MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Computer Science & Engineering

Scheme of Instruction and Examination

(Choice Based Credit System)

Applicable from the Academic Year 2021-22

V Semester

S.No.	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	CS501PC	Theory of Computation	3	0	0	30	70	3	3
2	CS503PC	Design and Analysis of Algorithms	3	0	0	30	70	3	3
3	CS504PC	Software Engineering	3	0	0	30	70	3	3
4	CS507PC	Web Technologies	3	0	0	30	70	3	3
5	CS510PC	Computer Networks	3	0	0	30	70	3	3
6		**Open Elective -I**	2	0	0	30	70	3	2
7	MC501HS	Intellectual Property Rights	3	0	0	30	70	3	0
8	MC501ES	Artificial intelligence	3	0	0	30	70	3	0
9	CS551PC	Software Engineering Lab	0	0	3	30	70	3	1.5
10	CS555PC	Web Technologies Lab	0	0	3	30	70	3	1.5
11	CS557PC	Computer Networks Lab	0	0	2	30	70	3	1
12	EN553HS	Finishing School-III (Advanced Communication Skills lab)	0	0	2	30	70	3	1
		Total Hours/Marks/Credits	**23**	**0**	**10**	**360**	**840**	**-**	**22**
	MC502ES	Cyber Security (for Other Branches)	3	0	0	30	70	3	0

VI Semester

S.No.	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	CS601PC	Introduction to Machine Learning	3	0	0	30	70	3	3
2	CS604PC	Compiler Design	3	0	0	30	70	3	3
3	CS605PC	Information Security and Block Chain Technology	3	0	0	30	70	3	3
4		**Professional Elective-I**	3	0	0	30	70	3	3
5		**Professional Elective II**	3	0	0	30	70	3	3
6		**Open Elective-II**	2	0	0	30	70	3	2
7	MC602ES	Cyber Security	3	0	0	30	70	3	0
8	CS651PC	Machine Learning Lab	0	0	3	30	70	3	1.5
9	CS654PC	Information Security Lab	0	0	3	30	70	3	1.5
10		**Professional Elective-II Lab**	0	0	2	30	70	3	1
11	MA654BS	Finishing School-IV (Quantitative Aptitude & Analytical Ability)	0	0	2	30	70	3	1
		Total Hours/Marks/Credits	**20**	**0**	**10**	**330**	**770**	**-**	**22**
12	MC601ESC	Environmental Science (for Lateral Entry Students)	3	0	0	30	70	3	0
	MC601ES	Artificial Intelligence (for other branches)	3	0	0	30	70	3	0

L: Lecture **T**: Tutorial **D**: Drawing **P** : Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Computer Science & Engineering

Scheme of Instruction and Examination

(Choice Based Credit System)

Applicable from the Academic Year 2021-22

VII-Semester

S.No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE inHours	
			L	T	P/D	CIE	SEE		
1	MS705HS	Organizational Behaviour	3	0	0	30	70	3	3
2	CS703PC	Big Data Analytics	3	0	0	30	70	3	3
3		**Professional Elective-III**	3	0	0	30	70	3	3
4		**Professional Elective-IV**	3	0	0	30	70	3	3
5		**Open Elective – III**	2	0	0	30	70	3	2
6	CS751PC	Big Data Analytics Lab	0	0	2	30	70	3	1
7		**Professional Elective-III Lab**	0	0	2	30	70	3	1
8	CS755PC	Industrial Oriented Mini Project/ Summer Internship	0	0	4	-	100	-	2
9	CS756PC	Seminar	0	0	2	100	-	-	1
10	CS757PC	Project Stage-I	0	0	4	30	70	-	2
		Total Hours/Marks/Credits	**14**	**0**	**14**	**340**	**660**	-	**21**

VIII-Semester

S.No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	CS801PC	Soft Computing	2	0	0	30	70	3	2
2		Professional Elective-V	3	0	0	30	70	3	3
3		Professional Elective-VI	3	0	0	30	70	3	3
4	CS851PC	Project Stage-II	0	0	16	30	70	-	8
		Total Hours/Marks/Credits	**8**	**0**	**16**	**120**	**280**	**-**	**16**

Grand Total of Credits

Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Credits	19	18	21	21	22	22	21	16	160

L: Lecture **T**: Tutorial **D**: Drawing **P** : Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

Professional Elective-I	
Code	**Subject**
CS611PE	Computer Vision
CS612PE	Design Patterns
CS613PE	Introduction to Data Science
Professional Elective-II	
CS615PE	Network Programming
CS617PE	DevOps
CS618PE	Internet of Things
Professional Elective-III	
CS711PE	Natural Language Processing
CS712PE	Full Stack Development
CS714PE	Data Mining
Professional Elective-IV	
CS715PE	Data Base Security
CS716PE	Cloud Computing
CS717PE	Reinforcement Learning
CS718PE	Distributed Systems
Professional Elective-V	
CS811PE	Social Networks Analysis
CS812PE	Web Services and Service Oriented Architecture
CS813PE	Data Stream Mining
CS814PE	Adhoc & Sensor Networks
Professional Elective-VI	
CS815PE	Mobile Application Development
CS816PE	Expert Systems
CS817PE	Digital Forensics
CS818PE	Neural Networks and Deep Learning

List of Open Electives offered: **Open Elective-I**	
CS521OE	Data Structures
CS522OE	Operating Systems
CS523OE	Database Management Systems
Open Elective-II	
CS621OE	Computer Networks
CS622OE	Software Engineering
CS623OE	Java Programming
Open Elective-III	
CS721OE	Python Programming
CS722OE	Internet of Things
CS723OE	Introduction to Machine Learning

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Computer Science & Engineering

Scheme of Instruction and Examination

(Choice Based Credit System)

Applicable from the Academic Year 2021-22

V Semester

S.No.	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	CS501PC	Theory of Computation	3	0	0	30	70	3	3
2	CS503PC	Design and Analysis of Algorithms	3	0	0	30	70	3	3
3	CS504PC	Software Engineering	3	0	0	30	70	3	3
4	CS507PC	Web Technologies	3	0	0	30	70	3	3
5	CS510PC	Computer Networks	3	0	0	30	70	3	3
6		**Open Elective -I**	2	0	0	30	70	3	2
7	MC501HS	Intellectual Property Rights	3	0	0	30	70	3	0
8	MC501ES	Artificial intelligence	3	0	0	30	70	3	0
9	CS551PC	Software Engineering Lab	0	0	3	30	70	3	1.5
10	CS555PC	Web Technologies Lab	0	0	3	30	70	3	1.5
11	CS557PC	Computer Networks Lab	0	0	2	30	70	3	1
12	EN553HS	Finishing School-III	0	0	2	30	70	3	1
		Total Hours/Marks/Credits	**23**	**0**	**10**	**360**	**840**	**-**	**22**
	MC502ES	Cyber Security (for Other Branches)	3	0	0	30	70	3	0

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical

CIE - Continuous Interna Evaluation **SEE -** Semester End Examination

L	T	P	C
3	0	0	3

V Semester Syllabus

CS501PC: Theory of Computation

(Common to CSE and IT)

Course Objectives:

- To provide introduction to some of the central ideas of theoretical computer sciencefrom the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automatatheory.
- To classify machines by their power to recognize languages.
- To employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undecidability.

Course Outcomes:

- Able to understand the concept of abstract machines and their power to recognize thelanguages.
- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Able to gain proficiency with mathematical tools and formal methods.

UNIT – I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Deterministic Finite Automata: Definition of DFA, how a DFA Process Strings, The language of DFA.

Nondeterministic Finite Automata: Formal Definition, an application: Text Search, Conversion of NFA to DFA.

Finite Automata with Epsilon-Transitions: Formal Definition, epsilon-closure, conversion of NFA with Є-transitions to DFA.

Moore and Melay machines: Definition of Moore and Melay machines, conversion of Melay to Moore machine and vice-versa.

UNIT – II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT – III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using aGrammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tree, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata: Definition of the Pushdown Automaton, the Language of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

UNIT – IV

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating Unit productions, Eliminating Є-productions, Chomsky Normal form and Greibach Normal form.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications.

Closure Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's.

UNIT – V

Turing Machines: Introduction to Turing Machine, Types of Turing machines, Formal Description, Instantaneous description, the language of a Turing machine, halting problem.

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, AnUndecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines, Universal Turing machine.

TEXT BOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education.
2. K.L.P Mishra and N. Chandrashekaran, Theory of Computer Science – Automata, Languages and computation, 2nd Edition, PHI.

REFERENCE BOOKS:

1. John C Martin, Introduction to Languages and The Theory of Computation, TMH.
2. Daniel I.A. Cohen, John Wiley, Introduction to Computer Theory,
3.Michael Sipser, Introduction to the Theory of Computation, 3rd Edition, Cengage Learning.

L	T	P	C
3	0	0	3

V Semester Syllabus
CS503PC: DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE, IT, CSE(AI&ML), CSE (Data Science))

Prerequisites:

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"

Course Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, greedy, Dynamic Programming, backtracking and branch and bound methods) and mention problems for which each technique is appropriate
- Describes how to evaluate and compare different algorithms using worst-, average-, and bestcase analysis.
- Explains the difference between tractable and intractable problems, and introduces the Problems that are P, NP and NP complete.

Course Outcomes:

- Student will be able to:
- Acquire the knowledge of algorithm analysis and its notations that are applied on the problems solved by divide and conquer paradigm.
- Use greedy approach to solve an appropriate problem for optimal solution.
- Apply dynamic programming approach to solve suitable problems
- Apply the concept of back tracking, branch and bound paradigm for real time problems.
- Analyze the complexity of problems and differentiate that in terms of P and NP problems with examples.

Unit I:

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort,Strassen's matrix multiplication.

Unit II:

Sets and Disjoint Set Unions: Introduction, Union and Find Operations with algorithms.

Greedy method: General method, applications-Job sequencing with dead lines, knapsack problem, Minimum cost spanning trees-Prim's and kruskal's Algorithm, Single source shortest path problem.

Unit III:

Dynamic Programming: General method, applications- Multistage Graphs, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, The Traveling sales person problem, Reliability design.

Unit IV :

Backtracking: General method, applications- The 8-Queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

Branch and Bound: General method, applications - 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling sales person problem,.

Unit V :

NP-Hard and NP-Complete problems: Basic concepts, Nondeterministic algorithms, The classes NP - Hard and NP-Complete, Cook's theorem, NP-Hard Graph Problems-Clique Decision Problem(CDP), Node cover decision problem.

Text Books:

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekharam, Fundamentals of Computer Algorithms, , Galgotia publications Pvt. Ltd, Second Edition, 2007.
2. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson education, Reprint 2002.

Reference Books:

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.T Sai, Introduction to Design and Analysis of Algorithms A strategic approach, Mc Graw Hill,2005.
2. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

   Introduction to Algorithms, 3rd Ed, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and Clifford Stein, PHI Pvt. Ltd., Pearson Education.

L	T	P	C
3	0	0	3

V Semester Syllabus
CS504PC: SOFTWARE ENGINEERING
(Common to CSE & IT)

Prerequisite: Object oriented Programming Language

Course Objectives:

- To understand different Software Process Models.
- To understand Software Requirements and SRS document.
- To understand different Software Architectural Styles.
- To understand different Software Testing Strategies and Methods.
- To understand Software Quality and metrics to ensure good quality software.

Course Outcomes:

- Ability to apply different Process Models.
- Ability to identify minimum requirements for the development of application.
- Ability to translate requirements to high level design models.
- Ability to conduct appropriate testing strategies and methods.

UNIT- I:

Introduction to Software Engineering: The Evolving Role of Software, Changing Nature of Software, Software Myths.

A Generic View of Process: Software Engineering- A Layered Technology, A Process Framework, The Capability Maturity Model Integration (CMMI).

Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, The Unified Process.

UNIT- II:

Agile Development: Agility and Cost of Change, Agile Process, Extreme Programming, Scrum, DSDM.

Software Requirements: Functional and Non-Functional Requirements, User Requirements, System Requirements and the Software Requirements Document.

Requirements Engineering Process: Feasibility Studies, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management.

UNIT- III:

System Modeling: UML modeling using Class diagram, Use case diagram, Sequence diagram and Activity Diagram.

Design Engineering: Design Process, Design Concepts, The Design Model.

Creating an Architectural Design: Software Architecture, Architectural Styles, Architectural Design. Modeling Component Level Design: Designing Class Based Components, Conducting Component Level Design. **User Interface Design**: Golden Rules, Interface Design Steps.

UNIT- IV:

Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging, Testing Conventional Applications: White-Box Testing, Black-Box Testing.

UNIT- V:

Quality Management: Software Quality, Formal Technical Reviews, SQA Tasks, Goals, Metrics, Software Reliability.

Product Metrics: Framework for Product Metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

TEXT BOOKS:

1. Roger S Pressman, Software engineering a practitioner's Approach, Eighth Edition, McGraw Hill International Edition.
2. Ian Sommerville, Software Engineering, Seventh Edition, Pearson education.

REFERENCE BOOKS:

1. Waman S Jawadekar, An Engineering approach Software Engineering principles and practice- The Mc Graw-Hill Companies.
2. Meiler page-Jones, Fundamentals of object-oriented design using UML, Pearson Education.
3. James F. Peters, Witold Pedrycz, John Wiley, Software Engineering.

L	T	P	C
3	0	0	3

V Semester Syllabus

CS507PC: WEB TECHNOLOGIES

(Common to CSE, IT & CSBS)

Prerequisites:

- A course on "Computer Programming and Data Structures".
- A course on "Java Programming"

Course Objectives:

- To introduce Client-side scripting with JavaScript and AJAX.
- To introduce PHP language for server-side scripting
- To introduce XML and processing of XML Data with Java
- To introduce Server-side programming with Java Servlets and JSP

Course Outcomes:

- Gain knowledge of client-side scripting, validation of forms and AJAXprogramming.
- Understand what is XML and how to parse and use XML Data with Java
- Understand server-side scripting with PHP language
- Gain knowledge of Server-side programming with Java Servlets
- Gain knowledge of Server-side programming with JSP.

