Gurugram University Gurugram

Curriculum for UG Degree Course in

Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology)

Gurugram University, Gurugram

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM

S. No.	Category	Breakup of Credits (Total 160)
1	Humanities and Social Sciences, including Management courses	11
2	Basic Science courses	19
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	30.5
4	Professional core courses	62
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	16
8	Mandatory Courses [Environmental Sciences, Induction training, Constitution of India, Essence of Indian Traditional Knowledge]	Non-credit
	Total	**162.5**

SEMESTER-WISE SUMMARY OF THE PROGRAM

S. No.	Semester	No. of Contact Hours	Credits	Marks
1.	I	25	19.5	900
2.	II	25	22	900
3.	III	28	22	1000
4.	IV	26	22	1000
5.	V	25	21	900
6.	VI	24	21	800
7.	VII	27	21	900
8.	VIII	22	14	500
	Total		**162.5**	6900

COURSE CODE AND DEFINITIONS

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences, including Management courses
PCC	Professional core courses
PEC	Professional Elective courses
OEC	Open Elective courses
LC	Laboratory course
MC	Mandatory courses
TRAINING	Training
PROJECT	Project

CREDIT DISTRIBUTION IN THE FIRST YEAR OF THE UNDERGRADUATE ENGINEERING PROGRAM

Bachelor of Technology (SCHEME A1)   Semester-1

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit
			L	T	P		
1.	HSE-101	Communication Skills in English	2	0	0	2	2
2.	BSM-101	Mathematics-I	3	1	0	4	4
3.	BSP-101 OR EEE-101	Physics OR Basic of Electrical and Electronics Engineering	3 3	1 0	0 0	4 OR 3	4 OR 3
4.	CSE-101	Programing for problem solving using C	3	0	0	3	3
5.	ENV-101	Basics of Environmental Science	2	0	0	2	2
6.	HSE-101P	Communication Skills in English (P).	0	0	2	2	1
7.	BSP-101P OR EEE-101P	Physics (P) OR Basic of Electrical and Electronics Engineering (P)	0	0	2	2	1
8.	CSE-101P	Programing for problem solving using C (P)	0	0	2	2	1
9.	CSE-103P OR MEE-102P	Engineering Graphics (Web Design) OR Workshop Practices (P)	1 1	0 0	2 3	3 OR 4	2 OR 2.5
10.	AUS-101	Sports (Audit Course) Compulsory	0	0	2	2*	0
						24+2*	20/19.5

Bachelor of Technology (SCHEME A1)   Semester-2

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit
			L	T	P		
1.	BSM-102	Mathematics-II	3	1	0	4	4
2.	HSV-102	Human Value & Soft Skills	2	0	2	4	3
3.	EEE-101 OR BSP-101	Basic of Electrical and Electronics Engineering OR Physics	3 3	0 1	0 0	3 OR 4	3 OR 4
4.	CSE-102	Data Structure Using C	3	0	0	3	3
5.	CSE-104	Object Oriented Concepts and Python Programming	3	0	0	3	3
6.	EEE-101P OR BSP-101P	Basic of Electrical and Electronics Engineering (P) OR Physics (P).	0	0	2	2	1
7.	CSE-102P	Data Structure Using C (P)	0	0	2	2	1
8.	CSE-104P	Object Oriented Concepts and Python Programming (P)	0	0	2	2	1
9.	MEE-102P OR CSE-103P	Workshop Practices (P) OR Engineering Graphics (Web Designing)	1 1	0 0	3 2	4 OR 3	2.5 OR 2
Total						27	21.5/22

HUMANITIES & SOCIAL SCIENCES, INCLUDING MANAGEMENT (HSMC)

S. No.	Code No.	Course Title	Hours Per week			Total Credits	Semester
			L	T	P		
1.		Communication Skills in English	2	0	2	3	I
2.		Basics of Environmental Science	2	0	0	2	I
3.		Human Value & Soft Skills	2	0	2	3	II
4.		Economics for Engineers	3	0	0	0	V
5.		Organizational Behaviour	3	0	0	3	VII
Total Credits						11	

BASIC SCIENCE COURSES (BSC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Mathematics-I	3	1	0	4	I
2.		Mathematics-II	3	1	0	4	II
3.		Physics	3	1	2	5	II
4.		Mathematics-III	3	0	0	3	III
5.		Discrete Mathematics	3	0	0	3	IV
Total Credits						19	

ENGINEERING SCIENCE COURSE (ESC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Basic of Electrical and Electronics Engineering	3	0	2	4	I
2.		Programming for problem-solving using C	3	0	2	4	I
3.		Workshop Practices(P)	1	0	2	2.5	I
4.		Data Structure Using C	3	0	2	4	II
5.		Object-Oriented Concepts and Python Programming	3	0	2	4	II
6.		Engineering Graphics (Web Design)	1	0	2	2	II
7.		Digital Electronics	3	0	2	4	III
8.		MOOC - I (Essential)	3	-	-	3	VIII
9.		MOOC - II (Essential)	3	-	-	3	VIII
					Total Credits	30.5	

PROFESSIONAL CORE COURSES (PCC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Advance Data structures	3	0	2	4	III
2.		Database Management Systems with SQL	3	0	2	4	III
3.		Programming with C++	3	0	2	4	III
4.		Foundations of Blockchain Technology	3	0	0	3	III
5.		Operating System	3	0	2	4	IV
6.		Programming in Java	3	0	2	4	IV
7.		Microprocessor and Microcontroller	3	0	2	4	IV
8.		Introduction to Internet of Things	3	0	2	4	IV
9.		Computer Organization & Architecture	3	0	0	3	IV
10.		Design & Analysis of Algorithms	3	0	2	4	V
11.		Computer Networks	3	0	2	4	V
12.		Cryptocurrency with Ethereum	3	0	0	3	V
13.		Formal Languages & Automata	3	0	0	3	V
14.		Advance Java Programming	3	0	2	4	VI
15.		Cloud computing	3	0	0	3	VI
16.		Compiler Design	3	0	0	3	VI
17.		Neural Networks	3	0	2	4	VII
Total Credits						62	

PROFESSIONAL ELECTIVE COURSES (PEC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Professional Elective Course - I	3	0	0	3	V
2.		Professional Elective Course - II	3	0	0	3	VI
3.		Professional Elective Course - III	3	0	0	3	VI
4.		Professional Elective Course - IV	3	0	0	3	VII
Total Credits						**12**	

OPEN ELECTIVE COURSES (OEC)

S. No.	Code No.	Course Title	Hours Per Week			Total Credits	Semester
			L	T	P		
1.		Open Elective Course – I	3	0	0	3	V
2.		Open Elective Course - II	3	0	0	3	VI
3.		Open Elective Course - III	3	0	0	3	VII
4.		Open Elective Course - IV	3	0	0	3	VII
Total Credits						**12**	

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

S. No.	Code No.	Course Title	Hours per week			Total Credits	Semester
			L	T	P		
1.		Practical Training - I	0	0	2	1	V
2.		Project - I	0	0	4	2	VI
3.		Practical Training - II	0	0	2	1	VII
4.		Project - II	0	0	8	4	VII
5.		Project - III	0	0	16	8	VIII
Total Credits						**16**	

Semester-wise Structure and Curriculum for

UG Course in

Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology)

Gurugram University
Scheme of Studies and Examination
Bachelor of Technology (SCHEME A1)   Semester-1

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit
			L	T	P		
1.	HSE-101	Communication Skills in English	2	0	0	2	2
2.	BSM-101	Mathematics-I	3	1	0	4	4
3.	BSP-101 OR EEE-101	Physics OR Basic of Electrical and Electronics Engineering	3 3	1 0	0 0	4 OR 3	4 OR 3
4.	CSE-101	Programing for problem solving using C	3	0	0	3	3
5.	ENV-101	Basics of Environmental Science	2	0	0	2	2
6.	HSE-101P	Communication Skills in English (P).	0	0	2	2	1
7.	BSP-101P OR EEE-101P	Physics (P) OR Basic of Electrical and Electronics Engineering (P)	0	0	2	2	1
8.	CSE-101P	Programing for problem solving using C (P)	0	0	2	2	1
9.	CSE-103P OR MEE-102P	Engineering Graphics (Web Design) OR Workshop Practices (P)	1 1	0 0	2 3	3 OR 4	2 OR 2.5
10.	AUS-101	Sports (Audit Course) Compulsory	0	0	2	2*	0
						24+2*	20/19.5

Gurugram University
Scheme of Studies and Examination
Bachelor of Technology (SCHEME A1)   Semester-2

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit
			L	T	P		
1.	BSM-102	Mathematics-II	3	1	0	4	4
2.	HSV-102	Human Value & Soft Skills	2	0	2	4	3
3.	EEE-101 OR BSP-101	Basic of Electrical and Electronics Engineering OR Physics	3 / 3	0 / 1	0 / 0	3 OR 4	3 OR 4
4.	CSE-102	Data Structure Using C	3	0	0	3	3
5.	CSE-104	Object Oriented Concepts and Python Programming	3	0	0	3	3
6.	EEE-101P OR BSP-101P	Basic of Electrical and Electronics Engineering (P) OR Physics (P).	0	0	2	2	1
7.	CSE-102P	Data Structure Using C (P)	0	0	2	2	1
8.	CSE-104P	Object Oriented Concepts and Python Programming (P)	0	0	2	2	1
9.	MEE-102P OR CSE-103P	Workshop Practices (P) OR Engineering Graphics (Web Designing)	1 / 1	0 / 0	3 / 2	4 OR 3	2.5 OR 2
Total						27	21.5/22

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - III

S.No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	ESC		Digital Electronics	3	0	0	3	3	30	70		100
2.	PCC		Advanced-Data Structure	3		0	3	3	30	70		100
3.	PCC		Database Management Systems with SQL	3	0	0	3	3	30	70		100
4.	PCC		Programming with C++	3	0	0	3	3	30	70		100
5.	PCC		Foundations of Blockchain Technology	3	0	0	3	3	30	70		100
6.	BSC		Mathematics - III	3	0	0	3	3	30	70		100
7.	LC		Digital Electronics Lab	0	0	2	2	1	50		50	100
8.	LC		Advanced-Data Structure Lab	0	0	2	2	1	50		50	100
9.	LC		Database Management Systems Lab	0	0	2	2	1	50		50	100
10.	LC		Programming with C++ Lab	0	0	2	2	1	50		50	100
11.	MC		Constitution of India*	2	0	0	2	0	30	70		100*
			Total	**20**	**0**	**8**	**28**	**22**	**380**	**420**	**200**	**1000**

*NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - IV

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Operating System	3	0	0	3	3	30	70		100
2.	PCC		Introduction to Internet of Things	3	0	0	3	3	30	70		100
3.	PCC		Programming in Java	3	0	0	3	3	30	70		100
4.	PCC		Microprocessor and Micro-controller	3	0	0	3	3	30	70		100
5.	BSC		Discrete Mathematics	3	0	0	3	3	30	70		100
6.	PCC		Computer Organization & Architecture	3	0	0	3	3	30	70		100
7.	LC		Operating System Lab	0	0	2	2	1	50		50	100
8.	LC		Programming in Java Lab	0	0	2	2	1	50		50	100
9.	LC		Microprocessor and Micro-controller Lab	0	0	2	2	1	50		50	100
10.	LC		Internet of Things Lab	0	0	2	2	1	50		50	100
			Total	**18**	**0**	**8**	**26**	**22**	**380**	**420**	**200**	**1000**

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry /Institute/ Professional Organization/Research Laboratory/ training centre etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - V

S.No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Design and Analysis of Algorithm	3	0	0	3	3	30	70		100
2.	PCC		Formal Languages & Automata	3	0	0	3	3	30	70		100
3.	PCC		Cryptocurrency With Ethereum	3	0	0	3	3	30	70		100
4.	PCC		Computer Networks	3	0	0	3	3	30	70		100
5.	PEC		Professional Elective Course - I	3	0	0	3	3	30	70		100
6.	OEC		Open Elective Course - I	3	0	0	3	3	30	70		100
7.	LC		Design and Analysis of Algorithm Lab	0	0	2	2	1	50		50	100
8.	LC		Computer Networks Lab	0	0	2	2	1	50		50	100
9.	HSMC		Economics for Engineers*	3	0	0	3	0	30	70		100*
10.	PT		Practical Training - I	0	0	2	2	1	100			100
			Total	**21**	**0**	**4**	**25**	**21**	**380**	**420**	**100**	**900**

NOTE:
1. *The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.
2. Choose any one from Professional Elective Course – I
3. Choose any one from Open Elective Course – I

Professional Elective Course – I
1. Software Engineering
2. Digital Image Processing
3. Distributed System
4. Web Technology
5. Big data analytics

Open Elective Course – I
1. Sensors, Actuators and Signal Processing
2. R – Programming
3. Communication Skills for Professionals
4. Soft Skills and Interpersonal Communication
5. Human Resource Management

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - VI

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Compiler Design	3	0	0	3	3	30	70		100
2.	PCC		Advance JAVA Programming	3	0	0	3	3	30	70		100
3.	PCC		Cloud Computing	3	0	0	3	3	30	70		100
4.	PEC		Professional Elective Course - II	3	0	0	3	3	30	70		100
5.	PEC		Professional Elective Course - III	3	0	0	3	3	30	70		100
6.	OEC		Open Elective Course - II	3	0	0	3	3	30	70		100
7.	LC		Advance JAVA Programming Lab	0	0	2	2	1	50		50	100
8.	PROJECT		Project - I	0	0	4	4	2	50		50	100
			Total	**18**	**0**	**6**	**24**	**21**	**280**	**420**	**100**	**800**

NOTE:
1. At the end of the 6th semester, each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training center etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.
2. Choose any one from Professional Elective Course – II & III
3. Choose any one from Open Elective Course – II

Professional Elective Course – II
1. Software Testing
2. Cybersecurity
3. Information Retrieval
4. Wearable computing, mixed reality and Internet of everything
5. Soft Computing

Professional Elective Course – III
1. Network Security and Cryptography
2. Internet Technologies
3. Mobile applications development
4. Advance Database Management System
5. Machine Learning

Open Elective Course – II
1. Open-Source Systems
2. Wireless Communication
3. Industrial Safety
4. Natural Language Processing
5. Disaster Management

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))

Scheme of Studies/Examination w.e.f. 2023-24

Semester - VII

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Neural Networks	3	0	0	3	3	30	70		100
2.	PEC		Professional Elective Course - IV	3	0	0	3	3	30	70		100
3.	PEC		Open Elective Course - III	3	0	0	3	3	30	70		100
4.	OEC		Open Elective Course - IV	3	0	0	3	3	30	70		100
5.	HSMC		Organizational Behaviour	3	0	0	3	3	30	70		100
6.	LC		Neural Networks Lab	0	0	2	2	1	50		50	100
7.	PROJECT		Project - II	0	0	8	8	4	100		100	100
8.	PT		Practical Training - II	0	0	2	2	1	100			100
			Total	**15**	**0**	**12**	**27**	**21**	**300**	**350**	**150**	**900**

NOTE:
1. **Choose any one from Professional Elective Course – IV**
2. **Choose any one from Open Elective Course – III & IV**

Professional Elective Course – IV
1. Cyber Security Threats
2. Advanced Computer Architecture
3. IOT for Industries
4. Information Hiding Techniques
5. Data Science

Open Elective Course – III
1. IOT Security
2. Cyber Forensics and Cyber Laws
3. Multimedia Technology
4. Web Mining
5. Material Science

Open Elective Course – IV
1. Nanoscience and Nanotechnology
2. Software Project Management
3. Electronic Principles
4. Fundamentals of Management
5. Wireless Adhoc and Sensor Networks

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - VIII

S. No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	ESC		MOOC-1 (Essential)	3	-	-	-	3	-	-	-	100
2.	ESC		MOOC-2 (Essential)	3	-	-	-	3	-	-	-	100
3.	PROJECT		Industrial Project/Project-III	0	0	16	16	8	150		150	300
			Total	**6**	**0**	**16**	**22**	**14**	**150**	**-**	**150**	**500**

NOTE: At the end of the 8th semester, each student has to submit the certificate of MOOCs (Essential).

3RD SEMESTER

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - III

S.No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	ESC		Digital Electronics	3	0	0	3	3	30	70		100
2.	PCC		Advanced-Data Structure	3		0	3	3	30	70		100
3.	PCC		Database Management Systems with SQL	3	0	0	3	3	30	70		100
4.	PCC		Programming with C++	3	0	0	3	3	30	70		100
5.	PCC		Foundations of Blockchain Technology	3	0	0	3	3	30	70		100
6.	BSC		Mathematics - III	3	0	0	3	3	30	70		100
7.	LC		Digital Electronics Lab	0	0	2	2	1	50		50	100
8.	LC		Advanced-Data Structure Lab	0	0	2	2	1	50		50	100
9.	LC		Database Management Systems Lab	0	0	2	2	1	50		50	100
10.	LC		Programming with C++ Lab	0	0	2	2	1	50		50	100
11.	MC		Constitution of India*	2	0	0	2	-	30	70		100*
			Total	**20**	**0**	**8**	**28**	**22**	**380**	**420**	**200**	**1000**

*NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

DIGITAL ELECTRONICS

Semester	III			
Course code				
Category	Engineering Science courses			
Course title	Digital Electronics			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand the basic theoretical concepts of digital systems like the binary system and Boolean algebra.
2. To use Boolean algebraic formulations to design digital systems. To design using combinational/sequential circuits**.**
3. To express real-life problems in logic design terminology.
4. To understand the logic of adders, subtractors and converters.

UNIT - I
FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems - binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT - II
COMBINATIONAL DIGITAL CIRCUITS
Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer, Decoders, Adders, Subtractors, BCD arithmetic, carry look-ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT - III
SEQUENTIAL CIRCUITS AND SYSTEMS
A 1-bit memory, the circuit properties of the Bistable latch, the clocked SR flip-flop, J-K flip-flop, T flip-flop and D flip-flop, applications of flip-flops, shift registers, applications of shift registers, serial-to-parallel converter, parallel-to-serial converter, ring counter, sequence generator, ripple

(Asynchronous) counters, synchronous counters, counters design using flip-flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT - IV

A/D AND D/A CONVERTERS

Digital to analog converters: weighted resistor/converter, R-2-R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Outline the general concepts and terminology related to logic gates, logic families, combinational and sequential circuits.

CO2: Discuss the basic analog/digital components and their interconnections in logic families and circuits.

CO3: Apply different methods/techniques to design various digital circuits.

CO4: Analyse day to day problems and industrial problems for their solutions using digital circuits.

CO5: Contrast different types of digital circuits and their designing methods.

CO6: Design digital circuit for various practical problems.

TEXT AND REFERENCE BOOKS:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer Design", Pearson Education India,2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4. Nasib Singh Gill and J B Dixit, "Digital Design and Computer Organization", University Science Press, New Delhi

ADVANCE DATA STRUCTURE

Semester	III	
Course code		
Category	Professional Core Courses	
Course title	Advance Data Structure	
Scheme and Credits	L T P Credits	
	3 0 0 3	
Classwork	30 Marks	
Exam	70 Marks	
Total	100 Marks	
Duration of Exam	03 Hours	

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand and apply linear data structures-List, Stack and Queue.
2. To understand the tree algorithms and their applications.
3. To learn different algorithms and analysis techniques.
4. To apply sorting algorithms in real-time applications

UNIT - I

Review of Linear Data Structures
Linked List: Traverse, Insertion, Deletion; Circular List: Traverse, Insertion, Deletion, Doubly List and Circular List: Insertion and deletions; Stacks and Queue implementation using linked list.
Introduction to Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, and Extendible Hashing.

