Shri Shamrao Patil(Yadravkar) Educational& Charitable Trust's

Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

NBA Accredited, Accredited by NAAC 'A' Grade, ISO 9001:2015 Certified

Department: Computer Science&Engineering
Class: T.Y.B.Tech

Rev: CSECourseStructure/00/2020-21
Semester: V

Sr No	Course Code	Course Type	Course	TeachingScheme				EvaluationScheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	CS501	PCC	Design Analysis & Algorithm	3	-	-	3	10	10	30	50	100	3
2	CS502	PCC	Advanced Java Programming	3	-	-	3	10	10	30	50	100	3
3	CS503	PEC	Elective-II	3	-	-	3	10	10	30	50	100	3
4	CS504	PCC	Software Engineering	3	-	-	3	10	10	30	50	100	3
5	OEXXX	OEC	Open Elective-I	3	-	-	3	10	10	30	50	100	3
6	CS505	PCC	Data Science and Visualization	1	-	2	3	15	15	-	20	50	2
7	CS506	PCC	Design Analysis & Algorithm Laboratory	-	-	2	2	15	15	-	20	50	1
8	CS507	PCC	Advanced Java Programming Laboratory	-	-	2	2	15	15	-	20	50	1
9	HMS05	HSMC	Aptitude Skills-III	1	-	-	1	25	25	-	-	50	1
10	HMS06	HSMC	Language Skills-III	-	-	2	2	25	25	-	-	50	Audit
11	PRJ04	PROJ	Mini Project-IV	-	-	2	2	25	25	-	-	50	1
Total				17	-	10	27	170	170	150	310	800	21

Elective-II

CS503A-Compiler Design
CS503B-System Programming
CS503C-File Structures

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS501	**PCC**	**Design Analysis & Algorithm**	**3-0-0**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs/week	CA I:10 Marks CA II:10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50Marks

Pre-Requisites: Basics of data structure

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand basics of algorithm and analyze performance of different algorithms using Divide and conquer.
CO2	Understand greedy Approach and Analyze the performance by taking different examples
CO3	Understand dynamic approach and Analyze the performance by taking different examples.
CO4	Design algorithm by applying backtracking technique.
CO5	Understand and Design NP Hard and NP Complete Problems
CO6	Understand concepts of branch and bound, compare performance with backtracking.

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Course Contents:

Unit 1: Divide and Conquer What is algorithm, Algorithm Specification, Performance Analysis, and Randomized Algorithm. Divide and Conquer-The general method, Binary search finding the maximum and minimum, Merge sort Quick sort Selection sort and analysis of these algorithms	[6]
Unit 2: Greedy Method The general method, Activity Selection Problem, Huffman Coding Knapsack problem, Job sequencing with deadlines Minimum-cost spanning trees – Prim's and Kruskal's Algorithms Optimal storage on tapes Optimal merge patterns analysis Single source shortest paths notations.	[6]
Unit3: Dynamic Programming Introduction, Characteristics of Dynamic Programming, Shortest paths: Bellman Ford, Floyd ,Warshall, Multistage graphs, All pair shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Sales person problem.	[6]
Unit4: Basic Traversal and Search Techniques and Backtracking Techniques for Binary Trees, Techniques for Graphs – Breadth First Search & Traversal, Depth First Search & Traversal, AND/OR graphs; Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.	[6]
Unit5: NP Hard and NP Complete Problems Basic Concepts NP Complete Problems, Hard Graph Problems.	[6]
Unit6: Branch and Bound Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and dynamic programming, Comparisons between Backtracking and greedy programming, Branch and Bound.	[6]

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Reference/Text books:-

1. Fundamentals of Computer Algorithms - Ellis Horowitz, Satraj Sahani, SaguthevarRajasejaran, Universities Press, Second Edition
2. Fundamentals of Algorithmics – Gilles Brassard, Paul Bratley (Pearson Education).
3. Mastering Algorithms with C – Kyle Loudon (SPD O'Reilly).
4. Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen VanGelder (Pearson Education).
5. Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis &Internet Examples, Wiley Publication, 2nd Edition, 2006
6. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.2.
7. Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS502	**PCC**	**Advanced JAVA Programming**	**3-0-0**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Java Programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using GUI Framework (AWT and Swing)
CO2	Handle events of AWT and Swings components.
CO3	Develop programs to handle events in Java Programming
CO4	Develop Java programs using networking concepts.
CO5	Develop programs using database
CO6	Develop programs using Servlet

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Course Contents:

Unit 1: Component, container, window,frame, panel. Creating windowed programs and applets. AWT controls and layout managers: use of AWT controls: labels, buttons, checkbox, checkbox group, scroll bars, text area, Use of layout managers:flow Layout, border Layout (), grid Layout, card Layout, grid bag Layout, menu bars, menus, dialog boxes, file dialog.	[6]
Unit 2: Introduction to swing: Swing features, Difference between AWT and Swings. Swing Components: JApplet, Icons and Labels, Text Fields, Combo Boxes. Buttons: The JButton, Check Boxes,Radio Buttons. Advanced Swing Components: Tabbed Panes, Scroll Panes, Trees,Tables, Progress bar, tool tips. MVC Architecture.	[6]
Unit 3: The delegation Event sources, Event listeners Model: Event classes: The Action Eventclass, the Item Event class, theKey Event class, the Mouse Event class, the Text Event class, the Window Event class.Adapter classes. Inner classes. Event listener interfaces: ActionListener Interface,ItemListener Interface, KeyListener Interface, MouseListenerInterface, MotiseMotion Interface, TextListener Interface, WindowsListener Interface	[6]
Unit 4: Socket Overview: Client/Server, Reserved Sockets, Proxy Servers Internet addressing Java and the Net: The Networking Classes and interfaces. InetAddress: Factory Methods,Instance Methods. TCP/IP Client Sockets URL: Format, The URI Class. URLConnection : TCP/IP ServerSocl‹ets, Datagrams : Datagram Packet ,Datagram server and Client	[6]
Unit5: Introduction to JDDC,ODBC JDBC Architecture: Two tier & Three tier models Types of JDBC Drivers Driver Interfaces and Driver, Manager class: Connection Interface, Statement Interface, Prepared Statement Interface,Result Set Interface, The essential JDBC Program	[6]