UNIT- I

HTML Common tags- List, Tables, images, forms, Frames, Cascading Style sheets. **Client-side Scripting:** Introduction to Javascript, Javascript language – declaringvariables, scope of variables, Objects, Functions, event handlers (onclick, onsubmit etc.),HTML Document Object Model, Form validation, Introduction to AJAX.

UNIT – II

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, XML-Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT- III

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT – IV

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT – V

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Scripting Elements, Directive Elements, Action Elements Implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP, Introduction to Content Management System(CMS).

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS

1. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Beginning Web Programming-Jon Duckett WROX.

L	T	P	C
3	0	0	3

V Semester Syllabus

CS510PC: COMPUTER NETWORKS

(Common to CSE, CSE(AI&ML), CSE (Data Science))

Course Objectives:

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers

Course Outcomes:

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Identify and analyze various routing algorithms, congestion control algorithms.
- Outline the transport layer protocols like TCP and UDP.
- List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I

Network Hardware: Local Area Networks, Metropolitan Area Networks, Wide AreaNetworks, Internetwork.

Network software: Protocol Hierarchies, Design Issues for the Layers, Connection-Orientedand Connectionless Services.

Reference Models: OSI, TCP/IP Reference models, Comparison of OSI and TCP/IP Models

Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: Magnetic Media, Twisted pairs, Coaxial Cable, Fiber Optics, Unguided Transmission Media: Radiowaves, Microwaves, Infrared.

UNIT - II

Data link layer: Design issues, **Framing**: Character Count, Character Stuffing, Bit Stuffing**Error Detection and Correction**: Block Codes, Simple Parity Check, LRC, Hamming Distance, Checksum, Hamming Code, CRC

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for anerror-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: Pipelining, Piggybacking, A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat,

Example data link protocols: HDLC, PPP

Medium Access sub layer: The channel allocation problem, Multiple access protocols:

ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Connecting devices at the data link layer.

UNIT - III

Network Layer: Design issues, **Routing algorithms**: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Link State Routing, **Congestion Control Algorithms:** Approaches to Congestion Control, Traffic awarerouting, Admission Control, Traffic throttling, Load shedding.

Quality of Service: Traffic Shaping, Packet scheduling, Admission Control, Integrated services, Differentiated Services, Internetworking,

Network layer in the Internet: IPv4 protocol, IP Addresses, IPv6 protocol, InternetControl Protocols: ICMP, ARP, RARP, BOOTP, DHCP,

Internetwork Routing: OSPF, BGP, Internet Multicasting.

UNIT - IV

Transport Layer:

Transport Services: Services provided to Upper layer, Transport service primitives, Berkeley Sockets

Elements of Transport protocols: Addressing, Error and Flow Control, Multiplexing, Crash Recovery, Connection management.

Internet Transport Protocols: TCP: Service Model, TCP Protocol, Segment header, TCP Connection establishment and Release, TCP Connection management, TCP Sliding Window, Timer management, TCP Congestion Control.

UDP: Protocol, UDP Header

UNIT - V

Application Layer: Domain name system- DNS Name Space, Resource records, Name Servers. SNMP, Electronic Mail: Architecture and Services, User Agent, Message Formats, Message Transfer, Final Delivery.

World Wide Web: Architectural Overview, Static Web pages, Dynamic web pages and Web applications, HTTP, Mobile Web.

Streaming audio and video: Digital Audio, Digital Video, Streaming Stored media, Streaming Live media, Real Time Conferencing.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI,2011.
2. Data Communications and Networking – Behrouz A. Forouzan. Fifth Edition TMH, 2017.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, PearsonEducation
2. “Data and Computer Communications” by William Stallings 9 th Edition, PearsonEducation 2010.
3. “TCP/IP Illustrated” by W. Richard Stevens,Addison-Wesley Professional;2 nd edition2011.

L	T	P	C
2	0	0	2

V Semester Syllabus
CS521OE:DATA STRUCTURES (Open Elective - I)

Prerequisites: Any programming language
Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as trees and graphs
- Understand the concepts of heaps and tries.
- Introduces sorting and pattern matching algorithms.

Course Outcomes:

- Student will be able to:
- Understand basic data structures such as arrays, linked lists, stacks and queues.
- Describe the hash function and concepts of collision and its resolution methods.
- Understand, design and implement the general tree data structures with their applications.
- Solve problem involving graphs, trees and heaps.
- Implement and know the application of algorithms for sorting and pattern matching

Unit I :
Introduction: Data structures-definition and types, Static and Dynamic representation of data structure and comparison. **Stack:** definition, operations on stacks, Notations- Infix, Prefix and Postfix representation. Infix to Postfix conversion example. Evaluation of Postfix expression example.

Unit II :
Hashing: Hash Functions, collision resolution techniques- Separate Chaining, Open Addressing- Linear probing, Quadratic Probing, Double Hashing. Rehashing, Extensible Hashing.
Dictionaries: Linear list representation, skip list representation, operations - insertion, deletion and searching.

Unit III :
Trees: Basic terminology, Types of trees: Binary Tree, Complete and Full Binary Tree, Extended Binary Trees, Threaded Binary Trees. **Search Trees**: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, Splay Trees-Insertion.

Unit IV:
Graphs-Basic terminology, Representation of graphs, **Graph Traversals**-Breadth First Search, Depth First Search with algorithms. **Sortings**: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

Unit V:

Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries

Text Books:

1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publications Pvt Ltd Delhi India.
2. Aaron M. Tenenbaum,Yedidyah Langsam and Moshe J. Augenstein, Data Structures Using C and C++, PHI Learning Private Limited, Delhi India.

Reference Books:

1. Richard F.Gillberg & Behrouz A. Forouzan, Data Structures, A Pseudo code Approach with C, Second Edition, Cengage Learning, India Edition, 2005.
2. Aaron M. Tenenbaum,Yedidyah Langsam and Moshe J. Augenstein, Data Structures Using C and C++, PHI Learning Private Limited, Delhi India.
3. Seymour Lipschutz, Schaum's Outlines, Data Structures, Special Second Edition,Tata McGraw-Hill,.

L	T	P	C
2	0	0	2

V Semester Syllabus
CS522OE: Operating Systems (Open Elective – I)

Course Objectives:

- To understand the OS role in the overall computer system and study different OS and compare their features.
- To understand the scheduling policies of OS and introduces system call Interface for process management.
- To understand process concurrency and synchronization.
- To understand the different memory management techniques.
- To understand the concepts of input/output, file management and Introduces system call for file management.

Course Outcomes:

- Define the fundamental components of a computer operating system and the interactions among them.
- Analyse the performance of CPU scheduling algorithms.
- Ability to design and solve synchronization problems using semaphores and monitors.
- Illustrate memory management techniques and deadlock handling methods.
- Ability to change Access control to protect files

Unit – I

Operating System – Introduction: Operating system objectives, User view, System view, Operating system definition, Computer System Architecture, OS Operations, **System Structures**: Operating System services, System Calls, Types of System Calls, System Programs, OS Structure.

Unit – II

Process and CPU Scheduling –Process concept**:** The Process, Process State, PCB, Threads. Process Scheduling-Scheduling Queues, Schedulers, Context Switch, and Operations on Processes.

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems using pipes, FIFOs, message queues, shared memory. System call interface for process management-fork(), exit(), wait(), waitpid(), exec().

Unit – III

Process Management and Synchronization - The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Monitors.

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

Unit – IV

Memory Management and Virtual Memory: – Memory Management Strategies- Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management-Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms-FIFO, Optimal, LRU, Allocation of Frames, Thrashing.

Unit – V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management.

System Calls-Usage of open(), create(), read(), write(), close(), lseek(), stat(), ioctl() system calls.Study of Different Operating Systems: Windows, Unix and Android.

Text Books

1. Abraham Silberchatz, Peter B. Galvin ,Operating System Principles-, Greg Gagne 9th Edition, John Wiley, 2014.
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition, Pearson, 2012.

Reference Books

1. Crowley, TMH, Operating System A Design Approach-
2. Andrew S, Modern Operating Systems, Tanenbaum 2nd edition, Pearson/PHI W.R. Stevens, Advanced programming in the UNIX environment, Pearson education.
3. Operating Systems-A Concept based Approach by Dhamdhere, TMH, 2nd Edition.

L	T	P	C
2	0	0	2

V Semester Syllabus

CS523OE: Database Management Systems (Open Elective-1)

Prerequisites: Data structures

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To apply the concurrency control, recovery, and indexing for the real time data
- To become familiar with database storage structures and access techniques

Course Outcomes:

- Design a database using ER modelling.
- Develop complex queries using SQL.
- Apply normalization techniques on databases.
- Explain the ACID properties of transactions and apply the serializability tests.
- Solve problems using various indexing and hashing techniques.

Unit I

Introduction: Purpose of Database Systems, View of Data, Database Languages, Database Models, Database Architecture, Database System Applications.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Unit II

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data

SQL: Queries, Constraints, Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Introduction to Views.

Unit III

Functional Dependencies -Introduction, Basic Definitions, Trivial, Non-Trivial functional dependencies, Closure of set of dependencies, Closure of Attributes

Schema Refinement: Problems caused by redundancy, decompositions, Properties of decomposition, Normalization- FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit IV

Transaction Management and Recovery: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols.

Unit V

Storage and Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure- Insertion, Deletion and Searching.

Text Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Data base Management Systems, , McGraw Hill Education (India) Private Limited, 3rd Edition.
2. A. Silberschatz, Henry. F. Korth, S. Sudarshan, Data base System Concepts, McGraw Hill Education (India) Private Limited, 6th edition.

REFERENCE BOOKS:

1. R Elmasri, ShamkantB.Navathe, Database Systems, 6th edition, Pearson Education.
2. M. L. Gillenson and others, Introduction to Database Management, Wiley StudentEdition.
3. C. J. Date, Database Development and Management, Introduction to Database Systems, Pearson Education.

L	T	P	C
3	0	0	0

V Semester Syllabus
MC501HS: Intellectual Property Rights

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter,selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd

MC501ES: ARTIFICIAL INTELLIGENCE
(Common to CSE, IT, CSBS, CSE (Data Science))

L	T	P	C
3	0	0	0

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic searchtogether with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machinelearning.

Course Outcomes:

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a givenproblem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machinelearning.

UNIT - I

Introduction: AI Definition, Agents and Environments, Structure of Agents, Types ofAgents. Problem Solving Agents: Problem spaces, states, goals and operators.

Uninformed Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening depth first search, Bidirectional Search.

UNIT – II

Informed Search: Heuristic Search strategies, Hill Climbing, A***,** Hill climbing search.
Game Playing: Adversarial Searches. Two player games. Min-max Search: Algorithm, Problems. Draw Back of Min-Max Algorithm. Alpha-beta pruning: Algorithm, Problems.

Constraint Satisfaction Problems: Definition, Crypt-Arithmetic Problems, Map Coloring, Backtracking.

UNIT - III

Basic Knowledge Representation and Reasoning: Propositional Logic: Basics of logic, truth tables and sentence conversions. First order logic: Difference between Proposition & First order logic. Conjunctive Normal form. Disjunctive Normal Form. Conversion of English sentences into First order logic. Resolution and theorem proving. Problems of Resolution. Forward Chaining: Definition, Example problems. Backward Chaining: Definition, Example problems.

UNIT – IV

Planning Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. **Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT – V

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

Text Books:

1. Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall. 2010, third edition.
2. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.

Reference Books:

1. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson
Education, 6th ed., 2009.
3. Artificial Intelligence – Patric Henry Winston – Third Edition, Pearson Education

L	T	P	C
0	0	3	1.5

V Semester Syllabus

CS551PC: SOFTWARE ENGINEERING LAB (Common to CSE & IT)

Prerequisites: Object Oriented Programming Language

Course Objectives:

- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes:

- Ability to translate requirements into System Models.
- Ability to generate a high-level design of the system from the software requirements.
- Understand different Software Testing Methodologies and design suitable test cases.
- Ability to prepare documentation using Computer Aided Software Engineering Tool.

List of Experiments

Do the following Exercises of any two projects given in the list of sample project so on any other projects:

1) Development of problem statement.
2) Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3) PreparationofSoftwareConfigurationManagementandRiskManagementrelateddocuments.
4) Study and usage of any Design phase CASE tool
5) Performing the Design by using any Design phase CASE tools.
6) Develop test cases for unit testing and integration testing
7) Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

TEXT BOOKS:

1. SoftwareEngineering,Apractitioner'sApproach-RogerS.Pressman,6th edition,McGrawHill InternationalEdition.
2. Software Engineering- Sommerville, 7th edition, PearsonEducation.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, PearsonEducation.

L	T	P	C
0	0	3	1.5

V Semester Syllabus
CS555PC: WEB TECHNOLOGIES LAB
(Common to CSE & IT)

Course Objectives:

- To enable the student to program web applications using the following technologies HTML, Javascript , AJAX, PHP, Tomcat Server, Servlets, JSP

Course Outcomes:

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

Note:

1. Use XAMPP Stack (Linux, Apache, MySQL and PHP) for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform wherever applicable
2. The list suggests the minimum program set. Hence, the concerned staff is requested toadd more problems to the list as needed

1. Install the following on the local machine
   - Apache Web Server (if not installed)
   - Tomcat Application Server locally
   - Install MySQL (if not installed)
   - Install PHP and configure it to work with Apache web server and MySQL (if not already configured)
2. Write an HTML page including javascript that takes a given set of integer numbers and shows them after sorting in descending order.
3. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.
4. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
6. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
7. Create an XML document that contains 10 users' information. Write a Java program, which takes User Id as input and returns the user details by taking the user information from the XML document using (a) DOM Parser and (b) SAX parser Implement the following web applications using (a) PHP, (b) Servlets and (c) JSP:
8. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise, a failure message is shown to the user.
9. Modify the above program to use an xml file instead of database.
10. Modify the above program to use AJAX to show the result on the same page below the submit button.
11. A simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands.
12. Modify the above program such that it stores each query in a database and checks the database first for the result. If the query is already available in the DB, it returns the value that was previously computed (from DB) or it computes the result and returns it after storing the new query and result in DB.
13. A web application takes a name as input and on submit it shows a hello <name> page where <name> is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name> message with the duration of usage (hint: Use session to store name and time).
14. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise, it should send "Welcome <name> to this site" message.
15. A web application for implementation:

    The user is first served a login page which takes user's name and password. After submitting the details, the server checks these values against the data from a database and takes the following decisions. If name and password match, serves a welcome page with user's full If name matches and password doesn't match, then serves "password mismatch" page

    If name is not found in the database, serves a registration page, where user's full name is asked and on submitting the full name, it stores, the login name, password, and full name in the database (hint: use session for storing the submitted login name and password)

16. A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.

REFERENCE BOOKS:

1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill
2. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
3. Java Server Pages –Hans Bergsten, SPD O'Reilly
4. Java Script, D.Flanagan, O'Reilly, SPD.
5. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.