UNIT - II

Advanced Trees: Trees: Review of binary trees and binary search trees: traversing, insertion, and deletion; **AVL Trees:** Introduction to AVL trees, Rotations in AVL trees: LL, RR, LR & RL,
Introduction, Search, Insert & delete operations: Red-Black Trees, 2-3 Trees, B-Trees, B+ Trees, Splay Trees.

UNIT - III

Sets: Representation on Sets, Operations on Sets, Application on Sets,
Files: File Concepts, File organization, Files and Streams, Working with Files Using I/O Stream, Sequential File Organization, Direct File Organization, Indexed Sequential Organization

UNIT - IV

Graphs: Representation, Basic terminology, traversal, connected components, shortest path, topological sort, Dijkstra's Algorithm, Floyd Warshall's Algorithm, network flow problems.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
  CO1: Design and Analyze programming problem statements.
  CO2: Understand the ADT/libraries, and use it to design algorithms for a specific problem.
  CO3: Select algorithm design approaches in a problem-specific manner.
  CO4: Compare & contrast the complexity analysis of various sorting & searching algorithms.
  CO5: To be able to analyse the efficiency of algorithms.
  CO6: Implement various data structure concepts on real-world industrial problems.

TEXT AND REFERENCE BOOKS:

1. Seymour Lipschutz: Data Structures with C, Schaum's outline by TMH
2. E Horowitz and S. Sahni: Fundamentals of Data Structures in C, Second Edition, Universities Press, Hyderabad.
3. R.B. Patel: Expert Data Structures in C, Khanna Publishers,2001.
4. R.L. Kruse: Data Structures & Program Design in C, PHI.
5. D.F. Knuth: The art of Computer Programming Vol 1, Narosa Publications,1985.
6. Byron S. Gottfried & J K Chhabra: Theory and Problems of Programming with C Language, Schaum's Series, TMH,2005.

DATABASE MANAGEMENT SYSTEMS WITH SQL

Semester	III			
Course code				
Category	Professional Core Courses			
Course title	Database Management Systems With SQL			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
3. To understand and use data manipulation language to query, update, and manage a database
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT - I
Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).
Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.

UNIT - II
Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.
Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.
Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT - III

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Storage strategies: Indices, B-trees, hashing,

UNIT - IV

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object-oriented and object-relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: For a given query, write relational algebra expressions for that query and optimize the developed expressions

CO2: For a given requirement specification, design the databases using E R method and normalization.

CO3: For a given specification, construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.

CO4: For a given query, optimize its execution using Query optimization algorithms

CO5: For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

CO6: Implement the isolation property, including locking, and time stamping based on concurrency control and Serializability of scheduling.

TEXT AND REFERENCE BOOKS:

1. Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2. Principles of Database and Knowledge–Base Systems, Vol 1 by J. D. Ullman, Computer Science Press.
3. Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
4. Foundations of Databases, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

PROGRAMMING WITH C++

Semester	III			
Course code				
Category	Professional Core Courses			
Course title	Programming with C++			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand how the C++ is superset of C by incorporating the Object-oriented features in C language.
2. To learn how to efficiently use the memory using Pointers and Dynamic Memory Management
3. To learn how to implement different types of constructors and the use of destructor.
4. To learn how to implement the concept of data abstraction, encapsulation and how to perform different types of overloading i.e. operators and functions.
5. To learn how inheritance helps to reuse the code.
6. To learn how we can implement dynamic binding with polymorphism.
7. To learn the use of exception handling in C++ programs.

UNIT - I
Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

UNIT - II
Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritances, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, the pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

UNIT - III

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract clasess, virtual destructors.

UNIT - IV

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

 CO1: Understand the concept of Object-Oriented Programming through C++.
 CO2: Identify importance of object-oriented programming and difference between Procedural programming and object oriented programming features.
 CO3: be able to make use of objects and classes for developing programs.
 CO4: be able to use various object-oriented concepts to solve different problems.
 CO5: be able to develop the programs /Projects using some advanced features of C++ Programming.

TEXT AND REFERENCE BOOKS:

1. BjraneStroustrup, "C++ Programming language",3rd edition, Pearson education Asia(1997)
2. LaforeR."Object oriented Programming in C++",4th Ed. Techmedia,New Delhi(2002).
3. Yashwant Kenetkar,"Let us C++",1stEd.,Oxford University Press(2006)
4. B.A. Forouzan and R.F. Gilberg,CompilerScience,"A structured approach using C++" Cengage Learning, New Delhi.

MATHEMATICS - III

Semester	III
Course code	
Category	Basic Science Courses
Course title	Mathematics - III
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks
Exam	70 Marks
Total	100 Marks
Duration of Exam	03 Hours

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Understand the basic concepts of Limits & Continuity.
2. Understand partial and total derivative and apply it to real time applications.
3. Understand the ordinary Differential Equations of First, Second and Higher Order.

UNIT - I

Multivariable Differential Calculus: Limit, Continuity and Partial derivatives, Homogeneous functions, Euler's Theorem, Total derivative, Maxima, Minima and Saddle points, Lagrange's method of undetermined multipliers.

UNIT - II

Multivariable Integral Calculus: Double integral, change of order of integration, Change of variables, Applications of double integral to find area enclosed by plane curves, Triple integral.

UNIT - III

Ordinary Differential Equations of first order: Linear and Bernoulli's equations, Exact differential equations, Equations reducible to exact differential equations, Applications of differential equations of first order and first degree to simple electric circuits, Newton's law of cooling, Heat flow and Orthogonal trajectories.

UNIT - IV

Ordinary Differential equations of second and higher order: Linear differential equations of second and higher order, Complete solution, Complementary function and Particular integral, Method of variation of parameters to find particular integral, Cauchy's and Legendre's linear equations, Simultaneous linear differential equations with constant coefficients, Applications of linear differential equations to oscillatory electric circuits.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Deal with functions of several variables and evaluate partial derivative.

CO2: Evaluate multiple integrals and their usage.

CO3: Solve ordinary differential equations that model physical processes.

CO4: Formulate and solve problems involving moment of inertia, volume and centre of gravity.

CO5: Solve engineering problems related to oscillatory electric circuits.

CO6: Solve field problems in engineering involving Ordinary Differential Equations like R-L-C circuits and to find heat loss

TEXT AND REFERENCE BOOKS:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
4. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
5. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems,Wiley India.
7. S. L. Ross, Differential Equations, Wiley India.
8. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India.
9. E. L. Ince, Ordinary Differential Equations, Dover Publications

FOUNDATIONS OF BLOCKCHAIN TECHNOLOGY

Semester	III			
Course code				
Category	Professional Core Courses			
Course title	Foundations of Blockchain Technology			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To introduce basic concepts of Blockchain.
2. To understand abstract models for Blockchain technology
3. To learn about usage of Blockchain technology in financial services.
4. To visualize the scope of blockchain & its role in futuristic development.

UNIT - II
Introduction to Blockchain: Overview of blockchain, need for blockchain, history of centralized services, trusted third party, Distributed consensus in open environments, Distributed Vs Decentralized Network, 51 % attack theory, Public blockchains, Private blockchains, Blockchain Architecture and working, Mining, Limitations of blockchain, Applications of blockchain

UNIT - II
Models for blockchain: GARAY model, RLA Model, Proof of Work (PoW), HashcashPoW, PoW Attacks and the monopoly problem, Proof of Stake(PoS), hybrid models(PoW+PoS), Proof of Burn and Proof of Elapsed Time.

UNIT - III
Permissioned Blockchain: Permissioned model and use cases, Design issues for Permissioned blockchains, State machine replication, Consensus models for permissioned blockchain, Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT - IV
Blockchain in Financial Service:- Digital Currency, Cross border payments, Steller and Ripple protocols, Project Ubin, Know Your Customer (KYC), Privacy Consents, Mortgage over Blockchain, Blockchain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Insurance.

Blockchain Security: Security properties, Security considerations for Blockchain, Intel SGX, Identities and Policies, Membership and Access Control, Blockchain Crypto Service Providers, Privacy in a Blockchain System, Privacy through Fabric Channels, Smart Contract Confidentiality.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Recognizing goals of Blockchain.

CO2: Understanding the basics of Blockchain, notation of Distributed Systems in Blockchain, and analyzing various problems.

CO3: Smart Contracts, transactions in Blockchain and Permissioned Blockchain.

CO4: Analyzing usage of Blockchain in finance.

CO5: Security issues in Blockchain.

TEXT AND REFERENCE BOOKS:

1. Blockchain: Blueprint for a New Economy, by Melanie Swan.
2. Blockchain: The blockchain for beginner's guide to blockchain technology and leveraging blockchain programming, by Josh Thompsons
3. Blockchain Basics by Daniel Drescher, Apress

CONSTITUTION OF INDIA

Semester	III				
Course code					
Category	Mandatory courses				
Course title	Constitution of India				
Scheme and Credits	L	T	P	Credits	
	2	0	0	-	
Classwork	30				
Exam	70				
Total	100				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
4. To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

UNIT - I
Philosophy of Indian Constitution: Salient features of Indian Constitution, Preamble, and Nature of Indian Constitution, Procedure for amendment of the Constitution.

UNIT - II
Federal structure and distribution of legislative and financial powers between the Union and the States

UNIT - III
Organs of Governance: President – Qualification and Powers of the President, Governor-Qualification and Powers of Governor,
Parliament: Composition, Qualifications and Disqualifications, Judiciary: Appointment, Tenure and Removal of Judges.

UNIT - IV
Fundamental Rights: Origin and development of Fundamental rights, Need for fundamental rights. Introduction to Rights to equality, right to freedom, right against exploitation, Right to freedom of religion, Cultural and Education rights and Fundamental duties.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to a revolution in India.

CO3: Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.

CO4: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO5: Discuss the passage of the Hindu Code Bill of 1956.

CO6: Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail.

TEXT AND REFERENCE BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, latest Edition
3. M.P. Jain, Indian Constitution Law, Lexis Nexis, latest edition
4. D.D. Basu, Introduction to Constitution of India, Lexis Nexis, latest edition.

NOTE: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.

DIGITAL ELECTRONICS LAB

Semester	III
Course code	
Category	Laboratory course
Course title	Digital Electronics Lab

Scheme and Credits	L	T	P	Credits	
	0	0	2	1	

Classwork	50 Marks
Exam	50 Marks
Total	100 Marks
Duration of Exam	02 Hours

CONTENTS

Implementation of all experiments with the help of Bread-Board.
1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Half Adder / Full Adder: Realization using basic and XOR gates.
3. Half Subtractor / Full Subtractor: Realization using NAND gates.
4. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.
5. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.
6. Multiplexer: Truth-table verification and realization of Half adder and Full adder.
7. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor.
8. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF.
9. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter.
10. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter.
11. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations.
12. DAC Operation: Study of 8-bit DAC, obtain staircase waveform.
13. ADC Operations: Study of 8-bit ADC

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
CO1: Define different types of logic gates, identify their ICs and also verify their truth table.
CO2: Derive basic logic gates, adder, and subtractor using universal gates.
CO3: Illustrate realization of Boolean expression in SOP and POS form and design it using logic gates.
CO4: Design and test combinational circuits.
CO5: Design and develop sequential circuits.
CO6: Demonstrate team-based laboratory activities with fellow students to interact effectively on a social and interpersonal level.

DATABASE MANAGEMENT SYSTEM LAB

Semester	III			
Course code				
Category	Laboratory course			
Course title	Database Management System Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion, updation and deletion.
10. Using the referential integrity constraints.
11. Write the query for creating the users and their role. Mini project (Application Development using Oracle/ MySQL)
    a. Inventory Control System
    b. Material Requirement Processing.
    c. Hospital Management System.
    d. Railway Reservation System.
    e. Personal Information System.
    f. Web-Based User Identification System.
    g. Time Table Management System.
    h. Hotel Management

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Identify the fundamental elements of relational database management systems.

CO2: Design and explain the basic concepts of relational data model, entity-relationship model, and relational database design.

CO3: Apply the relational database theory to formulate basic and advanced SQL queries and relational algebra expressions for the queries.

CO4: Identify the use of normalization and functional dependency in database design.

CO5: Understand the concept of transactions and serializability in database management system.

CO6: Classify the implementation details of Concurrency control protocols and discuss various database recovery methods.

ADVANCED DATA STRUCTURE LAB

Semester	III			
Course code				
Category	Laboratory course			
Course title	Advance Data Structure Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS

1. Write a program to implement all operations on 1-D array.
2. Write a program to implement all operations on Simple Linked List.
3. Write a program to implement all operations on a circular Linked List.
4. Write a program to implement all operations on a doubly Linked List.
5. Write a program to implement all operations on a doubly circular Linked List.
6. Write a program to implement all operations on Stack using Array.
7. Write a program to implement all operations on Stack using Linked List.
8. Write a program to implement all operations on Queue using Array.
9. Write a program to implement all operations on Queue using Linked List.
10. Write a Program to implement dictionary techniques.
11. Write a program to implement hashing techniques.
12. Write a Program to implement Red-Black Trees.
13. Write a Program to implement Binary Search Trees.
14. Write a Program to design a menu to implement: Quick, Merge, and Bubble sorting.
15. Write a Program to develop a recursive Program to implement Breadth First Search and Depth First Search.
16. Write a Program to develop a non-recursive Program to implement Breadth First Search and Depth First Search

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Identify the appropriate data structure for a given problem.
 CO2: Implement Dictionary by using hashing techniques.
 CO3: Analyse various basic operations of trees to improve the efficiency.
 CO4: Build a Binary Heap using Priority queues.
 CO5: Apply the concepts of data structures in various real-world applications.
 CO6: Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

PROGRAMMING WITH C++ LAB

Semester	III
Course code	
Category	Laboratory course
Course title	Programming with C++ Lab
Scheme and Credits	L	T	P	Credits	

Scheme and Credits	L	T	P	Credits
	0	0	2	1

Classwork	50 Marks
Exam	50 Marks
Total	100 Marks
Duration of Exam	02 Hours

CONTENTS

1. Write a program that uses a class where the member functions are defined inside a class.
2. Write a program that uses a class where the member functions are defined outside a class.
3. Write a program to demonstrate the use of static data members.
4. Write a program to demonstrate the use of const data members.
5. Write a program to demonstrate the use of zero argument and parameterized constructors.
6. Write a program to demonstrate the use of dynamic constructor.
7. Write a program to demonstrate the use of explicit constructor.
8. Write a program to demonstrate the use of initializer list.
9. Write a program to demonstrate the overloading of increment and decrement operators.
10. Write a program to demonstrate the overloading of binary arithmetic operators.
11. Write a program to demonstrate the overloading of memory management operators.
12. Write a program to demonstrate the multilevel inheritance.
13. Write a program to demonstrate the multiple inheritance.
14. Write a program to demonstrate the virtual derivation of a class.
15. Write a program to demonstrate the runtime polymorphism.
16. Write a program to demonstrate the exception handling.
17. Write a program to demonstrate the use of function template.
18. Write a program to demonstrate the use of class template.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand dynamic memory management techniques using pointers, constructors, destructors, etc.

CO2: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.

CO3: Classify inheritance with the understanding of early and late binding

CO4: Usage of exception handling and generic programming.

CO5: Develop the programs /Projects using some advanced features of C++ Programming.

CO6: Percept the utility and applicability of OOP.

4TH SEMESTER

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - IV

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Operating System	3	0	0	3	3	30	70		100
2.	PCC		Introduction to Internet of Things	3	0	0	3	3	30	70		100
3.	PCC		Programming in Java	3	0	0	3	3	30	70		100
4.	PCC		Microprocessor and Micro-controller	3	0	0	3	3	30	70		100
5.	BSC		Discrete Mathematics	3	0	0	3	3	30	70		100
6.	PCC		Computer Organization & Architecture	3	0	0	3	3	30	70		100
7.	LC		Operating System Lab	0	0	2	2	1	50		50	100
8.	LC		Programming in Java Lab	0	0	2	2	1	50		50	100
9.	LC		Microprocessor and Micro-controller Lab	0	0	2	2	1	50		50	100
10.	LC		Internet of Things Lab Lab	0	0	2	2	1	50		50	100
			Total	**18**	**0**	**8**	**26**	**22**	**380**	**420**	**200**	**1000**

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry /Institute/ Professional Organization/Research Laboratory/ training centre etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

OPERATING SYSTEM

Semester	IV			
Course code				
Category	Professional Core Courses			
Course title	Operating System			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand the mechanisms of OS to handle processes and threads and their communication.
2. To understand the process management mechanisms and scheduling algorithms.
3. To understand the mechanisms involved in memory management in OS and virtual memory concepts.
4. To understand the file management and deadlocks handling techniques in OS.

UNIT - I

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Multithreading.

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, SRTF, RR Scheduling.

UNIT - II

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT - III

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation

and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Optimal Page Replacement and Least Recently used (LRU).

UNIT - IV

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. Case study on UNIX and WINDOWS Operating System.

Case Studies: Comparative study of WINDOW, UNIX & LINUX system.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Explain the basic concepts of operating system.
 CO2: Describe mechanisms of OS to handle processes, threads, and their communication.
 CO3: Analyze the memory management and its allocation policies.
 CO4: Illustrate different conditions for deadlock and their possible solutions.
 CO5: Discuss the storage management policies with respect to different storage management technologies.
 CO6: Evaluate the concept of the operating system with respect to UNIX, Linux, Time, and mobile OS.

TEXT AND REFERENCE BOOKS:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
6. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Introduction to Internet of Thing

Semester	IV			
Course code				
Category	Professional Core Courses			
Course title	Introduction to Internet of Things			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication modules.
3. Remotely monitor data and control devices.
4. Develop real life IoT based projects.

UNIT - I

Introduction to IOT: Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT - II

Elements of IOT
Hardware Components- Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. **Embedded Platforms for IOT:** Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex
Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT - III

Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.
Programming the Ardunio: Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT.

UNIT - IV

Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
- CO1: Demonstrate basic concepts, principles and challenges in IoT.
- CO2: Illustrate functioning of hardware devices and sensors used for IoT.
- CO3: Analyze network communication aspects and protocols used in IoT.
- CO4: Apply IoT for developing real life applications using Ardunio programming.
- CO5: To develop IoT infrastructure for popular applications.

TEXT AND REFERENCE BOOKS:

1. Olivier Hersent, David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", willey
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. Arshdeep Bahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India

PROGRAMMING IN JAVA

Semester	IV				
Course code					
Category	Professional Core Courses				
Course title	Programming in Java				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methos etc.
2. Be able to use the Java SDK environment to create, debug and run simple Java programs.
3. To analyze the object-oriented paradigm using java programming language.
4. To implement small/medium scale java programs to resolve small business problems.

UNIT - I
Introduction to Java: Evolution of Java, Object Oriented Programming Structure, Overview and characteristics of Java, Java program Compilation and Execution Process, Organization of the Java Virtual Machine, Client side Programming, Platform Independency & Portability, Security, Relation b/w JVM, JRE and JDK, Introduction to JAR format, Naming Conventions, Data types & Type casting, operators, Security Promises of the JVM, Security Architecture and Security Policy, security aspects, sandbox model.

UNIT - II
OOPS Implementation: Classes, Objects, attributes, methods, data encapsulation, reference variables, Constructors, Anonymous block, Method Overloading, Static Data members, Block & methods; Memory Structure: Stack, Heap, Class & Method area
Class loading & Execution flow: Static vs Dynamic Class loading, implicit vs explicit class loading, class loading operations;
Argument Passing Mechanism: Passing primitive arguments, passing objects, Wrapper Classes;
This keyword: Referencing instance members, Intra class constructor chaining, Method chaining;
Inheritance & code reusability: Extending classes for code reusability, Usage of super keyword, Method Overriding, Object class
Inheritance & Runtime Polymorphism: Static & Dynamic binding, Inheritance and Is-A relation, Runtime Polymorphism and Generalization, Abstract classes & methods, Final Keyword;
Interfaces and Role based Inheritance: Feature & Role based Inheritance, Static & Dynamic classing Environment, classes & interfaces, interface applications in real scenarios; Has-A relation:

Aggregation & Composition, Nested classes, Inner classes, Anonymous Inner classes, String Buffer Class, tokenizer, applets, Life cycle of applet and Security concern

UNIT - III

Threads: Creating Threads, Thread Priority, Blocked States, Extending Thread Class, Runnable Interface, Starting Threads, Thread Synchronization, Synchronize Threads, Sync Code Block, Overriding Synced Methods, Thread Communication, wait, notify and notify all.