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Unit 6: The Life Cycle of a Servlet. Creating simple Servlet: The ServletAPI, javax. servlet Package, ServletInterface, Servlet Config Interface , Servlet Context Interface, Servlet Request Interface, Servlet Response Interface, Generic Servlet Class The javax.servlet. http Package:HttpServl etRequest Interface, HttpServletResponseInterface, HttpSession Interface , Cookie Class, HttpServlet Class, HttpSessionEvent Class , HttpSession BindingEvent Class. Handling HTTP Requests and Responses Handling HTTP GETRequests Handling HTTP POST Requests. Cookies and Session Tracking	[6]

Reference/Text books:-

1. Complete Reference Java 2 Programming
2. Black book Java programming

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS503 A	PEC	Compiler Design	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Theory of Computation

Course Outcomes: At the end of the course, students will be able to:

CO1	Define various phases of compiler design.
CO2	Summarize concepts of Lexical Analysis and apply it for token generation process.
CO3	Demonstrate steps involved in Syntax Analysis with help of various parsing techniques.
CO4	Analyze different syntax directed translation.
CO5	Apply code optimization techniques to improve performance of program in terms of speed and space.
CO6	Examine issues related to code generation such as storage management, register allocation

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Head of the Department
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Yadrav (Ichalkaranji) Dist. Kolhapur

Course Contents:

Unit 1: Introduction to Compiling: Compilers, Phases of a compiler, Compiler construction tools, cousins of the compiler.	[6]
Unit 2: Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyzer generator.	[6]
Unit 3: Syntax Analysis: The role of the Parser, Context-free grammars, Writing a Grammar, Top-down parsing- Recursive descent and predictive parsers (LL), Bottom-Up parsing- Operator precedence parsing, LR, SLR , CLR and LALR parsers.	[6]
Unit 4: Syntax Directed Translation and Intermediate Code Generation: Syntax directed definitions, construction of syntax tree, Bottom-Up Evaluation of S-Attributed definitions, Bottom-Up Evaluation of Inherited attributes, Intermediate languages, Assignment Statements, Boolean Expressions, back patching, procedure calls.	[6]

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COLLEGE OF ENGINEERING
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Unit 5: Code Optimization: Sources of optimization, Peephole optimization and basic blocks, loops in flow graphs, Data flow analysis and equations, code improving transformation	[6]
Unit 6: Code Generation: Issues in design of a code generator, The target machine, Run time storage management, Basic blocks and flow graphs, simple code generator, Generating Code from DAGs	[6]

Reference/Text books:-

1. Compilers - Principles, Techniques and Tools - A.V. Aho, R. Shethi and J.D. Ullman (PearsonEducation.)
2. Crafting A Compiler with C - Charles Fischer, Richard LeBlanc (Pearson publication)
3. Modern Compiler Design - D. Grune, H. Bal, C. Jacobs, K. Langendoen (Wiley publication)
4. Compiler construction – D.M. Dhamdare (Mc-Millan).

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS503 B	PEC	System Programming	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Computer Architecture & Organization, Theory of Computation

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify independently modern software development tools and creates novel solutions for Language processing applications.
CO2	Design and implement assemblers and macro processors.
CO3	Make use of tool LEX for generation of Lexical Analyzer.
CO4	Make use of YACC tool for generation of syntax analyzer.
CO5	Evaluate output for all the phases of compiler.
CO6	Apply code optimization in the compilation process.

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Course Contents:

Unit 1: INTRODUCTION TO SYSTEMS PROGRAMMING AND ASSEMBLERS Introduction: Need of System Software, Components of System Software, Language Processing Activities, Fundamentals of Language Processing. Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme, Pass structure of Assemblers, Design of Two Pass Assembler, Single pass assembler.	[6]
Unit 2: MACROPROCESSORS, LOADERS AND LINKERS Macro Processor: Macro Definition and call, Macro Expansion, Nested Macro Calls and definition, Advanced Macro Facilities, Design of two-pass Macro Processor. Loaders: Loader Schemes, Compile and Go, General Loader Scheme, Absolute Loader Scheme, Subroutine Linkages, Relocation and linking concepts, Self-relocating programs, Relocating Loaders, Direct Linking Loaders, Overlay Structure.	[6]
Unit 3: INTRODUCTION TO COMPILERS Phase structure of Compiler and entire compilation process. Lexical Analyzer: The Role of the Lexical Analyzer, Input Buffering. Specification of Tokens, Recognition of Tokens, Design of Lexical Analyzer using Uniform Symbol Table, Lexical Errors. LEX: LEX Specification, Generation of Lexical Analyzer by LEX.	[6]

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Yadrav (Ichalkaranji) Dist. Kolhapur.

Unit 4: PARSERS Role of parsers, Classification of Parsers: Top down parsers- recursive descent parser and predictive parser. Bottom up Parsers – Shift Reduce: SLR, CLR and LALR parsers. Error Detection and Recovery in Parser. YACC specification and Automatic construction of Parser (YACC).	[6]
Unit 5: SEMANTIC ANALYSIS AND STORAGE ALLOCATION Need, Syntax Directed Translation, Syntax Directed Definitions, and Translation of assignment Statements, iterative statements, Boolean expressions, conditional statements, Type Checking and Type conversion. Intermediate Code Formats: Postfix notation, Parse and syntax tress, Three address code, quadruples and triples. Storage Allocation: Storage organization and allocation strategies.	[6]
Unit 6: CODE GENERATION AND OPTIMIZATION Code Generation: Code generation Issues. Basic blocks and flow graphs, A Simple Code Generator. Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination, Removing of loop invariants, Induction variables and Reduction in strengths, use of machine idioms, Dynamic Programming Code Generation. Machine dependent Issues: Assignment and use of registers, Rearrangement of Quadruples for code optimization.	[6]

Reference/Text books:-

1 D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition.

2 Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers Principles, Techniques and Tools, Addison Wesley, ISBN:981–235–885 - 4, Low Price Edition.