L	T	P	C
0	0	2	1

V Semester Syllabus
CS557PC: COMPUTER NETWORKS LAB

Course Objectives:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frame

Course Outcomes:

- Implement data link layer farming methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer.
- To be able to work with different network tools

List of Experiments:

1. Write a program to implement framing.
   i. Fixed framing, ii. Variable framings
2. Write a program to implement stuffing techniques.
   i. Bit-stuffing ii. Character stuffing
3. Write a program to implement checksum
4. Write a program to compute CRC code for the polynomial CRC-12
5. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
6. Write a program to implement classful addressing.
7. Write a program to implement classless addressing.
8. Write a program to implement Dijsktra's algorithm to compute the shortest path through a network
9. Write a program to divide a given network into n-sub networks.
10. Implement distance vector routing algorithm for obtaining routing tables at each node.
11. Write a program to implement Link state routing
12. Write a program for congestion control using Leaky bucket algorithm
13. Implement data encryption and data decryption.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI,2011.
2. Data Communications and Networking – Behrouz A. Forouzan. Fifth Edition TMH, 2017.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. “Data and Computer Communications” by William Stallings 9 th Edition, Pearson Education 2010.
3. “TCP/IP Illustrated” by W. Richard Stevens,Addison-Wesley Professional; 2nd edition 2011.

L	T	P	C
0	0	2	1

V Semester Syllabus
EN553HS: Finishing School-III

(Advanced Communication Skills Lab)
[*Common to CSE, IT, CSBS, CSE (AI & ML) and CSE (Data Science]*

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the various needs of the students. The objectives of the course are as follows:

- To improve students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- To enable them to communicate their ideas relevantly and coherently in writing.
- To facilitate placement activities for the students.
- To make the students participate in both oral as well as written presentation skills.
- To equip the students to be efficient in Group Discussions, Presentation Skills and Interview Skills.

Course Outcomes:

Students will be able to:

- Acquire English language vocabulary and use it contextually
- Listen and speak effectively in English language
- Develop proficiency in academic reading and writing skills
- Increase possibilities of job prospects in their respective domain
- Communicate confidently in formal and informal contexts

INTRODUCTION:

Advanced English Communication Skills Lab is considered essential as the students need to prepare themselves for their careers which may require them to listen, speak, read and write in English both for their professional and interpersonal communication in the globalized context. This course would enable students to use English effectively and perform the following:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Participating in group discussions.
3. Facing interviews.
4. Writing project/research reports/technical reports.
5. Making oral presentations.
6. Writing formal letters.
7. Transferring information from non-verbal to verbal texts and vice-versa.
8. Taking part in social and professional communication.

Unit – I

Inter-personal Communication – Building General, Technical and Business English Vocabulary – Formal meeting–planning and circulating agenda–opening the meeting–during the meeting–closing the meeting-responding appropriately and relevantly – using the right body language-general-technical-business- vocabulary, analogy.

Unit – II

Reading Comprehension: Reading for facts-skimming-scanning-guessing meanings from context, inferring meaning, critical reading, effective online navigation, sample passages from TOEFL/GRE/IELTS.

Unit – III

Writing Skills: Planning for writing, structure and presentation of different types of writing - letter writing/resume writing, email netiquette, project report writing – feasible/business/ periodical/academic reports.

Unit – IV

Presentation Skills: Brief speeches-introduction to a structured talk– **o**ral presentations (individual and group) /PPTs, gambits of presentation skills – use of tag questions, summarising after a brief talk,opening/during/concluding a presentation.

Unit – V

Group Discussion and Interview Skills: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation - concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and mock interviews.

Text Books:

1. Effective Technical Communication by M Ashraf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

References:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar andHemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning Pvt. Ltd. New Delhi.
5. English Vocabulary in Use Series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley, 2012, Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.
10. How to Write and Speak Better, Reader's Digest, 2003
11. Cambridge IELTS 16 Academic student's book with answers, 2017
12. TOEFL Reading & Writing Workout, The Princeton Review.
13. GRE Reading Comprehension: Detailed Solutions to 325 questions. Vibrant Publishers, 2017
14. How to prepare for Group Discussions and Interviews by Harimohan Prasad and Rajneesh Prasad, TataMcgrawHill.
15. Keep Talking, Frederick Klippel, Cambridge University Press, South Asian edition (6 May 2010),
16. Objective English, Edgar Thorpe & Showick Thorpe, Pearson; 5th edition (1 August 2013).

L	T	P	C
3	0	0	0

V-Semester
MC502ES: CYBER SECURITY
(Common to all branches except CSE, IT, CSBS, CSE (AI & ML) & CSE (Data Science))

Prerequisites: NIL

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

The students will be able
- To understand various cyber-attacks and cybercrimes.
- Knowledge about cyberlaws and cyber forensics.
- Summarize cyber crimes in mobile and wireless devices, how to protect them
- Knowledge about IPR issues in cyber space and cyber terrorism.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, IP spoofing, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, 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.

UNIT- IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

TEXT BOOKS:

1. Nina God bole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, ComputerForensics and Legal Perspectives, Wiley, India 2012.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Mark F. Grady, Fransesco Parisi, " The Law and Economics of Cyber security", Cambridge University Press,2006.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press, 2016.
3. Introduction to Cyber Security, Chwan - Hwa (john) Wu, J. David Irwin, CRC Press T&F Group.

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Computer Science & Engineering

Scheme of Instruction and Examination

(Choice Based Credit System)

Applicable from the Academic Year 2021-22

VI Semester

S.No.	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	CS601PC	Introduction to Machine Learning	3	0	0	30	70	3	3
2	CS604PC	Compiler Design	3	0	0	30	70	3	3
3	CS605PC	Information Security and Block Chain Technology	3	0	0	30	70	3	3
4		**Professional Elective-I**	3	0	0	30	70	3	3
5		**Professional Elective II**	3	0	0	30	70	3	3
6		**Open Elective-II**	2	0	0	30	70	3	2
7	MC602ES	Cyber Security	3	0	0	30	70	3	0
8	CS651PC	Machine Learning Lab	0	0	3	30	70	3	1.5
9	CS654PC	Information Security Lab	0	0	3	30	70	3	1.5
10		**Professional Elective-II Lab**	0	0	2	30	70	3	1
11	MA654BS	Finishing School-IV (Quantitative Aptitude & Analytical Ability)	0	0	2	30	70	3	1
		Total Hours/Marks/Credits	**20**	**0**	**10**	**330**	**770**	**-**	**22**
12	MC601ESC	Environmental Science (for Lateral Entry Students)	3	0	0	30	70	3	0
	MC601ES	Artificial Intelligence (for other branches)	3	0	0	30	70	3	0

L: Lecture **T**: Tutorial **D**: Drawing **P** : Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

L	T	P	C
3	0	0	3

VI Semester Syllabus

CS601PC: Introduction to Machine Learning

Pre-Requisites: Basic Mathematics, Data Structures

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the regression and classification
- To understand building blocks artificial neural network and develop differentalgorithm for learning.
- To Understand various instance-based methods and unsupervised learning techniques
- To study the various probability-based learning techniques

Course Outcomes: **After completion of course, students would be able to**

- Identify potential applications of machine learning in practice
- Describe the differences in approaches and applicability of regression, classification
- Understand the Neural Networks and its usage in machine learning applications
- Understand the basic principles behind unsupervised learning methods.
- Apply Evolutionary Computation Methods to find solutions to complex problems

UNIT-I

Introduction- Learning- types of machine learning, supervised learning, machine learning, testing machine learning algorithms: overfitting, confusion matrix, accuracy metrics, turning data into probabilities, bias variance trade off

UNIT-II

Neural Networks: The perceptron- learning rate, bias, perceptron learning algorithm, linear separability-Exclusive-OR function, backpropagation algorithm, initialization of weights, MLP in practice, deriving back propagation, radial basis functions

UNIT-III

Dimensionality reduction- Linear discriminant analysis, principal component analysis, Factor analysis, independent component analysis, Support vector machines, optimal separation, kernels, SVM algorithm.

UNIT-IV

Unsupervised learning- k means algorithm, learning with trees- using decision trees-construction decision trees-classification and regression trees-ensemble learning-Boosting-Bagging-Random Forests

UNIT-V

Bayesian learning – Introduction, Bayes theorem, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

TEXT BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis, 2014
2. Machine Learning – Tom M. Mitchell, - MGH, 1997

REFERENCES:

1. Pattern recognition and Machine Learning, C. M. Bishop, Springer,2007
2. Introduction to Machine Learning, E. Alpaydin, MIT Press, 3rd Edition, 2014.
3. The Elements of Statistical Learning, Jerome H. Friedman, Robert Tibshirani, and TrevorHastie, Springer, second edition, 2009

L	T	P	C
3	0	0	3

VI-Semester Syllabus

CS604PC: Compiler Design
(Common CSE, IT)

Course Objectives:

- To understand the various phases in the design of a compiler.
- To understand the design of top-down and bottom-up parsers.
- To understand syntax directed translation schemes.
- To introduce lex and yacc tools.
- To learn to develop algorithms to generate code for a target machine.

Course Outcomes:

- Ability to design, develop, and implement a compiler for any language.
- Able to use lex and yacc tools for developing a scanner and a parser.
- Able to design and implement LL and LR parsers.
- Able to design algorithms to perform code optimization in order to improve theperformance of a program in terms of space and time complexity.
- Ability to design algorithms to generate machine code.

UNIT – I

Introduction: Language Processors, The Structure of a compiler, Phases of Compilation, Language Processing System, the Science of building a compiler, programming language basics.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Design of a Lexical-Analyzer Generator.

UNIT – II

Syntax Analysis: Introduction, writing a Grammar- Lexical Versus Syntactic Analysis, Eliminating Ambiguity, Elimination of Left Recursion, Left Factoring. Top-Down Parsing -

Problems of Top-down Parsing, Recursive descent Parsing, Back Tracking-Brute Force Method, Non-Recursive Predictive Parsing, LL (1) Grammar.

Bottom-Up Parsing: Introduction to LR Parsing: Shift reduce Parsing, Operator Precedence Grammar, Simple LR, More Powerful LR Parsers, Look Ahead LR, Using Ambiguous Grammars, Parser Generators-YACC.

UNIT – III

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed TranslationSchemes, and Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Three-Address Code Representations – Triples, Quadruples, Indirect Triples. Conversion of Popular Programming Languages Constructs into Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back Patching.

UNIT – IV

Run-Time Environments: Storage organization**,** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Mark-and-sweep Garbage Collection Algorithm, Introduction to Trace-Based Collection.

Code Generation: Object Code Forms**,** Machine Dependent Code Optimization, DAG Representation of Basic Blocks, Optimization of Intermediate Code by DAG, Issues in the Design of a Simple Code Generator, The Target Language, addresses in the Target Code, Code Generation Algorithm, Code Generation by DAG, Peephole Optimization, Register Allocation and Assignment.

UNIT – V

Machine-Independent Optimizations: The Principal Sources of Optimization -Constant Folding, Copy Propagation, Dead Code Elimination, Algebraic Transformation, Strength reduction, Common Sub Expression Elimination. Loop Optimization Techniques – Loop Invariant Code Motion, Strength Reduction on induction variable, Loop Unrolling.

Basic Blocks and Flow Graphs: Local Optimization, Global Optimization, Data Flow Properties: Available Expressions, Reaching Definition, Live Variable Analysis.

TEXT BOOKS

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica
S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Education, 2011.
2. Principles of Compiler Design by V Raghavan Mcgraw Hill Education, 2017.

REFERENCE BOOKS

1. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning, 19970.
2. The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH, 1985.
3. Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly, 1992.

L	T	P	C
3	0	0	3

VI Semester Syllabus

CS605PC: Information Security and Block Chain Technology

Course Objectives:

- Identify the threats and understand objectives of Information Security
- Analyze the various Cryptographic algorithms.
- Understand the Web Security mechanisms.
- To learn Key Management and Distribution.
- Understand the concepts of System security.

Course Outcomes:

- Identify the threats and understand objectives of Information Security
- Analyze the various Cryptographic algorithms.
- Understand the Web Security mechanisms.
- To learn Key Management and Distribution.
- Understand the concepts of System security.

UNIT – I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, substitution, and transposition techniques

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange

UNIT - III

Message authentication codes: Authentication requirements, HMAC, Digital signatures.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service,

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange.

UNIT - IV

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy: Block chain Architecture and Design-Basic cryptoprimitives: Hash chain to Block Chain-Basic consensus mechanisms

UNIT-V

Requirements for the consensus protocols-Proof of Work (PoW)- Permissioned Block chains-Design Goals-Consensus protocols for Permissioned Block chains. Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security - Principles and Practice: Pearson Education, 6th Edition
2. Atul Kahate, Cryptography and Network Security: Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security: Wiley India, 1st Edition.
2. Forouzan Mukhopadhyay, Cryptography and Network Security: Mc Graw Hill, 3rd Edition
3. Mark Stamp, Information Security, Principles, and Practice: Wiley India.
4. Mark Gates, "Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates2017.
5. Bahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017.