Swing & AWT:

Swing class hierarchy, containers, user interface components, graphics context, AWT Components, Component Class, Container Class, Layout Manager Interface Default Layouts, Insets and Dimensions, Border Layout, Flow Layout, Grid Layout, Card Layout Grid Bag Layout AWT Events, Event Models, Listeners, Class Listener, Adapters, Action Event Methods Focus Event Key Event, Mouse Events, Window Event

Package & Scopes: Need of Packages, associating classes to Packages, Class path environment variable, Import Keyword and Feature of static import, Public, protected, private & default scope, Private Inheritance;

Exception Handling: exception and error, Exception Handling & Robustness, Common Exceptions and Errors, Try and catch block, Exception handlers, throw keyword, Checked and Unchecked Exceptions, Role of finally, User defined Exceptions.

UNIT - IV

Collection Framework: Role and Importance of Collection Framework, List & Set based collection, Iterator & List Iterator, Maps, Searching elements in List, Hash and Tree based collections, Role of equals and hashCode() methods, Comparable and Comparator Interfaces, Thread Safety and Vector, Difference b/w Enumeration and Iterator, Type safety and Generics, Common algorithms and Collections class, Using Properties class for managing properties files;

Database Connectivity Using JDBC: Overview of native and ODBC Drives, Introduction to JDBC, Type of JDBC drivers, Usage of drivers, defining properties-based Connection Factory; Basic database operations: Insert, Delete, Update, and Select;

Prepared Statement: Statement, Prepared Statement, Setting Query parameters, Executing Queries;

Callable Statement: Creating PL/SQL Stored procedures and functions, Creating Callable statements, executing procedures & functions, Batch Updation, Transacting Queries, Programmatic initialization of database, ResultSetMetaData, DatabaseMetaData; Input/Output Stream, Stream Filters, Buffered Streams, Data input and Output Stream, Print Stream Random Access File,

Reflection: reflection API, newInstance()method, javap tool, creating javap tool, creating applet viewer, call private method, java 9 features.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

  CO1: Identify classes, objects, members of a class and relationships among them for a specific problem.
  CO2: Understand and demonstrate the concepts of garbage collection, polymorphism, inheritance etc.
  CO3: Do numeric (algebraic) and string-based computation.
  CO4: Understand and implement modularity as well as basic error-handling techniques.
  CO5: Develop, design and implement small multithreaded programs using Java language.
  CO6: Apply appropriate problem-solving strategies for the implementation of small/medium scale Java applications.

TEXT AND REFERENCE BOOKS:

1. E. Balaguruswamy, "Programming with Java", TMH
2. Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
3. Decker &Hirshfield, "Programming.Java", Vikas Publication.
4. Patrick Naughton and HerbertzSchidt, "Java-2 the complete Reference", TMH
5. Sierra & bates, "Head First Java", O'Reilly.

MICROPROCESSOR AND MICRO-CONTROLLER

Semester	IV				
Course code					
Category	Basic Science courses				
Course title	Microprocessor and Micro-controller				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To provide solid foundation on the fundamentals of microprocessors and applications, interfacing the external devices to the processor according to the user requirements thus, enabling to create novel products and solutions for real time problems.
2. Describe the architecture of 8086 microprocessors.
3. Develop programs for microprocessor and microcontrollers.
4. Compare microprocessors and microcontrollers.
5. Understand 8051, PIC and ARM microcontroller concepts, architecture and programming.

UNIT - I
THE 8086 MICRO-PROCESSOR
Introduction to 8086, Micro-processor architecture, Addressing modes, Instruction set and assembler directives, Assembly language programming, Modular Programming, Linking and Relocation, Stacks, Procedures, Macros, Interrupts and interrupt service routines, Byte and String Manipulation.

UNIT - II
8086 SYSTEM BUS STRUCTURE
8086 signals, Basic configurations, System bus timing, System design using 8086, I/O programming, Introduction to Multiprogramming, System Bus Structure, Multiprocessor configurations, Coprocessor, Closely coupled and loosely Coupled configurations, Introduction to advanced processors.

UNIT - III
I/O INTERFACING
Memory Interfacing and I/O interfacing, Parallel communication interface, Serial communication interface, D/A and A/D Interface, Timer, Keyboard /display controller, Interrupt controller, DMA controller, Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT - IV

MICROCONTROLLER

Architecture of 8051, Special Function Registers(SFRs), I/O Pins Ports and Circuits, Instruction set, Addressing modes, Assembly language programming.

INTERFACING MICROCONTROLLER

Programming 8051 Timers, Serial Port Programming, Interrupts Programming, LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand the operation and architecture of Intel 8085 microprocessor including Instruction Set Architecture, assembly language programming, timing and speed of operation.

CO2: Learn the operation of circuits for user interaction through switches, keyboard and display devices.

CO3: Understand the operation and architecture of Intel 8086 microprocessor including Instruction Set Architecture, assembly language programming, timing and speed of operation.

CO4: Understand the motivation and need for peripheral operations circuits for digital data exchange, timer, serial communication, merits of direct memory access, interrupt controller and other circuits.

CO5: Identify & diagnose common issues & errors that may arise during microprocessor & microcontroller programming.

CO6: Apply problem solving techniques to resolve hardware and software related problems.

TEXT AND REFERENCE BOOKS:

1. Microprocessors and interfacing: D V Hall; TMH
2. The 8088 & 8086 Microprocessors, Programming, interfacing, Hardware & Applications: Triebel & Singh; PHI
3. Microcomputer systems: the 8086/8088 Family: architecture, Programming &Design: Yu,Chang Liu & Glenn A Gibson; PHI.
4. Advanced Microprocessors and Interfacing: Badri Ram; TMH

DISCRETE MATHEMATICS

Semester	IV				
Course code					
Category	Basic Science courses				
Course title	Discrete Mathematics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand the basic theoretical concepts of set theory, functions, and relations.
2. To understand the basic theoretical concepts of logic systems and Boolean algebra.
3.
4. To express real-life problem of basic counting techniques and recurrence relations, algebraic structures.
5. The use of graphs theory concepts in real-life examples.

UNIT - I
SET THEORY, RELATIONS, FUNCTIONS, LOGIC AND PROPOSITIONAL CALCULUS
Set Theory: Introduction to set theory, Venn diagrams, Set operations, Algebra of sets, Duality, Finite and infinite sets, Counting principles, Power sets, Partitions, and Multi sets.

Relations: Cartesian product, Representation of relations, Types of relation, Binary relation, Equivalence relations, Partitions, Partial ordering relations, POSET, Hasse diagram, Lattices and its types.

Functions: Definition, Types of functions, Bijective functions, Composition of functions, Inverse functions, recursively defined functions, Finite and infinite sets, Countable and uncountable sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Logic And Propositional Calculus: Introduction, Propositions and compound propositions, Logical operations, Propositions and truth tables, Tautologies, Contradictions, Logical equivalence, Algebra of propositions, Conditional and Bi-conditional statements, The use of Quantifiers.

UNIT - II
BASIC COUNTING TECHNIQUES AND RECURRENCE RELATION
Basic Counting Techniques: Pigeon-hole principle, Permutation and Combination, the Division algorithm: Prime Numbers, The GCD: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Recursion And Recurrence Relation: Polynomials and their evaluation, Sequences, Introduction to AP, GP and AG Series, Partial Fractions, Recurrence Relation, Linear Recurrence Relations with

Constant Coefficients, Linear Homogeneous Recurrence Relations with Constant Coefficients, Particular Solution- Homogeneous Linear Difference Equations, Non-Homogeneous Linear Difference Equations, Total Solution, solving recurrence relation using generating functions.

UNIT - III
ALGEBRAIC STRUCTURES
Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups, Semigroups, Subgroups, Abelian groups, Cosets, Normal Subgroup, Cyclic groups, Congruence Relation and Quotient Structures, Permutation Groups, Lagrange's Theorem, Homomorphism, Isomorphism, Automorphism.

Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT - IV
GRAPHS THEORY: Introduction to graphs and their properties, Degree, Connectivity, Path, Cycle, Directed and undirected graphs, Subgraph, Bipartite Graphs, Regular Graphs, Connected Graphs, Multigraph and Weighted graph, Homomorphic and Isomorphic graphs, cut points and bridges, Paths and circuits, shortest path algorithm for weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
- CO1: To solve mathematical problems based on concepts of set theory, relations, functions and lattices.
- CO2: To express logical sentences in terms of quantifiers and logical connectives.
- CO3: To apply basic counting techniques to solve permutation and combination problems.
- CO4: To solve recurrence relations.
- CO5: To classify the algebraic structure of any given mathematical problem.
- CO6: To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

TEXT AND REFERENCE BOOKS:
1. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, 6th Edition, Tata McGraw Hill, 2011.
2. Satinder Bal Gupta: *A Text Book of Discrete Mathematics and Structures*, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, *Elements of Discrete Mathematics A Computer Oriented Approach*, Tata McGraw Hill, 3rd Edition, 2008.
4. J.P. Trembley and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill – 13th reprint, 2012.
5. Richard Johnsonbaugh, *Discrete Mathematics*, 6th Edition, Pearson Education Asia, 2011.
6. S. Lipschutz and M. Lipson, *Discrete Mathematics*, Tata McGraw Hill, 3rd Edition, 2010.
7. B. Kolman, R. C. Busby and S. C. Ross, *Discrete Mathematical structures*, 6th Edition, PHI, 2010.

COMPUTER ORGANIZATION & ARCHITECTURE

Semester	IV			
Course code				
Category	Professional Core Courses			
Course title	Computer Organization & Architecture			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. How Computer Systems work & the basic principles.
2. Instruction Level Architecture and Instruction Execution.
3. The current state of art in memory system design.
4. How I/O devices are accessed and its principles.
5. To provide the knowledge on Instruction Level Parallelism.
6. To impart the knowledge on microprogramming.
7. Concepts of advanced pipelining techniques.

UNIT - I

Data representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Gray codes, Decimal codes, Alphanumeric codes, Error Detection Codes.

Register Transfer and Microoperations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit.

UNIT - II

Basic Computer Organization and Design : Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output Instruction, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Central Processing Unit : General Register Organization, Stack organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.

UNIT - III

Pipelining: Parallel Processing, Amdahl's law, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Pipeline Hazards, RISC Pipeline.

Parallel Processors: Introduction to Parallel Processors, Concurrent access to memory andCache Coherency.

Vector Processing: Vector Operations, Memory Interleaving, Supercomputers, Array Processors: Attached Array Processor, SIMD Array Processor.

UNIT - IV

Input-output Organization: I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, Privileged and Non-Privileged Instructions, Software Interrupts.

Memory organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization, Virtual Memory.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: outline the general concepts of digital electronics and computer organization and architecture.

CO2: discuss the basic components and their interfacing.

CO3: discuss the basic components and their interfacing.

CO4: analyse the effect of addressing modes on the execution time of a program.

CO5: analyse the effect of addressing modes on the execution time of a program.

CO6: Design of simple computer with different instruction sets.

TEXT AND REFERENCE BOOKS:

1. "Computer System Architecture", 3rd Edition by M.Morris Mano, Pearson.
2. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
3. "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.
4. "Computer Architecture and Organization", 3rd Edition by John P. Hayes,WCB/McGraw-Hill
5. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
6. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring andHarry F. Jordan, Pearson Education.

OPERATING SYSTEM LAB

Semester	IV			
Course code				
Category	Laboratory course			
Course title	Operating System Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS

1. Introduction to UNIX File System.
2. File and Directory Related Commands in UNIX.
3. Essential UNIX Commands for working in UNIX environment.
4. I/O Redirection and Piping
5. Introduction to VI Editors.
6. Introduction of Processes in UNIX
7. Communication in UNIX and AWK.
8. Introduction of the concept of Shell Scripting.
9. Decision and Iterative Statements in Shell Scripting.
10. Writing the Shall Scripts for unknown problems.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: apply commands related to vi and Emacs editors, general utilities and file systems.
 CO2: write basic shell scripts and use sed commands as well as awk programming.
 CO3: analyse the results of memory management and disk management commands.
 CO4: evaluate solutions for different operating system problems such as scheduling, memory management and file management.
 CO5: create lab record for assignments that includes problem definitions, design of solutions and conclusions.
 CO6: demonstrate use of ethical practices, self-learning and team spirit.

PROGRAMMING IN JAVA LAB

Semester	IV				
Course code					
Category	Laboratory course				
Course title	Programming in Java Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

CONTENTS

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the 5 exception keywords.
5. Convert the content of a given file into the upper-case content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: implement Java programs using object-oriented concepts for problem solving.
 CO2: detect syntax and logical errors in java programs.
 CO3: apply exception handling for making robust JAVA code.
 CO4: design java applications using File I/O and GUI.
 CO5: create lab record for assignments that includes problem definitions, design of solutions and conclusions.
 CO6: Able to build dynamic user interfaces using applets and Event handling in java.

INTERNET OF THINGS LAB

Semester	IV				
Course code					
Category	Laboratory course				
Course title	Internet of Things Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

CONTENTS

The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

1. Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run some python programs on Pi like:
   a) Read your name and print Hello message with name
   b) Read two numbers and print their sum, difference, product and division.
   c) Word and character count of a given string.
   d) Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input.
3. Run some python programs on Pi like:
   a) Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   b) Handle Divided by Zero Exception.
   c) Print current time for 10 times with an interval of 10 seconds.
   d) Read a file line by line and print the word count of each line.
4. a) Light an LED through Python program
   b) Get input from two switches and switch on corresponding LEDs
   c) Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
5. a) Flash an LED based on cron output (acts as an alarm)
   b) Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
   c) Get the status of a bulb at a remote place (on the LAN) through web.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Understand the concept of Internet of Things.
 CO2: Implement interfacing of various sensors with Arduino/Raspberry Pi.
 CO3: Demonstrate the ability to transmit data wirelessly between different devices.
 CO4: Show an ability to upload/download sensor data on cloud and server.
 CO5: Examine various SQL queries from MySQL database

MICROPROCESSOR AND MICRO-CONTROLLER LAB

Semester	IV	
Course code		
Category	Laboratory course	
Course title	Microprocessor and Micro-controller Lab	
Scheme and Credits	L T P Credits	
	0 0 2 1	
Classwork	50 Marks	
Exam	50 Marks	
Total	100 Marks	
Duration of Exam	02 Hours	

CONTENTS

1. Write a program using 8085 and verify for:
   a. Addition of two 8,bit numbers.
   b. Addition of two 8,bit numbers (with carry).
2. Write a program using 8085 and verify for:
   a. 8,bit subtraction (display borrow)
   b. 16,bit subtraction (display borrow)
3. Write a program using 8085 for multiplication of two 8, bit numbers by repeated addition method. Check for minimum number of additions and test for typical data.
4. Write a program using 8085 for multiplication of two 8, bit numbers by bit rotation method and verify.
5. Write a program using 8086 for finding the square root of a given number and verify.
6. Write a program using 8086 for copying 12 bytes of data from source to destination and verify.
7. Write a program using 8086 and verify for:
   a. Finding the largest number from an array.
   b. Finding the smallest number from an array.
8. Write a program using 8086 for arranging an array of numbers in descending order and verify.
9. Write a program using 8086 for arranging an array of numbers in ascending order and verify.
10. Write a program to interface a two,digit number using seven,segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.
11. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.
12. To study implementation & interfacing of Display devices Like LCD, LED Bar graph & seven segment display with Microcontroller 8051/AT89C51
13. To study implementation & interfacing of Different motors like stepper motor, DC motor & servo Motors.
14. Write an ALP for temperature & pressure measurement
15. Write a program to interface a graphical LCD with 89C51

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO6: Ability to analyze and understand the architecture, instruction set, and functioning of microprocessors and microcontrollers.

CO7: Proficiency in programming microprocessors and microcontrollers using assembly language and high level languages.

CO8: Skill in designing and implementing simple embedded systems by interfacing peripherals and devices with microprocessors and microcontrollers.

CO9: Competence in troubleshooting and debugging microprocessor and microcontroller based systems.

CO10: Understanding of the memory organization, input/output operations, and interrupt handling mechanisms in microprocessors and microcontrollers.

CO11: Familiarity with real-time operating systems and their applications in microcontroller, based systems.

5TH SEMESTER

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - V

S.No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Design and Analysis of Algorithm	3	0	0	3	3	30	70		100
2.	PCC		Formal Languages & Automata	3	0	0	3	3	30	70		100
3.	PCC		Cryptocurrency With Ethereum	3	0	0	3	3	30	70		100
4.	PCC		Computer Networks	3	0	0	3	3	30	70		100
5.	PEC		Professional Elective Course - I	3	0	0	3	3	30	70		100
6.	OEC		Open Elective Course - I	3	0	0	3	3	30	70		100
7.	LC		Design and Analysis of Algorithm Lab	0	0	2	2	1	50		50	100
8.	LC		Computer Networks Lab	0	0	2	2	1	50		50	100
9.	HSMC		Economics for Engineers*	3	0	0	3	0	30	70		100*
10.	PT		Practical Training - I	0	0	2	2	1	100			100
			Total	**21**	**0**	**4**	**27**	**21**	**380**	**420**	**100**	**900**

NOTE:
1. *The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree. However, these marks will be shown in the detailed marks certificate of the students.
2. Choose any one from Professional Elective Course – I
3. Choose any one from Open Elective Course – I

Professional Elective Course – I
1. Software Engineering
2. Digital Image Processing
3. Distributed System
4. Web Technology
5. Big data analytics

Open Elective Course – I
1. Sensors, Actuators and Signal Processing
2. R – Programming
3. Communication Skills for Professionals
4. Soft Skills and Interpersonal Communication
5. Human Resource Management

DESIGN & ANALYSIS OF ALGORITHMS

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Design & Analysis of Algorithms				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

UNIT - I
Introduction to Algorithms: Algorithm, Performance Analysis (Time and Space complexity), Asymptotic Notation (Big O, Omega and Theta)-best, average and worst-case behaviour. Elementary Data Structures (Basic terminology of Stacks and Queues, Tree, Graph), Sets and Disjoint Set Union.

Divide and Conquer: General method, Binary Search, Merge Sort, Quick Sort, and other sorting algorithms with divide and conquer strategy, Strassen's Matrix Multiplication algorithms and analysis of these problems.

UNIT - II
Greedy Method: General method, Fractional Knapsack problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Single source shortest paths.

Dynamic Programming: General method, Optimal Binary Search Trees, 0/1 knapsack, The Traveling Salesperson problem.

UNIT - III
Back Tracking: General method, The 8-Queen's problem, Sum of subsets, Graph Colouring, Hamiltonian Cycles.

Branch and Bound: The method, 0/1 knapsack problem, Traveling Salesperson problem, Efficiency considerations.

UNIT - IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph problems, NP hard scheduling problems, NP hard code generation problems, and Some simplified NP hard problems.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: state terminology and concepts algorithmic techniques.
 CO2: discuss various algorithmic techniques.
 CO3: apply appropriate algorithmic techniques to solve computational problems.
 CO4: analysing algorithms for their efficiency by determining their complexity.
 CO5: compare the pros and cons of applying the different algorithmic techniques to solve problems.
 CO6: formulate efficient and effective algorithmic solutions for different real- world problems.

