | The MIT Press | 2 | 2010 |
| Reference Books: | | | | | |
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | The Elements of Statistical Learning | T. Hastie, R. Tibshirani, J. Friedman | Pearson Education | 2 | 2008 |
| 02 | NPTEL course Introduction to Machine Learning | Prof. Sudeshna Sarkar | NPTEL | - | - |
| 03 | Coursera Machine Learning | Andrew Ng | Coursera / Stanford University | - | - |



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| Class | T. Y. B. Tech Sem VI |
| Course Code & Course Title | 2CSCS314 Data Structures |
| Prerequisite/s | - |
| Teaching Scheme (Lecture/Practical/Tutorial) | 3/0/0 |
| Credits | 3 |
| Evaluation Scheme Theory: ISE/ MSE/ ESE | 40/30/30 |

| Course Outcomes (COs) : The students will be able to: | |
|---|--|
| 2CSCS314_1 | Describe fundamentals in data structures for solving problems. |
| 2CSCS314_2 | Apply appropriate linear data structure to solve the problem using a programming language. |
| 2CSCS314_3 | Apply appropriate non-linear data structure to solve the problem using a programming language. |
| 2CSCS314_4 | Compare and analyze different data structure algorithms and searching, sorting methods for solving problems. |

| Course Contents: | | |
|------------------|--|---------------|
| Unit No | Unit Name | Contact Hours |
| Unit 1 | Basics of Data Structures: Algorithm, ADT, Space and Time Complexity, Direct and Indirect recursion, analysis of recursive functions e.g. Towers of Hanoi | 3 Hrs |
| Unit 2 | Searching and Sorting Techniques Linear search, binary search, Internal and External Sorts, bubble sort, selection sort, insertion sort, merge sort, quick sort, radix sort, heap sort. Hashing - Definition, hash functions, overflow, collision, Collision resolution techniques, Open addressing, Chaining. | 9 Hrs |
| Unit 3 | Lists Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists. | 8 Hrs |
| Unit 4 | Stack and Queue Stacks as ADT, operations, representation using static and dynamic structures, applications of stack Queue as ADT, operations, representation using static and dynamic structures, circular queue, priority queue, double ended queue. | 8 Hrs |
| Unit 5 | Trees Basic terminology, representation, binary tree, traversal methods, binary search tree, AVL search tree, Heaps- Operations and their applications. | 7 Hrs |

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| Unit 6 | Graphs Basic concept of graph theory, storage representation: adjacency matrix, adjacency list, adjacency multi-lists, graph traversal techniques- BFS and DFS | 4 Hrs |
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| Text Books: | | | | | |
|-------------|---|--|------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Data Structures- A Pseudocode Approach with C | Richard F. Gilberg and Behrouz A. Forouzon | Cengage Learning | 2 | 2004 |
| 2 | Data Structures with C Schaum's Outlines Series | S. Lipschutz | Tata McGraw-Hill | - | 2017 |
| 3 | Data Structure using C | Reema Thareja | Oxford | 2 | 2014 |

| Reference Books: | | | | | |
|------------------|-----------------------------|---|------------------------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 1 | Data Structure using C | A. M. Tanenbaum, Y. Langsam, M. J. Augenstein | PrenticeHall Of India Pvt. Limited | - | 2003 |
| 2 | Understanding Pointers in C | Yashavant Kanetkar | BPB Publication | 1 | 2009 |
| 3 | C and Data Structures | N. B. Venkateshwarlu, E. V. Prasad | S. Chand and Company | - | 2010 |
| 4 | Let Us C | Yashavant Kanetkar | BPB Publication | 15 | 2016 |

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| Class | T. Y. B. Tech, Sem. VI |
| Course Code and Course Title | 2CSVS315 Web Programming |
| Prerequisite/s | - |
| Teaching Scheme: Lecture/T utorial/Practical | 2/0/2 |
| Credits | 03 |
| Evaluation Scheme: ISE/ESE | 50/50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSVS315_1 | Demonstrate proficiency in responsive web page design |
| 2CSVS315_2 | Develop web pages using different web programming techniques. |
| 2CSVS315_3 | Design and manage data-driven web applications |
| 2CSVS315_4 | Develop full-stack web application from scratch |

| | | |
|-------------------------|---|---------------|
| Course Contents: | | |
| Unit 1 | Responsive Web page design with HTML5, CSS3 Getting started with HTML 5, CSS3 and responsive web design, media queries: supporting differing viewports, embracing fluid layout, HTML5 for responsive design, CSS3: selectors, typography and color modes, stunning aesthetics with CSS3, CSS3 transitions, transformations and animations, conquer forms | 04 Hrs |
| Unit 2 | JavaScript Client-side scripting with JavaScript, variables, functions, conditions, loops and repetition, pop-up boxes, advance JavaScript: Introduction to ES6 features like let, const, and arrow functions, working with functions, objects, and arrays, variable types, scoping, and error handling, manipulating the DOM with JavaScript, handling events and user interactions with JavaScript, debugging and troubleshooting JavaScript code | 03 Hrs |
| Unit 3 | Basics of PHP General language feature, embedding PHP code in your Web pages, commenting your code, outputting data to the browser, PHP supported data types, identifiers, variables, constants, expressions, string interpolation and control structures, invoking a function, creating a function, function libraries, merging, slicing, splicing and dissecting arrays, other useful array functions | 04 Hrs |