L	T	P	C
3	0	0	3

VI Semester Syllabus
CS611PE: Computer Vision
(Professional Elective-I)

COURSE OBJECTIVES:

- To review image processing techniques for computer vision
- To understand shape and region analysis
- To understand Hough Transform and its applications to detect lines, circles, ellipses
- To understand three-dimensional image analysis techniques
- To understand motion analysis
- To study some applications of computer vision algorithms

COURSE OUTCOMES: Students have ability to

- Understand fundamentals of image processing techniques
- Apply feature descriptors to detect shapes of the objects
- Understand and apply HOUGH TRANSFORMs for real world applications
- Analyse the various 3D motion detection methods
- Apply 3D shape models for real world problems

UNIT I

IMAGE PROCESSING FOUNDATIONS: Review of image processing techniques classical filtering operations thresholding techniques edge detection techniques corner and interest point detection mathematical morphology texture

UNIT II

SHAPES AND REGIONS: Binary shape analysis connectedness object labeling and counting size filtering distance functions skeletons and thinning deformable shape analysis boundary tracking procedures active contours shape models and shape recognition centroidal profiles handling occlusion boundary length measures boundary descriptors chain codes Fourier descriptors region descriptors moments

UNIT III

HOUGH TRANSFORM: Line detection Hough Transform (HT) for line detection foot-ofnormal method line localization line fitting RANSAC for straight line detection HT based circular object detection accurate center location speed problem ellipse detection Case study: Human Iris location hole detection generalized Hough Transform (GHT) spatial matched filtering GHT for ellipse detection object location GHT for feature collation

UNIT IV

3D VISION AND MOTION: Methods for 3D vision projection schemes shape from shading photometric stereo shape from texture shape from focus active range finding surface representations point-based representation volumetric representations 3D object recognition 3D reconstruction introduction to motion triangulation bundle adjustment translational alignment

parametric motion spline-based motion optical flow layered motion.

UNIT V

APPLICATIONS: Photo album Face detection Face recognition Eigen faces Active appearance and 3D shape models of faces Application: Surveillance foreground-background separation particle filters Chamfer matching, tracking, and occlusion combining views from multiple cameras human gait analysis Application: In-vehicle vision system: locating roadway road markings identifying roadsigns locating pedestrains.

Text Book:

1. R.Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.

REFERENCES:

1. E. R. Davies. "Computer. Machine Vision", Fourth Edition, Academic Press. 2012.
2. Simon J. D Prince, "Computer Vision: Models, Learning, end Inference", Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Language Processing for Computer Vision", Third Edition, Academic Press, 2012.
4. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt.Publishing, 2012.
5. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms foranalyzing images", O'Reilly Media, 2012.

L	T	P	C
3	0	0	3

VI Semester Syllabus
CS612PE: Design Patterns
(Professional Elective-I)

Prerequisites: Software Engineering, Object Oriented Programming through Java

Course Objectives:

- The aim of the course is to appreciate the idea behind Design Patterns in handling common problems faced during building an application
- This course covers all pattern types from creational to structural, behavioral to concurrency and highlights the scenarios when one pattern must be chosen over others.

Course Outcomes:

- Ability to understand underlying principles of design patterns.
- To analyze the design and structure of a document editor and its supporting features.
- To differentiate between creational, structural, and behavioral design patterns.

UNIT – I

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How DesignPatterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT – II

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary

UNIT – III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT – IV

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

UNIT – V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

TEXT BOOKS:

1. Design Patterns, Erich Gamma, Pearson Education
2. Patterns in Java, Vol –I, Mark Grand, Wiley Dream Tech.

REFERENCE BOOKS:

1. Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech.
2. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech.
3. Head First Design Patterns, Eric Freeman, O'reily publications

L	T	P	C
3	0	0	3

VI Semester Syllabus

CS613PE: INTRODUCTION TO DATA SCIENCE
(Professional Elective-I)

Course Objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

Course Outcomes:

- After completion of the course, the student should be able to
- Understand basic terms what Statistical Inference means.
- Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
- describe the data using various statistical measures
- utilize R elements for data handling
- perform data reduction and apply visualization techniques.

UNIT - I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. **Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II

Data Types & Statistical Description

Types of Data: Attributes and Measurement, what is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displaysof Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, **Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. **Factors and Data Frames:** Introduction to Factors: Factor Levels, summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. **Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List. **Functions in R:** Introduction, writing a Functionin R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functionsin R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. **Data Visualization:** Pixel-Oriented, Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, PearsonEducation.
2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook," O'Reilly, 2011.

L	T	P	C
3	0	0	3

VI Semester Syllabus

CS615PE: Network Programming
(Professional Elective-II)

Course Objectives:

- Introduce the student to Unix/Linux kernel programming techniques
- Teach advanced C systems programming and debugging techniques in a Unix/Linux environment
- Review basic concepts covered in the core Operating Systems course prerequisite as they are realized in the Linux platform
- Discuss correct synchronization techniques for both application programs and kernel code running on uniprocessor as well as multiprocessor (SMM) platforms

Course Outcomes:

- Write correct and well documented advanced C code using low level Unix/Linux system calls that is demonstrated to execute correctly
- Know where to look for platform specific programming information and be familiar with reading and using man page information as well as other standard reference materials
- Clearly and accurately explain design decisions in written program documentation
- Be familiar with the mechanics of Unix/Linux kernel programming: installing/ configuring the Linux kernel from source and building a useful personal programming environment; modifying the kernel code and recompiling/testing/debugging the new kernel version; designing, installing and testing and debugging a new Linux kernel module and possibly a new system call.
- Be able to design and implement simple, but efficient, concurrent process and thread-based applications.

UNIT-I

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

IPC: Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores.

UNIT-II

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT-III

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host. Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP.

UNIT-IV

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

UNIT-V

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.
Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

TEXT BOOKS:

1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.
2. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.

REFERENCES:

1. UNIX Systems Programming using C++ T CHAN, PHI.

2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education

3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

L	T	P	C
3	0	0	3

VI Semester Syllabus
CS617PE: DevOps
(Professional Elective-II)
(Common to CSE, IT)

Course Objectives:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

Course Outcomes: On successful completion of the course, the student will:

- Identify components of Devops environment.
- Describe Software development models and architectures of DevOps.
- Apply different project management, integration, testing and code deployment tool.
- Investigate different DevOps Software development models.
- Assess various Devops practices.
- Collaborate and adopt Devops in real-time projects.

UNIT - I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. **DevOps influence on Architecture:** Introducing software architecture, the monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV

Integrating the system: Build systems, Jenkins build server, managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host,

Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective.AddisonWesley; ISBN-10.

L	T	P	C
3	0	0	3

VI Semester Syllabus
CS618PE: Internet of Things
(Professional Elective-II)
(Common to CSE: PE-II; CSBS:PE-III; CSE(AI&ML): P-III)

Course Objectives:

- To introduce the terminology, technology, and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To Introduce Programming Raspberry Pi with Python.
- To introduce the hardware and working principles of various sensors used for IoT

Course Outcomes: On successful completion of the course, the student will:

- Understand the concepts of Internet of Things.
- Design IoT applications in different domain and be able to analyze their performance.
- Able to know the Language features of Python.
- Able to know about working of Raspberry Pi
- Able to know the working of various Sensors.

Unit I: Introduction to Internet of Things

Introduction, Definition and Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT communication models, IoT Communication APIs. **IoT Enabling Technologies —** Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates- IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6.

Unit II: Domain Specific IoT

Introduction, Home Automation- Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Smart Cities- Smart Parking, Smart lighting, Smart roads, Structural Health Monitoring, Surveillance, Emergency Response, Environment- Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection, Energy- Smart Grids, Renewable Energy Systems**,** Prognostics, **Retail-** Inventory Management, Smart Payments, Smart Vending Machines, **Logistics-** Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics, **Agriculture-** Smart Irrigation, Green House Control, **Industry-** Machine

Diagnosis & Prognosis, Indoor Air Quality Monitoring, **Health & Lifestyle-** Health & Fitness Monitoring, Wearable Electronics. **IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT-** Software Defined Networking, Network Function Virtualization

Unit III:

IoT Systems - Logical Design using Python- Introduction, Python Data Types & Data Structures-Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, **Control Flow-** if, for,while, range, break/continue, pass

Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python Packages of Interest for IoT- JSON, XML, HTTPLib, URLLib, SMTPLib

Unit IV:

IoT Physical Devices and Endpoints - What is an IoT Device- Basic building blocks of an IoT Device**, Exemplary Device: Raspberry Pi**, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces - serial, SPI, I2C,

Programming Raspberry Pi with Python- Controlling LED with Raspberry Pi, interfacing anLED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

Unit V:

Buzzer- Function of a Buzzer, Two Kinds of Buzzer, **Relays-** What is a Relay, Its Working, Relay Uses, Why Relay is used in Motor Control, Relay Module.

Sensors: What is an IoT Sensor, **IoT Sensors Types-** Pressure Sensors, Light Sensors, Temperature & Humidity Sensors, Working with Camera Module.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bagha and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

REFERENCE BOOKS:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
2. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895
3. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series inSensors) 1st Edition, Kindle Edition by Volker Ziemann 2018.

L	T	P	C
2	0	0	2

VI Semester Syllabus
CS621OE: Computer Networks (Open Elective-II)

Course Objectives:

- Familiarize the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Identify the Error detection and correction techniques in Data Link Layer.
- Analyze the knowledge of routing algorithms.
- Understand the connection management of TCP&UDP Protocols.
- Ability to understand the concepts of DNS & Electronic Mail.

Course Outcomes: On successful completion of the course, the student will:

- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Gain the knowledge of Error detection and correction techniques.
- Gain the knowledge of routing algorithms.
- Gain the knowledge of TCP&UDP connection management.
- Gain the knowledge of DNS & Electronic Mail.

UNIT – I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT-II

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V Application Layer –Domain Name System, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. "Data and Computer Communications" by William Stallings 9th Edition, Pearson Education 2010.
3. "TCP/IP Illustrated" by W. Richard Stevens,Addison-Wesley Professional;2nd edition 2011.

L	T	P	C
2	0	0	2

VI Semester Syllabus
CS622OE: SOFTWARE ENGINEERING (Open Elective-II)

Course Objectives:

- To understanding of software process models such as waterfall and evolutionary models.
- To understanding of software requirements and SR document.
- To understanding of different software architectural styles.
- To understanding of software testing approaches such as unit testing and integrationtesting.
- To understanding on quality control and how to ensure good quality software.

Course Outcomes:

- Ability to identify the minimum requirements for the development of application.
- Ability to develop, maintain, efficient, reliable and cost-effective software solutions.
- Ability to write manual test cases.

UNIT- I

Introduction to Software Engineering: The evolving role of software, Changing Natureof Software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI).

Process models: The waterfall model, Incremental process models, Evolutionaryprocess models.

UNIT- II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, the software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation.

UNIT- III

Design Engineering: Design process and Design quality, Design concepts, the design model.

Creating an architectural design: software architecture, Architectural styles and Architectural Design.

Performing User interface design: Golden rules, User interface design steps.

UNIT- IV

Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging.

UNIT- V

Quality Management: Software Quality, Formal Technical Reviews, SQA Tasks, Goals, Metrics, Software Reliability.

TEXT BOOKS:

1. Software engineering A practitioner's Approach, Roger S Pressman, sixth editionMcGraw Hill International Edition.
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach-James F. Peters, Witold Pedrycz, JohnWiley.
2. Software Engineering principles and practice -Waman S Jawadekar, The Mc Graw-Hill Companies, 2008.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: PearsonEducation.

L	T	P	C
2	0	0	2

VI Semester Syllabus
CS623OE: JAVA PROGRAMMING (Open Elective-II)

Course Objectives:

- To understand object-oriented programming concepts using Java.
- To implement the concepts of packages and interfaces
- To introduce the concepts of exception handling and multithreading
- To describe various data manipulation operations using collection framework
- To develop Graphical User Interface applications using applets and swing

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to implement the concepts of packages and interfaces
- Able to develop multithreaded applications with synchronization
- Able to solve problems using java collection framework
- Able to design GUI based applications

UNIT – I

Object-Oriented Thinking- Introduction to Object-Oriented concepts, Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, introducing classes: Class fundamentals, Declaring objects, introducing Methods, Constructors, and this keyword, method overloading, String handling.

Inheritance– Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract class, using final with inheritance and Object class.

UNIT – II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces, extending interfaces, default interface methods, use static methods in an interface

Exception handling - Fundamentals of exception handling, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

UNIT – III

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files,generics.

UNIT – IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set. Collection algorithms, Arrays, The Legacy Classes,**More Utility classes**, String Tokenizer,Random, Scanner.

UNIT – V

GUI Programming with Swing – Introduction to AWT, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events.**A Simple Swing Application**, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets, Creating a Swing Applet, Painting in Swing, A Paint example.

Text Books:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd 2014.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education 2000.

Reference Books:

1. Y. Daniel Liang, Introduction to Java programming, Pearson Education 2013.
2. P. Radha Krishna Object Oriented Programming through Java, University Press 2007.
3. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, Oxford Univ. Press 2013.

L	T	P	C
3	0	0	0

VI-Semester Syllabus
MC602ES: CYBER SECURITY
(Common to CSE, IT, CSBS, CSE (AI & ML), CSE (Data Science))

Prerequisites: NIL

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

The students will be able
- To understand various cyber-attacks and cybercrimes.
- Knowledge about cyberlaws and cyber forensics.
- Summarize cyber crimes in mobile and wireless devices, how to protect them
- Knowledge about IPR issues in cyber space and cyber terrorism.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, IP spoofing, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, 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.

UNIT- IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

TEXT BOOKS:

1. Nina God bole and Sunit Belpure, Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives, Wiley, India 2012.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security:Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Mark F. Grady, Fransesco Parisi, "The Law and Economics of Cyber security," Cambridge University Press,2006.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press, 2016.
3. Introduction to Cyber Security, Chwan - Hwa (john) Wu, J. David Irwin, CRC PressT&F Group.

