HYDERABAD INSTITUTE OF TECHNOLOGY AND MANAGEMENT									
B.TECH. HR-2021 COURSE STRUCTURE									
COMPUTER SCIENCE AND ENGINEERING									
(Applicable from the batch admitted during 2021-22 and onwards)									
V – Semester (III – Year)									
S. No.	**Course code**	**Subject**	**Hours Per Week**			**Credits**	**Scheme of Evaluation**		
							Maximum Marks		
			L	**T**	**P**		**Int.**	**Ext.**	**Tot.**
1	21PC5CS13	Operating Systems	3	-	-	3	30	70	100
2	21PC5CS14	Computer Networks	3	-	-	3	30	70	100
3	21PC5CS15	Compiler Design	3	1	-	4	30	70	100
4		**Professional Elective - I**	3	-	-	3	30	70	100
5		**Open Elective - 1**	3	-	-	3	30	70	100
6	21PC5CS16	Operating Systems & Computer Networks Lab	-	-	3	1.5	30	70	100
7	21PC5CS17	Compiler Design Lab	-	-	2	1	30	70	100
8	21HS5EG05	Advanced English Communication Skills-Lab	-	-	2	1	30	70	100
9	21PR5IN02	Evaluation of Internship-2	-	-	2	1	100	0	100
10	21PR5CS02	Doing Engineering-2	-	1	1	1.5	30	70	100
TOTAL						**22**	**370**	**630**	**1000**
Mandatory Course (Non-Credit)									
11	21MC5HS03	Analytical Reasoning	2	-	-	0	100	0	**100**
VI – Semester (III – Year)									
S. No.	**Course code**	**Subject**	**Hours Per Week**			**Credits**	**Scheme of Evaluation**		
							Maximum Marks		
			L	**T**	**P**		**Int.**	**Ext.**	**Tot.**
1	21ES6CS05	Statistical Programming using R	3	1	-	4	30	70	100
2	21HS6MB02	Fundamentals of Engineering Management	2	-	-	2	30	70	100
3	21PC6CS18	Cloud Computing	3	-	-	3	30	70	100
4	21PC6CM03	Machine Learning	3	-	-	3	30	70	100
5		**Professional Elective - II**	3	-	-	3	30	70	100
6		**Open Elective - II**	3	-	-	3	30	70	100
7	21ES6CS06	R Programming Lab	-	-	3	1.5	30	70	100
8	21PC6CM04	Machine Learning-Lab	-	-	3	1.5	30	70	100
9	21PC6CS21	Cloud Computing Lab	-	-	2	1	30	70	100
TOTAL						**22**	**270**	**630**	**900**
Mandatory Course (Non-Credit)									
11	21MC6HS04	Quantitative Aptitude	2	-	-	0	100	0	**100**

Subject Code	Professional Elective 1
21PE5CD04	Software Engineering & Testing Methodologies
21PE5CS12	Data Mining
21PE5CS13	Computer Graphics
21PE5CS14	Image Processing
21PE5CS15	GPU Computing

Subject Code	Professional Elective 2
21PE6CS21	Software Process And Project Management
21PE6CS22	Mobile Application Development
21PE6CS23	Service Oriented Architecture
21PE6CS24	Adhoc Sensor Networks
21PE6CD21	Big Data Analytics

Sl.no	SUBJECT CODE	Open Elective-I	Offering Department
1	21OE6CS06	Computer Organization and Architecture	CSE
2	21OE5EC01	Electronics measurement & Instrumentation	ECE
3	21OE5ME01	Hybrid & Electric Vehicles	MECH
4	21OE5EE01	Fundamentals of Electric Circuit Analysis	EEE
5	21OE5HS01	Nanoscience and Technology	H&S
6	21OE5CM01	Introduction to Artificial Intelligence	CSE-AI&ML
7	21OE5CD01	Statistics for Data Science	CSE-DS
8	21OE5CO01	Introduction to IoT	CSE-IOT
9	21OE5CC01	Data Security	CSE-CS

Sl.no	SUBJECT CODE	Open Elective-II	Offering Department
1	21OE5CS09	OOPS using Java	CSE
2	21OE6EC02	Fundamentals of Digital Electronics	ECE
3	21OE6ME02	Total Quality Measurement & Six Sigma Applications	MECH

4	21OE6EE02	Fundamentals of Industrial Electronics	EEE
5	21OE6HS02	Medical Instrumentation	H&S
6	21OE6CM06	Expert Systems	CSE-AI
7	21OE6CD02	Data Mining and Data Analytics	CSE-DS
8	21OE6CO05	Sensors & Devices	CSE-IOT
9	21OE6CC02	Computer Hardware and System Essentials	CSE-CS

B.Tech III Year – V Sem	L	T	P	C
Subject Code: 21PC5CS13	3	0	0	3

OPERATING SYSTEMS

Course Objective

1. To understand the components, operations of the operating system
2. To interpret the scheduling policies and memory management issues
3. To understand the process concurrency and synchronization
4. To understand the concept of file management

Course Outcomes:

At the end of the course student will be able to

1. Understand the structure of Operating System and its architecture
2. Apply the scheduling strategies for real time implementations
3. Illustrate synchronization problems, deadlock and its techniques
4. Infer Security and Protection Mechanism

Module I

Operating System Introduction: Operating Systems objectives and functions, Computer System Architecture, OS Structure, OS Operations,

Evolution of Operating Systems - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special -Purpose Systems, Operating System services, User OS Interface, System Calls, Types of System Calls, System Programs, Operating System

Module II

Process - Process concepts-The Process, Process State, Process Control Block, Threads, Process Scheduling-Scheduling Queues, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria.

CPU Scheduling - Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Case studies: Linux, Windows.

Module III

Process Coordination – Process Synchronization, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

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

Module IV

Memory Management and Virtual Memory - Logical & Physical Address Space, Swapping, Contiguous Allocation,

Paging - Structure of Page Table, Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement Page Replacement Algorithms, Allocation of Frames, Thrashing.

Module V

File System Interface - The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation,
Efficiency and Performance.

Mass Storage Structure – Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk

Scheduling, Disk Management, and Swap space Management, System Protection, Goals of Protection, Principles of Protection.

TEXT BOOKS:

1. Operating System Principles , Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, Wiley Student Edition
2. Operating Systems – Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

REFERENCE BOOKS:

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI
2. Operating Systems A concept-based Approach, 2nd Edition, D.M.Dhamdhere, TMH.
3. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	M	L													
CO2	H	H			M										
CO3	M	H													
CO4	M	L			L										

	L	T	P	C
B.Tech III Year – V Sem				
Subject Code: 21PC5CS14	**3**	**0**	**0**	**3**

COMPUTER NETWORKS

Pre requisites:
1. A course on "Programming for problem solving"
2. A course on "Data Structures"

Course Objective
1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. 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:
At the end of the course student will be able to
1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

Module I
Introduction: 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.

Module 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

Module III
Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms

Module IV
Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.
Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP

Module V
Wireless and Mobile Networks: Cellular Internet Access: An Overview of Cellular Network Architecture, Cellular Data Networks (3G & 4 G)
Mobile Ad-Hoc Networks: Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks.

TEXT BOOKS:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2. Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, John wiley publication, Jan 2006

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH
3. Vijay Garg, ―Wireless Communications and networking‖, First Edition, Elsevier 2007

CO-PO &PSO Mapping:

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1												2
CO2		3			2									
CO3		3												2
CO4	2	1			1									

B.Tech III Year – V Sem	L	T	P	C
Subject Code: 21PC5CS15	3	1	0	4

COMPILER DESIGN

Prerequisite: Formal Languages of Automata Theory and C programming

Course Objectives:

1. To introduce the major concept areas of language translation and compiler design
2. To enrich the knowledge in various phases of compiler and its use
3. To implement Various parsers like LL,LR
4. To provide practical programming skills necessary for constructing a compiler

Course Outcomes:

1. Ability to apply the knowledge of lex tool &yacc tool to develop a scanner & parser
2. Ability to design a compiler, given a set of language features
3. Ability to implement various parsers like LR,LL
4. Design algorithms to do code optimization in order to improve the performance of a program in terms of space complexity and time complexity.

Module-1:

Introduction to Compilers – Analysis of the source program – Structure of a compiler, Phases of a compiler —the science of building a compiler, Compiler construction tools-YACC.

Lexical Analysis — Role of Lexical Analyzer — Input Buffering — Recognition of Tokens — the Lexical-Analyzer Generator Lex — Finite Automata — From Regular Expressions to Automata — Minimizing DFA

Module-2:

Syntax Analysis: Introduction, Grammars — Context-free grammars — Writing a grammar .Types of Parsings—Top-Down, Bottom-U, **Top-Down Parsing :** With Back Tracking –Eg : Brute Force ;Without Back Tracking or Predictive Parsing – i) Recursive Descent Parser, ii)Non-Recursive descent like LL(1) parser.

Bottom-UP Parsing, **shifts reduce parser**:

i) LR parser, LR (0), SLR (1),LALR(1),CLR(1)
ii) Operator Precedence parser Error Handling and Recovery in Syntax Analyzer-YACC.

Module – 3:
Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation:
Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

Module – 4:

Run-Time Environment And Code Generation: Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management ,Garbage and Trace-Based collection

Code Generation: Issues in design of Code Generation —design of a simple Code Generator.

Module-5:

Code Optimization: The Principal Sources of Optimization , Peephole Optimization , DAG ,Foundations of Data flow analysis, constant propagation, partial-redundancy elimination, loops in flow graphs, Register allocation and assignment, dynamic programming.

Text Books

1. Alfred V. Aho, Jeffrey D Ullman, “Compilers: Principles, Techniques and Tools”, Pearson Education Asia, 2012

2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005

Reference books

1. Allen I. Holub, “Compiler Design in C”, Prentice Hall of India, 2003

2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2003

3. HenkAlblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001

4. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003

5. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

CO-PO &PSO Mapping:

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1												2
CO2		3			2									
CO3		3												2
CO4	2	1			1									

B. Tech III Year-V Sem **L T P C**
Subject Code: 21PC5CS16 **0 0 3 1.5**

Operating Systems & Computer Networks Lab

Course Objective

- To do the implementation of operating system concepts
- To write the code to Implement and modify various concepts in operating systems
- To understand the working principle of various communication protocols.
- To analyze the traffic flow and the contents of protocol frames

Course Outcomes:

- Implement Inter process communication between two processes
- Implement scheduling, deadlock and file management
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design

List of Programs:

1. Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate all file allocation strategies a) Sequential b) Indexed c) Linked
3. Simulate MVT and MFT
4. Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG
5. Simulate Bankers Algorithm for Dead Lock Avoidance
6. Simulate Bankers Algorithm for Dead Lock Prevention
7. Simulate all page replacement algorithms a) FIF b) LRU c) LFU Etc.
8. Simulate Paging Technique of memory management.
9. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
10. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
11. 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.
12. Implement Dijsktra's algorithm to compute the shortest path through a network
13. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
14. Implement distance vector routing algorithm for obtaining routing tables at each node.
15. Implement data encryption and data decryption
16. Write a program for congestion control using Leaky bucket algorithm.

17. Write a program for frame sorting technique used in buffers.
18. Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.

Text Books:

1. Operating System Principles , Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, Wiley Student Edition
2. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

CO-PO &PSO Mapping

Course Name - Course Outcomes / Program Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	M	M			M										
CO2	H	M			M										
CO3	M	M			M										
CO4	M	M			M										

B.Tech III Year – V Sem	L	T	P	C
Subject Code: 21PC5CS17	0	0	2	1

Compiler Design Lab

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.

Course Outcomes:

- Design and develop Lex program
- Ability to design and develop 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.