3 J. J. Donovan, Systems Programming, McGraw-Hill, ISBN 13:978-0-07-460482-3, Indian Edition.

4 Leland L. Beck, "System Software An introduction to Systems Programming", Pearson Education, ISBN13: 9788177585551.

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS503 C	**PEC**	**File Structures**	**3-0-0**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Operating System, Object Oriented Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline the structure of file.
CO2	Summarize object oriented concepts in file organization.
CO3	Illustrate consequential processing and sorting of file.
CO4	Demonstrate multilevel indexing and B+ tree.
CO5	Illustrate indexing of sequential files.
CO6	Apply simple hashing algorithms.

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Course Contents:

Unit 1: Introduction: File Structures: The Heart of the file structure Design, A Short History of File Structure Design, A Conceptual Toolkit; Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape; CD-ROM: Introduction, Physical Organization, Strengths and Weaknesses; Storage as Hierarchy, A journey of a Byte, Buffer Management, Input /Output in UNIX.	[6]
Unit 2: Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Key sorting; What is an Index? A Simple Index for Entry-Sequenced File, Using Template Classes in C++ for Object I/O, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, Binding.	[6]
Unit 3: Consequential Processing and the Sorting of Large Files: A Model for Implementing Consequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include multiway Merging, A Second Look at Sorting	[6]

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in Memory, Merging as a Way of Sorting Large Files on Disk.	
Unit 4: Multi-Level Indexing and B-Trees: The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a BTree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst case Search Depth, Deletion, Merging and Redistribution, Redistribution during insertion; B* Trees, Buffering of pages; Virtual B-Trees; Variable-length Records and keys.	[6]
Unit 5: Indexed Sequential File Access and Prefix B + Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B-Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.	[6]
Unit 6: Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access. Extendible Hashing: How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.	[6]

Reference/Text books:-

1 Michael J. Folk, Bill Zoellick, Greg Riccardi: File Structures-An Object Oriented Approach with C++, 3rd Edition, Pearson Education, 1998.

2 K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj: File Structures Using C++, Tata McGraw-Hill, 2008.

3 Scot Robert Ladd: C++ Components and Algorithms, BPB Publications, 1993.

4 Raghu Ramakrishan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw Hill, 2003.

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Yadrav (Ichalkaranji) Dist. Kolhapur

T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS504	PCC	Software Engineering	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: -

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply generic models to structure the software development process.
CO2	Illustrate fundamental concepts of requirements engineering and requirements specification.
CO3	Explain different notion of complexity at both the module and system level
CO4	Make use of some widely known design methods.
CO5	Summarize the role and contents of testing activities in different life cycle phases.
CO6	Explain agile software development

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Course Contents:

Unit 1: The Evolving role of Software – Software – The changing Nature of Software – Legacy software – –A generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment – Personal and Team Process Models. Product and Process. Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – the Unified Process.	[6]
Unit 2: Software Engineering Practice – communication Practice – Planning practice Modeling practice– Construction Practice –Deployment. Requirements Engineering - Requirements Engineering tasks – Initiating the requirements Engineering Process Eliciting Requirements – Developing Use cases – Building the Analysis Models – Elements of the Analysis Model – Analysis pattern – Negotiating Requirements – Validating Requirements.	[6]
Unit 3: Requirements Analysis – Analysis Modeling approaches – data modeling concepts – Object oriented Analysis – Scenario based modeling – Flow oriented Modeling – Class based modeling – creating a behavior model.	[6]
Unit 4: Design Engineering – Design process -Design Quality-Design model-User interface Design – Testing strategies- strategies Issues for conventional and object oriented software-validation	[6]

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testing –system testing –Art of debugging – Project management	
Unit 5: Software evolution - Verification and Validation -Critical Systems Validation – Metrics for Process, Project and Product-Quality Management -Process Improvement –Risk Management-Configuration Management	[6]
Unit 6: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values	[6]

Reference/Text books:-

1 Roger S.Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Sixth edition, 2005.

2 Ian Sommerville, Software Engineering, 8th Edition, Pearson Education, 2008(UNIT V)

3 David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results , Prentice Hall, 2003

4 Stephan Schach, Software Engineering, Tata McGraw Hill, 2007. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education, second edition, 2001

5 Craig Larman, —Agile and Iterative Development: A Manager_s Guide , Addison-Wesley, 2004.

6 Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management , Butterworth-Heinemann, 2007.

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Head of the Department
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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS505	PCC	Data Science & Visualization	1-0-2	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 1 hr/week Practical: 2 hr/week	CA I:15 Marks CA II:15 Marks End Semester Exam: 20Marks

Pre-Requisites: Computational Statistics, Statistical Methods, Introduction to Probability statistics and Calculus

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand and describe the main concepts of data visualization.
CO2	Analyze data using exploratory visualization.
CO3	Create useful, performant visualizations from real-world data sources, including large and complex datasets.
CO4	Model data visualization and dashboards.