TEXT AND REFERENCE BOOKS:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publication
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,
5. Writing Efficient Programs, Bentley, J.L., PHI
6. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.
7. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H.
8. Fundamentals of Algorithms: The Art of Computer Programming Vol Knuth, D.E.: 1985, Naresh Publication.

FORMAL LANGUAGES & AUTOMATA THEORY

Semester	V	
Course code		
Category	Professional Core Courses	
Course title	Formal Languages & Automata Theory	
Scheme and Credits	L T P Credits	
	3 0 0 3	
Classwork	30 Marks	
Exam	70 Marks	
Total	100 Marks	
Duration of Exam	03 Hours	

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand basic concepts of formal languages and automata theory.
2. To study the types of Automata i.e., NFA, DFA, NFA with ϵ-transition and their interconversion methods and importance.
3. To Study formal languages of different kinds, such as regular and context-free languages. Understand the concept of grammar and its types. Removal of ambiguity and reduced form and Normal forms of grammar.
4. To develop the concepts and design of higher-level automata to accept the language not accepted by finite automata such as PDA &Turing machine.
5. To study the various properties of Turing machines and their design.

UNIT - I
Finite Automata: Introduction: Set, Power Set, Super Set, Alphabet, languages and grammars, productions and derivation, Deterministic finite automata (DFA), Non-Deterministic finite automata (NDFA), Equivalence of DFA and NDFA, Conversion of NFA to DFA, minimization of finite automata, Finite automata with ϵ- moves, Acceptability of a string by a finite Automata.
Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Equivalence of Mealy and Moore machines.

UNIT - II
Regular Expression: State and prove Arden's Method, Regular Expressions, Recursive definition of the regular expression, Regular expression conversion to Finite Automata, and vice versa.
Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

UNIT - III
Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their removal,

Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form (CNF) and Greibach Normal Form (GNF),

Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

UNIT - IV

Turing machines: The basic model for Turing machines I, Deterministic and Non- Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by a designed Turing machine. Variants of Turing machines, Halting problem of Turing machine, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators.

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
  CO1: define terminology related to the theory of computation.
  CO2: explain the basic concepts and applications of Theory of Computation.
  CO3: apply the principles of Theory of Computation to solve computational problems.
  CO4: compare and contrast the hierarchy of grammars.
  CO5: design various types of automata for given problems.
  CO6: To solve various problems of applying normal form techniques, push-down automata, and Turing Machines.

TEXT AND REFERENCE BOOKS:
1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
3. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
4. Raymond Greenlaw, H. James Hoover, Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
5. John C. Martin: Introduction to Languages and Automata Theory, 3rd edition, Tata McGraw-Hill, 2007

CRYPTOCURRENCY WITH ETHEREUM

Semester	V			
Course code				
Category	Professional Core Courses			
Course title	Cryptocurrency With Ethereum			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To introduce the concepts of cryptocurrency.
2. To understand working of Bitcoin and Ethereum
3. To study the security issues and safeguards related to bitcoin trading
4. To study governing cryptocurrency regulations and its impact on economy.

UNIT - I
Cryptocurrency: History, Distributed Ledger Technology (DLT), cryptocurrency in blockchain, Cryptographic basics for cryptocurrency: overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography.

UNIT - II
Bitcoin: Creation of coins, Wallet, Genesis Block, Merkel Tree, Bitcoin Scripts, Bitcoin P2P Network, hardness of mining, Transaction in Bitcoin Network, transaction verifiability, anonymity, forks, payments and double spending, Consensus in a Bitcoin network, mathematical analysis of properties of Bitcoin, Bitcoin protocols – Bitcoin Mining strategy and rewards, life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT - III
Ethereum: Ethereum Virtual Machine (EVM), Wallets for Ethereum, Ethereum Programming Language: Solidity, Smart Contracts, The turing completeness of smart contract languages, attacks on smart contracts, Ethereum Construction, DAO, GHOST, Vulnerability, Attacks, Sidechain: another type of blockchain, Namecoin

UNIT - IV
Cryptocurrency Regulation: Stakeholders, Roots of Bitcoin, Bitcoin scripting vs Ethereum smart contracts, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy, Global Acceptability perspective.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

 CO1: Cryptocurrency: Bitcoin and Ethereum
 CO2: Building efficient blockchain models to carry out tasks with the practical approach.
 CO3: Evaluating the use and risks involved with cryptocurrency
 CO4: Smart contracts and their implications.
 CO5: Demonstrate a sound technical knowledge of their selected project topic.
 CO6: Undertake problem identification, formulation and solution.

TEXT AND REFERENCE BOOKS:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press (July 19, 2016).
2. Mastering Bitcoin: Unlocking Digital Cryptocurrencies by Antonopoulos
3. Bitcoin: A Peer-to-Peer Electronic Cash System by Satoshi Nakamoto
4. ETHEREUM: A Secure Decentralized Transaction Ledger by Gavin Wood, Yellow paper.2014.
5. A survey of attacks on Ethereum smart contracts by Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli

COMPUTER NETWORKS

Semester	V				
Course code					
Category	Professional Core Courses				
Course title	Computer Networks				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To develop an understanding of modern network architectures from a design and Performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs).
3. To provide an opportunity to do Network programming.
4. To provide WLAN measurement ideas.

UNIT - I
Introduction: Data communication, Components, Data Representation, Simplex, Half Duplex, and Full Duplex Transmission, Modulation, Multiplexing, Computer networks, distributed processing, Internet, Topologies, Packet and circuit switching, connectionless and connection-oriented services.
Network Models: OSI model and TCP/IP Model
Physical Layer – LAN: Ethernet.

UNIT - II
Data Link Layer and Medium Access Sub Layer: MAC Addressing, Framing, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Protocol.
Medium Access Control: Random access, Controlled Access, and channelization protocols.
Network Layer: Logical addressing, classful and classless addressing, subnetting, Ipv4, ICMPv4, ARP, RARP and BOOTP, Ipv6, Ipv6 addressing.

UNIT - III
Network Devices: Repeater, hub, switch, router, and gateway.
Routing Algorithms: introduction to routing, Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State, and Distance Vector Routing
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP connection management.

UNIT - IV

Congestion Control, Quality of Service, QoS Improving techniques.

Application Layer: Domain Name Space (DNS), EMAIL, File Transfer Protocol (FTP), HTTP, SNMP

Network Security: Firewalls, security goals, types of attack, symmetric and asymmetric key ciphers.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
- CO1: Explain the functions of the different layers of the OSI Protocol.
- CO2: Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs) and describe the function of each.
- CO3: Identify and connect various connecting components of a computer network.
- CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, and Firewalls using open-source available software and tools.
- CO5: outline various models, topologies and devices of Computer Networks.
- CO6: Design engineering solutions to complex problems utilizing a systems approach.

TEXT AND REFERENCE BOOKS:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, latest Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, latest Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

ECONOMICS FOR ENGINEERS

Semester	V				
Course code					
Category	Humanities & Social Sciences, Including Management				
Course title	Economics for Engineers				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Understand how economic analysis can be applied to engineering decision-making processes.
2. Understand the implications of economic factors on engineering design, production, and operation decisions.
3. Apply economic principles to analyze and interpret the behavior of markets and industries.
4. Gain awareness of the relationship between economics and sustainable development in engineering practices.

UNIT - I
Definition of Economics- Various definitions, types of economics- Micro and Macro-Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.
Demand- Meaning of Demand, Law of Demand, Elasticity of Demand- meaning, factors effecting it, its practical application and importance.

UNIT - II
Production- Meaning of Production and factors of production, Law of variable proportions, and returns to scale, Internal external economies and diseconomies of scale. Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Realcost, Accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

UNIT - III
Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).
Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

UNIT - IV

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalization of Indian economy - merits and demerits.

Banking- Concept of a Bank, Commercial Bank- functions, Central Bank- functions,Difference between Commercial & Central Bank.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

  CO1: outline the principles of economics in general and economics in Indian context.

  CO2: discuss concepts related to economics in general and particularly relevant to Indian scenario.

  CO3: apply the principles of economics for solving problems related to Engineering sector.

  CO4: carry out cost/benefit/, life cycle and breakeven analyses on one or more economic alternatives.

  CO5: judge the issues and challenges of sustainable development.

  CO6: Undertake problem identification, formulation and solution.

TEXT AND REFERENCE BOOKS:

1. Alfred William Stonier, D. C. Hague, A text book of Economic Theory, 5th edition, Longman Higher Education, 1980.
2. K. K. Dewett, M. H. Navalur, Modem Economic Theory, S. Chand, 2006.
3. H. L. Ahuja, Modern Microeconomic: Theory and Applications, S. Chand, 2017.
4. N. Gregory Mankiw, Principles of Economics, 7th edition, South-Western College Publishing, 2013.
5. Ruddar Dutt & K. P. M. Sundhram, Indian Economy, S. Chand, 2004.
6. V. Mote, S. Paul, G. Gupta, Managerial, Economics, McGraw Hill Education, 2017.
7. Saroj Pareek, Text book of Business Economics, Neha Publishers and Distributors, 2013.
8. William McDonough and Michael Braungart, Cradle to Cradle Remaking the Way We Make Things, North Point Press, New York, 2002.
9. Sustainable Development Challenges, World Economic and Social Survey, United Nations Publication, 2013.

DESIGN & ANALYSIS OF ALGORITHMS LAB

Semester	V			
Course code				
Category	Laboratory course			
Course title	Design & Analysis of Algorithms Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS

1. Write a Program for iterative and recursive Binary Search.
2. Write a Program to sort a given set of elements using the Quick Sort/Merge Sort/Selection Sort method and determine the time required to sort the elements.
3. Write a Program for the implementation of the Fractional Knapsack problem using Greedy Method and 0/1 Knapsack problem using Dynamic Programming.
4. Write a Program to find the shortest path from a given vertex to other vertices in a weighted connected graph using Dijkstra's algorithm.
5. Write a Program to find the minimum cost spanning tree (MST) of a given undirected graph using Kruskal's algorithm/Prim's Algorithms.
6. Write a Program to implement the N-Queens problem using backtracking.
7. Write a Program to check whether a given graph is connected or not using the DFS method.
8. Write a program to implement the Travelling Salesman Problem (TSP).

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Develop and code program for the algorithms and analyze it to determine its computational complexity.

CO2: Identify and analyze worst-case running times of algorithms.

CO3: Model given engineering problem using graph and trees and write the corresponding algorithm to solve the problems.

CO4: Identify and apply the suitable algorithm for the given real-world problem.

CO5: Undertake problem identification, formulation and solution.

CO6: Design engineering solutions to complex problems utilising a systems approach.

WEB TECHNOLOGY LAB

Semester	V			
Course code				
Category	Laboratory course			
Course title	Web Technology Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS

1. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital

2. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 99 and shows it in words. It should not accept three and above digits, alphabets and special characters.

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS

4. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE

5. Write JavaScript to validate the following fields of the Registration page.
   a) First Name
   b) Last Name
   c) Password
   d) E,mail id
   e) Mobile Number
   f) Address

6. Write a program for implementing XML document for CUSTOMER DETAILS

7. Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not

8. Write a program to design a simple calculator using (a) JavaScript (b) PHP

9. Develop and demonstrate JavaScript with POP,UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) function
   Output: Display date in the textbox
   b) Input: A number n obtained using prompt
   Output: Factorial of n number using alert
   c) Input: A number n obtained using prompt
   Output: A multiplication table of numbers from 1 to 10 of n using alert

d) Input: A number n obtained using prompt and add another number using confirm
Output: Sum of the entire n numbers using alert
10. (Mini Project) Create your own website using all constructs studied in theory paper

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Design and implement dynamic websites with good aesthetic sense of designing and latest technical know, how's

CO2: Create web pages using HTML and Cascading Styles sheets

CO3: Analyze a web page and identify its elements and attributes

CO4: Create dynamic web pages using JavaScript

CO5: Build web applications using PHP •

CO6: Create XML documents and XML Schema

COMPUTERS NETWORK LAB

Semester	V			
Course code				
Category	Laboratory course			
Course title	Computer Network Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS
1. Study of Socket Programming and Client – Server model
2. Write a code simulating ARP /RARP protocols.
3. Write a code simulating PING and TRACEROUTE commands
4. Create a socket for HTTP for web page upload and download.
5. Write a program to implement RPC (Remote Procedure Call)
6. Implementation of Subnetting .
7. Applications using TCP Sockets like a. Echo client and echo server b. Chat c. File Transfer
8. Applications using TCP and UDP Sockets like. DNS e. SNMP f. File Transfer
9. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector
11. To learn handling and configuration of networking hardware like RJ,45 connector, CAT,6 cable, crimping tool, etc.
12. Configuration of router, hub, switch etc. (using real devices or simulators)
13. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
14. Network packet analysis using tools like Wireshark, tcpdump, etc.
15. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
16. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative &concurrent servers).

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
- CO1: Develop Client, Server architectures and prototypes by the means of correct standards and technology
- CO2: Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
- CO3: Analyse & Implement various framing methods of Data Link Layer.
- CO4: Demonstrate basic configuration of switches and routers.
- CO5: Analyse & Implement various Error and flow control techniques.
- CO6: Implement network routing and addressing techniques

PRACTICAL TRAINING - I

Semester	V				
Course code					
Category	Training				
Course title	Practical Training - I				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	100 Marks				
Exam					
Total	100 Marks				
Duration of Exam	03 Hours				

Professional Elective Course - I

SOFTWARE ENGINEERING

Semester	V			
Course code				
Category	Professional Elective Courses			
Course title	Software Engineering			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Be successful professionals in the field with solid fundamental knowledge of software engineering.
2. To enable students to apply a systematic application of scientific knowledge in creating and building cost-effective software solutions to business and other types of problems.
3. To make students understand different phases to make a software & study them in detail.
4. To make students understand different testing techniques for different projects, making the students understand to develop quality software, its maintenance & software reliability.
5. To make students aware about the design models & its principles (data design, component design, interface design & architectural design).

UNIT - I
Introduction:- Evolving role of software, Software Characteristics, Software crisis, Software myths, Software process, Software development Models: Waterfall Model, Prototype Model, Spiral, Model, RAD Model, Iterative Model, Incremental Model, Aspect-oriented Model, **Agile Methodology:** Pair and mob programming, high performance teams with core protocols, test driven development, behaviour driven development, continuous delivery, clean code, refactoring, extreme programming, Scrum.

UNIT - II
Requirements, Analysis & Specification:- Software Requirements engineering, Requirement Engineering Process, Requirement Engineering Tasks, Types of requirements, SRS.
System Modeling:- Data Modeling, Functional modeling and information flow: Data flow diagrams, Behavioral Modeling, The mechanics of structured analysis: Creating entity/ relationship diagram, data flow model, control flow model, the data dictionary.

UNIT - III
System Design:- Design principles, the design process; Design concepts: Abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding; Effective modular design: Functional independence, Cohesion,

Coupling; Design Heuristics for effective modularity, Data Design, Architecture Design, Interface Design.

Software Testing And Maintenance:- Testing terminology: error, bug/defect/fault, failure, Verification and validation, Test case design, Static testing, Dynamic testing, Black box testing, Boundary value analysis, White box testing, basis path testing, Unit testing, Integration testing, Acceptance Testing, debugging, debugging process debugging approaches. Software maintenance categories, Models.

UNIT - IV

Software Quality Models And Standards:- Quality concepts, Software Quality Assurance, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO 9126 Standard, Configuration Management, Software reengineering, reverse engineering, restructuring, forward engineering,

Software Project Management:- Project management concepts, Planning the software project, Software Estimations, empirical estimation COCOMO, staffing, team structures, staffing, risk analysis and management.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
- CO1: Understand basic concepts of software engineering, implement Software life cycle models and have knowledge of different estimation models.
- CO2: Understand requirements and modelling concepts in software development.
- CO3: Understand the different design principles of a software project and prepare soft testing strategies.
- CO4: Understand and incorporate the Software Quality standards and build a robust software.
- CO5: Undertake problem identification, formulation and solution.
- CO6: Design engineering solutions to complex problems utilising a systems approach.

TEXT AND REFERENCE BOOKS:
1. Software Engineering – A Practitioner's Approach, Roger S. Pressman, 1996, MGH.
2. Fundamentals of software Engineering, Rajib Mall, PHI
3. Software Engineering by Ian sommerville, Pearson Edu., 5th edition, 1999,AW,
4. Software Engineering – David Gustafson, 2002, T.M.H
5. Software Engineering Fundamentals Oxford University, Ali Behforooz and Frederick J. Hudson1995, JW&S
6. An Integrated Approach to Software Engineering by Pankaj jalote, 1991, Narosa.

DIGITAL IMAGE PROCESSING

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Digital Image Processing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To become familiar with digital image fundamentals.
2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
3. To learn concepts of degradation function and restoration techniques.
4. To study the image segmentation and representation techniques.
5. To become familiar with image compression and recognition method.

UNIT - I
Introduction to Image Processing: Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.

UNIT - II
Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.
Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.

UNIT - III
Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.

UNIT - IV
Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to

CO1: Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.

CO2: Operate on images using the techniques of smoothing, sharpening and enhancement.

CO3: Understand the restoration concepts and filtering techniques.

CO4: Learn the basics of segmentation, features extraction, compression and recognition methods for colour models.

CO5: Undertake problem identification, formulation and solution.

CO6: Design engineering solutions to complex problems utilizing a systems approach.

TEXT AND REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition,2010.
2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt, Digital Image Processing John Wiley, New York, 2002
7. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

WEB TECHNOLOGY

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Web Technology				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To familiarize the students with the basic concepts of internet, its history, ways to connect to internet and basics of world wide web and search engines.
2. To familiarize the student with the fundamental language of internet i.e., HTML.
3. To teach the student aware of the concepts of cascading style sheets.
4. To teach the student the students the basics of client side and Server-side scripting.

UNIT - I
HYPERTEXT MARKUP LANGUAGE: The anatomy of an HTML document: Marking up for structure and style: basic page markup, absolute and relative links, ordered and unordered lists, embedding images and controlling appearance, table creation and use, frames, nesting and targeting.
STYLE SHEETS: Separating style from structure with style sheets, Internal style specifications within HTML, External linked style specification using CSS, page and site design considerations.

UNIT - II
Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies. File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT - III
CLIENT SIDE PROGRAMMING: Introduction to Client side programming, Java Script syntax, the Document object model, Event handling, Output in JavaScript, Forms handling, cookies, Introduction to VBScript, Form Handling.

UNIT - IV

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Analyze given assignment to select sustainable web development and design methodology.

CO2: Identify the difference between the HTML PHP and XML documents.

CO3: Identify the engineering structural design of XML and parse tree

CO4: Analyze the difference between and PHP and XML.

CO5: Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management.

CO6: Develop web based application using suitable client side and server side web technologie.

TEXT AND REFERENCE BOOKS:

1. "Fundamentals of the Internet and the World Wide Web", Raymond Greenlaw and Ellen Hepp, TMH , latest edition.
2. "Internet & World Wide Programming", Deitel,Deitel & Nieto, Pearson Education
3. "Complete idiots guide to java script". Aron Weiss, QUE.
4. "Network firewalls", Kironjeet syan - New Rider Pub.

DISTRIBUTED SYSTEM

Semester	V			
Course code				
Category	Professional Elective Courses			
Course title	Distributed System			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To examine the fundamental principles of distributed systems, and provide students hands-on experience in developing distributed protocols.
2. Analyze the issues in distributed operating systems and to address these distributed systems issues in a broader sense. Emphasis will be placed on communication, process, naming, synchronization and fault tolerance.