List of Experiments:

Compiler Design Experiments

1. Write a LEX Program to scan reserved word & Identifiers of C Language
2. Implement Predictive parsing algorithm
3. Develop an operator precedence parser for a given language.
4. Construct a recursive descent parser for an expression.
5. Construct a LL(1) parser for an expression
6. Convert the BNF rules into YACC form and write code to generate abstract syntax tree.
7. Write a C program to generate three address code.
8. Implement SLR(1) Parsing algorithm
9. Design LALR bottom up parser for the given language

CO-PO& PSO Mapping:

CO-PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO-1	L	M	L		H				L	L					L
CO-2	L	H	L		H				H	H					M
CO-3	L	M	L		H				L	L					L
CO-4	L	M	L		H				L	L					L

B. Tech III Year – I Sem	**L**	**T**	**P**	**C**
Subject Code: 21HS5EG05	0	0	2	1

Advanced English Communication Skills Lab

Pre-requisite:

1. Basic knowledge of interpersonal and communication skills
2. Enriching the speaking and writing ability
3. Basic grammar rules of LSRW
4. Basic spoken English skills

Course Objectives: This course will enable students to:

1. To equip students of engineering and technology with effective speaking and listening skills in English.
2. To develop their soft skills and interpersonal skills for promoting excellence.
3. To understand the concept of employability skills and enhancing ones' communication skills, body language, behavior in the personal, professional and social forum.
4. To enrich their problem solving, critical and analytical skills.
5. To enhance the performance of the students at placement interviews, Group discussions and other recruitment exercises.

Course Outcomes: Upon completion of the course, the student should be able to

1. Understand the communication theory to interact skilfully and ethically.
2. Identify the challenges and abilities to persuade the people.
3. Apply communication strategies (both verbal and non-verbal skills) to bring out the results on social and industry demands.
4. Communicate effectively and deliver professional presentations.

Exercise 1- Activities on Fundamentals of 7C's of Effective Communication, Behavior skills and Building Vocabulary

Fundamentals of 7C's of Effective Communication and Building Vocabulary

Starting a conversation – responding appropriately and relevantly – Concise - Clear - Concerts - Coherent - Complete – Correct- Courtesy- using the right body language - attitude - Grooming - Formal and Informal Communication, Synonyms and Antonyms-root words, One-word substitutes, Prefixes and Suffixes, Study of word origin, Business vocabulary, Analogy, Idioms and phrases, Collocations, Usage of vocabulary.

Behaviour skills- Time Management– Role Play in different situations- Discourse Skills - Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise

Exercise 2- Activities on Reading Comprehension and Business English

General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading, Effective Business Conversation with dialogues reading and speaking activity.

Exercise 3- Activities on Writing Skills

Structure and presentation of different types of writing – letter writing/Resume writing/ E-correspondence/Technical report writing, Planning for writing- five elements of writing – Purpose, grabbing audience, maintaining clarity, unity, coherence - improving one's writing,

Exercise 4- Activities on Presentation Skills
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation -Oral presentations (individual and group) through JAM sessions/seminars/PPTs
Audience analysis - written presentations through Posters/Projects/Reports writing/ e-mails

Exercise 5: Activities on Group Discussion and Interview Skills
Dynamics of group discussion-Intervention- Structure of GD – types of GDs- Strategies in GD – Team work - summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation

Interview skills- Kinds of interviews -Concept and process- Required Key Skills - Pitfalls in interview- Pre-interview planning- opening strategies, answering strategies, post-Interview skills, Interview through tele-conference, video-conference and Mock Interviews.

Text Books:

1. Effective Technical Communication ,M Asharaf Rizvi, 2nd Edition, McGraw Hill Education (India) Pvt. Ltd, 2017
2. Academic Writing: A Handbook for International Students by Stephen Bailey, 5thEdition, Routledge, 2017

Reference Books:

1. Technical Communication, Anderson, P.V, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Verbal and Non-Verbal Reasoning, Prakash, P, Macmillan India Ltd., Second Edition, New Delhi, 2004.
4. The Oxford Guide to Writing and Speaking, John Seely, Oxford University Press, New Delhi, 2004.
5. Handbook for Technical Communication, David A. McMurrey & Joanne Buckley. 2012Cengage Learning.
6. Objective English, Thorpe, E, and Thorpe, S, Second Edition, Pearson Education, New Delhi, 2007.
7. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc graw Hill, 2009.

Web Resources:
1. https://eltlearningjourneys.com/2015/05/19/websites-for-learning-english/

MOOC's Courses:
1. NPTEL https://onlinecourses.swayam2.ac.in/nou22_lb28/preview
2. Communication Skills (Library and Information Science)
3. By Prof. Zuchamo Yanthan | Indira Gandhi National Open University

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	-	-	-	-	-	-	-	-	2	2	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-

B.Tech III Year–V Sem	L	T	P	C
Subject Code: 21PR5CS02	**1**	**0**	**1**	**1.5**

Doing Engineering 2
(Matrix Lab)

Pre-requisite: Basic Knowledge on Computer and C language

Course Objectives:
1. To learn features of MATLAB as a programming tool.
2. To promote new teaching model that will help to develop programming skills and technique to solve mathematical problems.
3. To understand MATLAB graphic feature and its applications.
4. To use MATLAB as a simulation tool.

Course Outcomes:

1) Able to use Matlab for interactive computations.
2) Familiar with memory and file management in Matlab.
3) Able to generate plots and export this for use in reports and presentations.
4) Able to program scripts and functions using the Matlab development environment.

Module-I:

MATLAB Environment: Introduction, Matlab environment, Matlab as a calculator, Matlab Online, Syntax and Semantics, Help, Plotting. Matrices and Operators: Introduction, the Colon Operator, Accessing Parts of a Matrix, Combining and Transforming Matrices, Arithmetic Part1, Arithmetic Part2, Operator Precedence.

Programs:

1. Graphing Functions Using MATLAB

Module-II:

Functions: Introduction, Function I/O, Formal Definition of Functions, Sub functions, Scope, Advantages of Functions, Scripts, and Problem Solving.

Programs:

1. Run MATLAB, find the command window and the blinking cursor.

Module-III:

Programmer's Toolbox: Introduction, Matrix Building, Input - output, Plotting, Debugging. Selection: Selection, If – Statements, Relational and Logical Operators, Nested If – Statements, Variable Number of Function Arguments, Robustness, Persistent Variables.

Program:

1. Remember the cosine rule? C^2=a^2+b^2-2ab cos(theta) Find the length of the hypotenuse of a triangle with angle 30o, and sides with lengths 10 and 20.

Module-IV:

Loops: For – Loops, While – Loops, Break Statements, Logical Indexing, Pre allocation. Data Types: Introduction, Strings, Structs, Cells.

Programs:

1. Try out sequences with step-size ≠1: [4:0.1:5], [5:-2:-5].

2. Create a list of the whole numbers between 10 and 20 (inclusive), find their sum.

Module-V:

File Input/ Output: File I/O, Excel Files, Text Files, Binary Files. Applications of Matlab in Electronics, Communication, Signal Processing, Image Processing.

Programs:

1. Create the vector of the previous question in decreasing order.

2. Find the sum of the odd numbers between 100 and 200.

Project: Car Number Plate Detection Using MATLAB and Image Processing

Text Books:

1. "A Guide to MATLAB - for Beginners and Experienced Users", 2nd Ed., Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Cambridge University Press, (2006).

2. "Essentials of MATLAB Programming", 2nd Ed., Stephen J. Chapman, Cengage Learning, (2009).

References:

1. "MATLAB Demystified", David McMahon, The McGraw-Hill Companies, (2007).

2. "MATLAB® for Engineers", 3rd Ed., Holly Moore, Pearson Education, Inc., (2012).

3. "Engineering computation with MATLAB", 2nd Ed., David M. Smith, Pearson Education, Inc., (2010).

CO-PO MAPPING:

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	M				H									
CO2	M				H									
CO3	M				H									
CO4	M				H									

	L	T	P	C
Subject Code: 21MC5HS03	**1**	**0**	**0**	**0**

Analytical Reasoning
(Common to CSE/EEE/ECE/CSM/CSD/CSC/CSO/ME)

Pre-requisite: Nil

Course Objectives:

1. Improve logical thinking to solve various questions and puzzles in Reasoning.
2. To help the student understand the importance of having his language skills kept ready for effective use
3. To understand the concept of employability skills
4. To enrich their problem solving, critical and analytical skills

Course Outcomes:

1. Improve logical thinking to solve various questions and puzzles in Reasoning.
2. To help the student understand the importance of having his language skills kept ready for effective use
3. To understand the concept of employability skills
4. To enrich their problem solving, critical and analytical skills

Module I:

Coding and Decoding: Coding and Decoding, Arrow Method, Chinese coding, Series, Analogy, Odd man out

Articles and Tenses: Introduction, usage of articles, Omission of Articles, Types of tenses, Forms and Usage of tenses.

Module II:

Direction Sense: Introduction, Distance method, Facing Method and Shadow Method.
Blood Relations: Introduction, Direct, Puzzle and Coded models.

Module III:

Voices and Forms of Speech: Introduction, conversion of active and passive voice, conversions of direct and indirect speech.

Module IV:

Data Arrangements: Linear Arrangement, Circular Arrangement, Multiple Arrangements.
Syllogisms: Introduction, Tick-Cross method, Inferential Technique, Venn-Diagram method.

Module V:

Visual Reasoning: Patterns, Folded Images, Cubes and Analytical Reasoning.
Sentence Correction: Subject-Verb Agreement, Pronoun Antecedent, Parallelism, Verb-Time Sequence Error, Determiners and Modifiers.

Text Books:

1. Quick Learning Objective General English, R.S. Aggarwal, Vikas Aggarwal, 2nd edition, S.Chand, 2003.

2. A Modern Approach to Logical Reasoning, R.S. Aggarwal, Revised Edition, 2nd edition, S Chand & Co Ltd, 2018.

Reference Books:

1. Test of Reasoning for all competitive examinations, Edgar Thorpe, 6th Edition, McGraw Hill Education, 2017.
2. How to Prepare for Logical Reasoning for CAT and other Management Examinations, Arun Sharma, 4th edition, McGraw Hill Education, 2017.
3. English Grammar and Verbal Reasoning – The Toolkit for Success, SimboNuga, Trafford Publishing, 2013

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – High; 2 – Medium; 1 - Low

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						1					2	3		
CO2						1					2	3		
CO3						1					2	3		
CO4						1					2	3		

DATA MINING
(Professional Elective-I)

B.Tech III year -V Sem	L	T	P	C
Subject Code: 21PE5CS12	3	0	0	3

Pre-Requisites:

1. Course on "Database Management Systems"
2. Knowledge of probability and statistics

Course Objectives:

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Course Outcomes:

1. Design a Data warehouse system and perform business analysis with OLAP tools
2. Apply suitable pre-processing and visualization techniques for data analysis
3. Apply preprocessing methods and appropriate classification techniques for data analysis
4. Ability to classify web pages, extracting knowledge from the web

Module-1

Data Mining: Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Data warehousing Architecture.

Data Models: Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

Module – II

Data Mining – Introduction: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data.

Data Preprocessing – Data Cleaning, Data Reduction, Data Transformation and Data discretization, Data Visualization, Data similarity and dissimilarity measures.

Module – III

Data Mining – Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods.

Pattern Mining: Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

Module - IV
Classification: Decision Tree Induction, Bayesian Classification, Bayesian belief Networks, Rule Based Classification.

Classification: Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy.

Module- V
Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Outlier analysis, outlier detection methods.