L	T	P	C
0	0	3	1.5

VI Semester Syllabus

CS651PC: MACHINE LEARNING LAB

(Common to CSE & CSE (Data Science))

Pre-Requisites: Python programming

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes: After completion of course, students would be able to:

1. Understand and apply data preprocessing techniques
2. Understand complexity of Machine Learning algorithms and their limitations.
3. Understand modern notions in data analysis-oriented computing.
4. Be capable of confidently applying common Machine Learning algorithms in practiceand implementing their own.
5. Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments:

1. Write a program to demonstrate the following in python Numpy: Indexing, Array, Slicing.
2. Write a program to demonstrate the following in python Pandas: Series, DataFrames,read .csv files, analyzing data
3. Write a program to demonstrate the following in python Matplotlib :pyplot, markers,line, labels, grid, subplots
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm.Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
5. Implement Random forest classification in python.
6. Implement k-nearest neighbour classification using python.
7. Implement linear regression using python.
8. Implement Naïve Bayes theorem to classify the English text.
9. Implement an algorithm to demonstrate the significance of genetic algorithm.
10. Implement the finite words classification system using Back-propagation algorithm.

TEXT BOOKS

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Python Machine Learning, Sebastian Raschka, PACKT publishing, 2015

REFERENCES

1. Machine Learning – Tom M. Mitchell, - MGH, 1997
2. Pattern recognition and Machine Learning, C. M. Bishop, Springer, 2007.
3. Introduction to Machine Learning, E. Alpaydin, MIT Press, 3rd Edition, 2014

L	T	P	C
0	0	3	1.5

VI Semester Syllabus
CS654PC: Information Security Lab

Course Objectives:

- To understand how to deploy encryption techniques to secure data in transitacross data networks
- To apply algorithms used for secure transactions in real world application

Course Outcomes:

After completion of the course, students will be able to

- Demonstrate the knowledge of cryptography, network security concepts and applications.
- Ability to apply security principles in system design

List of Experiments

1. Write a C program that contains a string (char pointer) with a value 'Hello world.' The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world.' The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms a. Caeser cipher b. Rail fence cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the AES/Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Write a C/JAVA program to Implement the Diffie-Hellman Key Exchange mechanism.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security (principles and approaches)," Pearson Education, 4th Edition.

REFERENCE BOOKS:

1. William Stallings, "Network Security Essentials (Applications and Standards)," Pearson Education.
2. Whitman, "Principles of Information Security," Thomson.

L	T	P	C
0	0	2	1

VI Semester Syllabus
CS661PE: Network Programming Lab
(Professional Elective-II)

Course Objectives:

- To understand inter process and inter-system communication
- To understand socket programming in its entirety
- To understand usage of TCP/UDP / Raw sockets
- To understand how to build network applications

Course Outcomes:

- To write socket API based programs
- To design and implement client-server applications using TCP and UDP sockets
- To analyze network programs

List of Experiments:

1. Write a C program that makes a copy of a file using
   a. standard I/O b. system calls.
2. Write a C program that counts the number of blanks in a text file
   a. Using standard I/O b. Using system calls
3. Implement in C the following Unix commands using system calls
   a. cat b. ls c. mv
4. Write a program that takes one or more file/directory names as command line input and reports the following information on the file.
   a. File type.
   b.Number of links.
   c.Time of last access.
   d. Read, Write and Execute permissions.
5. Write a C program to emulate the Unix ls –l command.
6. Write a C program that creates a directory, puts a file into it, and then removes it.
7. Write a C program that searches for a file in a directory and reports whether the file ispresent in the directory or not.
8. Write a C program to list for every file in a directory, its inode number and file name.
9. Write a C program that creates a file containing hole which is occupying some space but having nothing.
10. Write a C program that demonstrates redirection of standard output to a file. Ex: ls > f1.
11. Write a C program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen.
12. Write a C program to create a Zombie process.
13. Write a C program that illustrates how an orphan is created.
14. Write a C program that creates a child process to execute a command. The command to be executed is passed on the command line.
15. Write a C program that accepts two small numbers as arguments and then sums the two

numbers in a child process. The sum should be returned by child to the parent as its exit status and the parent should print the sum.

16. Write C program that illustrate communication between two unrelated processes using named pipe.
17. Write a C program in which a parent writes a message to a pipe and the child reads the message.
18. Write a C program that illustrates file-locking using semaphores.Write a C program (sender.c)
    a. to create a message queue with read and write permissions.
    b. to write 3 messages to it with different priority numbers.
19. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in 63.a) and displays them.
20. Write C program that illustrates two processes communicating via shared memory.
21. Design TCP iterative Client and server application to reverse the given input sentence
22. Design TCP iterative Client and server application to reverse the given input sentence
23. Design TCP client and server application to transfer file
24. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
25. Design a TCP concurrent server to echo given set of sentences using poll functions
26. Design UDP Client and server application to reverse the given input sentence
27. Design UDP Client server to transfer a file
28. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
29. Design a RPC application to add and subtract a given pair of integers

TEXT BOOKS:

1. Advance Unix Programming Richard Stevens, Second Edition Pearson Education
2. Advance Unix Programming, N.B. Venkateswarlu, BS Publication.
3. Unix and Shell programming, B.A Forouzan and R.F.Gilberg, Thomson.

L	T	P	C
0	0	2	1

VI Semester Syllabus
CS662PE: DevOps LAB
(Professional Elective-II)
(Common to CSE, IT)

Course Objectives:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in
- DevOps and related methods to reach a continuous delivery capability
- Implement automated system update and DevOps lifecycle

Course Outcomes:

- Identify components of DevOps environment
- Apply different project management, integration, testing and code deployment tool
- Investigate different DevOps Software development, models
- Demonstrate continuous integration and development using Jenkins.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018), ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wileypublications. ISBN: 9788126579952

REFERENCE BOOKS:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. AddisonWesley
2. Edureka DevOps Full Course - https://youtu.be/S_0q75eD8Yc

L	T	P	C
0	0	2	1

VI Semester Syllabus
CS663PE: Internet of Things Lab
(Professional Elective-II)
(Common to CSE: PE-II, CSE(AI&ML): P-III)

Course Objectives:

- Will be able to write and test on a Raspberry Pi, but not limited this only.
- Will be able to do some Python programs on Raspberry Pi

Course Outcomes: On successful completion of the course, the student will:

- Able to understand the applications areas of IOT.
- Able to realize the revolution of Internet and Mobile devices, cloud and Sensors networks.
- Working with Raspberry Pi.

List of Experiments:

1 Start Raspberry Pi and try various Linux commands in command terminal window: *ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.*

2. Run some python programs on Pi like:
   Read your name and print Hello message with name
   Read two numbers and print their sum, difference, product and
   division. Word and character count of a given string
   Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
   Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   Handle Divided by Zero Exception.
   Print current time for 10 times with an interval of 10
   seconds. Read a file line by line and print the word
   count of each line.
3. Light an LED through Python program
4. Get input from two switches and switch on corresponding LEDs
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm)

7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a

load.

8. Working with Camera Module.

9.a. A Python program to check the presence of light using **LDR Sensor Module** on Pi

b. A Python program to measure the intensity of light using **LDR Sensor Module** on Pi

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series inSensors) **1st Edition, Kindle Edition** by Volker Ziemann.

REFERENCE BOOKS:

1.Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

2.Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

3.N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

L	T	P	C
0	0	2	1

VI Semester Syllabus
MA654BS: Finishing School –IV
(Quantitative Aptitude & Analytical Ability)
(Common to CSE, IT, CSBS, CSE(AI&ML) & CSE (Data Science))

Course Objectives:

This is a foundation course and aims to enhance employability skills in students.

- Students will be introduced to higher order thinking skills and problem-solving on the following areas - Arithmetic ability, Numerical ability and General reasoning.
- Students will be trained to work systematically with speed and accuracy while solving problems.

Course Outcomes:

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

- Solve questions on the above-mentioned areas using shortcut and smart methods
- Understand the fundamental concepts of Aptitude skills
- Perform calculations with speed and accuracy

UNIT 1: QUANTITATIVE APTITUDE - NUMERICAL ABILITY

- Number system
  - Divisibility Rules
  - Square root
  - Cube root
  - Problems on numbers
  - LCM and HCF

UNIT 2: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY-I

- Percentage
- Ratio proportions
- Averages
- Profit, loss and discounts
- Simple and Compound interest

UNIT3: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY-II

- Pipes and Cisterns
- Ages
- Time- Work-Speed-Distance
- Clocks & Calendars
- Venn diagrams
- Tables and graphs

UNIT 4: REASONING ABILITY – GENERAL REASONING-I

- Coding decoding

- Directions
- Series completions - Letter, Number & Element Series
- Seating arrangements
- Symbols and Notations

UNIT 5: REASONING ABILITY- GENERAL REASONING -II

- Analogies
  - Alphabet Analogy
  - Numerical Analogy
- Classification
  - Alphabet Classification
  - Word Classification
  - Miscellaneous Classification
- Alphabet test
  - Arranging words in Alphabetical Order
  - Problems based on Letter-Word
  - Problems based on Alphabetical Quibble
- Blood Relations

REFERENCES:

1. R.S. Aggarwal - Quantitative Aptitude for Competitive Examinations.
2. Arun Sharma - Quantitative Aptitude for CAT.
3. Arihant Publications - Fast Track Objective Arithmetic.
4. Sarvesh K.-Quantitative aptitude
5. A New Approach to Reasoning Verbal & Non-Verbal, Book by B.S. Sijwalii and Indu Sijwali
6. A Modern Approach to Logical Reasoning, Book by Agarwala Vikas and R.S. Aggarwal

L	T	P	C
3	0	0	0

VI Semester Syllabus
MC601ESC: Environmental Science
(Common to all branches)

Course Objectives:

- To understand the natural resources and their conservation.
- To understand the importance of ecosystem, biodiversity and ecological balance forsustainable development.
- To gain knowledge about environmental pollution, effects and controlling measures.
- To study about global environmental problems and global issues.
- To understand the environmental policies, regulations and sustainable development.

Course Outcomes:

After completing the course, the student will be able to:

- Learn about different types of natural resources and take up the measures to protect theresources.
- Get the information about ecosystem, biodiversity and their usage and conservation.
- Get the information about the types of pollution, understand their effects and controllingmeasures.
- Gain the knowledge about current global environmental issues and initiations to betaken to protect the environment.
- Gain the knowledge about environmental acts, EIA, sustainable development and followthe rules and regulations.

UNIT I: NATURAL RESOURCES

Classification- Renewable and Non-renewable resources.

Forest resources-Uses, deforestation- causes, effects and preventive measures.

Water Resources - Uses and over utilization of ground water, rain water harvesting, dams - benefits and problems. Causes, effects and management of floods and drought.

Mineral resources - Uses and Impacts of mining.

Energy resources - Growing energy needs, renewable and non-renewable energy resources, useof alternate energy resources.

UNIT II: ECOSYSTEM AND BIODIVERSITY

Ecosystem: Concept of ecosystem - Structure and functions of ecosystem. Food chain, food web and ecological pyramids- significance. Primary and Secondary production - Energy flow models: universal and single channel. Biogeochemical Cycles: Carbon cycle and Nitrogen cycle.

Biodiversity: Definition, Levels of Biodiversity, Values of biodiversity, Hotspots of biodiversity,

Threats to biodiversity, Conservation of biodiversity: In-Situ and Ex-situ conservation methods.

UNIT III: ENVIRONMENTAL POLLUTION

Pollution-Definition and classification.

Air pollution: Definition, sources, causes, effects and control measures. Ambient air quality parameters, Case Study.

Water pollution: Definition, sources, causes, effects and control measures. Waste water treatment. Case Study (Namami Ganga Project)

Soil pollution: Sources, Land Degradation-Soil erosion –effects and control measures. Impacts of modern agriculture on soil. Bio-magnification and Bioaccumulation (Minnamata disease).

Noise pollution: Sources, effects and control measures.

Solid Waste: E-Waste and Municipal solid waste management.

UNIT IV: GLOBAL ENVIRONMENTAL ISSUES AND GLOBAL EFFORTS

Global warming: Greenhouse effect- definition, sources and effects of greenhouse gases. Ozone layer depletion-Importance of ozone layer, Ozone depleting substances - sources and effects. Acid rain - causes and effects. Climate change - National Action Plan on Climate Change(NAPCC) – Government of India Initiatives. International conventions/protocols: The Earth summit, Kyoto Protocol and Montreal Protocol. Carbon credits - Emission trading, Green Chemistry Principles. Biodiesel-concept - transesterification and advantages.

UNIT V: ENVIRONMENTAL ACTS, EIA &SUSTAINABLE DEVOLOPMENT

Environmental Protection Act-**Legal aspects**: Air(Prevention and Control of pollution) Act1981, Water (Prevention and control of pollution) Act -1974, Wildlife (Protection) Act– 1972, Biodiversity Act-2002.Environmental Impact Assessment – Concept, structure and flow chart of EIA. Concept of sustainable development- Environmental education, Concept of green building, Ecological foot print, Low carbon life style, Life cycle assessment (LCA) and Clean development mechanisms.

Project Work: Related to Current environmental issues.

Text Books:

1. ErachBharucha, Textbook of Environmental Studies for Undergraduate Courses, University Grants Commission, Universities Press, 3rd Edition.
2. Kaushik A., Kaushik C.P.,Text Book of Environmental Studies, New ageInternational Publishers, 4th Edition.

Reference Books:

1. Anji Reddy M ., Textbook of Environmental Sciences and Technology, BSPublication.
2. RajagopalanR.,Environmental Studies, Oxford UniversityPress, 3rd Edition
3. RaghavanNambiarK., Text Book of Environmental Studies, SciTech Publications 2ndEdition.

L	T	P	C
3	0	0	0

VI Semester Syllabus
MC601ES: ARTIFICIAL INTELLIGENCE
(Common to all Branches except CSE, IT, CSBS, CSE(AI&ML) & CSE (Data Science))

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic searchtogether with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machinelearning.

Course Outcomes:

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a givenproblem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machinelearning.

UNIT - I

Introduction: AI Definition, Agents and Environments, Structure of Agents, Types ofAgents. Problem Solving Agents: Problem spaces, states, goals and operators.

Uninformed Search Strategies: Breadth First Search, Depth First Search, Depth LimitedSearch, Iterative Deepening depth first search, Bidirectional Search.