UNIT - I
Introduction: Distributed Operating Systems Definition and goals, Hardware and Software concepts, Design issues.
Communication in Distributed System: Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC

UNIT - II
Synchronization in Distributed System: Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems
Processes and processors in Distributed systems: Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, real time distributed systems, Process migration and related issues

UNIT - III
Distributed File systems: Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study.
Distributed Shared Memory: Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing

UNIT - IV

Security Issues: Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management

Distributed Web-based Systems: Architecture, Processes, Communication, Naming, Synchronization

Case Studies: JAVA RMI, Sun Network File System, Google Case Study

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: List the principles of distributed systems and describe the problems and challenges associated with these principles.

CO2: Understand Distributed Computing techniques, Synchronous and Processes.

CO3: Apply Shared Data access and Files concepts.

CO4: Design distributed system that fulfills requirements with regards to key distributed systems properties.

CO5: Understand Distributed File Systems and Distributed Shared Memory.

CO6: Apply Distributed web-based system and understand the importance of security in distributed system

TEXT AND REFERENCE BOOKS:

1. Distributed Operating Systems by Andrew S Tannebaum, Pearson
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
3. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore, TimKindberg, Pearson
4. Distributed Computing by Sunita Mahajan & Seema Shah OXFORD
5. Distributed Systems: Principles and Paradigms by Andrew S Tanebaum, Maarten Van Steen, PHI 6. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiya and Jennifer Welch, Wiley India

BIG DATA ANALYTICS

Semester	V				
Course code					
Category	Professional Elective Courses				
Course title	Big Data Analytics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To describe the basic concepts of Big Data characteristics and Analytics.
2. To examine the Hadoop and MapReduce framework for processing large volume of data sets and various data analysis methods.
3. To store and retrieve the data effectively using MongoDB and report generation.
4. To analyze the big data for useful business applications and familiar with the Visualization.

UNIT - I
Introduction to Big Data: Types of Digital Data-Characteristics of Data, Evolution of Big Data, Definition of Big Data, Characteristics, Applications & Challenges with Big Data, 3Vs of Big Data, Non-Definitional traits of Big Data, Big Data workflow Management, Business Intelligence vs. Big Data, Distributed file systems.

UNIT - II
Big Data Analytics: Classification of analytics, Data Science, Terminologies in Big Data, CAP Theorem.
Introduction to Hadoop: Features, Advantages, Overview of Hadoop Eco systems, Hadoop distributions, SQL vs. Hadoop, Hadoop Components, Architecture, HDFS.

UNIT - III
Map Reduce: Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.
NoSQL: Types of Databases, Advantages, SQL vs. NoSQL, NewSQL
Mongo DB: Introduction, Features, Data types, Mongo DB Query language, CRUD operations, Arrays. Functions: Count, Sort, t – Limit, Skip, Aggregate, Map Reduce. Cursors: Indexes, Mongo Import, Mongo Export.

UNIT - IV
Cassandra: Introduction, Features, CQLData types, CQLSH, Key spaces, CRUD operations, Collections, Counter, TTL, alter commands, Import and Export, Querying System tables.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Identify the characteristics and challenges of big data analytics.

CO2: Implement the Hadoop and MapReduce framework for processing massive volume of data.

CO3: Analyze data by utilizing various statistical and data mining approaches.

CO4: Implement CRUD operations effectively using MongoDB and Report generation using Jaspersoft studio.

CO5: Explore the usage of Hadoop and its integration tools to manage Big Data and use Visualization Techniques.

CO6: Adapt adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

TEXT AND REFERENCE BOOKS:

1. T. Erl , W.Khattak and P. Buhler., *Big Data Fundamentals, Concepts, Drivers & Techniques* (1e), The Prentice Hall Service Technology Series, 2016.
2. S. Acharya, *Big Data and Analytics*, Wiley India Pvt. Ltd., 2015
3. V. Prajapati, *Big Data Analytics with R and Hadoop*, Packt Publishing Ltd., 2013.
4. A. Holmes, *Hadoop in Practice*, (2e), Manning Publications, 2015
5. S. Ryza, *Advanced Analytics with Spark: Patterns for Learning from Data at Scale*, (2e), O'Reilly, 2017

Open Elective Course - I

SENSORS, ACTUATORS AND SIGNAL PROCESSING

Semester	V			
Course code				
Category	Open Elective Courses			
Course title	Sensors, Actuators And Signal Processing			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
5. To understand the basic fundamentals of sensors and their characteristics.
6. To implement the principles of Resistive sensors and its signal conditioning circuit
7. To apply the concepts of Reactance variation and Electromagnetic sensors
8. To realize the Self-Generating sensors and its signal conditioning circuits
9. To interpret the concepts of Intelligent Sensors & other sensing methods

UNIT - I

Sensors / Transducers: Principles Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization. Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges, Inductive Sensors- Sensitivity and Linearity of the Sensor, Types- Capacitive Sensors, Electrostatic Transducer, Force/Stress Sensors using Quartz Resonators, Ultrasonic Sensors.

UNIT - II

Thermal Sensors: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Dielectric Constant and Refractive Index Thermo-sensors, Helium Low Temperature Thermometer, Nuclear Thermometer, Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermo-EMF Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermo-electric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors. Magnetic Sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto-resistive Sensing, Semiconductor Magneto-resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchronous, Synchronous resolvers, Eddy Current Sensors, Electromagnetic Flow meter, Switching Magnetic Sensors, SQUID Sensors.

Radiation Sensors: Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro Analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential – Standard Hydrogen Electrode (SHE)

– Liquid Junction and Other Potentials – Polarization – Concentration Polarization– Reference Electrodes – Sensor Electrodes – Electro ceramics in Gas Media .

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface, the Automation. Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

UNIT - III

Actuators: Pneumatic and Hydraulic Actuation Systems- Actuation systems, Pneumatic and hydraulic systems, Directional Control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves, Rotary actuators. Mechanical Actuation Systems Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

UNIT - IV

Introduction of Signal Processing: Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy Syllabus B. Tech., ICE: July 2018 admissions onwards Page36 and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation

Digital Signal Processors: Introduction – Architecture – Features – Addressing Formats – Functional modes – Introduction to Commercial Processors.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO7: Understand the concept of Sensors and Transducers.
 CO8: Application of Sensors, Actuators and Signal Processing.
 CO9: Understand the concept of Radiation Sensors and smart sensor.
CO10: Learn various types of sensors and actuators used.
CO11: Learn fundamentals of signal processors and digital signal processors.

TEXT AND REFERENCE BOOKS:
5. D. Patranabis," Sensors and Transducers", PHI Learning Private Limited.
6. W. Bolton, "Mechatronics", Pearson Education Limited.
7. Patranabis , "Sensors and Actuators", 2nd Edition, PHI, 2013.
8. Proakis JG and Manolakis DG, "Digital signal processing," Pearson Education India
9. Ifeacher EC and Jerris BW, "Digital signal processing – A practical approach," Pearson Education

R - PROGRAMMING

Semester	V				
Course code					
Category	Open Elective Coursee				
Course title	R - Programming				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Learn Fundamentals of R.
2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.
3. Cover the Basics of statistical data analysis with examples.
4. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.

UNIT - I

Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments.

Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), package.Description(), help(), find.package(), library() - Input and Output – Entering Data from keyboard.

R - Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame.

R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables

UNIT - II

R - Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators.

R - Decision Making: if statement, if – else statement, if – else if statement, switch statement.

R - Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

R - Function: function definition,Built-inn functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values.

UNIT - III

R – Strings: Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower().

R – Vectors: Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting.

R – List: Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector.

R – Matrices: Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division.

R - Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements.

R – Factors: creating factors, generating factor levels gl().

R - Data Frames: Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, **Expand Data Frame:** Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().

UNIT - IV

Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

Data Visualization through various plots and charts: bar charts, histogram, frequency polygon, density plots, scatter plots, box & whisker plots, heat and contour plots, plotting the above graphs in R, plotting with package ggplot2.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO1: outline concepts related to R programming and data analysis.
 CO2: explain the basic concepts and tools that are used to solve problems in data analytics.
 CO3: apply R programming for reading, cleaning, visualizing and analysing data.
 CO4: analyse the trends in data through exploratory data analysis.
 CO5: Understands the loading, retrieval techniques of data.
 CO6: Minimize and maximize functions simulation and visualization and statistical analysis using R.

TEXT AND REFERENCE BOOKS:
1. W. N. Venables, D. M. Smith and the R core Team, An introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics, version 3.3.2, 2016.
2. Saroj Dahiya Ratnoo and Himmat Singh Ratnoo, Essentials of R for Data Analytics, Wiley, 2021.
3. Hadley Wickham and Garrett Grolemund, R for Data Science Import, Tidy, Transform and model Data, O'Reilly, 2017.
4. Paul Teeter, R Cookbook, O'Reilly, 2011.
5. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013.
6. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.

COMMUNICATION SKILLS FOR PROFESSIONALS

Semester	V			
Course code				
Category	Open Elective Courses			
Course title	Communication Skills for Professionals			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To hone verbal and written communication
2. To acquaint students with multiple forms and formats of various technical and business reports
3. To develop competence for report writing with a focus on its techniques
4. To develop English Language Proficiency

UNIT - I

Mechanics of Report Writing: Objectives of Report Writing; Types of Reports on the basis of forms and content. Introduction to Formats of Reports; Structure of Reports: Front Matter, Main Body, Back Matter.

UNIT - II

Writing Business and Technical Report: Preliminary Strategies for Report Writing: Data Collection, Report Planning, Use of Illustrations, Point Formation, Preparing Notes/Drafts Using Appropriate Formats: Memo Format, Letter Format, Manuscript Format, Printed Forms.

UNIT - III

Oral Communication and Soft Skills: Group Discussions; Interviews for jobs: preparation and facing them Professional Presentations: Power Point Presentation, Oral Presentation, Role of Kinesics (Body Language) in Communication, General Etiquettes in Office areas, corporate lunch and dinner Handling, Telephone calls

UNIT - IV

Resumes and Job application: Writing of Resume--Chronological Resume and Functional Resume, Request for Reference/Recommendation, Writing Application Letters for Job; Writing Covering letter

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to

CO1: Get acquainted with multiple forms and formats of various technical and business reports
CO2: Develop competence for report writing with a focus on its complex writing techniques and procedures.
CO3: Develop their speaking skills with professional proficiency.
CO4: Equip themselves for Letter Writing Skills.
CO5: Recognized different styles of communication that they and their colleagues use to communicate and make decisions.
CO6: Selected ways to adapt their communication style and methods to create understanding and engagement with others.

TEXT AND REFERENCE BOOKS:

1. Sharma,Sangeeta, and Binod Mishra. Communication Skills for Engineers and Scientists. PHI,2009.
2. Tyagi,Kavita, and Padma Mishra. Advanced Technical Communication. PHI, 2011.
3. Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill Education, 2014.
4. Kumar, Sanjay, and PushpLata. Communication Skills. OUP, 2011.
5. Raman, Meenakshi and SangeetaSharma.Communication Skills. OUP,2011.
6. *Bhatnagar, Nitin, and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson Education,
7. Mitra,Barun K. Personality Development and Soft Skills. OUP,2011.
8. Kaul, Asha. Business Communication. PHI, 2nd Edition.
9. Namee, Patrick Mc. Success in Interviews: How to Succeed in any Job Interview, Ist Edition.
10. Argenti, Paul. Corporate Communication.6th Edition. McGraw Hill Education, 2012.

SOFT SKILLS AND INTERPERSONAL COMMUNICATION

Semester	V				
Course code					
Category	Open Elective Courses				
Course title	Soft Skills and Interpersonal Communication				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To train students to learn Soft Skills and engage in a successful and fruitful Interpersonal Communication

UNIT - I

Soft Skills: Introduction to Soft Skills & their classification, Importance of Soft Skills: Writing Resume/CV, Engaging in Group discussion, Appearing for Job interviews

UNIT - II

Interpersonal Skills, Behaviour, Relationships and Communication: Development and Role of Effective Interpersonal Skills, Development of Effective Speaking and Listening Skills

UNIT - III

Non-Verbal Elements in Interpersonal Communication: Role of Body Language, Paralinguistic Features, Proxemics/Space Distance and Haptics in Interpersonal Communication

UNIT - IV

Personality Development for Personal and Professional Growth: Desirable Personality, Personality Types, Analysis of Personality Development (Freudian and Swami Vivekananda's Concept), Grooming Personality for Personal and Professional Life

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Know now how soft skills complement hard skills for career growth
 CO2: Enhance communicative competence for professional enhancement
 CO3: Learn desirable body language and other non-verbal elements in interpersonal communication
 CO4: Groom personality for handling effectively various situations of personal and professional life.

CO5: Develop all-round personalities with a mature outlook to function effectively in different circumstances.

CO6: Take part effectively in various selection procedures adopted by the recruiters.

TEXT AND REFERENCE BOOKS:

1. Mitra, Barun K. Personality Development and Soft Skills. Delhi: OUP, 2nd Edition, 2016.
2. Butterfield, Jeff.Soft Skills for Everyone. Cengage Learning, 2017.
3. Raman, Meenakshi and Sangeeta Sharma. Communication Skills. OUP, 2011.
4. Ramesh, Gopalaswamy and Mahadevan Ramesh. The ACE of Soft Skills, Pearson India,2010.
5. Ribbons, Geoff and Richard Thompson.Body Language.Hodder& Stoughton, 2007.
6. Sharma, Sangeeta and Binod Mishra.Communication Skills for Engineers and Scientists. PHI, 2017.

HUMAN RESOURCE MANAGEMENT

Semester	V			
Course code				
Category	Open Elective Courses			
Course title	Human Resource Management			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To help the students develop an understanding of the management of human resources and develop abilities and skills required to manage them.

UNIT - I

Introduction – nature and scope of human resource management, HRM objectives and functions, HRM policies, HRM in globally competitive environment; strategic human resource management.

UNIT - II

Acquiring human resources – Man power planning, Job evaluation, job analysis and job design. Recruitment: Sources, Methods, constraints & challenges, selection: objectives and process, placement and induction.

UNIT - III

Developing human resources: Training: types, methods, training vs. development and evaluation of a training programme and training need assessment, career planning and development.

UNIT - IV

Performance appraisal: methods, process and challenges of performance appraisal, performance appraisal vs. potential appraisal, Compensation: wages & salaries administration and factors influencing compensation levels.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
- CO1: To have an understanding of the basic concepts, functions and processes of human resource management
- CO2: To be aware of the role, functions and functioning of human resource department of the organizations.

CO3: To Design and formulate various HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Reward Systems, Compensation Plans and Ethical Behavior.

CO4: dentify and apply new ideas, methods and ways of thinking

CO5: Demonstrate competence in communicating and exchanging ideas in a group context

CO6: Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy.

TEXT AND REFERENCE BOOKS:

1. Jyothi, Human Resource Management, Oxford University Press
2. Bohlander George and Scott Snell, Management Human Resources, Cengage, Mumbai
3. Bhattacharyya, Dipak Kumar, Human Resource Management, Excel Books, NewDelhi
4. Cascio Wayne F., Managing Human Resources, TMH, New Delhi
5. DeCenzo, David A, and Stephan P. Robbins, Fundamentals of Human Resource Management, Wiley India, New Delhi
6. Denisi, Angelo S, and Ricky W Griffin, Human Resource Management, Biztantra, New Delhi

6TH SEMESTER

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - VI

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Compiler Design	3	0	0	3	3	30	70		100
2.	PCC		Advance JAVA Programming	3	0	0	3	3	30	70		100
3.	PCC		Cloud Computing	3	0	0	3	3	30	70		100
4.	PEC		Professional Elective Course - II	3	0	0	3	3	30	70		100
5.	PEC		Professional Elective Course - III	3	0	0	3	3	30	70		100
6.	OEC		Open Elective Course - II	3	0	0	3	3	30	70		100
7.	LC		Advance JAVA Programming Lab	0	0	2	2	1	50		50	100
8.	PROJECT		Project - I	0	0	4	4	2	50		50	100
			Total	**18**	**0**	**6**	**24**	**21**	**280**	**420**	**100**	**800**

NOTE:
1. At the end of the 6th semester, each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training center etc. and submit the typed report along with a certificate from the organization & its evaluation shall be carried out in the 7th Semester.
2. Choose any one from Professional Elective Course – II & III
3. Choose any one from Open Elective Course – II

Professional Elective Course – II
1. Software Testing
2. Cybersecurity
3. Information Retrieval
4. Wearable computing, mixed reality and Internet of everything
5. Soft Computing

Professional Elective Course – III
1. Network Security and Cryptography
2. Internet Technologies
3. Mobile applications development
4. Advance Database Management System
5. Machine Learning

Open Elective Course – II
1. Open-Source Systems
2. Wireless Communication
3. Industrial Safety
4. Natural Language Processing
5. Disaster Management

COMPILER DESIGN

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Compiler Design				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis.
3. Design top-down and bottom-up parsers.
4. Identify synthesized and inherited attributes.
5. Develop syntax-directed translation schemes.

UNIT - I

Introduction to Compilers: Language Processors, The Structure of compiler: its different phases, Compiler Construction Tools, Applications of Compiler Technology.

Lexical Analysis: Role of lexical analyzer, Input Buffering, Specification, and recognition of tokens, design of lexical analyzer, regular expressions, A language specifying lexical analyzer, Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing the number of states of DFA, Implementation of lexical analyzer.

UNIT - II

Syntax Analysis: Role of parsers, context-free grammars.

Parsing Technique: Shift-reduce parsing, Operator precedence parsing, Top-down parsing, Predictive parsing.

UNIT - III

LR parsers, SLR, LALR, and Canonical LR parser.

Syntax Directed Translations: Syntax-directed definitions, construction of syntax trees, syntax-directed translation scheme, implementation of syntax-directed translation, Intermediate-Code Generation: three address code, quadruples and triples.

UNIT - IV

Symbol Table & Error Detection, and Recovery: Symbol tables: its contents and data structure for symbol tables; trees, arrays, linked lists, hash tables. Errors, lexical phase error, syntactic phase

error, and Semantic error. **Code Optimization & Code Generation:** Code generation, forms of objects code, machine-dependent code, optimization, register allocation for temporary and user defined variables.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: state principles of compiler design.

CO2: illustrate the essential phases for automatically converting source code into object code.

CO3: apply lexical analysis, syntax analysis and code optimization techniques for solving problems.

CO4: analyse a parse tree and a given BNF grammar.

CO5: compare and contrast syntax-oriented translation schemes.

CO6: design a lexical analyser from the specification of a language's lexical rules.

TEXT AND REFERENCE BOOKS:

1. Theory and practice of compiler writing, Tremblay & Sorenson, 1985, Mc. Graw Hill.
2. System software by Dhamdhere, 1986, MGH.
3. Principles of compiler Design, Narosa Publication
4. Elements compiler Design, Dr. M. Joseph, University Science Press
5. Compilers Principle, Techniques & Tools – Alfred V. AHO, Ravi Sethi & J.D. Ullman; 1998 Addison Wesley.

ADVANCE JAVA PROGRAMMING

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Advance Java Programming				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Programming in the Java programming language,
2. Knowledge of object-oriented paradigm in the Java programming language,
3. The use of Java in a variety of technologies and on different platforms.

UNIT - I

Servlet: Servlet introduction, web terminology, servlet API, servlet Interface, generic servlet, Http servlet, servlet lifecycle, servlet with IDE (eclipse, My eclipse, Net beans), servlet request, servlet collaboration, servlet configuration, context, attribute in servlet, session technique in servlet, event and listener, servlet filter, CRUD, pagination, input output stream, annotation, single thread model, SSI;

JSP: Lifecycle of JSP, JSPAPI, scripting elements, 9Implicit Objects, directive elements,
Exceptions, action elements, expression language, MVC in JSP, JSTL, custom tags, pagination, CRUD, JSTL function, formatting, XML, SQL tags.