Web and Text Mining : Text and Web data – Spatial Data mining– Multimedia Data mining– Text Mining– Mining the World Wide Web.

TEXT BOOKS:
1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson, 2016

REFERENCE BOOK:
1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.
2. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	3		3						3						
CO2	3		3						3						
CO3	3		3						3						
CO4	3		3						3						

B.Tech III Year- V Sem	L	T	P	C
Subject Code: 21PE5CS13	3	0	0	3

Computer Graphics

Course Objectives

1. To provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
2. To understand computer graphics techniques (2-D/3-D), focusing on 3D modelling, image synthesis, and rendering.
3. Introduce geometric transformations, geometric algorithms, software systems (OpenGL), 3D object models (surface, volume and implicit), visible surface algorithms, image synthesis, shading and mapping, ray tracing, radiosity, global illumination, photon mapping, and anti-aliasing.
4. To explore the interdisciplinary nature of computer graphics which is emphasized in the wide variety of examples and applications.

Course Outcomes

1. Develop a facility with the relevant mathematics of computer graphics, e.g., 3D rotations using both vector algebra, geometrical transformations and projections using homogeneous co-ordinations.
2. Illustrate Geometric transformations on both 2D and 3D objects
3. Apply principles and techniques of computer graphics.
4. Apply computer graphics concepts in the development of computer games, information visualization, and business applications.

MODULE- I

Introduction and Line Generation: Types of computer graphics, Graphic Displays-Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Midpoint circle generating algorithm, and parallel version of these algorithms.

MODULE -II

Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping

algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against nonrectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

MODULE -III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

MODULE-IV

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, introductory concepts of Spline, B spline and Bezier curves and surfaces.

MODULE -V

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method

Text Books

1. Computer Graphics C Version – Donald Hearn and M Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.

Reference Books

1. Computer Graphics – Amrendra N Sinha and Arun D Udai, TMH Publications
2. Computer Graphics: A Programming Approach – Steven Harrington, TMH Publications
3. Procedural Elements of Computer Graphics – Rogers, McGraw Hill
4. Computer Graphics, Steven Harrington, TMH Publications

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	3		3						3						
CO2	3		3		3				3						
CO3	3		3		3				3						
CO4	3		3		3				3						

B. Tech III Year–V Sem **L T P C**

Subject Code: 21PE5CS14 **3 0 0 3**

Image Processing

Course Objectives

1. To learn the fundamentals of image processing and various transformation applied in an image
2. To learn image enhancement techniques
3. To understand image restoration
4. To impart knowledge on different compression techniques
5. To discuss on image segmentation and feature representations

Course Outcomes

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

1. Differentiate and interpret various image enhancement techniques
2. Reconstruct the image from the degraded image
3. Analyze and use appropriate image compression techniques
4. Suggest proper image feature for classification problems

MODULE-I

Introduction

Introduction to Digital Image Processing - Characteristics of Digital Image - Basic relationship between pixels - Image sampling and quantization - Color models - Basic Geometric Transformations - Fourier Transform - Cosine Sine and Hartley Transform - Hadamard-Haar-Slant Transform - Discrete Fourier Transform.

MODULE- II

Image Enhancement Techniques

Spatial Domain Methods - Basic Grey Level Transformation - Histogram Processing - Image subtraction - Image averaging - Spatial filtering - Smoothing - Sharpening filters - Laplacian filters - Frequency domain filters - Smoothing - Sharpening filters - Homomorphic filtering.

MODULE-III

Image Restoration

Model of Image Degradation/restoration process - Noise models - Spatial and Frequency Filters - Inverse filtering & Wiener Filtering - Least mean square filtering - Constrained least mean square filtering.

MODULE-IV

Image Compression

Fundamentals Image Compression Models - Lossless compression: Variable length coding - LZW coding - Bit plane coding - predictive coding - DPCM - Lossy Compression: Lossy Predictive Coding - Transform coding - Wavelet coding.

MODULE-V

Image Segmentation & Analysis

Image Segmentation techniques - Edge detection - Thresholding - Region - Boundary Extraction & Representation - Region - Moment representation - chain codes - Polygonal approximation - Texture - Pattern Recognition.

Text Book

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Fourth Edition, Pearson Education, 2018.
2. 1. A.K. Jain, "Fundamentals of Digital Image Processing", PHI, New Delhi, 1995.

Reference Books

1. William K Pratt, "Digital Image Processing", Fourth Edition, John Wiley, 2007

CO-PO Mapping:

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		3												
CO2		3		3										
CO3		3												
CO4		3												

B.Tech. III Year V Sem.	**L**	**T**	**P**	**C**
Subject Code: 21PE5CS15	**3**	**0**	**0**	**3**

GPU Computing

Course Pre-requisite: Computer Architecture

Course Objectives

1. To learn parallel programming with Graphics Processing Units (GPUs).
2. To Learn application of software to GPUs,
3. To Learn the performance of different routing protocols.

Course Outcomes

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

1. Understand the concepts in parallel programming
2. Implementation of programs on GPUs,
3. Examine and evaluate the effectiveness of various routing protocols.
4. Analyze various synchronisation theories, and apply case studies in a real-time setting.

Module – I

Introduction: History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA OpenCL /Open ACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps / Wavefronts, Thread blocks / Workgroups, Streaming multiprocessors, 1D / 2D/ 3D thread mapping, Device properties, Simple Programs

Module – II

Memory: Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories

Module – III

Synchronization: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU Functions: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.

Module – IV

Support: Debugging GPU Programs. Profiling, Profile tools, Performance aspects Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based-Synchronization - Overlapping data transfer and kernel execution, pitfalls.

Module – V

Case Studies: Image Processing, Graph algorithms, Simulations, Deep Learning Advanced topics: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing

TEXT BOOK:

1. Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wenmei Hwu; Morgan Kaufman; 2010 (ISBN: 978-0123814722)
2. GPU Computing Gems Emerald Edition

REFERENCE BOOKS:

1. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook :Morgan Kaufman; 2012 (ISBN: 978-0124159334)

CO-PO/PSO Mapping:

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3												
CO2		3		1										
CO3		3												
CO4		3												

B. Tech III Year–V Sem	L	T	P	C
Subject Code: 21OE5CS06	3	0	0	3

Computer Organization and Architecture

Pre-requisite: NIL

Course Objective:

1. The purpose of the course is to introduce principles of computer organization and the basic architectural concepts
2. Understand the representation fixed-point and floating-point numbers in computer and develop hardware algorithms using them for fixed-point and floating-point arithmetic.
3. The course would display understanding of instruction set of RISC processor and develop understanding of how memory is organized and managed in a modern digital computer, including cache, virtual and physical memory.
4. It discusses input-output units and how they communicate with the processor, and howtheir performance is computed.

Course Outcomes:

1. Understand the theory and architecture of Digital computer system
2. Define different number systems, compliments, combinational circuits and Sequential circuits
3. Explain and use fixed point addition, subtraction, multiplication (Booth's) and division (Restoring and non-restoring) algorithms
4. Explain the concept of Computer I/O Organization, Memory, RISC, CISC Characteristics

Module I:

Digital Computers: Introduction to digital computers, need of Computer Organization and Computer Architecture, Basic of Computer Architecture and Organisation, Von Neumann Computers

Data Representation: Data Types, (r-1)'s Compliment, r's compliment, Fixed point Representation, conversion of Fractions, Floating point representation, Gray code, Error detection code

Module II:

Digital Logic Circuits -I: Logic gates, Boolean Algebra, Map simplification, Combinational circuits-Half Adder and Full Adder, Decoders and Multiplexers

Digital Logic Circuits -II: Flip-Flops- SR, JK, D, T and Edge triggered, Excitation Tables, Registers, Shift Registers, Binary Counters

Module III:

Computer Arithmetic -I: Addition and subtraction, multiplication Algorithms, Division Algorithms

Computer Arithmetic –II: Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Module IV:

Basic Computer Organization: Instruction Codes, Computer Registers, Computer Instructions, Timing and control, Instruction Cycle, Memory- Reference Instructions, Input-Output and Interupt

Input-Output Organization: Priority interrupt, Peripheral devices, Input output interface, Data transfer schemes, Program control and interrupts, Direct memory access transfer, Input/output processor.

Module V:

Memory Unit: Memory Hierarchy, Main Memory, Auxiliary Memory, Associate Memory and Cache Memory

Computer Architecture: CISC Characteristics, RISC Characteristics.

Text Books:

1. Computer System Architecture by Morris Mano, Prentice hall, 3rd Edition, (2007)
2. Computer Organization by Carl Hamacher, Zvonko Vranesic, SafwatZaky, Tata McgrawHill, 5th Edition, (2011)

References:

1. Computer Architecture: A Quantitative Approach by Hennessy, J. L, David A Patterson, and Goldberg, Pearson Education, 4th Edition, (2006)
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.

CO-PO/PSO Mapping Chart:

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*		
CO-PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO-1	2													**2**	
CO-2	2	2	3											2	
CO-3	2	2	2											2	
CO-4	2	2	2											2	

B. Tech III Year – V Sem	L	T	P	C
Subject Code: 21OE5EC01	3	0	0	3

ELECTRONIC MEASUREMENTS & INSTRUMENTATION

(OPEN ELECTIVE)

Prerequisite: Basic Electrical and Electronics

Course Objectives: This course will enable students to:

1. Learn and understand functioning of various measuring system and metrics for performance analysis.
2. Acquire knowledge of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. To Compare various measuring bridges and their balancing conditions.
4. Learn and understand the use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes: Upon completion of the course, the student should be able to

1. Explain the instrument and measurements of the parameters
2. Describe signal generators and analyzers
3. Categorize oscilloscopes for different applications
4. Apply the transducers for measurement of different parameters

MODULE I : Performance characteristics of instruments

Static characteristics: Accuracy, Resolution, Precision, Expected value, Error, Sensitivity.

Dynamic Characteristics: Speed of response, Fidelity, Lag and Dynamic error.

Types of errors in measurements and their analysis. Design of multi-range AC , DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter.

MODULE II

Bridge circuits : Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance-Schearing Bridge. Wien Bridge, Errors and precautions in using bridges.

Q-meter: principle of operation, measurement methods and sources of errors.

Counters : principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

MODULE III

Specifications and designing aspects of Signal Generators: AF sine and square wave signal generators, Function Generators, Random noise generators, arbitrary waveform generators.

Wave Analyzers: Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

MODULE IV:

General purpose CROs: Block diagram, functions and implementation of various blocks, specifications, various controls and their functions, types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns.

Special purpose CROs: sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope.

MODULE V:

Transducers: Transducers, Active & Passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers.

Measurement of physical parameters: Temperature, force, pressure, velocity, acceleration and displacement.

Textbooks :

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill,2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrickand W.D. Cooper, PHI, 5th Edition, 2002.
3. Electronic Measurements And Instrumentation- A.K. Sawhney, Dhanpat Rai&CO(P) Limited, Jan2015.

Reference books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12thEdition,2002.

CO-PO &PSO Mapping:

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	-	-	-	1	2	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	2	-

B. Tech III Year–V Sem	L	T	P	C
Subject Code: 21OE5ME01	3	0	0	3

Hybrid & Electric Vehicles

Pre-requisites: IC engines, automobile engineering, basic electrical electronics engineering

Objectives: To understand the fundamental concepts, and principles, of hybrid and electric vehicles.

To know the various aspects of hybrid and electric drive trains such as their configuration,

Students should understand various automotive systems and the basics of the drive train in automobiles.

Module I

Introduction: Layout of the automobile–introduction chassis and body components. Types of Automobile engines–Power unit -working of two stroke and four stroke engine–Introduction to engine lubrication–engine servicing

Fuel System: Fuel supply systems working in IC engines,–fuel injection an its types.