Course Contents:

Unit 1: Introduction to Data Science Defining Data Science, Recognizing Different Types of Data, Gaining Insight Into DataScience Process, Data Science Process: Overview, Different Steps Machine Learning Definition and Relation with Data Science.	[3]
Unit 2: Data pre-processing Data Preprocessing: Data Quality, Major Tasks in Data Preprocessing, Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Data Value Conflict Detection and Resolution, Data Reduction. Overview of Data Reduction Strategies.	[3]
Unit 3: Basics of Data Visualization Introduction to Data Visualization, Challenges of Data Visualization, Definition and Types of Dashboard, Evolution of Dashboard, Dashboard Design and Principles.	[3]

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Unit4: Data Visualization using Python Types of Data Visualization: Basic Charts Scatter Plots, Histogram, Advanced Visualization Techniques Like Streamline and Statistical Measures, Plots, Graphs, Networks, Hierarchies, Reports.	[3]
Unit 5: Data visualization of multidimensional data Need of Data Modeling, Multidimensional Data Models, Mapping of High Dimensional Data Into Suitable Visualization Metod, High Dimensional Data, Visualization Tools.	[3]
Unit6: Data Analyzing and Visualization using python Data Analysis Libraries: Will Learn to Use Pandas Dataframes, Numpy Multi-Dimentional Arrays, and Scipy Libraries to Work with a Various Dataset, Pandas, An Open-Source Library: Load, Manipulate, Analyze and Visualize Various Datasets. Matplotlib, Scikit-Learn.	[3]

Reference Books:

1. Alice Zheng- Evaluating Machine Learning Models: A Beginner's Guide to Key Concepts and Pitfalls, O'Reilly Media, 2015. ISBN 1491932465, 9781491932469.

2. Big data black book, Dream Tech Publication.

3. Ben Fry- Visualizing Data. Released December 2007. Publisher(s): O'Reilly Media, Inc. ISBN: 9780596514556.

4. Data Science Using Python and R by Chantal D. Larose and Daniel T. Larose, Wiley Publication.

5. Python for Data Science and Visualization -Beginners to Pro, Udemy.

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List of Experiments:

1	To study data science basics.
2	To download and observe different datasets from Kaggle.com
3	To understand different operations on data.
4	Access an open source dataset "Titanic". Apply pre-processing techniques on the raw dataset.
5	Build training and testing dataset of assignment to predict the probability of a survival of a person based on gender, age and passenger-class.
6	Use Netflix Movies and TV Shows dataset from Kaggle and perform following operation: a. Make a visualization showing the total number of movies watched by children b. Make a visualization showing the total number of standup comedies c. Make a visualization showing most watched shows d. Make a visualization showing highest rated show make a dashboard (DASHBOARD A)containing all of these above visualizations.
7	Explore New York City -311 Complaints and Housing datasets.
8	Analyze and visualize data using Python.
9	Perform feature engineering exercise using Python.
10	Build and validate predictive machine learning model using Python.

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS506	**PCC**	**Design Analysis & Algorithm Lab**	**0-0-2**	**1 Credit**

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	CA I:15 Marks CA II:15 Marks End Semester Exam: 20Marks

Pre-Requisites: C Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Design and implement algorithm by taking simple problems.
CO2	Implement algorithm on greedy Approach and Analyze the performance.
CO3	Develop an algorithm on dynamic approach and Analyze the performance.
CO4	Implement algorithm by applying backtracking technique.
CO5	Design and Implement algorithm on NP Hard and NP Complete Problems
CO6	Implement algorithm on branch and bound technique.

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Course Contents:

List of Experiments:

The term work includes Assignments and results of each practical

1. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
2. Implement Quick Sort algorithm and determine the time required to sort the elements
3. Implement Insertion Sort algorithm and determine the time required to sort the elements
4. Implement Heap Sort algorithm and determine the time required to sort the elements
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm
6. Find the Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
7. Find the Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm
8. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
9. Implement 0/1 Knapsack problem using Dynamic Programming.
10 Implement N Queen's problem using Back Tracking.

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

CS507	PCC	Advanced Java Programming Lab	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA I:15 Marks CA II:15 Marks End Semester Exam: 20Marks

Pre-Requisites: JAVA Programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using GUI Framework (AWT and Swing)
CO2	Handle events of AWT and Swings components.
CO3	Develop programs to handle events in Java Programming
CO4	Develop Java programs using networking concepts.
CO5	Develop programs using database
CO6	Develop programs using Servlet

List of Experiments:

1. Write a program to demonstrate use of AWT controls.
2. Write a program to demonstrate different layouts.
3. Write a program to make use of swing controls.
4. Write a program to handle different events.
5. Write a program to demonstrate use of Adapter class.
6. Write a program to retrieve hostname and IP address in InetAddress class.
7. Write a program that demonstrates TCP/IP based communication between client and server.
8. Write a program to establish successful connection to database.
9. Write a servlet to display the user name and password accepted from the client.
10. Write a servlet for demonstrating the concept of session and cookies.

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

HMS05	HSMC	Aptitude skills-III	1-0-0	1 Credit

Teaching Scheme:	Evaluation Scheme:
Lecture: 1 hour/week	CA I:25 Marks CA II:25 Marks

Pre-Requisites: Communication Skills, Aptitude Skills I,II.

Course Outcomes: At the end of the course, students will be able to:

1	Solve the problems on system of equation
2	Solve the problems on seating arrangement
3	Solve the logical reasoning problems
4	Solve the critical analysis problems
5	Solve the problems of Data interpretation
6	Solve the problems of permutations and Combinations

Unit 1: System of equations Quadratic equations, Surds and indices, solution of equations, Ages	[2]
Unit 2: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement	[2]
Unit 3: Logical Reasoning Numerical based on sense of direction, Blood relations, Odd man Out	[2]
Unit4: Critical analysis Clocks and Calendar based problems, Crypt arithmetic, heights and distances	[2]
Unit 5: Data Interpretation Table form, Bar form, Line for Pi chart form	[2]
Unit6: Permutations and Combinations Numbers and Words Repetition allowed and Repetition not allowed Load, Manipulate,	[2]

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Text Books:

1. RS Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning ",S. Chand Publisher; 2016 edition
2. RS Aggarwal, " Quantitative Aptitude for Competitive Examinations ", S. Chand Publisher; 2016 edition
3. Raymond Murphy "Essential English Grammar with Answers", Murphy

Reference Books:

1. Rao N,D,V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition
3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

HMS06	HSMC	Language skills-III	0-0-0	Audit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hour/week	CA I:25 Marks CA II:25 Marks

Pre-Requisites: Basics of Programming.