UNIT – II

Informed Search: Heuristic Search strategies, Hill Climbing, A*, Hill climbing search.
Game Playing: Adversarial Searches. Two player games. Min-max Search: Algorithm, Problems. Draw Back of Min-Max Algorithm. Alpha-beta pruning: Algorithm, Problems.

Constraint Satisfaction Problems: Definition, Crypt-Arithmetic Problems, Map Coloring, Backtracking.

UNIT - III

Basic Knowledge Representation and Reasoning: Propositional Logic: Basics of logic, truth tables and sentence conversions. First order logic: Difference between Proposition & First order logic. Conjunctive Normal form. Disjunctive Normal Form. Conversion of English sentences into First order logic. Resolution and theorem proving. Problems of Resolution. Forward Chaining: Definition, Example problems. Backward Chaining: Definition, Example problems.

UNIT – IV

Planning Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. **Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT – V

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule, and Its Use **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, ApproximateInference in Bayesian Networks, Relational and First-Order Probability

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall. 2010,third edition.
2. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGrawHill.

REFERENCE BOOKS:

1. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
3. Artificial Intelligence – Patric Henry Winston – Third Edition, Pearson Education

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Computer Science & Engineering

Scheme of Instruction and Examination

(Choice Based Credit System)

Applicable from the Academic Year 2021-22

VII Semester

S.No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	MS705HS	Organizational Behavior	3	0	0	30	70	3	3
2	CS703PC	Big Data Analytics	3	0	0	30	70	3	3
3		**Professional Elective-III**	3	0	0	30	70	3	3
4		**Professional Elective-IV**	3	0	0	30	70	3	3
5		**Open Elective – III**	2	0	0	30	70	3	2
6	CS751PC	Big Data Analytics Lab	0	0	2	30	70	3	1
7		**Professional Elective-III Lab**	0	0	2	30	70	3	1
8	CS755PC	Industrial Oriented Mini Project/ Summer Internship	0	0	4	-	100	-	2
9	CS756PC	Seminar	0	0	2	100	-	-	1
10	CS757PC	Project Stage-I	0	0	4	30	70	-	2
		Total Hours/Marks/Credits	**14**	**0**	**14**	**340**	**660**	**-**	**21**

L: Lecture **T**: Tutorial **D**: Drawing **P** : Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

L	T	P	C
3	0	0	3

VII Semester Syllabus
MS705HS: Organizational Behaviour

Course Objectives: The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Behavior.

UNIT- I

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational designon Organizational Behaviour. Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization – Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

UNIT-II

Cognitive Processes-II: Personality and Attitudes – Personality as a continuum – Meaning of personality- Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organizational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation- Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

UNIT- III

Dynamics of OB-I: Communication – types – interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision-making techniques – creativity and group decision making.

Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra- individual conflict - strategies to cope with stress and conflict.

UNIT- IV

Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teamsin modern work place.

UNIT- V

Leading High performance: Job design and Goal setting for High performance- Quality of Work Life- Socio technical Design and High-performance work practices - Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

REFERENCE BOOKS:

1. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
2. McShane: Organizational Behaviour, 3e, TMH, 2008
3. Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
4. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e,TMH, New Delhi, 2009.
5. Pierce and Gardner: Management and Organisational Behaviour: An Integratedperspective, Thomson, 2009.

6. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, NewDelhi, 2009.
7. Pareek Udai: Behavioural Process at Work: Oxford & IBH, New Delhi, 2009.
8. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
9. Hitt: Organizational Behaviour, Wiley, 2008
10. Aswathappa: Organisational Behaviour, 7/e, Himalaya, 2009
11. Mullins: Management and Organisational Behaviour, Pearson, 2008.
12. McShane, Glinow: Organisational Behaviour--Essentials, TMH, 2009.
13. Ivancevich: Organisational Behaviour and Management, 7/e, TMH, 2008.

L	T	P	C
3	0	0	3

VII Semester Syllabus
CS703PC: BIG DATA ANALYTICS

Course Objectives:

- The purpose of this course is to provide the students with the knowledge of Big data Analytics, principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes:

- Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
- Ability to program using HADOOP and Map reduce, NOSQL
- Ability to understand the importance of Big Data in Social Media and Mining.

UNIT - I

Introduction to Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data –Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT - II

Big Data Technologies: Hadoop's Parallel World – Data discovery – Open source technology for BigData Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

UNIT - III

Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out ofHadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT - IV

Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Dataprocessing, HIVE, PIG.

UNIT - V

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR.

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st

Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterpriseand Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich,Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

L	T	P	C
3	0	0	3

VII Semester Syllabus
CS711PE: NATURAL LANGUAGE PROCESSING
(Professional Elective-III)
(Common to CSE:PE-III, CSBS:PE-IV & CSE (Data Science): PE-IV)

Prerequisites: Data structures, finite automata and probability theory

Course Objectives:

Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating
- empirical NLP systems Able to manipulate probabilities, construct statistical models over stringsand trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms,Able to design different language modeling Techniques

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges,

Morphological Models. POS tagging, Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT - II

Syntax Analysis: Parsing Natural Language, A Data-Driven Approach to Syntax,

Representation of Syntactic Structure, Parsing Algorithms, Treebanks, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense

Systems, Software.

UNIT - IV

Predicate - Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter

Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication

2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

L	T	P	C
3	0	0	3

VII Semester Syllabus
CS712PE: Full Stack Development
(Professional Elective-III)
(Common to CSE & IT)

Pre-Requisites:

- Object Oriented Programming
- Web Technologies

Course Objectives:

- Students will become familiar to implement fast, efficient, interactive and scalable web applications using run time environment provided by the full stack components.

Course Outcomes:

- Understand Full stack components for developing web application.
- Apply packages of NodeJS to work with Data, Files, Http Requests and Responses.
- Use MongoDB data base for storing and processing huge data and connects with NodeJS application.
- Design faster and effective single page applications using Express and Angular.
- Create interactive user interfaces with react components.

UNIT-I

Introduction to Full Stack Development:

Understanding the Basic Web Development Framework- User, Browser, Webserver, Backend Services, Full Stack Components - Node.js, MongoDB, Express, React, Angular. Java Script Fundamentals, NodeJS- Understanding Node.js, Installing Node.js, Working with Node Packages, creating a Node.js Application, Understanding the Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks.

UNIT-II

Node.js:

Working with JSON, Using the Buffer Module to Buffer Data, Using the Stream Module to Stream Data, Accessing the File System from Node.js- Opening, Closing, Writing, Reading Files and other File System Tasks. Implementing HTTP Services in Node.js- Processing URLs, Processing Query Strings and Form Parameters, Understanding Request, Response, and Server Objects, Implementing HTTP Clients and Servers in Node.js, Implementing HTTPS Servers and Clients. Using Additional Node.js Modules-Using the os Module, Using the util Module, Using the dns Module, Using the crypto Module.

UNIT-III

MongoDB:

Need of NoSQL, Understanding MongoDB, MongoDB Data Types, Planning Your Data Model, Building the MongoDB Environment, Administering User Accounts, Configuring Access Control, Administering Databases, Managing Collections, Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js, Understanding the Objects Used in the MongoDB Node.js Driver, Accessing and Manipulating Databases, Accessing and Manipulating Collections

UNIT-IV

Express and Angular:

Getting Started with Express, Configuring Routes, Using Requests Objects, Using Response Objects. Angular: importance of Angular, Understanding Angular, creating a Basic Angular Application,

Angular Components, Expressions, Data Binding, Built-in Directives, Custom Directives, Implementing Angular Services in Web Applications.

UNIT-V

React:

Need of React, Simple React Structure, The Virtual DOM, React Components, Introducing React Components, Creating Components in React, Data and Data Flow in React, Rendering and Life Cycle Methods in React, Working with forms in React, integrating third party libraries, Routing in React.

TEXT BOOKS:

1. Brad Dayley, Brendan Dayley, Caleb Dayley., Node.js, MongoDB and Angular Web Development, 2nd Edition, Addison-Wesley, 2019.
2. Mark Tielens Thomas, React in Action, 1st Edition, Manning Publications.

REFERENCE BOOKS:

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, Apress, 2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', 1st edition, Apress, 2018.
3. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, 2nd edition, Addison-Wesley Professional, 2018.

L	T	P	C
3	0	0	3

VII Semester Syllabus
CS714PE: DATA MINING
(Professional Elective-III)

Course Objectives:

- Learn data mining concepts understand association rules mining.
- Discuss classification algorithms learn how data is grouped usingclustering techniques.
- To develop the abilities of critical analysis to data mining systems and applications.
- To implement practical and theoretical understanding of the technologies fordata mining
- To understand the strengths and limitations of various data mining models.

Course Outcomes:

- Ability to perform the preprocessing of data and apply mining techniques on it.
- Ability to identify the association rules, classification, and clusters in large data sets.
- Ability to solve real world problems in business and scientific information usingdata mining
- Ability to classify web pages, extracting knowledge from the web

UNIT - I

Introduction to Data Warehouses, Data Mining: Datawarehouses, OLTP vs OLAP, Multidimensional data Model, Schemas, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation.

UNIT - II

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Mining Frequent Itemsets Using Vertical Data Format,Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT - III

Classification: Problem Definition, General Approaches to solving a classification problem , Classification techniques, Decision Trees-Decision tree Construction , Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics, Evaluation of Classifiers.

UNIT - IV

Clustering: Measures of Similarity and Dissimilarity- Basics Problem Definition, Clustering Overview, Partitioning Clustering-K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Evaluation of Clustering Algorithms**,** OutlierDetection.

UNIT - V

Web Mining,: Introduction, web mining, web content mining, web structure mining, we usage mining, Data Mining Applications, **Data Mining and Society**-Ubiquitous and Invisible Data Mining, Privacy, Security and social impacts of Data Mining.

TEXT BOOKS:

1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 3rd Edition, 2006.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing

REFERENCE BOOKS:

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.
3. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press

L	T	P	C
3	0	0	3

VII Semester Syllabus

CS715PE: Data Base Security
(PROFESSIONAL ELECTIVE - IV)
(Common to CSE, CSE (Data Science))

Course Objectives:

- To learn the security of databases
- To learn the design techniques of database security.
- To learn the Security Software Design.

Course Outcomes:

Students would be able to

- Ability to carry out a risk analysis for large database.
- Ability to setup and maintain the accounts with privileges and roles.

UNIT-I

Introduction: Introduction to Databases Security Problems in Data bases Security Controls Conclusions.

Security Models -1: Introduction Access Matrix Model Take-Grant Model Acten Model PN Model Hartson and Hsiao's Model Fernandez's Model Bussolati and Martella's Model for Distributed databases.

UNIT-II

Security Models -2: Bell and LaPadula's Model Biba's Model Dion's Model Sea View Model Jajodia and Sandhu's Model The Lattice Model for the Flow Control conclusion.

Security Mechanisms: Introduction User Identification/Authentication Memory Protection Resource Protection Control Flow Mechanisms Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria.

UNIT-III

Security Software Design: Introduction A Methodological Approach to Security Software Design, Secure Operating System Design, Secure DBMS Design Security Packages Database Security Design **Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions, Types of Attacks, Inference Controls, Evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery.

UNIT-IV

Models for the Protection of New Generation Database Systems -1: Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Databases.

UNIT-V

Models for the Protection of New Generation Database Systems -2: A Model for the Protection of New Generation Database Systems: the Orion Model ajodia and Kogan's Model A Model for the Protection of Active Databases Conclusions.

TEXT BOOKS:

1. Database Security by Castano, Pearson Edition
2. Database Security and Auditing: Protecting Data Integrity and Accessibility, 1stEdition, Hassan Afyouni,THOMSON Edition.

REFERENCE BOOK:

1. Data base security by Al fredbasta , melissazgola, CENGAGE learning.

L	T	P	C
3	0	0	3

VII Semester Syllabus
CS716PE: CLOUD COMPUTING
(Professional Elective-IV)
(Common to CSE, IT, CSE(AI&ML) & CSE(Data Science) : PE V)

Pre-requisites:

Knowledge on Computer Networks, Operating Systems and Distributed Systems.

Course Objectives:

- To know the basics of cloud computing and its advantages.
- To analyze the components of cloud computing and its business perspective.
- To understand various cloud service/deployment models.
- To evaluate the various cloud development tools
- To study various cloud service provider services

Course Outcomes:

- Ability to understand the fundamentals of cloud computing.
- Understand the architecture of cloud computing model.
- Ability to understand various service and deployment models of cloud.
- Understand the concept of virtualization and its types.
- Understanding cloud service providers and cloud based applications.

UNIT – I

Cloud Computing Fundamentals: Motivation for Cloud Computing, Basic Principles of Cloud computing. Five Essential Characteristics, Four Cloud Deployment Models, Three service Offering Models, Requirements for Cloud Services - Cloud Ecosystem, Cloud Application - Virtualization- approaches and types

UNIT – II

Cloud Computing Architecture and Management: Cloud architecture Layers, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Networking Technologies, Applications on the Cloud, Managing the Cloud application, Migrating Application to Cloud- Phases of Cloud Migration - Approaches for Cloud Migration

UNIT – III

Cloud Deployment Models: Private Cloud, Public cloud, Community Cloud and Hybrid Cloud – Characteristics, Suitability, Issues, Advantages and Disadvantages.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service - Characteristics, Suitability, Pros and Cons and Summary.

UNIT – IV

Virtualization technology

Virtual Machine Technology - Types of virtualization - System virtual machines- Virtual machines and elastic computing, Virtual machine migration - Virtualization Applications In Enterprises- Security through virtualization, Desktop virtualization, Server consolidation, Automating infrastructure management, Pitfalls Of Virtualization.

UNIT – V

Cloud Service Providers and Applications: Amazon Web Services, Amazon Elastic Compute Cloud, Google Cloud Platform, Google App Engine, Microsoft Azure, Windows Azure, IBM Cloud Models – Cloud Security issues – Case studies in Cloud Computing and its applications.

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014.

2.“Enterprise Cloud Computing Technology Architecture Applications”, Gautam Shroff, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O’Reilly, SPD, rp 2011.