Cooling System: Cooling Requirements, Air Cooling, Forced Circulation System–Radiators–Types–Cooling Fan-water pump, thermostat, evaporative cooling-antifreeze solutions.

Module II

Ignition System: Function of an ignition system, battery ignition system, constructional features ofstorage, battery, auto transformer, contact breaker points, condenser, and spark plug.

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, Bendixdrive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge–oil pressure gauge, engine temperature indicator etc.

Transmission System: -components and working principle. The layout of the power transmission system in a conventional and hybrid vehicle (fuel vs electrical)-introduction of components

Suspension System: Objects of suspension systems –, Dependent and Independent suspension system, air suspension system. Vehicle stability assist supplemental restraint system (SRS).

Module III

Braking System: Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic..

Steering System: Steering geometry – Ackerman Steering Mechanism, Davis Steering Mechanism ,Hydraulic and electric power steering-working principle ,construction and working.

Introduction To Hybrid Vehicles:

History of hybrid and electric vehicles, social and The environmental importance of hybrid and electric vehicles, the impact of modern drive-trains on energy supplies.

Module IV

Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Trains: Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Module V

Energy Storage: Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

Energy Management Strategies: Energy Management Strategies: Introduction to energy

management strategies used in hybrid and electric vehicles, classification of different energy management strategies,

TEXTBOOKS:

1. Automobile Engineering/WilliamHCrouse.
2. A Text Book Automobile Engineering–Manzoor, Nawazish Mehdi & Yosuf Ali, Frontline Publications.
3. T. Denton, Electric and Hybrid Vehicles, Routledge, 2016

Reference Books:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016
3. K. Netwon, W. Steeds, T. K.Garrett, ―Automotive Engineering‖, Butterworth-Heinamann, 13th Edition, 2016.

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

1. Understand the working of IC engines,
2. Demonstrate the working of power transmission and brakes.
3. Understand the models to describe conventional, and hybrid vehicles and their performance.
4. Understand the different strategies related to energy storage systems.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 –Low

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1											2	2
CO2	3	1											2	2
CO3	3	1											2	2
CO4	3	1											2	2

	L	T	P	C
B.Tech III Year – V Sem				
Subject Code: 21OE5EE01	**3**	**0**	**0**	**3**

FUNDAMENTALS OF ELECTRICAL CIRCUIT ANALYSIS

Pre-requisite: Basic Mathematics & Physics

Course Objectives:

1) To introduce the concepts of electrical circuits and their components
2) To Analyze electrical circuits with the help of network theorems
3) To understand DC circuits and single-phase AC circuits
4) To analyse the magnetic circuits

Course Outcomes:

At the end of course student will be able to do

1. CO1 – To understand the electrical circuits with DC excitation.
2. CO2 – To analyze electrical circuits with the help of network theorems
3. CO3 – To analyze electrical circuits with AC excitation
4. CO4 – To analyse the magnetic circuits.

Module I: D.C. Circuits

Introduction to Electrical Circuits: Current, Voltage, Power, Energy, Ohm's law, types of elements, Kirchoff laws, types of sources, resistive networks, inductive networks, capacitive networks, series, parallel circuits, analysis of simple circuits with dc excitation.

Network Analysis: Mesh and Nodal analysis, Voltage and current divide rule, source transformation technique, and star-delta and delta star transformation, simple problems.

Module II:Network Theorems

Network Theorems -I: Superposition, reciprocity, Thevenin's, Norton's theorems for DC excitations, numerical problems.

Network Theorems -II: Tellegen's, Maximum power transfer, Milliman's for DC excitations, numerical problems.

Module III:A.C. Circuits

Single Phase AC Circuits: Representation of sinusoidal waveforms, Average and RMS values, peak factor, and Formfactor. Real power, Reactive power, Apparent power, power factor, Numerical problems.

RLC Analysis:Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, and RLC combinations for both series and parallel, Numerical problems.

Module IV:Magnetic Circuits

Absolute and Relative Permeability of a Medium, Laws of Magnetic Force,Flux Density (B),Faraday's laws of electromagnetic induction –concept of self and mutual inductance – dot convention

Coefficient of coupling –composite magnetic circuit - Analysis of series and parallel magnetic circuit, Simple Problems.

Module V: Network Topologies

Network Topology-I
Basic definitions of graph theory, Incidence Matrices, Branch path incidence matrices**,** and numerical problems.

Network Topology-II
Cut set matrices, Relation between branch currents I_b and loop currents I_l, Tie set matrices, the relation between branch voltages and node voltages. Duality concept and numerical problems.

TEXTBOOKS:

1. A Chakrabarty, "Electric Circuits", Dhanipat Rai & Sons, 6th Edition, 2010. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
2. M E Van Valkenberg, "Network Analysis", PHI, 3rd Edition, 2014.

REFERENCE BOOKS:

1. A Sudhakar, Shyammohan S Palli, "Circuits and Networks", Tata McGraw-Hill, 4th Edition, 2010.
2. David A Bell, "Electric circuits", Oxford University Press, 7th Edition, 2009.
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice-Hall India, 1989

Web Resources:

1. **https://nptel.ac.in/courses/108/104/108104139/**

2. https://nptel.ac.in/courses/117/106/117106108/

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2			3								2	2
CO2	2	3											2	
CO3	2	3											2	
CO4	2	1											2	

B.Tech III Year – V Sem	**L**	**T**	**P**	**C**
Subject Code: 21OE5CM01	**3**	**0**	**0**	**3**

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Objectives

1. To provide a strong foundation of fundamental concepts in artificial intelligence.
2. To provide a basic exposition to the goals and methods of Artificial intelligence
3. To provide the exposition to uncertainty management, decision making and learning methods.
4. To provide different knowledge representation, reasoning, and learning techniques.

Course Outcomes

1. Discuss basic concepts of Artificial Intelligence, AI principles, AI Task domains and application.
2. Apply searching techniques, constraint satisfaction problem and game playing techniques which involve perception, reasoning and learning.
3. Explain working of uncertainty management, decision making and learning methods.
4. Apply different knowledge representation, reasoning, and learning techniques to real world problems.

MODULE-I

Introduction: Artificial Intelligence, AI Problems, AI Techniques, the Level of the Model, Criteria for Success. Problem Space and Search, Defining the Problem as a State Space Search, Problem Characteristics; Tic-Tac-Toe Problem, Production Systems.

Basic Search Techniques: Solving Problems by searching; Issues in The Design of Search Programs; Uniform search strategies; Breadth first search, depth first search, depth limited search, bidirectional search, Best First search, comparing search strategies in terms of complexity.

MODULE-II

Special Search Techniques: Heuristic Search, greedy best first search, A* search Problem Reduction, AO*Algorithm; Hill climbing search, Simulated Annealing search; Genetic Algorithm; Constraint Satisfaction Problems; Adversarial search, Games, Optimal decisions and strategies in games, Minimax search, Alpha, beta pruning.

Knowledge Representation: Procedural Vs Declarative Knowledge, Representations & Approaches to Knowledge Representation, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms.

MODULE-III

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL, Normal Forms, Unification &Resolution, Representation Using Rules, Natural Deduction.

Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC.

MODULE-IV

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Model and Temporal Logics.

Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory.

Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems.

MODULE-IV

Experts Systems: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Fuzzy Expert systems.

Learning: Types of learning, general learning model, Learning by induction; generalization, specialization, example of inductive learner.

Text Book:

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence, Elaine Rich and Knight, Mcgraw-Hill Publications

References:

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
2. Multi Agent systems- a modern approach to Distributed Artificial intelligence, Weiss. G, MIT Press.
3. Artificial Intelligence: A modern Approach, Russell and Norvig, Printice Hall

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low

CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2	PSO3
CO-1		3										2	2		
CO-2	3												2		
CO-3		3										2	2		
CO-4	3											2	2		

B.Tech III – V Sem **L T P C**
Subject Code: 21OE5CD01 **3 0 0 3**

Statistics for Data Science

Course Objective

1. The Number Theory basic concepts useful for cryptography etc
2. The theory of Probability, and probability distributions of single and multiple random variables 3. The sampling theory and testing of hypothesis and making inferences
4. Stochastic process and Markov chains.

Course Outcomes:

1. Apply the number theory concepts to cryptography domain
2. Apply the concepts of probability and distributions to some case studies
3. Correlate the material of one unit to the material in other units
4. Resolve the potential misconceptions and hazards in each topic of study.

Module I

Greatest Common Divisors and Prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers
Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences

Module II

Simple Linear Regression and Correlation: Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study
Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence. Discrete probability
Distributions: Binomial Distribution, Poisson distribution.

Module III

Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Fundamental Sampling
Distributions: Random Sampling, Sampling Distributions, Sampling, Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t–Distribution, F Distribution.

Module IV

Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.

Module V

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison Wesley, ISBN 978 0-321-50031-1
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

REFERENCE BOOKS:

1. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications 2. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO 2	PSO 3
CO1	M	L			L										
CO2	M	L			L										
CO3	M	L			L										
CO4	M	L			L										

B. Tech III Year – V Sem	L	T	P	C
Subject Code: 21OE5CO01	3	0	0	3

FUNDAMENTALS OF IOT

PREREQUISITE: Basics of computers

COURSE OBJECTIVE:

1. The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time.
2. The course enables student to understand the basics of Internet of things and protocols.
3. Introduces some of the application areas where Internet of Things can be applied.
4. Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things

COURSE OUTCOMES:

1. Interpret the concepts of IoT
2. Analyze the importance of Protocols in IoT
3. Understand the IoT architecture
4. Apply IoT concepts in Industry applications and IoT platforms

Module 1:

Introduction to IOT - IoT and its importance, Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications

Overview of Governance, Privacy and Security Issues.

Module II

IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – **Protocols** – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

Module III

IOT ARCHITECTURE - IoT Open-source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models

IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

Module IV

WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT

Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

Module V:

IOT APPLICATIONS – Qualitative study of sensors, IoT applications for industry: Future Factory Concepts, Smart Objects, Smart Applications.

Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

TEXT & REFERENCES:

Text:

- Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applicationsand Protocols", Wiley, 2012.

References:

- Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1st Edition, Apress Publications, 2013
- CunoPfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1

Course Outcomes (CO)	**CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low**													
	Program Outcomes (POs)												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3								2	2			1	
CO2	3	1			3				2	2			2	
CO3	3	1			2				2	2			2	
CO4	3	1	3		3				2	2			1	

B. Tech III Year–V Sem	**L**	**T**	**P**	**C**
Subject Code: 21OE5CC01	**3**	**1**	**-**	**4**

DATA SECURITY

Prerequisite(s): Nil

Course Objectives:

• To introduce different classical cryptographic techniques and its theoretical security analysis.
• To provide and demonstrate different cryptanalysis attacks against the cryptographic techniques, and their attack models.
• To show the impact of these ciphers on society during the time of their use.

Course Outcomes:

At the end of the course, students are able to:

CO1: Identify the basic language & terminologies of cryptography.
CO2: Demonstrate Encryption and Decryption methods using various ciphers of classical cryptography.
CO3: Perform cryptanalysis of classical cryptography.
CO4: Understand the concept of digital signatures.

Module 1:

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks.
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric keycryptography, steganography, key range and key size, possible types of attacks.

Module 2:

Symmetric key Ciphers: Algorithms Types, Algorithm Modes, Data Encryption Standards, International Data Encryption Algorithm (IDEA), RC4, RC5, Blowfish,
Case Study: Secure Multiparty Calculation.

Module 3:

Asymmetric key Ciphers - I: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Comparison of symmetric and symmetric Key Cryptography.