Course Outcomes: At the end of the course, students will be able to:

1	Explain essentials and fundamentals of Python Programming.
2	Illustrate data types and variables.
3	Illustrate Operators and Expressions.
4	Make a use of Decision making and looping statements.

Unit 1: Introduction What is Python, what can python do, why python, how to use Python, Python indentation, python comments, basic syntax of program ,first program of python	[6]
Unit 2: Variable and data types Creating variable ,casting, variable name ,global variable, local variable, built indata types, string, constructor, function of data type , type conversion	[6]
Unit 3 :Operators in Python Unary Operator ,Binary operator -:(arithmetic operator, logical operator ,assignment operator, ,membership operator ,identity operator ,bitwise operator) , ternary operator	[6]
Unit 4: Statements and loops Input & Output Statements ,Conditional Statements ,Simple if Statement ,If-else statement ,Else-if Ladder, Nested if statement, ,while loop ,for loop ,break ,continue ,pass statements	[6]

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester V

PRJ04	**PROJ**	**Mini Project-IV**	**0-0-2**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical:- 2 hrs/week	CA-I:25 Marks CA-II: 25 Marks

Pre-Requisites:- Basic knowledge of Communication skills and Computer programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the method/tools used to develop the solution.
CO4	Demonstrate tangible solutions to the problem
CO5	Describe the solution with the help of a project report and presentation.

About Hackathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms that students will use to solve real-world challenges. This course focuses on the selection of methods/engineering tools/analytical techniques for problem-solving. Through this course, students gain a thorough understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills, and responsibility.

Guidelines:

1. Every student shall undertake the Hackathon activity for semester V.
2. Minimum three and maximum of five students should work together in Hackathon
3. The students have to work on different approaches and finalize the best methodology to

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solve the problem in consultation with the project guide.

4. The students should use different tools /Techniques for the development of the solution to the problem.
5. While developing solutions, the student can take care of effective use of resources, follow ethical practices, finance management,
6. The solution should be optimal, affordable, user-friendly and environment friendly.
7. Critically analysis and testing of the solution provided.
8. By using IPR, students should reserve their rights of innovations as well as communicate new findings to society with the help of research papers.

The committee of senior faculty members and a project guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members.

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Department: Computer Science & Engineering
Class: T.Y.B.Tech

Rev: CSE Course Structure/00/2020-21
Semester: VI

Sr No	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	CS601	PCC	Data Warehousing and Data Mining	3	-	-	3	10	10	30	50	100	3
2	CS602	PCC	Machine learning	3	-	-	3	10	10	30	50	100	3
3	CS603	PEC	Elective-III	3	-	-	3	10	10	30	50	100	3
4	CS604	PCC	Computer Organization & Architecture	3	-	-	3	10	10	30	50	100	3
5	OEXXX	OEC	Open Elective-II	3	-	-	3	10	10	30	50	100	3
6	CS605	PCC	Machine learning Lab	-	-	2	2	15	15	-	20	50	1
7	CS606	PCC	Web Technologies Lab	1	-	2	3	15	15	-	20	50	2
8	PRJ05	PROJ	Mega Project Phase –I (Seminar)	-	-	4	4	25	25	-	50	100	2
9	HMS07	HSMC	Aptitude Skills-IV	1	-	-	1	25	25	-	-	50	Audit
10	HMS08	HSMC	Language Skills-IV	-	-	2	2	25	25	-	-	50	1
11	IFT02	PROJ	Industrial Training/ Field Training	-	-	-	-	-	-	-	50	50	Audit
Total				17	-	10	27	155	155	150	390	850	21

Elective-III
CS603A- Information Security
CS603B- Network Security
CS603C- Cyber Security

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

CS601	PCC	Data Warehousing and Data Mining	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA I:10 Marks CA II:10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50Marks

Pre-Requisites: Basic concepts of Database Management System

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply data warehousing concepts and OLAP Operations.
CO2	Understand Data Mining concepts and knowledge discovery process.
CO3	Apply Knowledge to build association based rules technique for real world case studies.
CO4	Justify the usage of various Classification algorithms with prediction on provided huge data.
CO5	Justify the usage of various Clustering algorithms on provided huge data.
CO6	Understand the Data Warehouse designing process with issues.

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Course Contents:

Unit 1: Data Warehouse and OLAP: Introduction to Data Ware House, Differences between operational database systems and data Ware House, Data Ware House characteristics, Data Warehouse Architecture and its components, Extraction-Transformation-Loading, Logical (Multi-dimensional), Data Modeling, OLAP: OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.	[6]
Unit 2: Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Data Transformation; Measures of similarity and dissimilarity-Basics	[6]
Unit3: Association rule mining Association Rules: Problem Definition, Frequent item set generation, The APRIORI Principle, Support and confidence measures, association rule generation; APRIORI algorithm. FP-Growth Algorithms, Compact Representation of Frequent item Set-Maximal Frequent item set, closed frequent item set	[6]
Unit 4: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Prediction, Classifier Accuracy.	[6]
Unit5: Clustering: Types of data, categorization of major clustering methods, K-means partitioning methods, **hierarchical** methods, density based methods, grid based methods, model based clustering methods, outlier analysis.	[6]
Unit6: Data Warehouse Design: Design issues: Monitoring, Wrappers, Integration, Data cleaning, Data loading, Materialized views, Warehouse Maintenance. Conceptual data modeling, Data warehouse design using ER approach. Aspects of building data warehouses	[6]

Reference/Text books:-

- Data Mining-Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006
- Undamentals of Data Warehouses, M. Jarke, M. Lenzerini, Y. Vassiliou, P. Vassiliadis (ed.), Springer -Verlag, 1999

Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

CS602	PCC	Machine Learning	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA I:10 Marks CA II:10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50Marks

Pre-Requisites: Statistics, data science.