UNIT - II

Struts: Introduction, features, models, components, struts2 architecture, action, configuration, interceptors, validation method, aware Interfaces, stuts2withI18N, zero configuration, struts2withtiles, hibernate with struts2, spring with struts2, UI tags;

Mail API: java mail introduction, methods of sending email, sending mail by Gmail, receiving email, sending attachment, receiving attachment, sending html, forwarding, deleting email.

UNIT - III

Hibernate(HB): Introduction, architecture, HB with IDE, HB Log4j, inheritance mapping, HB mapping, transaction management, HB query language, HB criteria query language, named query, HB caching, integration, HB lifecycle;

Spring: Introduction, modules, spring with IDE, dependency injection methods, spring AOP, spring Jdbc template, spring ORM, SPEL, MVC tag library, applications, spring remoting, spring OXM, spring web, security models, spring boot, spring with angular.

UNIT - IV

Android: Introduction, history & versions, architecture, building blocks, emulator, android widgets, activity and intents, android fragments, android menu, android service, SQLite, XML & JSON, android speech, multimedia, telephony, maps;

Design Pattern: java design pattern, creational, structural, behavioral, J2EE patterns, presentation layers.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Knowledge of the structure and model of the Java programming language, (knowledge).
 CO2: Use the Java programming language for various programming technologies (understanding).
 CO3: Develop software in the Java programming language.
 CO4: Demonstrate a sound technical knowledge of their selected project topic.
 CO5: Undertake problem identification, formulation and solution.
 CO6: Conduct an engineering project.

TEXT AND REFERENCE BOOKS:

1. Patrick Naught on and Herbertz Schidt, "Java-2 the complete Reference",TMH
2. Sierra & bates, "Head First Java", O'Reilly.
3. E. Balaguruswamy, "Programming with Java",TMH
4. Horstmann, "Computing Conceptswith Java2 Essentials", John Wiley.
5. Decker & Hirsh field, "Programming.Java", Vikas Publication.

CLOUD COMPUTING

Semester	VI				
Course code					
Category	Professional Core Courses				
Course title	Cloud Computing				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

UNIT - I
INTRODUCTION TO CLOUD COMPUTING: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing.

UNIT - II
CLOUD COMPUTING ARCHITECTURE: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model Cloud Deployment Models Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise .

UNIT - III
SECURITY ISSUES IN CLOUD COMPUTING: Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

SECURITY MANAGEMENT IN THE CLOUD: Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS Privacy Issues Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

UNIT - IV

AUDIT AND COMPLIANCE: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a Cloud.

DATA INTENSIVE COMPUTING: Map-Reduce Programming Characterizing Data-Intensive Computations, Technologies for Data- Intensive Computing, Storage Systems, Programming Platforms, MapReduce Programming, MapReduce Programming Model, Example Application

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Recall and summarize the basic concepts of cloud computing
 CO2: Discuss the architectural design of cloud and illustrate various programming models.
 CO3: Outline the virtualization technology and determine their uses.
 CO4: Explain the basic threats and security mechanism in cloud
 CO5: Summarize the cloud available platforms for business and industry perspective

TEXT AND REFERENCE BOOKS:

1. "Cloud Computing Explained: Implementation Handbook for Enterprises", John Rhoton, Publication Date: November 2, 2009
2. "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)", Tim Mather, ISBN-10: 0596802765,O'Reilly Media, September 2009

ADVANCE JAVA PROGRAMMING LAB

Semester	VI			
Course code				
Category	Laboratory course			
Course title	Advance Java Programming Lab			
Scheme and Credits	L	T	P	Credits
	0	0	2	1
Classwork	50 Marks			
Exam	50 Marks			
Total	100 Marks			
Duration of Exam	02 Hours			

CONTENTS

1. Servlet Program: User Registration Form
   a. Create a servlet to handle user registration form submission.
   b. Store the user data in a database using JDBC.
   c. Perform validation on the form inputs and display appropriate error messages.
   d. Redirect the user to a success page upon successful registration.
2. JSP Program: Employee Management System
   a. Create a JSP page to display a list of employees retrieved from a database.
   b. Implement CRUD operations (Create, Read, Update, Delete) for managing employee records.
   c. Use JSTL (JavaServer Pages Standard Tag Library) for iteration and conditional rendering.
   d. Apply formatting using JSTL functions and display data in a tabular format.
3. Struts Program: Employee Management with Struts
   a. Create an Employee Management web application using Struts framework.
   b. Implement actions, forms, and validation using Struts annotations.
   c. Apply interceptors for authentication and authorization.
   d. Integrate with Hibernate for database operations.
4. Mail API Program: Email Client Application
   a. Develop an email client application using Java Mail API.
   b. Implement features such as sending and receiving emails.
   c. Support attachments, HTML content, forwarding, and deleting emails.
   d. Use Gmail SMTP and IMAP servers for email communication.
5. Hibernate Program: Product Catalog Management
   a. Build a product catalog management system using Hibernate framework.
   b. Define Hibernate mapping for product and category entities.
   c. Perform CRUD operations on the database using Hibernate APIs.
   d. Utilize Hibernate query language and criteria queries for advanced querying.
6. Spring Program: Library Management System
   a. Develop a library management system using Spring framework.
   b. Utilize Spring's dependency injection for managing application components.
   c. Implement Spring AOP for logging and transaction management.
   d. Integrate with Spring JDBC Template for database operations.
7. Android Program: Weather Forecast App
   a. Create a weather forecast application for Android devices.

b. Fetch weather data from a web API using HTTP requests.
c. Display the weather information using Android widgets and RecyclerView.
d. Implement features like location-based weather, caching, and multi-day forecasts.

8. Design Pattern Program: Factory Method Pattern
   a. Implement the Factory Method design pattern in Java.
   b. Create a factory interface and concrete factories for creating different types of products.
   c. Define a common product interface and concrete product classes.
   d. Demonstrate the flexibility of the pattern by creating and using products through the factory.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to

CO1: Explore the usage of JSP scripting elements, implicit objects, and directive elements.

CO2: Familiarize yourself with the Java Mail API, its methods, and practical implementation for sending and receiving emails.

CO3: Understand Hibernate caching mechanisms and its integration with other technologies.

CO4: Understand the importance and implementation of design patterns in Java, including creational, structural, and behavioral patterns.

CO5: Explore J2EE patterns and presentation layers to develop scalable and maintainable enterprise-level applications.

CO6: Explore various Android components like widgets, activities, intents, fragments, menus, and services.

PROJECT - I

Semester	VI				
Course code					
Category	Project				
Course title	Project - I				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVE
1. To allow students to demonstrate skills learned during their course of study by asking them to deliver a product that has passed through the design, analysis, testing and evaluation
2. To encourage research through the integration learned in a number of courses.
3. To allow students to develop problem solving skills.
4. To encourage teamwork.
5. To improve students' communication skills by asking them to produce both a professional report and to give an oral presentation and prepare a technical report.

Students will be assigned projects (Applications/Research based) individually or in a group of not more than 3 students depending on the efforts required for completion of the project.

The project will have 4 stages: (*Marks for internal evaluation are given in brackets)
1. Synopsis submission   (5 marks),
2. 1st mid-term progress evaluation (Literature Survey in case of research project)   (5 marks)
3. 2nd mid-term progress evaluation (Paper Publishing/acceptance in a reputed Journal or Conference acceptance/ Presenting)   (5 marks)
4. Final submission evaluation

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and/or publication and viva.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
CO1: Demonstrate a sound technical knowledge of their selected project topic.
CO2: Undertake problem identification and formulation.
CO3: Design engineering formula to complex problems utilising a systems approach.
CO4: Research and engineering project.
CO5: Communicate with engineers and the community at large in written and oral form.
CO6: Demonstrate the knowledge, skills and attitudes of a professional engineer.

Professional Elective Course - II

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course title	Software Testing			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To study fundamental concepts of software testing including software testing objectives, process, criteria, strategies, and methods.
2. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To gain an insight into techniques and skills on how to use modern software testing tools to support software testing projects.

UNIT - I

Introduction: Overview of Software Development Life Cycle (SDLC), Significance of Software Testing in SDLC, Objectives and Limitations of software testing. Difference between an Error, Fault and Failure (Software Bug), Software Testing Life Cycle (STLC) and Seven Principles of Software Testing, Role of Software Testing in Software Quality

UNIT - II

Test Case Design: Test Cases and Test Suite, Test Case Planning and Designing, Characteristics of Good Test Case Design, Format of test case.
Testing Activities: Levels of Testing- Unit, Integration Testing and System Testing. V Model for Software Testing.

UNIT - III

Types of Software Testing: Black box testing, White Box and Gray Box Testing.
Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis
 and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools.

UNIT - IV

Types of Software Testing: Black box testing, White Box and Gray Box Testing.

Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis
and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand software testing and quality as a fundamental component of software development life cycle.

CO2: Understand and design the test cases for a given problem

CO3: Understand the process of Reporting of software failures(bugs) using tools like Bugzilla

CO4: Develop the knowledge of selection of appropriate test cases for execution during regression testing.

CO5: Compare and contrast the various activities of Quality Assurance, Quality planning and Quality Control.

CO6: Conduct formal inspections, record and evaluate results of inspections.

TEXT AND REFERENCE BOOKS:

1. "Software Testing: Principles and Practices", by Naresh Chauhan. Oxford University Press
2. "William Perry, Effective Methods for Software Testing, John Wiley & Sons, New York, 1995.
3. Boris Beizer, Software Testing Techniques, Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, Software Testing, Pearson Education Asia, 2002
5. Roger S. Pressman, Software Engineering – A Practitioner's Approach, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
6. Boris Beizer, Black-Box Testing – Techniques for Functional Testing of Software and Systems, John Wiley & Sons Inc., New York, 1995.
7. K.K. Aggarwal & Yogesh Singh, Software Engineering, New Age International Publishers, New Delhi, 2003.

CYBERSECURITY

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Cybersecurity				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
The course has been designed to give students an extensive overview of cyber security issues, tools and techniques that are critical in solving problems in cyber security domains.The course aims at providing students with concepts of computer security, cryptography, digital money, secure protocols, detection and other security techniques. The course will help students to gauge understanding in essential techniques in protecting Information Systems, IT infrastructure, analysing and monitoring potential threats and attacks, devising security architecture and implementing security solutions. The students will also have a wider perspective to information security from national security perspective from both technology and legal perspective.

UNIT - I

Cyber Security Concepts
Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning).
Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

UNIT - II

Cryptography and Cryptanalysis: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.
Open Source/ Free/ Trial Tools: Implementation of Cryptographic techniques, OpenSSL, Hash Values Calculations MD5, SHA1, SHA256, SHA 512, Steganography (Stools)

UNIT - III

Infrastructure and Network Security: Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks.

Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.
Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain & abel, iptables/ Windows Firewall, snort, suricata, fail2ban

UNIT - IV

Cyber Security Vulnerabilities& Safe Guard: Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment.
Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
  CO1: Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.
  CO2: Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
  CO3: Identify common trade-offs and compromises that are made in the design and development process of Information Systems
  CO4: Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

TEXT AND REFERENCE BOOKS:
1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.
2. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House.
3. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.
4. Atul Kahate, "Cryptography and Network Security", McGraw Hill.
5. V.K. Pachghare, "Cryptography and Information Security", PHI Learning
6. Nina Godbole, "Information System Security", Wiley
7. Bothra Harsh, "Hacking", Khanna Publishing House, Delhi.

INFORMATION RETRIEVAL

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course Title	Information Retrieval				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To build an understanding of the fundamental concepts of Information Retrieval
2. To understand the elements of Web Search Engines and Crawlers
3. To familiarize students with the basic taxonomy and terminology of Indices and to understand Heap's Law for estimation and Zipf's law for modeling distribution of terms
4. To understand dictionary compression and posting list compression and to introduce the scoring , tf-idf weighting and vector space model for scoring

UNIT - I

Information retrieval problem, an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval, an inverted index, Bi-word indexes, Positional indexes, Combination schemes

UNIT - II

Search Engines: Basic Building Blocks and Architecture, Text Acquisition, Text Transformation, Index Creation, User Interaction, Ranking, Evaluation. **CRAWL AND FEEDS:** Crawling the Web, Retrieving Web Pages, The Web Crawler, Freshness, Focused Crawling, Deep Web, Crawling Documents and Email, Storing the Documents, Detecting Duplicates

UNIT - III

INDEX CONSTRUCTION AND COMPRESSION: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing **Index compression:** Statistical properties of terms in information retrieval, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression, Dictionary as a string, Blocked storage, Postings file compression

UNIT - IV

SCORING, TERM WEIGHTING AND THE VECTOR SPACE MODEL: Parametric and zone indexes, Weighted zone scoring, Learning weights, The optimal weight, Term frequency and

weighting, Inverse document frequency, Tf-idf weighting, The vector space model for scoring , Computing scores in a complete search system.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
CO1: Understand basic Information Retrieval Systems and learn how Boolean queries are processed.
CO2: Realize the data structures like Inverted Indices used in Information retrieval systems.
CO3: understand the basic concept of Search Engines their architecture and its various functional components and understand the basic concept of Web crawlers and their architecture
CO4: identify the different types of indices: inverted index, positional index, biword index and be able make estimations and model distribution of terms and compressions
CO5: enumerate various types of indices and also understand the concept of efficient storage of indices and learn tf-idf scoring and vector space model scoring for ranking.

TEXT AND REFERENCE BOOKS:
1. C.D.Manning, P. Raghavan and H.Schutze "Introduction to Information Retrieval", Cambridge University Press, Latest Edition
2. B.Croft, D.Metzler, T.Strohman, "Search Engines : Information Retrieval in Practice", AddisionWesley, Latest Edition

SOFT COMPUTING

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course title	Soft Computing			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
4. To provide students an hand-on experience on MATLAB to implement various strategies.

UNIT - I
INTRODUCTION TO SOFT COMPUTING: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT - II
FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT - III
NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT - IV
GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to

CO1: Identify and describe soft computing techniques and their roles in building intelligent Machines.
CO2: Develop intelligent systems leveraging the paradigm of soft computing techniques.
CO3: Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
CO4: Recognize the feasibility of applying a soft computing methodology for a particular problem.
CO5: Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms.
CO6: Evaluate and compare solutions by various soft computing approaches for a given problem.

TEXT AND REFERENCE BOOKS:
1. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", PHI
2. Satish Kumar, "Neural Networks: A classroom approach" Tata McGraw Hill.
3. Haykin S., "Neural Networks-A Comprehensive Foundations", PHI
4. Anderson J.A., "An Introduction to Neural Networks", PHI
5. M.Ganesh, "Introduction to Fuzzy sets and Fuzzy Logic" PHI.
6. N P Padhy and S P Simon, " Soft Computing with MATLAB Programming", Oxford University Press

INTERNET OF THINGS

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course Title	Internet of Things			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Student will be able to learn the basics of IOT.
2. Student will be able to analyse basic protocols of wireless and MAC.
3. Students will get familiar with web of things.
4. Students will get basic knowledge of resource management.

UNIT - I
INTRODUCTION TO IOT: Introduction to IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs ,IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network, Challenges in IoT(Design ,Development, Security)

UNIT - II
NETWORK AND COMMUNICATION ASPECTS: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.

UNIT - III
WEB OF THINGS: Web of Things vs Internet of things, two pillars of web, Architecture and standardization of IoT, Unified multitier-WoT architecture, WoT portals and Business intelligence, Cloud of things: Grid/SOA and cloud computing, Cloud middleware, cloud standards

UNIT - IV
RESOURCE MANAGEMENT IN IOT: Domain specific applications of IoT, Home automation, Industry applications, Surveillance applications, Other IoT applications Clustering, Synchronization, Software agents.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to

CO1: **Understand** the basics of application areas of IOT.
CO2: Analyze basic protocols network.
CO3: Explain and realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
CO4: Discuss the architecture, operation, and business benefits of an IoT solution
CO5: Examine the potential business opportunities that IoT can uncover
CO6: Explore the relationship between IoT, cloud computing, and big data and Identify how IoT differs from traditional data collection system

TEXT AND REFERENCE BOOKS:
1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

Professional Elective Course - III

NETWORK SECURITY AND CRYPTOGRAPHY

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course title	Network Security And Cryptography			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand cryptography theories; algorithms & systems.
2. To understand the symmetric and asymmetric key algorithms.
3. To understand necessary approaches & techniques to build protection mechanisms in order to secure Computer Networks.
4. Acquire fundamental knowledge on the concepts of different security layers.

UNIT - I
Introduction: Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

UNIT - II
Symmetric Key Algorithms: Introduction, algorithms types and modes, DES, AES.
Asymmetric Key Algorithms: Introduction, history of asymmetric key cryptography, RSA symmetric and asymmetric key cryptography together, Digital signature.

UNIT - III
Internet Security Protocols: Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), S SL versus SET, Electronic Money, Email Security.

UNIT - IV
User Authentication And Kerberos: - Introduction, Authentication basics, Passwords, authentication tokens, certificate-based authentication, biometric-based authentication, Kerberos, key distribution center(KDC), Security handshake pitfalls, single Sign on(SSO) approach.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO1: Identify services that enhance the security and its mechanism.

CO2: Classify security attacks on information over network. Describe and apply classical encryption techniques.

CO3: Explain and apply modern block cipher with modes

CO4: Compare conventional encryption algorithms & public key cryptography, and design Encryption algorithm to provide the Integration and confidentiality of a message.

CO5: Understand the concept of hash function with application and message authentication code in security system

CO6: Classify key management schemes and discuss web security and transport level security protocols.

TEXT AND REFERENCE BOOKS:
1. Cryptography and Network Security, 2nd Edition by Atul Kahate, TMH
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP, Stalling, Willian (AWL)
4. SNMP: A Guide to Network Management (MGH)
5. Telecom Network Management by H.H. Wang (MGH)
6. Network Management by U. Dlack (MGH)

INTERNET TECHNOLOGIES

Semester	VI
Course code	
Category	Professional Elective Courses
Course title	Internet Technologies
Scheme and Credits	L T P Credits 3 0 0 3
Classwork	30 Marks
Exam	70 Marks
Total	100 Marks
Duration of Exam	03 Hours

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

UNIT - I

WEB SERVERS: Web Protocols- Working of web browser - Browser & Server Communication - Web Server Functions - Web Security - Fire Wall - Proxy Servers - Virtual Directories - MIME - HTTP Headers - Deployment using web servers.

WEB PROGRAMMING: HTML5 Structural Elements-Images - HTML5 Form Elements and Attributes - DHTML - CSS3-Selectors-Box model-Positioning elements-Colors-Shadows-Gradients-Transitions and Transformations.

UNIT - II

JAVASCRIPT: Java Script - Core JavaScript - lexical structure- types-values and variables-expression and operators-statements-objects arrays-functions- classes and modules- pattern matching with regular expressions- java script in web browser-the window objects scripting documents-handling events.

UNIT - III

ANGULARJS: An Overview of the AngularJS Life Cycle-Integrating AngularJS with Existing JavaScript and jQuery-Adding AngularJS to the Node.js Environment-Bootstrapping AngularJS in an HTML Document- Creating a Basic AngularJS Application-Using AngularJS Templates to Create Views- Implementing Directives in AngularJS Views- Implementing AngularJS Services in Web Applications.

NODE.JS: Using Events, Listeners, Timers, and Callbacks in Node.js-5 Handling Data I/O in Node.js- Accessing the File System from Node.js- Implementing HTTP Services in Node.js-implementing Socket Services in Node.js- Scaling Applications Using Multiple Processors in Node.js- Implementing Express in Node.js

UNIT - IV

MONGODB: Understanding NoSQL and MongoDB- Manipulating MongoDB Documents from Node.js- Accessing MongoDB Documents from Node.js- Advanced MongoDB Concepts

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
CO1: Understanding of the concept of the web servers and its working.
CO2: Analyze a web page and identify its elements and attributes.
CO3: Build dynamic web pages using JavaScript (Client side programming).
CO4: Acquire in depth knowledge in web services using the latest server-side technologies.
CO5: Ability to design and develop web server applications using Node JS and Angular JS.
CO6: Demonstrate the connectivity of web pages and database like NoSQL and MongoDB.