Module 4:

Asymmetric key Ciphers - II: Digital signatures, Elgamal Digital Signature Scheme, Attacks on Digital Signature, Knapsack Algorithm, Problems with Public key Exchange.

Module 5:

Public – Key Infrastructure : Digital Certificates, private - Key management, The PKIX Model, Public Key Cryptography Standards(PKCS) , XML, PKI and security.

Text Books:

1. Padmanabhan T R, Shyamala C and Harini N, "Cryptography and Security", Wiley Publications 2011.
2. Josef Pieprzyk, Thomas Hardjono and Jenifer Seberry, "Fundamentals of Computer Security", Springer 2010.

Resources:

1. Douglas R Stinson, "Cryptography: Theory and Practice", CRC Press 2005.
2. Alfred J Menezes, Paul C Van Oorshot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC press 1996.

CO-PO/PSO Mapping:

CO-PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2	PSO3
CO-1			2				3								
CO-2				2			1								
CO-3				3				1							
CO-4		1						3							

B.Tech III Year – VI Sem	**L**	**T**	**P**	**C**
Subject Code: 21ES6CS05	**3**	**1**	**0**	**4**

Statistical Programming with R

Course Objective

1. Use R for statistical programming, computation, graphics, and modeling,
2. Write functions and use R in an efficient way
3. Be able to expand their knowledge of R on their own.

Course Outcomes:

At the end of the course student will be able to

1. List motivation for learning a programming language
2. Import, review, manipulate and summarize data-sets in R
3. Explore data-sets to create testable hypotheses and identify appropriate statistical tests
4. Perform appropriate statistical tests using R Create and edit visualizations with

Module-I Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

Module–II R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quick sort Implementation-Extended Extended Example: A Binary Search Tree.

Module-III Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.

Module-IV Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

Module–V Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

Text Books:

1) The Art of R Programming, A K Verma, Cengage Learning.

3) The Art of R Programming, Norman Matloff, No starch Press.

Reference Books:

1) R Cookbook, Paul Teetor, Oreilly.

2) R in Action, Rob Kabacoff, Manning

2) R for Everyone, Lander, Pearson

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	M	L										L			
CO2	H	H			M							M			
CO3	M	M													
CO4	M	L			L							L			

B. Tech III Year- II Sem	**L**	**T**	**P**	**C**
Subject Code: 21HS6MB02	**2**	**0**	**0**	**2**

Fundamentals of Engineering Management

Pre-requisite: Nil

Course Objective:

1. To understand the Management Concepts, applications of concepts in Practical aspects of business
2. To induce the development of Managerial Skills for Engineers.
3. To study the system and process of effective controlling in the organization.
4. To enable students to understand the key components of a successful project and to embed the necessary processes, components, and attributes into execution of their projects; allows practice of communication skills to organize project teams

Course Outcomes: Upon completion of the course, the student should be able to

1. Comprehend the concepts & principles of management in real life industry.
2. Describe the interaction of organizational designs and competitive strategies
3. Apply the concept of operations management in manufacturing and service sector and will be able to plan and implement production and service related decisions.
4. Demonstrate strong conceptual knowledge in the functional area of Human Resource Management, Marketing management and Project Management

Module I:

Introduction to Management: Evolution of Management, Nature & Scope-Functions of Management-Role of Manager-levels of Management-Managerial Skills - Challenges

Planning & Strategic Management: Planning - Planning Process - Types of Plans - MBO

Module II:

Organization Structure: Organization Design - Organizational Structure - Departmentation - Delegation - Centralization – Decentralization - Recentralization -Organizational Culture - Organizational climate - Organizational change

Human Resource Management-HR Planning - Recruitment & Selection - Training & Development-Performance appraisal - Job satisfaction-Stress Management Practices

Module III:

Operation Management: Introduction to Operations Management - Principles and Types of Plant Layout - Methods of production (Job Batch and Mass production) - Method study and Work Measurement

Quality Management – TQM - Six sigma - Deming's Contribution to Quality – Inventory Management – EOQ - ABC Analysis - JIT System-Business Process Re-engineering (BPR)

Module IV:

Marketing Management: Introduction to Marketing-Functions of Marketing-Marketing vs. Selling- Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation

Distribution Decisions, Promotion and Communication Strategies:

Types of Marketing - Direct Marketing - Network Marketing - Digital Marketing -Channels of Distribution - Supply Chain Management (SCM)

Module V:

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP.

ERP Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

Text Books:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009.

Reference Books:

1. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2. , "ERP Demystified", Alexis Leon, Tata McGraw Hill
3. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
4. Industrial Engineering and Management: Including Production Management, T.R.Banga, S.C Sharma , Khanna Publishers.

Web Resources

1. http://nptel.ac.in/courses/109105121/
2. http://nptel.ac.in/courses/122105021/

CO-PO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low												
Course Outcomes (COs)	**Program Outcomes (POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	-	-	-	-	-	-	-	-	2	-	2	-
CO2	-	-	-	-	-	-	-	-	2	2	2	-
CO3	-	-	-	-	-	-	-	-	2	-	2	-
CO4	-	-	-	-	-	-	-	-	1	-	2	-

	L	T	P	C
B.Tech III Year – VI Sem				
Subject Code: 21PC6CS18	**3**	**0**	**0**	**3**

Cloud Computing

Course Objectives:

1. This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now.
2. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

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

1. Describe the different computing paradigms
2. Demonstrate the service delivery models of cloud computing architecture and its limitations
3. Analyze the core issues of cloud computing such as security, privacy, and interoperability.
4. Implement the ways in which the cloud can be programmed and deployed the cloud service providers

Module-I
Cloud Computing Overview :Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self- service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Module-II
Cloud Insights Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

Module-III
Cloud Architecture- Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds -Advantages of Cloud computing.

Module-IV
Cloud Simulators- Cloud Sim and Green Cloud Introduction to Simulator, understanding Cloud Sim simulator, Cloud Sim Architecture (User code, Cloud Sim, Grid Sim, Sim Java) Understanding Working platform for Cloud Sim, Introduction to Green Cloud

Module-V
Introduction to VMWare Simulator Basics of VM Ware, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Text Book:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:

1. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	2	2													
CO2	2	2													
CO3	1	1			1		2								
CO4	2				2		3								

B. Tech III Year–I Sem	L	T	P	C
Subject Code: 21PC5CM03	3	1	0	4

Machine Learning

Prerequisite:

1. Linear Algebra and Calculus
2. Knowledge of statistics

Course Objectives:

1. To introduce the basic concepts and techniques of Machine Learning.
2. To apply feature engineering techniques to the given data.
3. To apply machine learning concepts to solve problems.
4. To apply clustering techniques to the given problem.

Module-I

Introduction to Machine Learning and Pre-processing: Introduction to Machine learning, Types of Machine Learning: Supervised Learning, Unsupervised Learning, Semi-supervised Learning, Reinforcement Learning, Deep Learning, Extreme Learning, Application of Machine learning.

Data Collection (Sources), Types of missing data, Missing data handling using Imputation Technique.

Module – II

Data Engineering: Different types of data distribution: Normal distribution, Skewed distribution, Data transformations, Handling Imbalanced data, Outlier detection, Different types of Feature selection techniques in machine learning.

Module - III

Linear Algorithms: Linear Regression, Logistic Regression, Logistic Regression using Maximum Likelihood Estimation, Gradient Descent for Machine Learning, Batch Gradient Descent, Stochastic Gradient Descent, lasso and ridge regression, Parametric machine learning techniques, Performance metrics for Linear algorithms.

Module – IV

Non-Linear Algorithms: Decision Trees: ID3, CART, Naive Bayes, K-Nearest Neighbour's, Support Vector Machines: Maximal-Margin Classifier, Soft Margin Classifier, Kernels, non-parametric machine learning techniques, performance metrics for Non-linear algorithms.

Module – V

Unsupervised Learning: Introduction to Unsupervised learning, fundamentals of Clustering techniques: K-mean clustering, Hierarchical clustering-agglomerative and divisive clustering, linkages, different distance measures, and its appropriate application.

Text Books:

1. Python: Deeper Insights into Machine Learning by David Julian, John Hearty, and Sebastian Raschka, 2016.
2. Machine Learning with Python, Coding Mark, Charlie Creative Lab, 2020.

Reference Text Books:

1. U Dinesh Kumar Manaranjan Pradhan, Machine Learning Using Python, Wiley India Pvt. Ltd, 2019.
2. Mark Fenner, Machine Learning with Python for Everyone, Addison-Wesley Professional, 2019.

Web Resources & E-Books:

1. https://machinelearningmastery.com/
2. https://www.kdnuggets.com/

MOOC's Courses:

1. "Introduction to Machine Learning", NPTEL
2. "Machine Learning for Engineering and Science applications", NPTEL

Course Outcomes:

Upon completing this course, the student will be able to

1. Describe the different types of machine learning techniques.
2. Use different feature engineering techniques on the given data.
3. Classify the given data using machine learning techniques.
4. Employ clustering techniques to handle unlabelled data.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low															
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**														
CO2	**3**	**2**											**2**		
CO3	**3**	**2**											**2**		**1**
CO4	**3**	**2**											**2**		**1**

B.Tech III Year VI Sem	L	T	P	C
Subject Code: 21ES6CS06	0	0	3	1.5

R Programming Lab

Course Objective:

1. The basics of statistical computing and data analysis.
2. How to use R for analytical programming.
3. How to implement data structure in R.
4. Data visualization in R.
5. Writing custom R functions.

Course Outcomes:

At the end of the Course, the Student will be able to:

1. Setup R Programming Environment.
2. Understand and use R – Data types and Data Structures.
3. Develop programming logic using R – Packages.
4. Analyze data sets using R – programming capabilities.

List of Programs:

1. Download and install R-Programming environment and install basic packages using install packages() command in R.

2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,)

3. Write a program to find list of even numbers from 1 to n using R-Loops.

4. Create a function to print squares of numbers in sequence.

5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.

6. Implement different String Manipulation functions in R.

7. Implement different data structures in R (Vectors, Lists, Data Frames)

8. Write a program to read a csv file and analyze the data in the file in R

9. Create pie chart and bar chart using R.

10. Create a data set and do statistical analysis on the data using R

Text Books:

1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, 2 nd Edition, Pearson Education, 2018.
2. S. R. Mani Sekhar and T. V. Suresh Kumar, Programming with R,1 st Edition,, CENGAGE, 2017.

Reference Books:

1. Introduction to R Programming. by Hicham and Mohamed Ibnalkad

CO-PO &PSO Mapping:

CO-PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO-1	L				H										
CO-2	L				H										
CO-3	L				H										
CO-4	L				H										

B. Tech III Year–I Sem	L	T	P	C
Subject Code: 21PC5CM04	0	0	3	1.5

Machine Learning Lab

Prerequisite:

1. Python Programming
2. Knowledge of statistics

Course Objectives:

1. To implement the machine learning techniques on a given dataset.
2. To use various data preprocessing techniques on the given data.
3. To compare different machine learning techniques.
4. To select suitable model parameters for different machine learning techniques.

Lab Programs:

1. Working with the dataset.
   a) Download any dataset from the repository and import it as an input.
   b) Summarize the imported dataset: no of samples, no of features, target vector using python programming.
   c) Split the dataset into training, testing and validation dataset using Python Programming.
2. Consider any dataset and apply suitable imputation technique to handle the missing data.
   a) Summarize the dataset and also determine the missing values present in the dataset.
   b) Based on the missing values, use a suitable technique to handle the missing data.
   c) Summarize the dataset after the imputation of missing values.
3. Apply Linear Regression on a given dataset and comment on its efficiency and performance.
   a) Implement linear regression using Sklearn library.
   b) Split the obtained dataset into training and testing: ratio of 80-20, 70-30.
   c) Evaluate the model using metrics: Mean Squared Error, Absolute Error and Root Mean Squared Error.
4. Apply Linear Regression to the given dataset.
   a) Evaluate the model performance after L1 Regularization.
   b) Evaluate the model performance after L2 Regularization.