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of basics of machine learning to perform classification algorithms
CO2	Choose & differentiate different supervised learning algorithms for solving the problems
CO3	Solve the problems by making use of concepts of neural networks
CO4	Identify suitable hypothesis by choosing correct theory among different theories
CO5	Choose and apply clustering algorithm and identify its applicability in real life problems

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Course Contents:

Unit 1: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias,evaluation, cross-validation, Linear regression, Decision trees, over fitting.	[6]
Unit 2: Instance based learning, Feature reduction, Collaborative filtering based recommendation, Probability and Bayes learning.	[6]
Unit3: Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM.	[6]
Unit 4: Neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network.	[6]
Unit5: Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning.	[6]
Unit6: Clustering: k-means, adaptive hierarchical clustering, and Gaussian mixture model.	[6]
Reference/Text books:- • Machine Learning, Tom Mitchell, First Edition, McGraw Hill, 1997. • Introduction to Machine Learning, 2nd Edition, by Ethem Alpaydin	

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T.Y.(COMPUTERSCIENCEANDENGINEERING) Semester VI

CS603A	PEC	Information Security	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10 Marks CAII:10Marks Mid Semester Exam: 30 Marks End Semester Exam:50 Marks

Pre-Requisites: Algorithm, Windows, Linux OS

Course Outcomes: At the end of the course students will be able to:

CO1	Make the use of basics of Information Security
CO2	Apply user identification & Authentication methods
CO3	Apply Cryptographic Algorithm & protocols to maintain the security
CO4	Apply firewall techniques and to main the security
CO5	Choose and apply various standards in this area
CO6	Learn technological aspects of Information Security

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Course Contents:

Unit 1: INTRODUCTION History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC	[6]
Unit2: USER AUTHENTICATION AND ACCESS CONTROL Identification & authentication: username & password, guessing password, Password attacks-Piggybacking, Shoulder surfing, Dumpster diving. Biometrics: Finger prints, Handprints, Retina patterns, voice patterns, Signature and writing patterns, Keystrokes. Access controls : Definition, Authentication mechanism, Principle-Authentication, Authorization, Audit, Policies: DAC,MAC,RBAC	[6]
Unit3: CRYPTOGRAPHY Introduction: Plain Text, Cipher Text, cryptography, cryptoanalysis, cryptology, Encryption, Decryption Caesars cipher, modified Caesar Cipher, Transposition Techniques: simple, columnar Transposition Steganography: Procedure, Symmetric & asymmetric cryptography: Introduction to symmetric encryption, DES algorithm, Asymmetric key cryptography: digital signature.	[6]
Unit4: FIREWALL AND INTRUCTION DETECTION SYSTEM Firewall : Need of firewall , types of firewall – packet filters , stateful packet filters, application gateways, circuit gateways Firewall policies, configuration, limitations, DMZ. Intrusion detection system, vulnerability assessment, misuse detection, anomaly detection.	[6]
Unit5: LOGICAL DESIGN Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity	[6]
Unit6: PHYSICAL DESIGN Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel	[6]

Reference/Text books:-

1. Michael E Whitman and Herbert J Mattord, —Principles of Information Securityl, Vikas Publishing House, New Delhi, 2003
2. Micki Krause, Harold F. Tipton, — Handbook of Information Security Managementl, Vol 1-3 CRCPress LLC, 2004.
3. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposedl, Tata McGraw- Hill, 2003

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CS603B	PEC	Network Security	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture:3hrs/week	CA I:10 Marks CAII:10Marks Mid Semester Exam: 30 Marks End Semester Exam:50 Marks

Pre-Requisites: Algorithm, Windows, Linux OS

Course Outcomes: At the end of the course students will be able to:

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3	Apply the different cryptographic operations of public key cryptography
CO4	Apply the various Authentication schemes to simulate different applications.
CO5	Understand various Security practices and System security standards
CO6	Understand the various IP security policies.

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Course Contents:

Unit 1: Introduction Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.	[6]
Unit2: Symmetric Cryptography MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.	[6]
Unit3: Public Key Cryptography MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography	[6]
Unit4: Message Authentication And Integrity Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509	[6]
Unit5: Security Practice And System Security Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls	[6]
Unit6: IP Security: IP Security Overview, IP Security Policy, Encapsulation Security Payload (ESP), Combining security Associations Internet Key Exchange. Cryptographic Suites	[6]

Reference/Text books:-

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.
2. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
3. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007
4. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

CS603C	PEC	Cyber Security	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA I:10 Marks CA II:10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50Marks

Pre-Requisites: Computer Networks.

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate the concept of cybercrime and cyber offenses.
CO2	Emphasize on security challenges of mobile devices and organizational measures to handle such threats.
CO3	Explore the tools and methods used in cybercrime.
CO4	Elaborate on the legal perspectives of cybercrimes in India.
CO5	Illustrate the concept of Computer forensics
CO6	Understand the concept of Computer Forensics Laboratory

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Head of the Department
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Course Contents:

Unit 1:Introduction to Cybercrime, Cyber offenses Definition and Origins of the Word Cybercrime, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes; Cybercrime - The Legal Perspectives, Cybercrimes - An Indian Perspective, Cybercrime and the Indian ITA 2000; A Global Perspective on Cybercrimes. How Criminals Plan the Attacks; Social Engineering; Cyber stalking; Botnets - The Fuel for Cybercrime, Attack Vector, Cloud Computing	[6]
Unit 2:Cybercrime in case of Mobile and Wireless devices, Phishing and Identity Theft Proliferation of Mobile and Wireless Devices; Trends in Mobility, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication Service Security; Attacks on Mobile/Cell phones; Mobile Devices- Security implications for organizations; Organizational measures for handling mobile devices-related security issues; Organizational security policies and measures in mobile computing era. Phishing; Identity theft.	[6]
Unit 3:Tools and Methods Used in Cybercrime Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.	[6]
Unit 4:The Legal Perspectives Cybercrime and the Legal Landscape around the World, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Digital 70 Signatures and the Indian IT Act, Amendments to the Indian IT Act	[6]
Unit 5:Computer Forensics Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation	[6]
Unit 6: Setting up a Computer Forensics Laboratory Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Special Tools and Techniques	[6]
Reference/Textbooks:- 1) Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives – Nina Godbole, Sunit Belapure, Wiley : April 2011 India Publications Released 2) 2. Computer Forensics and Cyber Crime An Introduction by Marjie T. Britz ,Pearson publication, 2nd edition	