L	T	P	C
3	0	0	3

VII Semester Syllabus
CS717PE: REINFORCEMENT LEARNING
(Professional Elective-IV)

Course Objectives:

- Knowledge on fundamentals of reinforcement learning and the methods used to create agents that can solve a variety of complex tasks.

Course Outcomes:

- Understand basics of RL.
- Understand RL Framework and Markov Decision Process.
- Analyzing through the use of Dynamic Programming and Monte Carlo.
- Understand TD(0) algorithm, TD(λ) algorithm.

UNIT - I

Basics of probability and linear algebra, Definition of a stochastic multi-armed bandit, Definition of regret, Achieving sublinear regret, UCB algorithm, KL-UCB, Thompson Sampling.

UNIT - II

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

UNIT - III

The Reinforcement Learning problem, prediction and control problems, Model-basedalgorithm, Monte Carlo methods for prediction, and Online implementation of Monte Carlo policy evaluation

UNIT - IV

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa.

UNIT - V

n-step returns; TD(λ) algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear TD(λ). Tile coding; Control with function approximation; Policy search; Policy gradient methods; Experience replay; Fitted Q Iteration; Case studies.

TEXT BOOKS:

1. "Reinforcement learning: An introduction," First Edition, Sutton, Richard S., and Andrew G.Barto, MIT press 2020.
2. "Statistical reinforcement learning: modern machine learning approaches," First Edition,Sugiyama, Masashi. CRC Press 2015.

REFERENCE BOOKS:

1. "Bandit algorithms," First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press.2020.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, HanyAbdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brandon Brown "Deep Reinforcement Learning in Action," First Edition,Manning Publications 2020.

L	T	P	C
3	0	0	3

VII Semester Syllabus

CS718PE: DISTRIBUTED SYSTEMS
(Professional Elective-IV)
(Common to CSE & CSBS)

Prerequisites

1. A course on "Operating Systems"
2. A course on "Computer Organization & Architecture"

Course Objectives:

- This course provides an insight into Distributed systems.
- Topics include- Peer to Peer Systems, Transactions and Concurrencycontrol, Security and Distributed shared memory

Course Outcomes:

- Ability to understand Transactions and Concurrency control.
- Ability to understand Security issues.
- Understanding Distributed shared memory.
- Ability to design distributed systems for basic level applications.
- To understand different Fault tolerant mechanisms.

UNIT - I

Characterization of Distributed Systems-Introduction, Examples of Distributedsystems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, InterprocessCommunication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Casestudy-Java RMI.

UNIT - II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT - III

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store. Time and Global States-Introduction, Clocks, events, and Process states, synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus, and related problems.

UNIT - IV

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V

Replication- Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and TKindberg, FourthEdition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V.Steen, PearsonEducation.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyani andMukesh Singhal, Cambridge, rp 2010.
3. Distributed Computing Pearls, Gadi Taubenfeld, Michel Raynal, Springer 2018

L	T	P	C
2	0	0	2

VII Semester Syllabus
CS721OE: Python Programming (Open Elective – III)

(Except CSE, IT, CSBS, CSE(AI&ML), CSE (Data Science))

Course Objectives

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes

- Develop essential programming skills in computer programming concepts like data types,containers.
- Apply the basics of programming in the Python language.
- Solve coding tasks related Exceptions and Functions.
- Solve coding tasks related to the fundamental notions and techniques used in object-orientedprogramming.
- Solve coding tasks related to GUI Programming.

Unit – I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, NestedLoops.

Unit – II

Sequences: Introduction to Sequences: Strings, Lists, and Tuples, Mapping, Set Types and Dictionaries

String: Strings and Operators, Built-in Methods and Special Features of String. Related Modules.

Lists: Operators, Built-in Functions, List Type Built in Methods, Special Features of List, Related Modules
Tuples: Built-in Functions, Tuple Type Built in Methods, Special Features of Tuples, Related Modules
Mapping and Set Type: Dictionaries, Dictionary Keys, Operators and Built-in Methods. Set type, Operator and Built in Methods. Related Modules.

Unit – III
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.
Functions: What are Functions, Defining and Creating functions, Function Arguments: Formal and Variable length, Calling functions, Recursive Functions and Variable Scope.
Modules: Modules, Standard Modules, Importing Modules, Namespaces and Packages.

Unit – IV
File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations
Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support
Design with Classes: Objects and Classes, Data modelling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.

Unit – V
GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

TEXT BOOKS:

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2016.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2018.

REFERENCE BOOKS:

1. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press, 2019.
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2017.
3. Core Python Programming, Wesley J.Chun, Second Edition ,Pearson 2007.

e-Resources:
https://www.tutorialspoint.com/python3/python_tutorial.pdf

L	T	P	C
2	0	0	2

VII Semester Syllabus
CS722OE: Internet of Things (Open Elective-III)
(Except CSE, IT, CSBS, CSE(AI&ML), CSE (Data Science))

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To Introduce Programming Raspberry Pi with Python.
- To introduce the hardware and working principles of various sensors used for IoT

Course Outcomes: On successful completion of the course, the student will:

- Understand the concepts of Internet of Things.
- Design IoT applications in different domain and be able to analyze their performance.
- Able to know the Language features of Python.
- Able to know about working of Raspberry Pi
- Able to know the working of various Sensors.

Unit I:

Introduction to Internet of Things —Introduction, Definition and Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT communication models, IoT Communication APIs. IoT Enabling Technologies — Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems.

Unit II:

Domain Specific IoT — Introduction, Home Automation, Smart Cities, Environment- Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle, IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software Defined Networking, Network Function Virtualization

Unit III:

IoT Systems - Logical Design using Python- Introduction, Python Data Types & Data Structures, Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Control Flow- if, for, while, range, break/continue, pass, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python.

Unit IV:

IoT Physical Devices and Endpoints - What is an IoT Device- Basic building blocks of an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces - serial, SPI, I2C, Programming Raspberry Pi with Python- Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

Unit V:

Buzzer- Function of a Buzzer, Two Kinds of Buzzer, Relays- What is a Relay, Its Working, Relay Uses, Why Relay is used in Motor Control, Relay Module.

Sensors: What is an IoT Sensor, IoT Sensors Types- Pressure Sensors, Light Sensors, Temperature & Humidity Sensors.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

REFERENCE BOOKS:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.
2. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) 1st Edition, Kindle Edition by Volker Ziemann.
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895.

L	T	P	C
2	0	0	2

VII Semester Syllabus

CS723OE: Introduction to Machine Learning (Open Elective-III)

(Except CSE, IT, CSBS, CSE(AI&ML), CSE (Data Science))

Prerequisites

1. Data Structures
2. Knowledge on statistical methods

Course Objectives:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes:

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarkson explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches tolearning, using prior knowledge to initialize the hypothesis.

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

L	T	P	C
0	0	2	1

VII Semester Syllabus
CS751PC: BIG DATA ANALYTICS LAB

Course Objectives:

- The purpose of this course is to provide the students with the knowledge of Big dataAnalytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes:

- Use Excel as an Analytical tool and visualization tool.
- Ability to program using HADOOP and Map reduce.
- Ability to perform data analytics using ML in R.
- Use cassandra to perform social media analytics.

List of Experiments:

1. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)
2. Process big data in HBase
3. Store and retrieve data in Pig
4. Perform Social media analysis using cassandra
5. Buyer event analytics using Cassandra on suitable product sales data.
6. Using Power Pivot (Excel) Perform the following on any dataset
   a) Big Data Analytics
   b) Big Data Charting
7. Use R-Project to carry out statistical analysis of big data
8. Use R-Project for data visualization of social media data

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013).
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw- Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

L	T	P	C
0	0	2	1

VII Semester Syllabus
CS752PE: NATURAL LANGUAGE PROCESSING LAB
(Professional Elective-III)

Course Objectives:

- Knowledge on basic Language processing features, design an innovative applicationusing NLP components

Course Outcomes:

After completion of the course, students will be able to

- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems 4.
- Able to design, implement, and analyze NLP algorithms

List of Experiments (NLP)

1. Word Analysis
2. Word Generation
3. Morphology
4. Stemming
5. Lemmatization
6. Parsing algorithms for syntactic analysis
7. Meaning Representation Systems
8. N-Grams
9. N-Grams Smoothing
10. Case Study using NLTK

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

REFERENCE BOOK:

1. Breck Baldwin, —Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015

L	T	P	C
0	0	2	1

CS753PE: Full Stack Development Lab
(Professional Elective-III)
(Common to CSE & IT)

Pre-Requisites:

1. Object Oriented Programming
2. Web Technologies

Course Objectives:

- Introduce fast, efficient, interactive, and scalable web applications using run time environmentprovided by the full stack components.

Course Outcomes:

- Design flexible and responsive Web applications using Node JS, React, Express and Angular.
- Perform CRUD operations with MongoDB on huge amount of data.
- Develop real time applications using react components.
- Use various full stack modules to handle http requests and responses.

List of Experiments:

1. Create an application to setup node JS environment and display "Hello World."
2. Create a Node JS application for user login system.
3. Write a Node JS program to perform read, write and other operations on a file.
4. Write a Node JS program to read form data from query string and generate response usingNodeJS
5. Create a food delivery website where users can order food from a particular restaurant listed inthe website for handling http requests and responses using NodeJS.
6. Implement a program with basic commands on databases and collections using MongoDB.
7. Implement CRUD operations on the given dataset using MongoDB.
8. Perform Count, Limit, Sort, and Skip operations on the given collections using MongoDB.
9. Develop an angular JS form to apply CSS and Events.
10. Develop a Job Registration form and validate it using angular JS.
11. Write an angular JS application to access JSON file data of an employee from a server using $http service.
12. Develop a web application to manage student information using Express and Angular JS.
13. Write a program to create a simple calculator Application using React JS.
14. Write a program to create a voting application using React JS
15. Develop a leave management system for an organization where users can apply different typesof leaves such as casual leave and medical leave. They also can view the available number ofdays using react application.
16. Build a music store application using react components and provide routing among the web pages.
17. Create a react application for an online store which consist of registration, login, product information pages and implement routing to navigate through these pages.

TEXT BOOKS:

1. Brad Dayley, Brendan Dayley, Caleb Dayley., Node.js, MongoDB and Angular Web Development, 2nd Edition, Addison-Wesley,2019.
2. Mark Tielens Thomas., React in Action, 1st Edition, Manning Publications.

REFERENCE BOOKS:

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node, 2nd Edition, Apress,2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday SkillsExpected of a Modern Full Stack Web Developer', 1st edition, Apress, 2018.
3. Brad Green& Seshadri. Angular JS. 1st Edition. O'Reilly Media, 2013.
4. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications UsingReact and Redux, 2nd edition, Addison-Wesley Professional, 2018.

L	T	P	C
0	0	2	1

VII Semester Syllabus
CS754PE: DATA MINING Lab
(PROFESSIONAL ELECTIVE - III)

Course Objectives:

- To obtain practical experience using data mining techniques on real world data sets.
- Emphasize hands-on experience working with all real data sets.
- Apply Data Preprocessing rules/techniques, Association rules, Classification techniques,Clustering and Data Mining techniques on a given data set.

Course Outcomes:

- Ability to add Mining Algorithms as a component to the existing tools
- Ability to apply Mining techniques for realistic data

List of Sample Problems:

Task 1: Credit Risk Assessment
Description:
The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.
To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable ruleswhich can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. Credit dataset (original) Excel spreadsheet version of the German credit data.
In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer!)
A few notes on the German dataset

1. DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter).

2. owns_telephone. German phone rates are much higher than in Canada so fewer people own telephones.
3. foreign_worker. There are millions of these in Germany (many from Turkey). It is very hard to get German citizenship if you were not born of German parents.
4. There are 20 attributes used in judging a loan applicant. The goal is to classify the applicant into one of two categories, good or bad.

Subtasks: (Turn in your answers to the following tasks)

1. List all the categorical (or nominal) attributes and the real-valued attributes seperately. (5 marks)
2. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes. (5 marks)
3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training. (10 marks)
4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy? (10 marks)
5. Is testing on the training set as you did above a good idea? Why or Why not ? (10 marks)
6. One approach for solving the problem encountered in the previous question is using cross-validation? Describe what is cross-validation briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why? (10 marks)
7. Check to see if the data shows a bias against "foreign workers" (attribute 20), or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute, you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss. (10 marks)
8. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.) (10 marks)
9. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifcations equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)? (10 marks)

10. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model? (10 marks)
11. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase? (10 marks)
12. (Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR. (10 marks)

Task Resources:

- Mentor lecture on Decision Trees
- Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)
- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)
- Weka resources:
    - Introduction to Weka (html version) (download ppt version)
    - Download Weka
    - Weka Tutorial
    - ARFF format
    - Using Weka from command line

Task 2: Hospital Management System

Data Warehouse consists Dimension Table and Fact Table.

REMEMBER The following

Dimension

The dimension object (Dimension):

_ Name

_ Attributes (Levels) , with one primary key

_ Hierarchies

One time dimension is must.

About Levels and Hierarchies

Dimension objects (dimension) consist of a set of levels and a set of hierarchies defined over those levels. The levels represent levels of aggregation. Hierarchies describe parent-child relationships among a set of levels.

For example, a typical calendar dimension could contain five levels. Two hierarchies can bedefined on these levels:

H1: YearL > QuarterL > MonthL > WeekL > DayLH2:

YearL > WeekL > DayL

The hierarchies are described from parent to child, so that Year is the parent of Quarter,Quarter the parent of Month, and so forth.

About Unique Key Constraints

When you create a definition for a hierarchy, Warehouse Builder creates an identifier key for each level of the hierarchy and a unique key constraint on the lowest level (Base Level) Design a Hospital Management system data warehouse (TARGET) consists of DimensionsPatient, Medicine, Supplier, Time. Where measures are 'NO UNITS', UNIT PRICE. Assume the Relational database (SOURCE) table schemas as follows

TIME (day, month, year),

PATIENT (patient_name, Age, Address, etc.,)

MEDICINE (Medicine_Brand_name, Drug_name, Supplier, no_units, Uinit_Price, etc.,)

SUPPLIER :(Supplier_name, Medicine_Brand_name, Address, etc.,)

If each Dimension has 6 levels, decide the levels and hierarchies, Assume the level names suitably.