5. Apply Logistic Regression on the given dataset and perform the model evaluation using confusion matrix.
    a) Download the dataset from the repository and import it as input.
    b) Build Logistic Regression Model and train the dataset.
    c) Evaluate the model performance using AUC-ROC curve, Confusion Matrix: Accuracy, Precision, Recall, F score.
6. Apply Decision tree (ID3) technique to the given data set for classification.
    a) Build the decision tree for the training dataset.
    b) Use the different hyperparameters to improve the model.
    c) Evaluate the model performance on the test dataset.
7. Use Support Vector Machine to perform the classification and regression on a dataset.
    a) Import the dataset and perform the classification and regression using SVM.
    b) Evaluate the model's performance on testing dataset and validation dataset.
    c) Use Sklearn's Grid Search CV method to find the best-fit Model.
8. Apply K-Means Clustering on the collected dataset.
    a) Implement K-Means clustering using sklearn.
    b) Check for the best k-value.
9. Use K-Nearest Neighbor technique on a given dataset and analyze the performance by changing the value of K.
    a) Implement the KNN algorithm.
    b) Apply KNN model to the dataset and perform testing on unseen dataset.
    c) Change the value of K in KNN and analyze the model's performance.
10. Use the different classification algorithms on the given dataset and perform the comparison.
    a) Compare different classification techniques.
    b) Justify which classification technique is better.

Text Books:

1. Python: Deeper Insights into Machine Learning by David Julian, John Hearty, and Sebastian Raschka, 2016.
2. Machine Learning with Python, Coding Mark, Charlie Creative Lab, 2020.

Reference Text Books:

1 U Dinesh Kumar Manaranjan Pradhan, Machine Learning Using Python, Wiley India Pvt. Ltd, 2019.

2 Mark Fenner, Machine Learning with Python for Everyone, Addison-Wesley Professional, 2019.

Web Resources & E-Books:

1. https://machinelearningmastery.com/
2. https://www.kdnuggets.com/

MOOC's Courses:

1. "Introduction to Machine Learning", NPTEL
2. Machine Learning for Engineering and Science applications: NPTEL

Course Outcomes:

Upon completing this course, the student will be able to

1. Summarize the data.
2. Employ the different data preprocessing operations on the given dataset.
3. Demonstrate the Regression and Classification technique on the given data.
4. Use K-means clustering algorithm to handle the real-world problem.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low															
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**			**3**				**1**	**1**			**2**		**2**
CO2	**3**	**2**			**3**				**1**	**1**			**2**		**2**
CO3	**3**	**2**			**3**				**1**	**1**			**3**		**2**
CO4	**3**	**2**			**3**				**1**	**1**			**3**		**2**

HR 21

B.Tech III Year – VI Sem	L	T	P	C
Subject Code: 21PC6CS21	0	0	2	1

CLOUD COMPUTING LAB

Course Objective:

1. To develop web applications in cloud.
2. To learn the design and development process involved in creating a cloud based application.
3. To learn to implement and use parallel programming using Hadoop.

Course Outcomes:

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

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Manipulate large data sets in a parallel environment.

List of Programs:

1. Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

Text Books:

1. Cloud Computing: Concepts, Technology & Architecture Written by: Thomas Erl, Ricardo Puttini, Zaigham Mahmood
2. Cloud Computing: A Hands-On Approach Written by: Arshdeep Bahga, and Vijay Madisetti Architecting the Cloud: Design Decisions for Cloud Computing Service Models Written by: Michael J. Kavis

Reference Books:

1. Cloud Computing: Theory and Practice Written by: Dan Marinescu

CO-PO &PSO Mapping:

CO-PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO-1	1				3										
CO-2	1				3										
CO-3	1				3										
CO-4	1				3										

	L	T	P	C
Subject Code: 21MC6HS04	**2**	**0**	**0**	**0**

QUANITATIVE APTITUDE
(Common to CSE/EEE/ECE/CSM/CSD/CSC/CSO/ME)

Course Overview

This course provides the basic skills required in solving the problems of Aptitude required by various companies for Campus Recruitment and competitive tests. The contents of course include solving problems on different concepts such as Permutations and Combinations, Averages, Percentages and Logarithms etc.

Course Pre/co-requisites

No prior knowledge is required.

Course Objectives:

1. To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.
2. To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
3. To critically evaluate numerous possibilities related to puzzles.

Course Outcomes (COs)

After the completion of the course, the student will be able to:

1. Apply the concepts of ratios, proportions and percentages to solve problems.
2. Solve problems on Logarithms, permutations, combinations, clocks, and calendars.
3. Able to recall and use the concepts to solve problems numerical estimation with respect to company specific and competitive tests
4. Interpret data using graphs and charts.

Module I:

Arithmetic ability:-Algebraic operations- BODMAS – Fractions – Number system - Divisibility rules LCM&GCD (HCF), Simplification

Ratio and Proportion: Ratio, Proportion, Variations, Problems on Ages

Module II:

Percentages, Simple Interest (SI) and Compound Interest (CI): Fundamentals of Percentage, Percentage change, SI and CI, Relation between SI and CI.

Profit and Loss, Partnerships: Basic terminology in profit and loss, Types of partnership, Problems related to partnership

Module III:

Time and Work, Pipe and Cistern, Speed, Time and Distance, Problems on trains & boats, Calendar problems, Clock problems. Average, Mixtures and Alligation: Averages, Weighted average, Difference between mixture and alligation, Problems on Mixtures and alligation

Module IV:
Data Interpretation: Introduction, Tabulation, Bar Graph, Pie Charts, Line Graphs, Combined Graphs, Geometry: Lines and Angles, Triangle, Trigonometry, Circle, Height and Distance, Quadrilateral and Polygon

Module V:
Permutations and Combinations: Fundamentals counting principle, Definition of Permutation, Seating arrangement, Problems related to alphabets, Rank of the word, Problems related to numbers, Circular permutation, Combination.Logarithms: Fundamental formulae of logarithms and problems, finding number of terms on expanding a given number.

Text Book:
1. Quantitative Aptitude for competitive examinations, .R.S Aggarwal,S.Chand,2017.

Reference Books
1. Quantitative Aptitude for competitive examinations, AbhijitGuha, 6th Edition, McGraw Hill Education.
2. Dinesh Khattar, The Pearson guide to Quantitative Aptitude for Competitive Examinations, 3rd Edition, Pearson Education.

Webresources:
1. www.m4maths.com
2. www.Indiabix.com

CO-PO/PSO Mapping Chart **(3/2/1 indicates strength of correlation)** **3 – High; 2 – Medium; 1 - Low**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1						2					2	3		
CO2						2					2	3		
CO3						2					2	3		
CO4						2					2	3		

B.Tech III year-VI Sem	L	T	P	C
Subject Code: 21PE6CS21	**3**	**0**	**0**	**3**

Software Process and Project Management

Course Objective

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development
3. To Understand familiarize Project Management framework & Tools and software economics

Course Outcomes:

At the end of the course student will be able to

1. Understand of software life cycle, driven process and methodologies, including classic and agile methodologies and to successfully implement.
2. Understand the knowledge of a managerial and technical standpoint, examine key workflows of major and minor milestones, artifacts, and metrics.
3. Analyze the project organizations, organizational evolution, and process automation are examples of project organizations.
4. Apply the Software Project Management Practices and Generation Software Economics, and Modern Process Transitions are all examples of modern project profiles.

Module – I

Software Process Maturity Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

Module – II

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

Module – III

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown structures, Planning guidelines,cost and schedule estimating process, iteration planning process, Pragmatic planning.

Module – IV

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management

indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

Module – V

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education .
2. Software Project Management, Walker Royce, Pearson Education

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	M	L										L			
CO2	H	H			M							M			
CO3	M	M													
CO4	M	L			L							L			

HR 21

B.Tech III year- VI sem	**L**	**T**	**P**	**C**
Subject Code: 21PE6CS22	**3**	**0**	**0**	**3**

Mobile Application Development

Course Objective

1. Facilitate students to understand android SDK
2. Help students to gain a basic understanding of Android application development
3. Inculcate working knowledge of Android Studio development tool

Course Outcomes

At the end of the course student will be able to

1. Identify various concepts of mobile programming that make it unique from programming for other platforms
2. Evaluate mobile applications on their design pros and cons.
3. Develop mobile applications for the Android operating system that use basic and advanced phone features.
4. Demonstrate the deployment of applications to the Android marketplace for distribution.

Module-I

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

Module -II

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions

Module -III

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Module -IV

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

Module V

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Android Application Development All in one for Dummies by Barry Burd, Edition: I

REFERENCE BOOKS:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	1		3												
CO2	1		3												
CO3	1		2												
CO4	1		3												

B.Tech. III Year VI Sem.	**L**	**T**	**P**	**C**
Subject Code: 21PE6CS23	3	0	0	3

SERVICE ORIENTED ARCHITECTURE

Pre-Requisites:

1. Strong programming skills with Java experience.
2. Object-Oriented Programming and Design skills.
3. Moderate understanding of computer architecture and of operating systems.

Course Objectives: Students undergoing this course are expected to

1. Provide fundamental concepts of Service Oriented Architecture..
2. Gain knowledge about SOAP, WSDL and XML to create web services.
3. Gain knowledge about design and development of Web services.
4. Can describe the principles, characteristics and objectives of service-oriented computing

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

1. Analyze basic principles of Service Oriented Architecture and apply these concepts to develop a sample application
2. Identify and select the appropriate framework components in the creation of web service solutions and Design, develop and test Web services.
3. Demonstrate an understanding of the service composition, manage a modern medium scale software development project using SOA principles.
4. Demonstrate an understanding of the principles linking business processes, process oriented architectures and service oriented architectures, Web Services Description Language (WSDL), Simple Object Access Protocol (SOAP).

Module-I

SOA and Web Services Fundamentals: Introducing SOA - Fundamental SOA, Common characteristics of Contemporary SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA. Evolution of SOA- an SOA timeline, the continuing evolution of SOA, The roots of SOA. Web Services and primitive SOA- the Web Services frame work, Services, Service descriptions, messaging.

Module-II

Web Services Extensions: Web Services and Contemporary SOA - Message exchange patterns, Service Activity, Coordination, Atomic transactions, Business Activities, Orchestration, Choreography, Addressing, Reliable messaging, Correlation, Policies, Metadata exchange and Security.

Module-III

SOA and Services – Orientation: Principles of Service Orientation - Anatomy of SOA, Common Principles of Service-Orientation, interrelation between Principles of ServiceOrientation, Service-Orientation and Object Orientation, Native Web Services support for Principles of Service-Orientation. Service Layers - Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

Module-IV

Building SOA (Planning and Analysis): SOA Delivery Strategies - SOA delivery lifecycle phases, the top-down strategy, The bottom-up strategy, The agile strategy. Service Oriented Analysis-- Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Service, Service Modeling, Service Modeling guidelines, Classifying Service model logic, Contrasting Service modeling approaches.

Module-V

Building SOA (Technology and Design): Service Oriented Design-Introduction to ServiceOriented design, WSDL related XML schema language basics, WSDL language basics, SOAP language basics, Service interface design tools. Service Design- Service Design overview, Entity-centric business Service Design, Application Service Design, Task-centric business Service Design, Service Design guidelines. SOA Platforms--SOA Platform basics, SOA support in J2EE and .NET, Integration Considerations.