TEXT AND REFERENCE BOOKS:
1. Deitel & Deitel, "Internet & World Wide Web How to Program", Pearson Education India, fifth Edition, 2011.
2. David Flanagan "JavaScript: The Definitive Guide, O'Reilly Media, Inc. May 2011.
3. Brad Dayley "Node.js, MongoDB, and AngularJS Web Development", Addison-Wesley Professional. 2014
4. Brad Green, Shyam Seshadri "AngularJS", O'Reilly; 1st Edition Apr 2013.
5. Negrino and Smith, "Javascript for the World Wide Web", 5th Edition, Peach pit Press,2003

WEARABLE COMPUTING, MIXED REALITY AND INTERNET OF EVERYTHING

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course title	Wearable Computing, Mixed Reality And Internet of Everything			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1.

UNIT - I

INTRODUCTION: Introduction – History - Creative Coding Platforms - Open Source Platforms – PIC - Arduino, Sketch, Raspberry Pi, Iterative coding methodology – Python Programming - Mobile phones and similar devices - Arm Devices - Basic Electronics (circuit theory, measurements, parts identification) Sensors and Software: Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World

UNIT - II

SOFTWARE HARDWARE FRAMEWORKS: Software: open Frameworks as our IDE (C/C++) - "Arduino" Language (C/C++) - Hardware: Desktop / Laptop / Raspberry Pi - How to approach a programming problem? Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, etc. Analog to Digital Conversion (ADC) - Digital to Analog Conversion (DAC)– Microcontrollers - Communication – Serial& Parallel - Hardware to Hardware Communication - I2C/IIC (Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication

UNIT - III

CYBERNETICS AND HUMANISTIC INTELLIGENCE: Wearables - Augmented Reality – Mixed Reality. Case studies, Oculus Rift (2012, 2013), AR versus VR - IoT and Wearables: Smart Cites and Wearable Computing as a form of urban design - Advanced I/O – open Frameworks:Live Network feeds (push and pull) - Data persistence (saving data and preferences) - Database interface (MySQL, sqLite, XML, PHP/Web) - Arduino: Wired/Wireless Networking (hardware vs. USB proxy) - Software serial (RS-232) talking to other devices - Advanced sensor/device communication SPI - Advance IC interfacing / Bitbanging (bitwise operators) - Linux –GPIO

UNIT - IV

THE WORLD OF THE FUTURE – INTERNET OF EVERYTHING: Humanistic Intelligence, Mann 1998. Wearable Computing and IoT (Internet of Things) The scalespace theory; sur/surveillance; integrity; Veillance Contract; Humanistic Intelligence; MedialityAxis? Overview of Mobile and Wearable Computing, Augmented Reality, and Internet of Things. The fundamental axes of the Wearables + IoT + AR space - Free-roaming AR: Wearable Computing, Wireless, Sensing, and Metasensing with light bulbs Phenomenal Augmented Reality: Real world physical phenomena as the fundamental basis of mobile and wearable AR.

FUTURE AND PERSPECTIVES: Internet of Everything – The Future and perspectives - Challenges

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

 CO1: Understand advanced and emerging technologies.
 CO2: Obtain skills to do advanced research and programming.
 CO3: Learn how to use software programs to perform varying and complex tasks.
 CO4: Expand upon the knowledge learned and apply it to solve real world problems

TEXT AND REFERENCE BOOKS:

1. Practical Electronics for Inventors, Third Edition," by Paul ScherzandSimon Monk. 2016
2. Intel Galileo and Intel Galileo Gen 2API Features and Arduino Projects for Linux Programmers, Ramon, Manoel 2014 (Open Access)
3. Fundamentals of Wearable Computers and Augmented Reality, Second Edition by Woodrow Barfield 2015
4. Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design By OmeshTickoo, Ravi Iyer 2016
5. Programming Interactivity, Second Edition By Josha Noble, 2012
6. Programming the Raspberry Pi: Getting Started with Python 2E, 2016

ADVANCE DATABASE MANAGEMENT SYSTEM

Semester	VI			
Course code				
Category	Professional Elective Courses			
Course title	Advance Database Management System			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand DBMS Components, Advantages and Disadvantages.
2. Understanding Data modeling: ER, EER, Network, Hierarchical and Relational data models.
3. Understanding normalization, general strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization.
4. To understand transaction concept, schedules, serializability, locking and concurrency control protocols.

UNIT - I
Introduction: Architecture, Advantages, Disadvantages, Data models, relational algebra, SQL, Normal forms.
Query Processing: General strategies for query processing, transformations, expected size, statistics in estimation, query improvement. Query evaluation, view processing, query processor.

UNIT - II
Recovery: Reliability, Transactions, recovery in centralized DBMS, reflecting updates, Buffer management logging schemes, disaster recovery.
Concurrency: Introduction, Serializability, Concurrency control, locking schemes, Timestamp based ordering, Optimistic, Scheduling, Multi-version techniques, Deadlocks.

UNIT - III
Parallel and Distributed Databases: Distributed Data Storage – Fragmentation & Replication, Location and Fragment.
Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

UNIT - IV

Objected Oriented and Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Students will get understanding of DBMS Components, Its advantages and disadvantages.

CO2: Understanding about various types of Data modeling: ER, EER, Network, Hierarchical and Relational data models.

CO3: Explain the concept of distributed database architecture & design and web technology using databases.

CO4: Understanding normalization, general strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization.

CO5: Understanding transaction concept, schedules, serializability, locking and concurrency control protocols.

TEXT AND REFERENCE BOOKS:

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education,2007
2. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
3. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998
4. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007 2
5. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
6. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
7. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision Wesley

MACHINE LEARNING

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Machine Learning				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Understand the machine learning techniques.
2. Gain knowledge of linear regression models, Random Forests
3. KNN classifier Gain knowledge on the basics of probabilistic approaches like Naïve Bayes, Bayes Theorem
4. Acquire knowledge of Support Vector machines, K-means clustering techniques
5. Introduce the working principle of Artificial Neural networks

UNIT - I
Machine Learning: Definition, History, Need, Features, Classification of Machine Learning: Supervised learning, Unsupervised learning, Reinforcement Learning, Machine Learning life cycle, Applications of Machine Learning, Parametric vs. non-parametric models. Learning theory-bias/variance tradeoff, Underfitting, Overfitting, Major differences between statistical modelling and machine learning, Steps in machine learning model development, Machine learning losses, when to stop tuning machine learning models, Train, validation, and test data Cross-validation, Grid Search.

UNIT - II
Dimensionality reduction: Definition, Row vector and Column vector, how to represent a dataset, how to represent a dataset as a Matrix, Data preprocessing in Machine Learning: Feature Normalization, Mean of a data matrix, Column Standardization, Co-variance of a Data Matrix, Principal Component Analysis for Dimensionality reduction.

UNIT - III
Supervised Learning: Definition, how it works. Types of Supervised learning algorithms k - Nearest Neighbours, Naïve Bayes, Decision Trees, Naive Bayes, Linear Regression, Logistic Regression, Support Vector Machines.

UNIT - IV

Unsupervised Learning: Clustering: K-means. Ensemble Methods: Boosting, Bagging, Random Forests.

Dimensionality reduction techniques: PCA, LDA, ICA, SVD

Evaluation: Performance measurement of models in terms of accuracy, confusion matrix, precision & recall, F1-score, receiver Operating Characteristic Curve (ROC) curve and AUC, Median absolute deviation (MAD), Distribution of errors

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Acquire the knowledge of machine learning model evaluation methods/measurements.

CO2: Understand different types of machine learning techniques and their applications in the real world.

CO3: Apply various mathematical models for supervised machine learning models.

CO4: Apply and evaluate the unsupervised machine learning models through various clustering algorithms.

CO5: Evaluate various machine learning algorithms through statistical learning techniques.

CO6: Apply reinforcement learning algorithms to solve real-time complex problems with an understanding of the trade-offs involved.

CO7: Design the recommendation system using natural language processing and evaluate the machine learning models through ANN.

TEXT AND REFERENCE BOOKS:

1. E. Alpaydin, Introduction to Machine Learning, (3e), PHI Learning 2015.
2. S Marsland, Chapman and Hall, Machine Learning: An Algorithmic Perspective, (2e), CRC,2014.
3. M. Bishop, Pattern Recognition and Machine Learning, (2e), Springer, 2013.
4. T. Mitchell, Machine Learning, (1e), McGraw Hill Education, 2017.
5. L.E. Sucar, Probabilistic Graphical Models: Principles and Applications (Advances in Computer Vision and Pattern Recognition), (1e), Springer, 2016

Open Elective Course - II

OPEN-SOURCE SYSTEMS

Semester	VI				
Course code					
Category	Open Elective Courses				
Course title	Open-Source Systems				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

UNIT - I
FOSS PHILOSOPHY AND LINUX PACKAGE
Introduction to Software Terminologies - Overview of Free/Open-Source Software - Definition of FOSS & GNU - History of GNU/ Linux and the Free Software Movement, Advantages of Free Software and GNU/Linux, FOSS usage, trends and potential - global and Indian-Free Software Licenses (GPL, LGPL, AGPL). Installing software - from source code as well as using binary packages - Understanding build systems - constructing make files and using make, using Autoconf and autogen to automatically generate make files tailored for different development environments.

UNIT - II
OPEN-SOURCE NON-RELATIONAL DATABASES
NoSQL definition - relational Vs non-relational database - working with NoSQL - Running MongoDB - Getting A Database Connection - Inserting Data into A Collection - Accessing Data from a Query - CouchDB-Developing with CouchDB - Example application - Deploying CouchDB.

UNIT - III
OPEN-SOURCE PROGRAMMING LANGUAGES
PHP: Introduction - Programming in web environment - variables - constants - data types -operators - Statements - Functions - Arrays - OOP - String Manipulation and regular expression - File handling and data storage - PHP and SQL database - PHP and LDAP - PHP Connectivity - Sending and receiving E-mails - Debugging and error handling - Security - Templates.
PYTHON: Syntax and Style - Python Objects - Numbers - Sequences - Strings - Lists and Tuples - Dictionaries - Conditionals and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OOP - Execution Environment.

UNIT - IV

OPEN-SOURCE TOOLS AND TECHNOLOGIES

Web Server: Apache Web server -Google Web server- Working with Web Server - Configuring and Using Apache web services

MDA: Introduction to MDA - Genesis of MDA - Meta Object Facility - UML -UML Profiles - MDA Applications- case studies.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Students shall be able to understand the importance of FOSS.

CO2: Ability to create and manipulate non-relational data bases.

CO3: Understand various version control sytems.

CO4: Ability to write programs using PHP, Python and manipulate SQL data base.

CO5: Ability to configure and use Apache web services, acquire knowledge to develop software models using MDA.

TEXT AND REFERENCE BOOKS:

1. Mike McGrath, "Linux in easy steps, Sixth Edition", Tata McGraw-Hill, Sixth Edition 2010.
2. N. B. Venkateshwarlu, "Introduction to Linux: Installation and Programming", First Edition, BS Publishers, 2006.
3. Steve Suchring, "MySQL Bible", John Wiley, 2007.
4. Steven Holzner, "PHP: The Complete Reference", TMH Edition; 2007
5. J.Chris Anderson, "CouchDB : Definitive Guide", First Edition, O'Reilly series, 2010.
6. Wesley J.Chun, "Core Python Programming", Prentice Hall, 2007
7. Stephen J. Mellor, Marc Balces, "Executable UMS: A foundation for MDA", Addison Wesley, 2002.

WIRELESS COMMUNICATION

Semester	VI			
Course code				
Category	Open Elective Courses			
Course title	Wireless Communication			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To know about the evolution of wireless communication systems and various generations of cellular systems.
2. To understand the basic design principles of cellular systems.
3. To understand the advanced multiple access techniques.
4. To understand the diverse reception techniques and applications of cellular networks.

UNIT - I
INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, and comparison of various wireless systems.

MODERN WIRELESS COMMUNICATION SYSTEMS: Second-generation cellular networks, third-generation wireless networks, wireless in the local loop, wireless local area networks, Bluetooth and Personal Area networks.

UNIT - II
INTRODUCTION TO CELLULAR MOBILE SYSTEMS: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analogue cellular systems, digital Cellular Systems.

CELLULAR SYSTEM DESIGN FUNDAMENTALS: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and trade-off service, improving coverage and capacity.

UNIT - III
MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum Multiple Access, space division multiple access, packet ratio, the capacity of cellular systems.

UNIT - IV

WIRELESS NETWORKING: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signalling, ISDN (Integrated Services Digital Networks), advanced intelligent network**.**

INTELLIGENT CELL CONCEPT AND APPLICATION: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1: Understand the evolution of wireless communication systems and various generations of cellular systems.
- CO2: Summarize the challenges of wireless transmission and different design models.
- CO3: To illustrate the working of a cellular network and discuss issues related to cellular network design.
- CO4: Understand the advanced multiple access techniques.
- CO5: Understand the diverse reception techniques and applications of cellular networks.

TEXT AND REFERENCE BOOKS:

1. Wireless Communications: Theodore S. Rappaport; Pearsons.
2. Mobile Cellular Telecommunication: W.C.Y.Lee; McGraw Hill
3. Mobile Communications: Jochen Schiller; Pearson

INDUSTRIAL SAFTEY

Semester	VI			
Course code				
Category	Open Elective Courses			
Course title	Industrial Saftey			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To teach the students the concept of industrial safety and provide useful practical knowledge for workplace safety.
2. To identify, evaluate control the hazards to prevent or mitigate harm or damage to people, property and the environment.
3. To understand about fire and explosion, preventive methods, relief and its sizing methods
4. To analyze industrial hazards and its risk assessment

UNIT - I
Introduction: Concept of loss prevention, origin of process hazards, types of process hazards, acceptable risks, accident and loss statics, nature of accident process, concepts of inherent safety in plants or Factories, dose Vs response curve, toxicants entry route, thresh limit values, safety regulations.

UNIT - II
Hazards: Fire, Chemical (industrial and laboratory scale), electrical, mechanical, biohazards (natural and anthropogenic), toxic materials, their types and preventive measures, Liquid and vapor phase hazardous methods, storage and handling, containment, precautions, Personal safety precautions.

UNIT - III
Risk management principles, risk analysis techniques, risk control, hazards operability studies, hazard analysis, Fault tree analysis, Consequences analysis, human error analysis, accidental error analysis, economics of risk management, check list, reliability theory, event tree, HAZOP, safety reviews, what if analysis.

UNIT - IV
Safety audit, procedure for safety auditing, audit report, safety report, safety training, emergency planning and disaster management, introduction to security risk factors tables.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- CO1: Analyze the effect of the release of toxic substances.
- CO2: Understand the industrial laws, regulations and source models.
- CO3: Understand the methods of hazard identification and preventive measures and develop safety programs to prevent the damage or loss.
- CO4: Conduct safety audits and improve safety practices.
- CO5: Identify relevant regulatory and national consensus standards along with best practices that are applicable.
- CO6: Analyze injury and illness data for trends.

TEXT AND REFERENCE BOOKS:

1. Chemical Hazards and safety, 2nd Edition, DawandeDenet& Co. , 2012
2. Loss preventions in process industries, Lees Butterworth-Heinemann, 1980.
3. Industrial safety Handbook, William and Handley, McGraw Hill.
4. Safety and Hazard management in Chemical Industries, Vyas, Atlantic 2013.
5. Industrial safety, health environment & Security, Basudev Panda, Laxmi publication ISBN-97893-81159-43-9
6. Industrial Safety and Health Management, 4th Edition, C. Ray Asfahl, Prentice Hall International Series, 1984

NATURAL LANGUAGE PROCESSING

Semester	VI			
Course code				
Category	Professional Core Courses			
Course title	Natural Language Processing			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.
2. Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.
3. Develop speech-based applications that use speech analysis (phonetics, speech recognition, and synthesis).
4. Evaluate the performance of NLP tools and systems.

UNIT - I
Introduction: A computational framework for natural language, description of English or an Indian language in the framework lexicon, algorithms and data structures for implementation of the framework, Finite state automata, the different analysis levels used for NLP (morphological, syntactic, semantic, pragmatic, Recursive and augmented transition networks. Applications like machine translations.

UNIT - II
Word level and syntactic analysis
Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of-Speech Tagging. Syntactic Analysis: Context-free Grammar, Constituency, Parsing-Probabilistic Parsing. Machine-readable dictionaries and lexical databases, RTN, ATN.

UNIT - III
Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and Structure. Knowledge Representation, reasoning.
Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG.

Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.

UNIT - IV

Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation
Lexical Resources: World Net, Frame Net, Stemmers, POS Tagger.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO1: Understand language and the tools that are available to efficiently study and analyse large collections of text.
 CO2: Understand the concepts of linguistic foundations that underlie natural language processing, which would provide the knowledge for building components of NLP systems.
 CO3: Learn computational frameworks for natural language processing.
 CO4: Demonstrate the concepts of morphology, syntactic analysis, semantic interpretation and pragmatics of the language, and understanding them to apply in different research areas.
 CO5: Recognize the significance of research in natural language processing for common NLP tasks such as text classification, spam filtering, spell checking, machine learning, etc. to engage in lifelong learning.
 CO6: Understand the concepts of linguistic foundations that underlie natural language processing, which would provide the knowledge for building components of NLP systems.

TEXT AND REFERENCE BOOKS:
1. Natural Language understanding by James Allen, Pearson Education, 2002.
2. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall, 2016.
3. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press, 1990.
4. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
5. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley
6. https://www.coursera.org/specializations/natural-language-processing

DISASTER MANAGEMENT

Semester	VI				
Course code					
Category	Open Elective Courses				
Course title	Disaster Management				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To provide basic conceptual understanding of disasters and its relationships with development.
2. Provide an understanding of the social nature of natural hazards and disasters
3. Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.

UNIT - I
Introduction: Definition of Disaster, hazard, Global and Indian scenario, role of engineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmospheric disasters, Disaster Mitigation

UNIT - II
Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion
Man-made Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

UNIT - III
Case Studies: Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kedarnath landslide, Kerala floods, cyclone Fani and Amphan, Bihar floods, Covid 19, Forest Related disasters, Mining disasters, Atmospheric disasters.

UNIT - IV
Disaster Management: Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: To know natural as well as manmade disaster and their extent and possible effects on the economy.

CO2: Explain the natural environment and its relationships with human activities and realize the importance of ecosystem and biodiversity for maintaining ecological balance and know the objective and scope of the course.

CO3: To Plan national importance structures based upon the previous history.

CO4: To acquaint with government policies, acts and various organizational structures associated with an emergency.

CO5: To know the simple dos and don'ts in such extreme events and act accordingly.