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T.Y. (Computer Science & Engineering) Semester VI

CS604	PCC	Computer Organization & architecture	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3hrs/week	CA I: 10 Marks CA II : 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Operating System

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the basics structure of computers, operations and instructions
CO2	Design arithmetic and logic unit.
CO3	Understand pipelined execution and design control unit
CO4	Understand parallel processing architectures
CO5	Understand the various memory systems and I/O communication

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Course Contents:	Hours
Unit 1: BASIC STRUCTURE OF A COMPUTER SYSTEM Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision-making – MIPS Addressing.	[7]
Unit 2: ARITHMETIC FOR COMPUTERS Addition and Subtraction – Multiplication – Division – Floating Point Representation –Floating Point Operations – Sub word Parallelism	[7]
Unit 3: PROCESSOR AND CONTROL UNIT A Basic MIPS implementation – Building a Data path – Control Implementation Scheme –Pipelining – Pipelined data path and control – Handling Data Hazards & Control Hazards –Exceptions.	[7]
Unit 4: PARALLELISIM Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.	[7]
Unit 5: MEMORY & I/O SYSTEMS Memory Hierarchy – memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits – USB.	[7]

Text books:-

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

Reference Book:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approachl, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

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COLLEGE OF ENGINEERING
Yadrav (Ichalkaranji) Dist. Kolhapur

T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

CS605	PCC	Machine Learning Lab	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA I:15 Marks CA II:15 Marks End Semester Exam: 20Marks

Pre-Requisites: Statistics, data science.

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of basics of machine learning to perform classification algorithms
CO2	Choose & differentiate different supervised learning algorithms for solving the problems
CO3	Solve the problems by making use of concepts of neural networks
CO4	Identify suitable hypothesis by choosing correct theory among different theories
CO5	Choose and apply clustering algorithm and identify its applicability in real life problems

Experiment List:

1) Implementation of Linear Regression
2) Implementation of Decision Tree
3) Implementation of K nearest neighbor
4) Study experiment on Recommendation System
5) Implementation of Bayes Theorem
6) Implementation of Support Vector Machine
7) Implementation of Logistic Regression
8) Implementation of Back propagation
9) Study experiment on Ensemble Learning
10) Implementation of K means Clustering

T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

CS606	PCC	Web Technologies Lab	1-0-2	2 Credit

Teaching Scheme	Examination Scheme
Lecture:1hr/week Practical: 2hr/week	CA I:15 Marks CA II:15 Marks End Semester Exam: 20Marks

Pre-Requisites: HTML

Course Outcomes: At the end of the course students will be able to:

CO1	Use LAMP Stack for web applications
CO2	Use Tomcat Server for Servlets and JSPs
CO3	Write simple applications with Technologies like HTML, Javascript, AJAX, PHP, Servlets and JSPs
CO4	Connect to Database and get results
CO5	Parse XML files using Java (DOM and SAX parsers)

Head of the Department
Computer Science & Engineering
SHARAD INSTITUTE OF TECHNOLOGY
COLLEGE OF ENGINEERING
Yadrav (Ichalkaranji) Dist. Kolhapur

Course Contents:

Unit 1: Introduction to WWW & HTML: Protocols and programs, secure application and development tools, the web browser, What is server, web servers, Logging users, dynamic IP **Web Design**: Web site design principles, planning the site and navigation, **Introduction to HTML** : The development process, Html tags and simple HTML forms, web site structure	[2]
Unit 2: Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2	[2]
Unit 3: JavaScript : Client side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition	[2]
Unit 4: Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations	[2]
Unit 5: Web Servers: Introduction to web servers, installation and configuration. **Introduction to JSP**: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Code Snippets, implicit objects, Requests, Using Cookies and Session for Session Tracking.	[2]
Unit 6: PHP : Starting to script on server side, Arrays, function and forms, advance PHP **Databases:** Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP MyAdmin and database bugs.	[2]

Reference/ Text Books:

1. Steven Holzner, "HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications: Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

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COLLEGE OF ENGINEERING
Yadrav (Ichalkaranji) Dist. Kolhapur

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Experiment List:

Sr. No.	Name of Experiment
1	Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
2	Create user Student feedback form (use textbox, text area, checkbox, radio button, select box etc.)
3	Create your resume using HTML tags also experiment with colors, text, link, size and also other tags you studied.
4	Use Inline CSS to format your resume that you created.
5	Use External CSS to format your class timetable as you created.
6	Use External, Internal, and Inline CSS to format college web page that you created.
7	Develop simple calculator for addition, subtraction, multiplication and division operation using JavaScript
8	Create HTML Page that contains form with fields Name, Email, Mobile No, Gender, Favorite Color and a button now write a JavaScript code to combine and display the information in textbox when the button is clicked.
9	Write a php program to check if number is prime or not.
10	Write a php script to read data from txt file and display it in html table (the file contains info in format Name: Password: Email)
11	Write PHP Script for storing and retrieving user information from MySql table. 1. Design A HTML page which takes Name, Address, Email and Mobile No. From user (register.php) 2. Store this data in Mysql database / text file. 3. Next page display all user in html table using PHP (display.php)

T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

PRJ05	PROJ	**Mega Project Phase-I**	0-0-4	2 Credits

Teaching Scheme:	Examination Scheme:
Practical: 4 hrs/week	CA I: 25 Marks CA II: 25 Marks End Semester Examination: 50 Marks

Pre-Requisites: All courses

Course Outcomes: At the end of the course, students will be able to:

CO1	State the exact title of the project and problem definition.
CO2	Explain the motivation, objectives and scope of the project.
CO3	Review the literature related to the selected topic of the project.
CO4	Design the mechanism, components of the system and prepare detailed drawings.
CO5	Evaluate the cost considering different materials/manufacturing processes.