Design the Hospital Management system data warehouse using all schemas. Give theexample 4-D cube with assumption names.

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Computer Science & Engineering

Scheme of Instruction and Examination

(Choice Based Credit System)

Applicable from the Academic Year 2021-22

VIII-Semester

S.No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	CS801PC	Soft Computing	2	0	0	30	70	3	2
2		Professional Elective-V	3	0	0	30	70	3	3
3		Professional Elective-VI	3	0	0	30	70	3	3
4	CS851PC	Project Stage-II	0	0	16	30	70	-	8
		Total Hours/Marks/Credits	**8**	**0**	**16**	**120**	**280**	**-**	**16**

L: Lecture **T**: Tutorial **D**: Drawing **P** : Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

L	T	P	C
2	0	0	2

VIII Semester Syllabus

CS801PC: SOFT COMPUTING

Course Objectives:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on humanexperience
- Familiarize the Neuro-Fuzzy modeling using Classification and Clusteringtechniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

Course Outcomes:

On completion of this course, the students will be able to:

- Identify the difference between Conventional Artificial Intelligence toComputational Intelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems
- Apply the Classification and clustering techniques on various applications.
- Understand the advanced neural networks and its applications
- Perform various operations of genetic algorithms, Rough Sets.
- Comprehend various techniques to build model for various applications

Unt-I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.
Pattern Recognition, Fuzzy Pattern Recognition, Image Processing, Fuzzy Image Processing, Image Processing Through Clustering, Application of Soft Computing in Real Estate, Soft Computing in Mobile Ad hoc Network, Biogeography-Based Optimization, Soft Computing in Information Retrieval and Semantic Web, Soft Computing in Software Engineering

Unit- II

Fuzzy Sets Classical Sets and Fuzzy Sets, Crisp Sets, Fuzzy Sets: History and Origin, Fuzzy Sets: Basic Concepts, Paradigm Shift, Representations of Fuzzy Sets, Alpha-cuts, Basic Operations on Fuzzy Sets, Fuzzy Complements, Intersections, and Unions
Fuzzy Relations: Crisp Relations and Fuzzy Relations, Crisp Relations, Fuzzy Relations, Binary Fuzzy Relations, Intuitionistic Fuzzy Relations
Fuzzy Logic: Classical Logic and Fuzzy Logic, Interval Analysis, Fuzzy Numbers, Fuzzy Logic.
Fuzzy Rule-Based Systems: Fuzzy Rule-Based Systems, Linguistic Variables and Linguistic, Hedges, Rule-Based Systems, Conventional Programs Versus Rule-Based Systems, Fuzzy Proposition suzzification and Defuzzification, Approximate Reasoning

Unit-III

Fuzzy Decision Making: Problem Solving Versus Decision Making, Individual Fuzzy Decision Making, Multiperson Decision Making, Multicriteria Decision Making, Multistage Decision Making

Particle Swarm Optimization: PSO Algorithm Variants of PSO, Discrete Binary PSO, Adaptive PSO, Multi-objective PSO Hybrid Model of PSO, Classification Model: ANNPSO, Clustering Model

Unit-IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

History of Evolutionary Computing, Genetic Algorithms: History, Basic Concepts, Basic Operators for Genetic Algorithms Crossover and Mutation Properties, Single-site Crossover, Two-point Crossover, Multipoint Crossover

Unit-V

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

Fundamentals of Rough Set Theory ,Rough Approximations, Knowledge Base, Properties of Approximations, Proofs of Properties of Approximation, Measures of Accuracy, Topological Characterization of Imprecision, Intuitive Meanings of Kinds of Rough Sets, Kinds of Complement, Union, and Intersection of Rough Sets, Rough Membership Function, Difference Between Fuzzy Sets and Rough Sets, Attribute Reduction, Reduct and Core, Rough Sets, Rule Induction, and Discemibility Matrix, Knowledge Representation, Knowledge Representation Systems, Significance of Attributes, Decision Tables, Rule Induction, Discernibility Matrix

Integration of Soft Computing Techniques, Fuzzy Neural Networks, Fuzzy Rough Sets, Rough Fuzzy Sets, Rough Fuzzy C-Means Algorithm, Intuitionistic Fuzzy Rough Sets, Rough Intuitionistic Fuzzy Sets, Rough Intuitionistic Fuzzy C-Means Algorithm, Steps of the RIFCM Algorithm, Flowchart of the RIFCM Algorithm, Experimental Comparison, Neuro Fuzzy Systems, Some Neuro Fuzzy Systems, Fuzzy Genetic Algorithms

TEXT BOOK:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J.Anuradha –Cengage Learning

REFERENCE BOOKS:

1. S. N. Sivanandam & S. N. Deepa, “Principles of Soft Computing”, 2nd edition, Wiley India, 2008.
2. David E. Goldberg, “Genetic Algorithms-In Search, optimization and Machine learning”,Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PearsonEducation, 2004.
4. G.J. Klir & B. Yuan, “Fuzzy Sets & Fuzzy Logic”, PHI, 1995.
5. Melanie Mitchell, “An Introduction to Genetic Algorithm”, PHI, 1998.
6. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw- Hill Internationaleditions, 1995

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS811PE: SOCIAL NETWORKS ANALYSIS
(Professional Elective-V)
(Common to CSE & IT)

Prerequisites

1. A course on "Web Technologies".
2. A course on "Computer Networks".
3. A course on "Data Warehousing and Data Mining".

Course Objectives:

- It introduces the concepts of social media
- It provides the mechanisms for social network analysis
- Includes the concepts that allow for better visualization and analysis of widelyused services such as email, Wikis, Twitter, flickr, YouTube, etc.

Course Outcomes:

- Ability to construct social network maps easily
- Gain skills in tracking the content flow through the social media
- Use NodeXL to perform social network analysis

UNIT - I:

Introduction: Social Media and Social Networks**. Social Media:** New Technologies of Collaboration.

Social Network Analysis: Measuring, Mapping, and Modeling collections of Connections.

UNIT - II:

NodeXL, Layout, Visual Design, and Labeling, Calculating and Visualizing Network Metrics, PreparingData and Filtering, Clustering and Grouping.

UNIT - III:

CASE STUDIES - I:

Email: The lifeblood of Modern Communication**. Thread Networks:** Mapping Message Boards andEmail Lists. **Twitter:** Conversation, Entertainment and Information.

UNIT - IV:

CASE STUDIES - II: Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

UNIT-V:

CASE STUDIES - III:

You Tube: Contrasting Patterns of Content Interaction, and Prominence**. Wiki Networks:** Connectionsof Creativity and Collaboration.

TEXT BOOKS:

1. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL:Insights from a Connected World, Morgan Kaufmann, 2011.
2. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability, Sybex, 2009.

REFERENCE BOOK:

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and UsingMetrics, 1st Edition, MGH, 2011.

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS812PE: WEB SERVICES & SERVICE ORIENTED ARCHITECTURE
(Professional Elective-V)

Course Objectives:

- To Understand Web Services and implementation model for SOA
- To Understand the SOA, its Principles and Benefits
- To Understand XML concepts
- To Understand paradigms needed for testing Web Services
- To explore different Test Strategies for SOA-based applications
- To implement functional testing, compliance testing and load testing of Web Services
- To Identify bug-finding ideas in testing Web Services

UNIT - I

Evolution and Emergence of Web Services - Evolution of distributed computing, Core distributed computing technologies – client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

UNIT - II

Web Services Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, nonfunctional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

UNIT – III

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP: Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

UNIT – IV

Registering and Discovering Services: The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

UNIT – V

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

TEXT BOOKS:

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, WileyIndia.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

REFERENCE BOOKS:

1. XML, Web Services, and the Data Revolution, F.P. Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.
4. McGovern, et al., "Java web Services Architecture", Morgan Kaufmann Publishers, 2005.
5. J2EE Web Services, Richard Monson-Haefel, Pearson Education.

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS813PE: DATA STREAM MINING
(Professional Elective-V)
(Common to CSE:PE-V & CSE (Data Science):PE-VI)

Prerequisites

1. A basic knowledge of "Data Mining"

Course Objectives:

- The aim of the course is to introduce the fundamentals of Data Stream Mining.
- The course gives an overview of – Mining Strategies, methods andalgorithms for data stream mining.

Course Outcomes:

- Understand how to formulate a knowledge extraction problem from data streams.
- Ability to apply methods / algorithms to new data stream analysis problems.
- Evaluate the results and understand the functioning of the methods studied.
- Demonstrate decision tree and adaptive Hoeffding Tree concepts

UNIT - I

MOA Stream Mining, Assumptions, Requirements, Mining Strategies, Change Detection Strategies, MOA Experimental Settings, Previous Evaluation Practices, Evaluation Procedures for Data Streams, Testing Framework, Environments, Data Sources, Generation Speed and Data Size, Evolving Stream Experimental Setting.

UNIT - II

Hoeffding Trees, The Hoeffding Bound for Tree Induction, The Basic Algorithm, Memory Management, Numeric Attributes, Batch Setting Approaches, Data Stream Approaches.

UNIT - III

Prediction Strategies, Majority Class, Naïve Bayes Leaves, Adaptive Hybrid, Hoeffding Tree Ensembles, Data Stream Setting, Realistic Ensemble Sizes.

UNIT - IV

Evolving Data Streams, Algorithms for Mining with Change, A Methodology for Adaptive Stream Mining, Optimal Change Detector and Predictor, Adaptive Sliding Windows, Introduction, Maintaining UpdatedWindows of Varying Length.

UNIT - V

Adaptive Hoeffding Trees, Introduction, Decision Trees on Sliding Windows, Hoeffding Adaptive Trees, Adaptive Ensemble Methods, New methods of Bagging using trees of different size, New method of bagging using ADWIN, Adaptive Hoeffding Option Trees, Method performance.

TEXT BOOK:

1. DATA STREAM MINING: A Practical Approach by Albert Bifet and Richard Kirkby.

REFERENCE BOOKS:

1. Knowledge discovery from data streams by Gama João. ISBN: 978-1-4398-2611-9.
2. Machine Learning for Data Streams by Albert Bifet, Ricard Gavalda; MIT Press, 2017.

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS814PE: Adhoc & Sensor Networks
(Professional Elective-V)
(Common to CSE & IT)

Prerequisites

1. A course on "Computer Networks"
2. A course on "Mobile Computing"

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state-of-the-art research in the emerging subject ofAd Hoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

UNIT - I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology- based routing algorithms-**Proactive**: DSDV; **Reactive**: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding- DREAM, LAR.

UNIT - II

Data Transmission - Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting: Tree-based:** AMRIS, MAODV; **Mesh-based:** ODMRP, CAMP; **Hybrid:** AMRoute**,** MCEDAR.

UNIT - III

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA,MGR**.** TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensornetworks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to theinherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal,World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, LeonidasGuibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

REFERENCE BOOKS:

1. Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy,B. S. Manoj, Pearson
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS815PE: MOBILE APPLICATION DEVELOPMENT
(Professional Elective-VI)

Prerequisites:

1. Acquaintance with JAVA programming.
2. A Course on DBMS.

Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operatingsystems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity onmobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes,layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding andusing Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,2013.

REFERENCE BOOK:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India(Wrox)

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS816PE: EXPERT SYSTEMS
(Professional Elective-VI)

Course Objectives:

- Understand the basic techniques of artificial intelligence.
- Understand the Non-monotonic reasoning and statistical reasoning.

Course Outcomes:

- Apply the basic techniques of artificial intelligence.
- Discuss the architecture of an expert system and its tools.
- Understand the importance of building an expert systems.
- Understand various problems with an expert systems.

UNIT - I

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first –Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning.

UNIT - II

Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

UNIT - III

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

UNIT - IV

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT - V

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts,difficulties during development.

TEXT BOOKS:

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, New Delhi.
2. Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman.

REFERENCE BOOKS:

1. Stuart Russel and other Peter Norvig, "Artificial Intelligence – A Modern Approach", Prentice-Hall.
2. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley.
3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.
4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley.
5. Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman &Allanheld, New Jersey.

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS817PE: DIGITAL FORENSICS
(Professional Elective-VI)

Prerequisite: Network Security

Course Objectives:

- A brief explanation of the objective is to provide digital evidences which are obtained from digital media.
- In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computer plays in a certain crime.
- According to a snippet from the United States Security Service, the functions computer has in different kinds of crimes

Course Outcomes:

- Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics.

UNIT- I

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology –Steps - Activities in Initial Response, Phase after detection of an incident

UNIT-II

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive

UNIT – III

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

UNIT - IV

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT - V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGrawHill, 2006.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media,New Delhi.

REFERENCES:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison-Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson,Springer International edition.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

L	T	P	C
3	0	0	3

VIII Semester Syllabus
CS818PE: NEURAL NETWORKS and DEEP LEARNING
(Professional Elective-VI)
(Common to CSE, IT)

Course Objectives:

- To introduce the foundations of Artificial neural Networks
- To learn various types of Artificial neural Networks
- To acquire knowledge on Deep Learning concepts

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to use an efficient algorithm for Deep Models
- Ability to select the Learning networks in modelling real world systems

Unit-I

Basics of artificial neural networks (ANN): Artificial neurons, Computational models of neurons, Structure of neural networks, Feedforward neural networks: Pattern classification using perceprton, Multilayer feedforward neural networks (MLFFNNs), Backpropagation learning.

Unit-II

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

Optimization for Train Deep Models:Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)

Unit-III

Convolution neural networks (CNNs): Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet, Training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs.

Unit-IV

Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Autoencoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

Unit-V

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXT BOOKS:

1. S. Haykin, Neural Networks and Learning Machines, Prentice Hall of India, 2010.
2. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

REFERENCES:

1. Michael Nielsen, *Neural Networks and Deep Learning*, Determination Press, 2015
2. Satish Kumar, *Neural Networks - A Class Room Approach*, Second Edition, TataMcGraw-Hill, 2013
3. B. Yegnanarayana, *Artificial Neural Networks*, Prentice- Hall of India, 199.