TEXT BOOKS

1. Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education.
2. Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education.

REFERENCES BOOKS

1. The Definitive guide to SOA, Jeff Devies& others, A press, Dreamtech.
2. Java SOA Cook book, E.H Hewitt, SPD.
3. SOA in practice, N. M. Josuttis, SPD.
4. SOA for Enterprise Applications, Shankar. K, Wiley India Edition.

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
CO1	1		3												
CO2	1		3												
CO3	1		2												
CO4	1		3												

HR 21

B.Tech. III Year VI Sem.	**L**	**T**	**P**	**C**
Subject Code: 21PE6CS24	3	0	0	3

Adhoc Sensor Networks

Course Pre-requisite
Computer Networks

Course Objectives

1. To facilitate the students to understand need for Infrastructure less networks and their importance in the future directions for wireless communications
2. To provide a broad coverage of challenges and security issues related to the design and management of wireless sensor networks.

Course Outcomes
On successful completion of the course, students will be able to:

1. Describe the design problems with sensor and ad hoc networks.
2. Examine and evaluate the effectiveness of various routing protocols.
3. Assess the quality of service (QoS) problems in ad hoc networks, and compare various Transport layer and secure protocols.
4. Analyze the energy efficiency of several wireless sensor network protocols.

Module – I
INTRODUCTION & MAC PROTOCOLS Ad Hoc Wireless Networks Issues - MAC protocols for ad hoc Wireless Networks: Issues - Classification of MAC Protocols - Contention Based protocols - Contention-Based Protocols with Reservation Mechanisms - Contention-Based MAC Protocols with scheduling Mechanisms.

Module – II
ROUTING PROTOCOLS Classifications - Table Driven - On-Demand - Hybrid and Hierarchical Routing Protocols - Routing Protocols with efficient Flooding mechanism - Power aware Routing Protocols - Operation of Multicast Routing Protocols - Energy efficient Multicasting and Multicasting with QoS guarantees.

Module – III
TRANSPORT LAYER AND SECURITY PROTOCOLS Introduction - Issues - Design Goals - Classification of Transport Layer Solutions - TCP over Ad Hoc Wireless Networks - Other Transport Layer Protocols - Security in Ad Hoc Wireless Networks - Secure Routing in Ad Hoc wireless Networks.

Module – IV
QOS Introduction - Issues and Challenges - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions - QoS Frameworks for Ad Hoc Wireless Networks

Module – V

ENERGY MANAGEMENT Introduction - Need for Energy Management - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes - System Power Management Schemes

TEXT BOOK:

1. Siva Ram Murthy C, Manoj B.S., Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall.
2. Chai-Keong Toh, Ad Hoc Mobile Wireless Networks, PHI, 2002.

REFERENCE BOOKS:

1. Charles Perkins, Ad Hoc Networking, Addison Wesley, 2001.
2. Mohammed Liyas, Handbook of Ad Hoc Wireless Networks, CRC Press, 2003.

CO-PO/PSO Mapping:

Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1													
CO2	1	1		1		2	3							
CO3	1	1		1		2	3							
CO4	1	1		1		2	3							

HR 21

	L	T	P	C
B.Tech III Year – VI Sem				
Subject Code: 21OE6CS09	**3**	**0**	**0**	**3**

Object Oriented Programming Using Java

Prerequisites: Programming in C

Course Objectives:
1. Understand fundamental concepts and object oriented concepts in Java
2. Implementing the concept of packages and exception handling in Java.
3. Implement the concept of multithreading and inter process communication in Java.
4. Develop GUI applications.

Course Outcomes:
1. Solve the given problem using OOPS technique.
2. Explain the concept of Package and Exception Handling.
3. Implement Multi threading and Inter process communication in java
4. Develop GUI based applications using applet, AWT , Event handling and swing.

Module - I
History and Evolution of java: Java's lineage, Java and internet, Byte code, Java buzzwords, Evolution of java.
Object oriented programming - data, types, variables, Arrays,operators, control statements, type conversion and casting, Introduction to classes, objects, methods, constructor, this and static keywords , garbage collection, overloading methods, parameter passing, access control, command line arguments,exploring String class
Inheritance: member access and inheritance, Multilevel Inheritance, super and final keywords, method overriding, dynamic method dispatch, abstract classes and methods.

Module- II
Packages and Interfaces: Defining, Creating and Accessing a Package, understanding CLASSPATH, importing packages, Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.
Exception handling: Concepts of exception handling and its benefits, usage of try, catch, throw, throws and finally, built in exceptions, creating own exceptions.

Module -III
Multithreading: Differences between multi-threading and multi programming, thread life cycle, creating threads using thread class and Run able interface, thread priorities, synchronization , inter thread communication.
I/O Streams: Stream classes, Byte and character streams, File class, reading and writing files,reading and writing from console, serialization.

Module -IV
Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, creating applets, passing parameters to applets.

AWT: class hierarchy, user interface components- labels, buttons, scrollbars, text components, checkbox, checkbox groups, choices, lists panels – scroll pane, dialogs, menu bar, Layout Managers- Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

Module- V

Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- J Applet, J Frame and J Component, Image Icon, J Label, J Text field, J Button, J Checkbox, J List, J Radio button, J Combo Box, J Tabbed Pane, J Scroll Pane.
The Collections Framework (java.util)- Collections overview, Collection Interfaces, Generics The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array De-queue. Accessing a Collection via an iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hash table, Properties, Stack, Vector More Utility classes, String Tokenizer, Date, Calendar, Random, Scanner

Text Books:
1. The Complete Reference JAVA 2, Author: Herbert Schield , ninth edition Publishers: TataMec-Hill
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, PearsonEducation.

Reference Books:
1. An Introduction to JAVA Programming (Chapter 6) Author: Y.Daniel Liang , Publishers:Tata Mec-Hill.
2. Programming with JAVA (2nd Edition) Author: E. Balagurusamy Publishers: Tata Mec-Hill.
3. Internet and Java Programming, R.Krishna Murthu and S.Prabhu, New Age Publishers

CO-PO/PSO Mapping:

Course Outcomes(COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***		
	PO 1	**PO 2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**
CO1	**2**														**1**
CO2	**2**														**1**
CO3	**2**														**1**
CO4	**3**	**1**	**1**	**1**	**3**										**3**

B. Tech III Year – VI Sem	**L**	**T**	**P**	**C**
Subject Code:21OE6EC02	3	0	0	3

Fundamentals of Digital Electronics

(Open Elective)

Prerequisite: Basic knowledge on computers

Course Objectives:

This course provides in-depth knowledge of Digital logic techniques of digital circuits, which is the basis for design of any digital circuit.

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To impart the concepts of combinational, sequential logic circuits.
3. To learn the concepts of sequential circuits, enabling them to analyse sequential systems in terms of state machines.

Course Outcomes: Upon completion of the course, the student should be able to

1. Explain the numerical information in different forms and Boolean Algebra theorems
2. Solve Boolean expressions using Boolean Theorems-maps
3. Design and analyze combinational and sequential circuits
4. Implement logic families and realization of logic gates

Module I: Number Systems & Boolean Algebra:

Number Systems: Number base conversions: Binary, Octal, Decimal, Hexa-decimal, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.
Boolean algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates. The Karnaugh Map Method, don't care map entries, Prime and Essential Implicants.

Module II: Combinational Logic Circuits:
Basic Arithmetic Circuits- Half adder, Full adder, Half subtractor, Full subtractor, 4-bit parallel adder/subtractor. BCD Adder
Combinational logic circuits: 2-bit comparator, Multiplexers, Implementation of Boolean functions using Multiplexers, Decoders, Implementation of Boolean functions using Decoder, Demultiplexers, Encoder, Priority Encoder, Code converters.

Module III: Sequential Circuits Fundamentals:
Introduction to Sequential Circuits: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops,
Flip flop Conversions: Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Module IV: Sequential Logic Applications:

Sequential Logic Applications: Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Universal shift register, Applications of Shift Registers

Design of Counters: Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Module V: Design and Analysis of Sequential Machines: Introduction to Finite State Machines- Mealy Machine and Moore Machine, State diagram, State Assignment and minimization, Design Procedure and Realization using Flip-Flops.

Introduction to CMOS Technology: CMOS technology, Working states of CMOS, Types of CMOS, AND, OR and NOT Gates using CMOS.

Text Books:

1. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, Tata McGraw-Hill, 2007.

Reference Books:

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013

Web Resources:

1. http://blog.digitalelectronics.co.in/
2. www.nesoacademy.org/electronics-engineering/digital-electronics/digital
3. https://www.slideshare.net/JournalsPubwwwjourna/international-journal-of-digital-electronics-vol-2-issue-2
2. https://lecturenotes.in/subject/203/switching-theory-and-logic-design-stld
3. http://www.infocobuild.com/education/audio-video-courses/electronics/DigitalCircuitsSystems
4. https://nptel.ac.in/courses/117105080/

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	**3**	**3**	**3**	-	-	-	-	-	-	-	-	-	-	-
CO4	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-

B. Tech III Year–VI Sem	**L**	**T**	**P**	**C**
Subject Code: 21OE6ME02	**3**	**0**	**0**	**3**

TOTAL QUALITY MANAGEMENT & SIX SIGMA APPLICATIONS

Pre-requisite: Management Science &Production Technology, Machine Tools

Course Objectives:

1. To understand the quality concepts and tools
2. To discuss about techniques relating to total quality management.
3. To understand the Principles and Practices of TQM
4. To understand the implementation of ISO 9000 AND Six sigma in a system

Module I

Introduction: The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems.
Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control.

Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

Module II

Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships.

Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure.

Module III

Organizing for TQM**:** The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools

Seven Tools of TQM: Stratification, check sheet, Scatter diagram, lshikawa diagram, pane to diagram, Kepner& Tregoe Methodology.

Module IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

Use of Quality Cost information, Accounting Systems and Quality Management.

Module V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third party audit.

Documentation ISO9000 and services, the cost of certification implementing the system.

Six sigma and applications of sixsigma.

Text Books:

1. Total Quality Management / Joel E. Ross/Taylor and Franscis Limited.
2. Total Quality Management/P. N. Mukherjee/PHI
3. "Lean Six Sigma: Combining Six Sigma with Lean Speed" by Michael L. George, David Rowlands, and Bill Kastle, published by McGraw-Hill Education
4.

Reference Books:

1. Beyond TQM / Robert L.Flood
2. Statistical Quality Control / E.L. Grant.
3. Total Quality Management:A Practical Approach/H. Lal
4.

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

1) Understand the fundamental principles of Total Quality Management.
2) Analyze the different quality approaches
3) Evaluate the different tools in Total Quality Management
4) Describe the importance and implementing of ISO9000 in the system and Six sigma

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2						1	2	2	2	2	2	
CO2	3	2	2					1	2	2	2	2	2	
CO3	3	2	2					1	2	2	2	2	2	
CO4	3	2	2					1	2	2	2	2	2	

** If more PSOs are there in a particular branch, required no of columns can be added.*

B.Tech III Year – VI Sem

Subject Code: 21OE6EE02

L	T	P	C
3	0	0	3

FUNDAMENTALS OF INDUSTRIAL ELECTRONICS
OPEN ELECTIVE II
ALL BRANCHES EXCEPT EEE

Pre-requisite: Basic Electrical and Electronics Engineering or Analog and Digital Circuits

Course Objectives:

1) To Design/develop suitable power converter for efficient control or conversion of power in drive applications.
2) To Design / develop suitable power converter for efficient transmission and utilization of power in Industrial applications.