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| Unit 4 | <p>Advanced Topics in PHP Regular expressions and other string-specific functions, alternatives for regular expression functions, PHP and Web forms, validating form data, uploading files with PHP Using PHP with MySQL: Installation prerequisites, using the MySQLi extension, interacting with the Database, executing database transactions, Session handling, configuration directives</p> | 04 Hrs |
| Unit 5 | <p>React Introduction to React, working with functional components, working with data in functional component, creating state components, working with child components, react basics introduction, understanding react lifecycle, working with routing in react, working with forms, understanding uncontrolled elements, performance optimization with react</p> | 05 Hrs |
| Unit 6 | <p>NodeJs Getting started with Node.js, Node.js execution model, events in Node.js, streams in Node.js, accessing local system using Node.js, Node.js for Web, socket programming, accessing data with Node.js, building apps with Node.js, securing Node.js</p> | 06 Hrs |

Experiment List:

| | |
|----|---|
| 1 | Programs based on newly introduced elements of HTML5. |
| 2 | Programs based on Typography and background properties of CSS3, animation effect by using the transition feature of CSS. |
| 3 | Programs based on JavaScript operators, functions and objects. |
| 4 | Programs based on ES6 features |
| 5 | Program to implement PHP variables, Expression, arrays, control structure |
| 6 | Design a web form and validate it using PHP using regular expressions |
| 7 | Design a web page to perform CRUD operations on MySQL database using PHP |
| 8 | Write a program to manage session in PHP |
| 9 | Create a simple application where users can add, delete, and mark tasks as completed using React |
| 10 | Develop an application where users can input a data and get the details using React |
| 11 | Set up a Node.js server using Express to handle API requests, Create routes for fetching tasks, adding tasks, marking tasks as completed, and deleting tasks, Use in-memory storage (e.g., arrays) to store the list of tasks temporarily, Implement CRUD (Create, Read, Update, Delete) operations for managing tasks. |
| 12 | Create a route for handling data requests from the frontend of weather application, implement logic to fetch weather data from the external API and forward it to the frontend, implement error handling for failed API requests or invalid city names. |

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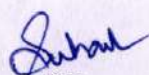
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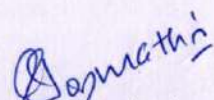
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| Text Books: | | | | | |
|-------------|---|--|-------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Learning HTML, PHP, MySQL, JavaScript & CSS | Robbin Nixon | O'Reilly | 3rd | 2014 |
| 02 | PHP and MySQL | Sheve Suehring, Tim Converse, Joyce Park | Wiley India | — | 2009 |
| 03 | Developing Web Application | Ralph Moseley, M.T. Savaliya | Wiley India | 2nd | 2013 |
| 04 | Professional Node.js | Petro Tixeria | Wiley India | 1st | 2013 |

| Reference Books: | | | | | |
|------------------|--|----------------------|----------------------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | Web Technology HTML, JavaScript, PHP, ASP.NET & AJAX | Dremtech Publication | Dremtech Publication | 2nd | 2015 |
| 03 | Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5 | Robin Nixon | Shroff Publication | 3rd | 2014 |


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| Class | T. Y. B. Tech Sem VI |
| Course Code & Course Title | 2CSEL316 Mini Project |
| Prerequisite/s | - |
| Teaching Scheme (Lecture/Practical/Tutorial) | -/4/- |
| Credits | 2 |
| Evaluation Scheme Theory: ISE | 50 |

Course Outcomes (COs):

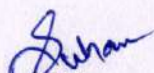
Upon successful completion of this course, the student will be able to:

| | |
|------------|---|
| 2CSEL316_1 | Identify specific problem from selected domain. |
| 2CSEL316_2 | Analyze the hardware and/or software requirements of the proposed work. |
| 2CSEL316_3 | Identify and use relevant tools and technologies for documentation, designing, coding, testing and debugging software / hardware pertaining to their major project. |
| 2CSEL316_4 | Design and construct software system, components, or process to meet desired needs. |
| 2CSEL316_5 | Defend or argue or appraise the result obtained during project work |
| 2CSEL316_6 | Develop summarizing, writing, documentation, and presentation skills to showcase their project work leading to effective communication. |

Course Contents:

Platforms: Free and open source software

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|---|---|
| 1 | Three students (Maximum) in a group shall carry out a mini project. A batch of practical / shall be divided into mini project groups. |
| 2 | Mini project topics and the work for these groups in the batch shall be guided by a teacher for the batch, preferably on one of the topics which is selected by a student in his / her domain. |
| 3 | Alternatively, a group may select another topic of relevance in consultation with senior students and teachers. |
| 4 | A group shall undertake IBM TGMC (The Great Mind Challenge) projects, past Smart India Hackathon, KPIT Sparkle topic. Students shall use deployment tools like GitHub, plagiarism check tool Turnitin, and report writing tool Latex for their mini project work. |
| 5 | The teacher shall periodically assess the performance of individual student in the mini project jointly with a teacher of another batch. This assessment will be used for determining ISE marks of the mini project. |


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| 6 | Project group shall submit hardcopy of project report along with related code and documentation in soft form at the end of semester. |
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| Class | T.Y. B. Tech. Semester-VI |
| Course Code and Course Title | Aptitude and Reasoning Part-IV 2CSCC317 |
| Prerequisite/s | 2CSCC208, 2CSCC220, 2CSCC310 |
| Teaching Scheme: Lecture/Tutorial /Practical | 00/00/02 |
| Credits | 01 |
| Evaluation Scheme: ISE | 50 |

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| Course Outcomes (COs): | |
| Upon successful completion of this course, the student will be able to: | |
| 2CSCC317_1 | Solve problem based on basic and advance probability, Permutation and Combination |
| 2CSCC317_2 | Solve problem based on Syllogism, graphs, data interpretations, Arithmetic, Calendar |
| 2CSCC317_3 | Solve problem based on gaming round |
| 2CSCC317_4 | Demonstrate Verbal skills and Interview Skills |

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|-------------------------|--|----------------|
| Course Contents: | | |
| Unit 1 | Advance Probability: Advance Permutation Combination | 04 Hrs. |
| Unit 2 | Statement Assumption, Syllogism | 04 Hrs. |
| Unit 3 | Mixed Bar Graph, Pie Chart Data Interpretation(Avg & Ratio Proportion based) | 04 Hrs. |
| Unit 4 | Gaming Round OR Capgemini Part 1 Gaming Round OR Capgemini Part 2 | 04 Hrs. |
| Unit 5 | Company Specific Revision for Arithmetic (S.T.D., Time Rate Work) Revision of Calendar Reminder theorem Power Cycle | 04 Hrs. |
| Unit 6 | Verbal Ability Revision Part 1 Verbal Ability Revision Part 2 Interview Etiquettes & Grooming | 04 Hrs. |

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| Text Books: | | | | | |
|-------------|--|--------------|-----------|---------|-----------------|
| Sr. No | Title | Author | Publisher | Edition | Year of Edition |
| 01 | R.S. Agarwal | R.S. Agarwal | S Chand | | 2019 |
| 02 | R.S. Agarwal (Verbal and Non-verbal Reasoning) | R.S. Agarwal | S Chand | | 2010 |
| 03 | Wren & Martin (Verbal, Grammar) | P.C. Wren | S Chand | | 2017 |

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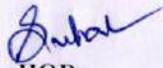
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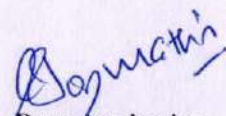


QDCET Department of Computer Science & Engineering

LIST OF OPEN ELECTIVE COURSE

| Sr.No | Course Code | Course Category | Course Name |
|-------|-------------|-------------------------------|---|
| 1 | 2ILOE351 | Health Care Management | <u>Economics of Health and Education</u> |
| 2 | 2ILOE352 | Business Marketing | <u>Business to Business Marketing (B2B)</u> |
| 3 | 2ILOE353 | Intellectual Property Rights | <u>Patent Law for Engineers and Scientists</u> |
| 4 | 2ILOE354 | | <u>Economics of Innovation</u> |
| 5 | 2ILOE355 | Business Laws | <u>E-Business</u> |
| 6 | 2ILOE356 | Finance and Accounting | <u>Management Accounting</u> |
| 7 | 2ILOE357 | Banking and Insurance | <u>Economics of Banking and Finance Markets</u> |
| 8 | 2ILOE358 | Investment Management | <u>Quantitative Investment Management</u> |
| 9 | 2ILOE359 | Human Resource Management | <u>Human Resource Development</u> |
| 10 | 2ILOE360 | Business Management | <u>Advanced Business Decision Support Systems</u> |
| 11 | 2ILOE361 | Language | <u>Introduction to Japanese Language and Culture - II</u> |
| 12 | 2ILOE362 | | <u>German - I</u> |
| 13 | 2ILOE363 | Retail and Channel Management | <u>Operations and Supply Chain Management</u> |


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