Head of the Department
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COLLEGE OF ENGINEERING
Yadrav (Ichalkaranji) Dist. Kolhapur

The students in a group of not more than FOUR will work under the guidance of the faculty member on the project work undertaken by them. The completion of work, the submission of the report and assessment should be done at the end of VII Sem. The project work should consist of any of the following or appropriate combination: 1. A comprehensive and up-to-date survey of literature related to study of a phenomenon or product. 2. Design of any equipment and / or its fabrication and testing. 3. Critical Analysis of any design or process for optimizing the same. 4. Experimental verification of principles used in applications related to various specializations related to Mechanical Engineering. 5. Software development for particular applications. 6. A combination of the above. It is expected that the students should complete at least 50% of the total project work in VI Semester. The objective is to prepare the students to examine any design or process or phenomenon from all angles, to encourage the process of independent thinking and working and to expose them to industry. The students may preferably select the project works from their opted elective subjects. The students should submit the report in a prescribed format, before the end of VII semester. The report shall be comprehensive and presented typed on A4 size sheets and bound. Number of copies to be submitted is number of students plus two. The assessment would be carried out by the panel of examiners for both, term work and oral examinations.	

Head of the Department
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Yadrav (Ichalkaranji) Dist. Kolhapur

T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

HMS07	HSMC	Aptitude Skills-IV	1-0-0	Audit

Teaching Scheme	Examination Scheme
Lecture:1hr/week	CA I:25 Marks CA II:25 Marks

Pre-Requisites: Communication Skills, Aptitude Skills I, II

Course Outcomes: At the end of the course students will be able to:

CO1	Solve the problems on system of equation.
CO2	Solve the problems on seating arrangement.
CO3	Solve the logical reasoning problems.
CO4	Solve the critical analysis problems.
CO5	Solve the problems of Data interpretation
CO6	Solve the problems mensuration's.

Course Contents:

Unit 1: System of equations quadratic equations, Surds and indices, solution of equations, Ages	[2]
Unit 2: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement,	[2]
Unit 3: Logical Reasoning Numerical based on sense of direction, Blood relations, Odd man Out	[2]
Unit 4: Critical analysis Clocks and Calendar based problems, Crypt arithmetic, heights and distances	[2]
Unit 5: Data Interpretation Table form, Bar form, Line for Pi chart form	[2]

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Unit 6: Mensuration's 2D mensuration's and 3D mensuration's, venn diagram	[2]

Text Books:

1. RS Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning ",S. Chand Publisher; 2016 edition
2. RS Aggarwal, " Quantitative Aptitude for Competitive Examinations ", S. Chand Publisher; 2016 edition
3. Raymond Murphy "Essential English Grammar with Answers", Murphy

Reference Books:

1. Rao N,D,V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition
3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition

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T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

HMS08	HSMC	Language Skills-IV	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Practical:2 hrs/week	CA I:25 Marks CA II:25 Marks

Pre-Requisites: Language Skills I, II

Course Outcomes: At the end of the course students will be able to:

CO1	Make use of functions in python programming.
CO2	Make use of python collections.
CO3	Elaborate classes and its objects in python.
CO4	Elaborate file & its handling functions.

Course Contents:

Unit 1: Function Why we Need Function ,Categories of Functions-Predefined ,User-define ,Parts of Functions Arguments, Return Value ,Definition of Function ,Function Calling ,Lambda(Introduction)	[6]
Unit 2 :Python Collections List, tuple, set, dictionary,constructor ,check, change ,remove item ,list comprehension ,Sort ,loop through ,joining	[6]
Unit 4: Class and Object OOP Characteristics ,creating class ,__init__() method, creating Object ,accessing methods and variables of class ,constructor and destructor ,inheritance ,super(),function overloading	[6]
Unit 4: File handling Path & Directory Settings-Absolute,Relative,File Modes(r,w,a,etc),Open & Close file Reading File using Python--Read Line By Line readline() function,Read Word,Read character(offset),Writing Text File using Python--Write Mode,Append Mode, Exception handling.	[6]

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Yadrav (Ichalkaranji) Dist. Kolhapur

T.Y. (COMPUTER SCIENCE AND ENGINEERING) Semester VI

IFT02	PROJ	Internship/Field Training	0-0-0	Audit

Teaching Scheme:	Examination Scheme:
	End Semester Examination : 50 Marks

Pre-Requisites: Basic knowledge of all courses

Course Description:-Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the Fourth and Fifth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the Sixth semester by the department.
Course Learning Outcomes:-
After successful completion of the course, students will be able to
1. Verify the Technical knowledge in real industrial situations.
2. Develop interpersonal communication skills.
3. Discuss activities and functions of the industry in which the Internship/training has done.
4. Write the technical report.
Prerequisite: - Basics of Computer Science Engineering, Good written and Oral Communication.
Guideline for Students:-
1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.
Student's Diary/ Daily Log
The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

Head of the Department
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SHARAD INSTITUTE OF TECHNOLOGY
COLLEGE OF ENGINEERING
Yadrav (Ichalkaranji) Dist. Kolhapur

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.
Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training. It will be evaluated on the basis of the following criteria:
• Regularity in maintenance of the diary.
• Adequacy & quality of information recorded.
• Drawings, sketches and data recorded.
• Thought process and recording techniques used.
• Organization of the information.
Internship Report
After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:
• Originality.
• Adequacy and purposeful write-up.
• Organization, format, drawings, sketches, style, language etc.
• Variety and relevance of learning experience.
• Practical applications, relationships with basic theory and concepts taught in the course.
Evaluation of Internship/Training
• The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:
• Quality of content presented.
• Proper planning for presentation.
• Effectiveness of presentation.
• Depth of knowledge and skills.
• Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

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