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

1) CO1 – Understand the differences between signal level and power level devices.
2) CO2 – Analyze controlled rectifier circuits.
3) CO3 – Analyze the operation of DC-DC choppers.
4) CO4 – Analyze the operation of voltage source inverters.

Module I:Power Switching Devices and Protection Circuits

Power Switching Devices:

Types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, Power MOSFET, Power IGBT. SCR VI Characteristics, Switching characteristics.

Thyristor voltage and current ratings and protection using Snubber Circuit.

Module II:Triggering and Commutation

Triggering Circuits: R, RC and UJT triggering circuits

Commutation Circuits: Types of Commutation circuits (Class A, B,C,D,E,F)

Module III:Rectifiers

Single Phase Rectifier: Principles of single-phase half-controlled converter with R, RL and RLE load. Principles of single-phase fully-controlled converter with RLE load. Problems on Single phase Rectifiers.

Three Phase Rectifier: Principles of three-phase fully-controlled converter operation with RLE load. Problems on Three phase Rectifiers.

Module IV:Choppers, AC Voltage Converters and Cycloconverters

DC-DC Converters (Choppers)
Introduction of Choppers, Control strategies in Choppers, Time Ratio Control, Step down and Step Up Choppers with problems.

AC Voltage Converters and Cycloconverters
Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single-phase voltage controllers for R, R-L loads.

Cyclo-converter- Principle of operation of single phase cyclo-converters: Mid Tap and Bridge type, relevant waveforms.

Module V:Inverters and Applications

DC-AC Converters (Inverters)
Introduction, principle of operation, performance parameters, single phase half and full bridge inverters with R, RL loads. Problems on single phase inverters.
Applications: UPS, SMPS, Battery Charger.

TEXT BOOKS:

1. Dr.P.S.Bimbhra, "Power Electronics", Khanna Publishers, New Delhi.
2. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.

Reference Books:

1.N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
2. MD Singh and KB Kanchandhani, " Power Electronics", Tata Mc Graw Hill Publishing Company Limited, New Delhi.

Web Resources: www.mathworks .com

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1											1	2
CO2	2	2	3		2								2	2
CO3	1	2	3		2								2	2
CO4	1	2	3		2								2	2

B. Tech III Year–VI Sem	L	T	P	C
Subject Code: 21OE6CM06	3	0	0	3

Expert Systems

Prerequisite:

1. Artificial Intelligence

Course Objectives:

1. Understand Expert Systems and their applications.
2. Illustrate Fuzzy Logic Concepts with an example.
3. Understand the Genetic Algorithm and its applications.
4. Explain the components of Expert System building and its tools.

Module-I

Overview of Expert Systems:

Introduction to Expert System: Characteristics of Expert System, Advantages and Disadvantages of Expert Systems, Different types of Expert Systems: Rule-based Expert Systems, Knowledge-based Expert Systems, Model-based, Case-based, and Hybrid Expert Systems, Working Architecture of Expert Systems, Components of Expert Systems, Applications of Expert Systems, Techniques for extracting the knowledge from Domain Experts.

Module – II

Knowledge Representation:

Representations and Mapping: General goal of Knowledge Representation, Approaches to Knowledge Representation: Simple Relational Knowledge, Inheritable Knowledge, Inferential Knowledge, Procedural Knowledge or Operational Knowledge, Classification of Knowledge Representation Systems: Logics (Predicate Logic, Description Logic, Nonmonotonic Logic); Procedural Schemas (Production rules), Structural Schemas (Weak slot-and-filler structures, Strong slot-and-filler structures), Knowledge-Based Systems.

Module - III

Fuzzy Logic:

Introduction to Fuzzy Logic, Fuzzy set theory, Fuzzy sets: Operation on Fuzzy sets, Scalar cardinality, fuzzy cardinality, union and intersection, complement, equilibrium points, aggregation, projection, composition, decomposition, cylindrical extension, fuzzy relation, Fuzzy membership functions, Fuzzy Expert Systems, Fuzzy Decision Making, Applications of Fuzzy System, De-fuzzification.

Module – IV

Genetic Algorithms:

Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem; Genetic algorithms operators-methods of selection, crossover and mutation, Simple GA(SGA), Different types of GA, generation gap, steady state GA, Applications of GA.

Module – V

Development of Expert System:

Nature of Expert System tools, Types of tools available for expert system building, Stages in the development of expert system tools. Building an Expert system, Stages of Expert system development, Tasks in building the Expert System.

Text Books:

1. Principles of Expert Systems by Peter, J.F. Lucas & Linda C. van der Gaag, 2014.
2. Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering by Nikola K. Kasabov, 1998.
3. Introduction to Genetic Algorithms by S. N. Sivanandam and S. N. Deepa 2008.

Reference Text Books:

1. David Goldberg. V Genetic Algorithms in Search, Optimization, and Machine Learning, Pearson Education, 2009.
2. Zimmermann. H.J, "Fuzzy set theory-and its Applications"- Springer international edition, 2011.

Web Resources & E-Books:

1. https://www.geeksforgeeks.org/
2. https://www.sciencedirect.com/journal/expert-systems-with-applications/

MOOC's Courses:

1. NPTEL Course on "Introduction to Fuzzy Set Theory, Arithmetic and Logic".
2. NPTEL Course on "Fundamentals Of Artificial Intelligence"

Course Outcomes:

Upon completing this course, the student will be able to

1. Describe the Expert Systems and their applications.
2. Use Knowledge Representation to solve the problem.
3. Illustrate the Fuzzy Logic and Genetic Algorithms with an example.
4. Discuss the Expert System building and its tools.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – High; 2 – Medium; 1 - Low

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2	3	2													2
CO3	3	2													2
CO4	2														

B.Tech III – VI Sem	L	T	P	C
Subject Code: 21OE6CD02	3	0	0	3

Data Mining and Data Analytics

Course Objective

1. Understand the concepts of Data Mining
2. Familiarize with association rule mining
3. Familiarize various classification algorithms
4. Understand the concepts of Cluster analysis
5. Implement the Data mining concepts with various domains

Course Outcomes:

1. Discuss varies Data Mining Principles.
2. Analyze the impact of data analytics for business decisions and strategy.
3. Apply the Association, Clustering rules for mining the data.
4. Design various classification techniques.

Module I

Introduction to Data warehouse, Difference between operational database systems and data warehouses. Data warehouse Characteristics, Data warehouse Architecture.
Introduction: What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of Similarity and Dissimilarity – Basics.

Module II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables. Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

Module III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.
Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

Module IV

Association Rule Mining & Classification: Mining Frequent Patterns–Associations and correlations – Mining Methods–Mining Various kinds of Association Rules– Correlation Analysis.
Classification: Classification and Prediction – Basic concepts–Decision tree induction– Bayesian classification, Lazy learner.

Module V

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis– Categorization of Major Clustering Methods– Partitioning Methods.
Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Techniques – ArunKPujari

REFERENCE BOOKS

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira

CO-PO &PSO Mapping:

Course Name - Course Outcomes / Program Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	M												M		
CO2	M	H											H		
CO3	H		M											M	
CO4	M													H	

B.Tech III Year – VI Sem	L	T	P	C
Subject Code: 21OE6CO05	3	0	0	3

SENSORS AND DEVICES

Prerequisite: IoT, ADE

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 the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

- Understand the IoT value chain structure (device, data cloud), application areas and technologies involved.
- Analyse IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
- Market forecast for IoT devices with a focus on sensors
- Explore Internet of Things with the help of preparing projects designed for Raspberry Pi

MODULE-I:

Introduction to Internet of Things- Definition and Characteristics of IoT, Sensors, Physical Design of IoT – IoT Protocols, IoT communication models, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems

Types: Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

MODULE-II:

IoT - Software defined networks, network function virtualization, difference between SDN and NFV for IoT

M2M Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

MODULE-III:

IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi

Programming – Interfaces (serial, SPI, I2C), Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

MODULE-IV:

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors

MODULE-V:

IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT

Course project on IoT Application

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn W allace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 - Low														
Program Outcomes (POs)													**Program Specific Outcomes***	
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO-1	3												1	
CO-2	3	1											2	
CO-3	3	1											2	
CO-4	3	1											1	

B. Tech III Year–VI Sem	L	T	P	C
Subject Code: 21OE6CC02	3	0	0	3

COMPUTER HARDWARE AND SYSTEM ESSENTIALS

Prerequisites: Nil

Course Objectives:

• Computer hardware essentials is designed to introduce students to a basic understanding of the different types of computing devices, computer components (CPU, memory, power supplies, etc.), and operating systems.
• It also introduces building a fully functional Linux and Installing applications.
• Understand the basic of circuit building.

Course Outcomes:

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

CO1: Understanding the working principles of different computing devices (desktop computers, laptops, etc.).
CO2: Understand connection interfaces between peripheral devices, storage devices, displays.
CO3: Understand the procedure for Installation of OS - Linux and supporting, upgrading and new applications.
CO4: Understand the concepts of number system and circuit building.

Module 1:

Components of Computer System: Computer Memory: Secondary storage device types, Basic Principles of operation: Sequential Access device, Direct Access device -Magnetic disks,Optical disks, memory storage devices, Ports: Serial and Parallel Ports, Specialized Expansion Ports: SCSI, USB, MIDI, Expansion Slots and Boards, PC Cards, Plug and Play, HDMI ports, networking ports. System software: bootstrap module, configuration.

Module 2:

OS loading: typical Linux virtual machine. Installing a Linux virtual machine. Using package manager to install/update software. Understanding disk partitions and obtaining partition information using system tools. Obtaining essential system resource utilization and information using system tools and proc file system: disk utilization, memory utilization, process information, CPU utilization.

Module 3:

Operating System: Introduction, Objectives, classification and functions of Operating System, Basics of popular operating system (LINUX, WINDOWS). Kernel prompt, Shell commands.

The User Interface: Task Bar, Icons, Menu, Running an Application. Operating System Simple Setting: Changing System Date and Time, Changing Display Properties, To Add or

Remove a Windows Component, Changing Mouse Properties, Adding and removing Printers. File and Directory Management: Creating and renaming of files and directories, Common utilities. Interrupts statements in various OS and its uses.

Module 4:

Number systems - Signed and Unsigned numbers arithmetic, Binary, Decimal, Octal, Hex, BCD etc. Introduction to logic circuits: Variables and functions, Inversion- Truth tables – Logic Gates and Networks - Boolean algebra - Synthesis using gates - Design examples – Optimized implementation of logic functions: Karnaugh map - Strategy for minimization – Minimization of product of sums forms - Incompletely specified functions - Multiple output circuits – Tabular method for minimization.

Module 5:

Combinational circuit building blocks: Multiplexers - Decoders - Encoders, Sequential circuit building blocks: Flipflops-SR, JK, D and T- Registers - Counters
- A simple sequential circuit design example from state diagram.

Textbook:

1. Brookshear JG. Computer science: an overview. Eleventh Edition, Addison-Wesley Publishing Company; 2011.
2. Givone DD. Digital Principles and Design.Tata McGraw Hill Publishing Company Limited; 2003.
3. Mano MM, Ciletti MD. Digital Design with Introduction to the Verilog HDL.Fifth Edition, Pearson Education; 2015.

References:

1. Norton, Peter. Introduction to computers. Sixth edition, Tata McGraw-HILL; 2008.
2. Wakerly JF. Digital Design Principles and Practices. Fourth Edition, Pearson Education; 2008.
3. Sinha, Pradeep K., and Priti Sinha. Computer fundamentals. BPB publications; 2010.

CO-PO/PSO Mapping:

CO-PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO2	PSO3
CO-1			2				3								
CO-2				2											
CO-3					2	2									
CO-4		1						3							