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 & TECHNOLOGY ASHTA 416 301

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	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2CSPC202	Data Structures	3	-	2	4	40	16	30	30	24	100	40	50	20	50	20	100	40	200
2CSPC203	Computer Organization and Architecture	3	-	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
2CSPC204	Operating System	3	-	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
2CSHS205	Psychology	2	-	-	2	50	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**														**825**
	Total Contact Hours				**28**														

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Annasaheb Dange College of Engineering and Technology Ashta

Department of Computer Science and Engineering

ADCET

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

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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Unit 6	**Graph theory:** Basic concepts of graph theory, Storage representation and manipulation of Graphs, PERT and related techniques.	07 Hrs.

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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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

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

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	15th	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:	
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 8085Architecture, 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	PEARSO 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

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 Dhamdhere	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

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

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	**Templates:** Generic classes, Generic functions, Applying generic functions, type name & export keyword, power of templates. Namespace fundamentals, **Standard Template Library**: STL containers, STL algorithms, STL iterative & C++ streams, Run-Time Type ID (RTTI)	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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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:	
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, 42nd 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, Loksabha - Structure, Rajyasabha – Structure, Governor of State, Chief Minister and Council of Ministers in a state.	02

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

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

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

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.**

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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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

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	**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 **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	6 Hrs.
Unit 2	**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.	9 Hrs.

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Unit 3	**Functional Dependency and Normalization** Importance of a good schema design, Motivation for normal forms, Atomic domains and1NF, 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 Educati on.	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	Alexis Leon, Mathews Leon	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

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, NASI/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:	
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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	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 Wirelss 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:	
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	Willey	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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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

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	**Introduction to Cyber Security: Basics of Cyber Crimes** **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 **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. **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 **Internet Governance –** What is it? Actors, Challenges and Constraints, Need for a Comprehensive Cyber Security Policy, Need for an International convention on Cyberspace.	7 Hrs
2	**Vulnerabilities and Cyber Security Safeguards** **Cyber Security Safeguards-** Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, **Authentication and Remote Access** - User,	6 Hrs

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	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.	
3	**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	7 Hrs
4	**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.	7 Hrs
5	**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	6 Hrs

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6	**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.	6 Hrs

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

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

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

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. FSchumacher.	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

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	**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. Objects and Classes: Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Creating and using objects, Access Modifiers, Static Fields and Methods, this keyword.	04 Hrs
Unit 2	**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,	05 Hrs
Unit 3	**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	04 Hrs.
Unit 4	**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	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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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

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.	**5**
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 14001Standard, 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

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.

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

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**

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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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

ADCET

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													775
	Total Contact Hours				26													

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

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Department of Computer Science and Engineering

ADCET

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	P	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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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													700
	Total Contact Hours				29													

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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ADCET

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													350
	Total Contact Hours	6 + Internship																

Professional Elective - IV	
2CSPE405	Big Data Anaytics
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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05/43

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 Rajasejaran	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. Brately	Pearson Education	1	2015

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	The Design and Analysis of Algorithms	Aho, Hopfcraft 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	**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	6 Hrs.
Unit 2	**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.	9 Hrs.

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Unit 3	**Functional Dependency and Normalization** Importance of a good schema design, Motivation for normal forms, Atomic domains and1NF, 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	7 Hrs.
	handling.	
Unit 6	**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.	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- 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

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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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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:	
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:		
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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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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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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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

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.

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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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 Retails- IOT Possibilities in the Retail	**06 Hrs.**
	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).	
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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Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
02	The Internet of Things: Key Applications and Protocols	Olivier Hersent,DavidBoswarthick, Omar Elloumi	ISBN 978-1119-99435-0, Wiley Publications.	2nd	2012
03	Internet of Things, A Hands on Approach	Arshdeep Bahga, Vijay Madisetti	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

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:		
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
I	Real time system design and analysis	Phillip A. Laplante	Wiley India	Edition	2004
2	Embedded Real-Time Systems: Concepts,	Dr.K.V.K. K.Prasad	Dreamtech Press	New Edition	2015
3	Real-TimeSystems: Theoryand Practice,	RajibMall,	Pearson,	I[st]Edition	2006
4	Real Time Systems	JaneW.S. Liu,	Pearson Education	1[st]Edition	2000
Reference Books					
I	Embedded and RealTime Operating Systems	WangK.C.	Springer	First	2017
2	Building a Real Time Operating System	ColinWalls	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,

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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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

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.

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):_init_,_str_,_repr___	**04 Hrs.**
Unit 5	**Modules, Packages, and Libraries** Understanding modules and packages; Importing modules and packages; Standard libraries: os, sys, math, random, datetime; Third-party libraries: NumPy, Pandas, Matplotlib; Exploring documentation and using external libraries	**05 Hrs.**
Unit 6	**Advanced Topics and Applications** Regular expressions: Syntax, patterns, re module; Lambda functions and map, filter, reduce 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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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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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

Course Contents:		
Unit 1	• Basic Permutation and Combination • Advance Permutation and Combination	**04 Hrs.**
Unit 2	• Probability • Application of Probability	**04 Hrs.**
Unit 3	• Cubes, Dices & cube painting • Syllogism	**04 Hrs.**
Unit 4	• Mensuration 3D • Circle & Triangle	**04 Hrs.**
Unit 5	• Resume writing & resume making • Interview Techniques	**04 Hrs.**
Unit 6	• Closed Test & advanced Grammar • Synonyms & Antonyms	**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 & 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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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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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

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	Jawadekar 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

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.

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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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

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

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	**04 Hrs**
	responsive design, CSS3: selectors, typography and color modes, stunning aesthetics with CSS3, CSS3 transitions, transformations and animations, conquer forms	
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	**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	**04 Hrs**
Unit 5	**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	**05 Hrs**
Unit 6	**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	**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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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	
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

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

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 RateWork) 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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LIST OF OPEN ELECTIVE COURSE

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

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