TEXT AND REFERENCE BOOKS:

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

7TH SEMESTER

B. Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))

Scheme of Studies/Examination w.e.f. 2023-24

Semester - VII

S.N.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
1.	PCC		Neural Networks	3	0	0	3	3	30	70		100
2.	PEC		Professional Elective Course - IV	3	0	0	3	3	30	70		100
3.	PEC		Open Elective Course - III	3	0	0	3	3	30	70		100
4.	OEC		Open Elective Course - IV	3	0	0	3	3	30	70		100
5.	HSMC		Organizational Behaviour	3	0	0	3	3	30	70		100
6.	LC		Neural Networks Lab	0	0	2	2	1	50		50	100
7.	PROJECT		Project - II	0	0	8	8	4	100		100	100
8.	TRAINING		Practical Training - II	0	0	2	2	1	100			100
			Total	15	0	11	27	21	400	350	150	900

NOTE:
1. **Choose any one from Professional Elective Course – IV**
2. **Choose any one from Open Elective Course – III & IV**

Professional Elective Course – IV
1. Cyber Security Threats
2. Advanced Computer Architecture
3. IOT for Industries
4. Information Hiding Techniques
5. Data Science

Open Elective Course – III
1. IOT Security
2. Cyber Forensics And Cyber Laws
3. Multimedia Technology
4. Web Mining
5. Material Science

Open Elective Course – IV
1. Nanoscience And Nanotechnology
2. Software Project Management
3. Electronic Principles
4. Fundamentals of Management
5. Wireless Adhoc and Sensor Networks

NEURAL NETWORK

Semester	VII				
Course code					
Category	Professional Core Courses				
Course title	Neural Network				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:
1. To understand the different issues involved in the design and implementation of neural networks
2. To study the basics of neural Networks and its activation functions.
3. To understand concept of perceptron and its application in real world.
4. To introduce techniques used for training artificial neural networks.
5. To implement design of an artificial neural network and build a NN model to solve a problem.

UNIT I
Introduction to ANN: Need of Artificial Neural Network, Biological Neurons and Memory, Structure & Function of a single Neuron, Biological neuron equivalencies to artificial neuron model, Evolution of neural network, Application of Artificial Neural Network
Models of Artificial Neuron & activation functions

UNIT II
McCulloch and Pits Neural Network (MCP Model): Architecture, Solution of AND, OR, XOR function using MCP model,
Hebb Model: Architecture, training and testing, Hebb network for AND, OR function.
Supervised Learning Network: Architecture of Perceptron Network, training and Testing algorithm for single output and multi-output model. Adaptive Linear Neuron (Adaline): Architecture, training and Testing algorithm

UNIT III
Learning Rules: Introduction to learning and type of learning, Hebbian Learning Rule, Perceptron Learning Rule, Correlation Learning Rule, Delta Learning Rule, Competitive Learning Rule
Back propagation Network: Back Propagation networks, Architecture of Back-propagation(BP) Networks, Back-propagation Learning

UNIT IV
Associative Memory Networks: Auto associative and Hetro associative memory and their architecture, training (insertion) and testing (Retrieval) algorithm using Hebb rule and Outer Product rule. Storage capacity, testing of associative memory for missing and mistaken data, Bidirectional Associative memory

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand the difference between biological neuron and artificial neuron.
CO2: Familiar with different Neural network Models
CO3: Understand the concept of learning in Neural Network.
CO4: Understanding of CNN and RNN to model for real-world applications.
CO5: Analyse the given conceptual problem and able to visualize in Neural Network
CO6: Understand the associative memory and its architecture.

TEXT AND REFERENCE BOOKS:
1. Introduction to artificial Neural systems by Jacek M. Zurada, 1994, Jaico Publ. House.
2. Principles of Soft Computing by S.N. Deepa, S.N. Sivanandam., Weley publication.
3. "Neural Networks: A Comprehensive formulation", Simon Haykin, 1998
4. "Neural Networks", Kosko, 1992, PHI.
5. "Neural Network Fundamentals" – N.K. Bose , P. Liang, 2002, T.M.H
6. Neural Network To design and build a simple NN model to solve a problem, T.N.Shankar, University Science Press
1. Neuro Fuzzy Systems, Lamba, V.K., University Science Press

ORGANIZATIONAL BEHAVIOR

Semester	VII			
Course code				
Category	HSMC			
Course title	Organizational Behavior			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
The objective of this course is to expose the students to basic concepts of management and provide insights necessary to understand behavioral processes at individual, team and organizational level.

UNIT - II

Introduction of Management- Meaning, definitions, nature of management; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, staffing, Directing & Controlling, Interrelationship of managerial functions, scope of management & Importance of management. Difference between management and administration.

UNIT - II

Introduction of organization: - Meaning and process of Organization, Management v/s Organization;
Fundamentals of Organizational Behavior: Concepts, evolution, importance and relationship with other Fields; Contemporary challenges and opportunities of OB.
Individual Processes and Behavior-**Personality**- Concept, determinants and applications;
Perception- Concept, process and applications,
Learning- Concept (Brief Introduction);
Motivation- Concept, techniques and importance.

UNIT - III

Interpersonal Processes- **Teams and Groups**- Definition of Group, Stages of group development, Types of groups, meaning of team, merits and demerits of team; difference between team and group,
Conflict- Concept, sources, types, management of conflict;
Leadership: Concept, function, styles & qualities of leadership.
Communication – Meaning, process, channels of communication, importance and barriers of communication.

UNIT - IV

Organizational Processes: Organizational structure - Meaning and types of organizational structure and their effect on human behavior;

Organizational culture - Elements, types and factors affecting organizational culture.

Organizational change: Concept, types & factors affecting organizational change, Resistance to Change.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Students will be able to apply the managerial concepts in practical life.

CO2: The students will be able to understand the concept of organizational behavior at individual level and interpersonal level.

CO3: Students will be able to understand the behavioral dynamics in organizations.

CO4: Students will be able to understand the organizational culture and change.

CO5: To develop creative and innovative ideas that could positively shape the organizations.

CO6: To accept and embrace in working with different people from different cultural and diverse background in the workplace.

TEXT AND REFERENCE BOOKS:

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi.
3. Satya Raju, Management – Text & Cases, PHI, New Delhi.
4. Kavita Singh, OrganisationalBehaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding OrganisationalBehaviour, Oxford University Press, New Delhi.
6. Robbins, S.P. & Judge, T.A., OrganisationalBehaviour, Prentice Hall of India, New Delhi.
7. GhumanKarminder, Aswathappa K., Management concept practice and cases, Mc Graw Hill education.
8. Chhabra T. N., Fundamental of Management, Sun India Publications-New Delhi

NEURAL NETWORKS LAB

Semester	VI	
Course code		
Category	Professional Core Courses	
Course title	Neural Networks Lab	
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	50 Marks	
Exam	50 Marks	
Total	100 Marks	
Duration of Exam	02 Hours	

CONTENTS

1. Introduction to Matlab in context with NN.
2. Plotting of Activation Functions: Threshold functions, Signum function, Sigmoid function, Tan-hyperbolic function, Ramp function, Identity function using matlab.
3. Implementation of some basic model like MCP with suitable example.
4. Perceptron Learning Implementation
5. Multilayer Perceptron and its Hyperparameter Tuning
6. Hyperparameter Tuning
7. Implementation of Multilayer Neural Network using Keras and Data Augmentation on MNIST dataset.
8. CNN Implementation on MNIST Dataset.
9. Transfer Learning of pretrained models on MNIST dataset
10. Transfer Learning on Plant Village dataset for Plant Disease Detection
11. Sentiment Analysis using Recurrent Neural Networks(RNN)
12. Text Generation using LSTM
13. Denoising and Dimensionality Reduction for Medical MNIST dataset using Autoencoders

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: For a given conceptual problem student will be able to analyze the problem and able to visualize using NN.

CO2: Students will be familiar with different NN models and its implementation.

CO3: Students will be able to understand the concept of CNN, RNN and their implementation.

CO4: Apply deep learning models to handle uncertainty and solve engineering problems.

CO5: Identify and describe Neural Network and deep learning techniques in building intelligent machines.

PRACTICAL TRAINING - II

Semester	VII				
Course code					
Category	PT				
Course title	Practical Training - II				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	100				
Exam	-				
Total	100				
Duration of Exam	3 Hrs				

PROJECT - II

Semester	VII				
Course code					
Category	Laboratory course				
Course title	Project - II				
Scheme and Credits	L	T	P	Credits	
	0	0	6	3	
Classwork	100 Marks				
Exam	100 Marks				
Total	200 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVE
1. To allow students to demonstrate a wide range of the skills by working on PROJECT-I that has passed through the design, analysis, testing and evaluation.
2. To encourage problem solving skills.
3. To allow students to develop problem solving, synthesis and evaluation skills.
4. To encourage teamwork and leadership.
5. To improve students' communication skills by asking them to produce both a professional report and a professional poster and to give an oral presentation.

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.
The project will have 4 stages:
(*Marks for internal evaluation are given in brackets)
1. Synopsis submission (10 marks)
2. 1st mid-term progress evaluation (10 marks)
3. 2nd mid-term progress evaluation (10 marks)
4. Final submission evaluation (20 marks)

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and/or publication and viva.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
CO1: Demonstrate a sound technical knowledge of their selected project solution.
CO2: Undertake problem solution.
CO3: Design engineering solutions to complex problems utilising a systems approach.
CO4: Conduct the remaining engineering project.
CO5: Communicate with team members at large in written an oral form.
CO6: Demonstrate the knowledge, skills and attitudes of a professional engineer.

Professional Elective Course - IV

CYBER SECURITY THREATS

Semester	VII				
Course code					
Category	Professional Elective Courses				
Course title	Cyber Security Threats				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. The learner will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
3. The learner will be able to examine secure software development practices.
4. The learner will understand principles of web security.
5. The learner will be able to incorporate approaches for risk management and best practices.
6. The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.

UNIT - II
Introduction: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crimes. Network Threats: Active/ Passive – Interference – Interception – Impersonation – Worms –Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security.

UNIT - II
Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation –Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools –Threat identification - Threat Analysis - Threat Modelling - Model for Information Security Planning.

UNIT - III
Security Elements: Authorization and Authentication - types, policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots

UNIT - IV

Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training, Email and Internet use policies.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.

CO2: Design, develop, test and evaluate secure software.

CO3: Develop policies and procedures to manage enterprise security risks.

CO4: Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

CO5: Interpret and forensically investigate security incidents.

TEXT AND REFERENCE BOOKS:

1. Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
3. Joseph M Kizza, "Computer Network Security", Springer Verlag, 2005
4. Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.

ADVANCED COMPUTER ARCHITECTURE

Semester	VII			
Course code				
Category	Professional Elective Courses			
Course title	Advanced Computer Architecture			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To make students know about the Parallelism concepts in Programming.
2. To give the students an elaborate idea about the different memory systems and buses.
3. To introduce the advanced processor architectures to the students.
4. To make the students know about the importance of multiprocessor and multicomputer.
5. To study about data flow computer architectures.

UNIT - II
Architecture And Machines: Some definition and terms, interpretation and microprogramming. The instruction set, Basic data types, Instructions, Addressing and Memory. Virtual to real mapping. Basic Instruction Timing.

UNIT - II
Cache Memory Notion: Basic Notion, Cache Organization, Cache Data, adjusting the data for cache organization, write policies, strategies for line replacement at miss time, Cache Environment, other types of Cache. Split I and D-Caches, on chip caches, Two level Caches, write assembly Cache, Cache references per instruction, technology dependent Cache considerations, virtual to real translation, overlapping the Tcycle in V-R Translation, studies. Design summary.

UNIT - III
Memory System Design: The physical memory, models of simple processor memory interaction, processor memory modeling using queuing theory, open, closed and mixedqueue models, waiting time, performance, and buffer size, review and selection of queuing models, processors with cache.

UNIT - IV
Concurrent Processors: Vector Processors, Vector Memory, Multiple Issue Machines, Comparing vector and Multiple Issue processors.
Shared Memory Multiprocessors: Basic issues, partitioning, synchronization and coherency, Type of shared Memory multiprocessors, Memory Coherence in shared Memory Multiprocessors.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Understand the Concept of Parallel Processing and its applications.
CO2: Implement the Hardware for Arithmetic Operations.
CO3: Analyze the performance of different scalar Computers.
CO4: Develop the Pipelining Concept for a given set of Instructions.
CO5: Distinguish the performance of pipelining and non-pipelining environment in a processor.

TEXT AND REFERENCE BOOKS:

1. Advance computer architecture by Hwang & Briggs, 1993, TMH.
2. Pipelined and Parallel processor design by Michael J. Fiynn – 1995, Narosa

IOT FOR INDUSTRIES

Semester	VII			
Course code				
Category	Professional Elective Courses			
Course title	3. IOT for Industries			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Students will learn the new evolution in hardware, software, and data.
2. While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
3. Students acquire upcoming Industrial IoT: Roadmap to the Connected World Course offers important insights on overcoming the challenges and thrive in this exciting space

UNIT - II
Introduction & Architecture: What is IIoT and connected world? the difference between IoT and IIoT, Architecture of IIoT, IoT node, Challenges of IIOT
IIOT Components: Fundamentals of Control System, introductions, components, closed loop & open loop system, Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

UNIT - II
Communication Technologies of IIoT: Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication.

UNIT - III
Visualization and Data Types of IIoT: Front-end EDGE devices, Enterprise data for IIoT, Emerging descriptive data standards for IIoT, Cloud data base, Could computing, Fog or Edge computing, Programmable logic controller (PLC), Real-time control system.

UNIT - IV

Applications: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance, UAV, Autonomous Vehicles.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: CO-1: Explain the fundamental communication architectures and networking concepts of Industrial IoT

CO2: Identify and describe the basic concepts of networking devices in Industries

CO3: Compare and assess different network models and techniques of Industrial IoT systems

CO4: Describe the working of different protocols at different layers

CO5: Demonstrate the application of different fields under the subset of Industrial IoT environment

TEXT AND REFERENCE BOOKS:

1. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
2. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
3. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)

INFORMATION HIDING TECHNIQUES

Semester	VII			
Course code				
Category	Professional Elective Courses			
Course title	Information Hiding Techniques			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To learn about data hiding applications and their techniques.
2. To learn about hacking.
3. To learn security-based protocols, attacks and intrusions.
4. To work with advance data hiding techniques.

UNIT - II

Introduction to Information Hiding: Types of Information Hiding, Applications, Importance & Significances. Differences between cryptography and steganography, Wisdom from Cryptography, types of steganography their application and significances. Past present and future of steganography

UNIT - II

Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data, Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text, Steganographic system, Study of Different methods of insertion and retrieval of message using image steganography, Study of histrogram analysis using MATLAB of original image and stegno image

UNIT - III

Basics of watermarking, Watermarking process, Watermarking applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking, Bit plane of an Image, study of noises in stego images and their comparisons, Robustness of watermarking schemes on different attacks like blurring, cropping , compression of theimage. PSNR calculation of the images.

UNIT - IV

Use of image steganography in biometric sciences, Study of security enhancement of biometric template using steganographic Frame proof codes:-Definition, Introduction of frame proof codes, Methods to obtain 2- frame proof codes using mutually orthogonal latin squares. Use of frame proof codes in ownership and software piracy.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Explain information security.

CO2: Give an overview of access control of relational databases.

CO3: State the basic concept in information systems security, including security technology and principles, software security and trusted systems and IT security management.

CO4: Learn advance data hiding techniques.

CO5: Understand how to apply these data hiding techniques in real-life projects.

TEXT AND REFERENCE BOOKS:

1. Recent Advancesin Information Hiding and Applications, Pan, J.-S., Huang, H.-C., Jain, L.C., Zhao, Y., Springer (2013).

2. Information Hiding Techniques for Steganography and Digital Watermarking, Stefan Katzenbeisser, Fabien A. P. Petitcolas, Artech House, 2000.

DATA SCIENCE

Semester	VII				
Course code					
Category	Professional Elective Courses				
Course title	Data Science with R programming				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. . Able to apply fundamental algorithmic ideas to process data.
2. Understand the Data Analytics lifecycle.
3. Able to construct predictive models to classify new data set.
4. Learn to apply hypotheses and data into actionable predictions.
5. Document and communicate the results effectively to different stakeholders.
6. Effectively communicate the findings using visualization techniques

UNIT - I
Introduction to Data Science: Concept of Data Science, Traits of Big data, statistical modelling and algorithm modelling, AI and data science, Myths of Data science

UNIT - II
Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, working with data: Reading Files, Scraping the Web,

UNIT - III
Data Science Methodology: Business Understanding, Analytic Approach, Data Requirements, Data Collection, Data Understanding, data Preparation, Modeling, Evaluation, Deployment, feedback

UNIT - IV

Data Science Application: Prediction and elections, Recommendations and business analytics, clustering and text analytics.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO1: Understand the value of data science and the process behind using it.

CO2: Use Python to gather, store, clean, analyse, and visualise data-sets.
CO3: Apply toolkits to formulate and test data hypotheses and uncover relationships within data-sets
CO4: Understand the data science methodology in the data science pipeline
CO5: Understand real-world challenges with several case studies

TEXT AND REFERENCE BOOKS:

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics" , EMC Education Services,2015
2. Nina Zumel, John Mount,"Practical Data Science with R",Manning Publications,2014
3. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman,"Mining of Massive Datasets", Cambridge University Press,2014
4. Mark Gardener,"Beginning R- The Statistical Programming Language", John Wiley & Sons, Inc,2012
5. W.N.Venables, D.M.Smithandthe R Core Team,"An Introduction to R", 2013
6. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd.,2014

Open Elective Course - III

IOT SECURITY

Semester	VII				
Course code					
Category	Open Elective Courses				
Course title	IOT Security				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. . Introduce the IoT security issues and countermeasures.
2. Introduce the cryptology principles related IoT security.
3. Introduce the embedded devices and security attacks
4. Introduce the IoT protocol and Built-in security features
5. Provide the details of selective IoT case study and their security challenges

UNIT - I

Introduction to IoT Security – Vulnerabilities, Attacks and Countermeasures. Information Assurance. Attack types. New security threats and vulnerabilities. Fault Trees and CPS. Countermeasures to thwart attack. Threat Modeling.

UNIT - II

Security Management & Cryptology: Security Controls - Authentication, Confidentiality, Integrity; Access Control, Key Management and Protocols, Cipher – Symmetric Key Algorithms, Public Private Key Cryptography; Attacks – Dictionary and Brute Force, Lookup Tables, Reverse Look Tables, Rainbow Tables, Hashing – MDS, SHA256. SHA 512, Ripe MD, WI, Data Mining.

UNIT - III

Attack Surface & Threat Assessment: Embedded Devices – UART, SPI, I2C, JTAG, Attacks – Software and cloud components, Firmware devices, Web and Mobile Applications.
IoT Protocol: IoT Protocol Built-in Security Features – Transport Layer, SSL/TLS and DTLS, Kerberos, Cloud security for IoT

UNIT - IV

IoT Case study: : Smart Agriculture, Cities, Grid, Healthcare, Homes, Supply Chain, and Transportation, Application of Security Concepts to Create IoT system

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Explain the various IoT security issues and corresponding countermeasures

CO2: Discuss the principles of cryptology to enhance the IoT security.

CO3: Explain the embedded devices of IoT systems and related security attacks.

CO4: Explain the IoT protocol and Built-in security features

CO5: Complete selective IoT case study and their security challenges.

TEXT AND REFERENCE BOOKS:

1. Brian Russell & D. Van Duren, Practical Internet of Things Security, Packt Publishing, 2016.
2. Shancang Li, Li Da Xu, Securing the Internet of Things, Elsevier, 2017.
3. Internet of Things: Privacy & Security in a Connected World, Federal Trade Commission, 2015

CYBER FORENSICS AND CYBER LAWS

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Cyber Forensics And Cyber Laws			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
6. To learn the overview of cybercrime.
7. To learn the issues of cybercrime.
8. To learn the various methods to investigate cybercrime and learn about digital forensics.
9. To understand the laws and acts behind.

UNIT - II

Introduction: Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime, Social Engineering, Categories of Cyber Crime, Property Cyber Crime. Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

UNIT - II

Introduction to Digital Forensics: Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

UNIT - III

Introduction to Cyber Crime Investigation: Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, Email Recovery, Hands on Case Studies, Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT - IV

Cyber Laws and Ethics: Digital Evidence Controls - Evidence Handling Procedures - Basics of Indian Evidence ACT IPC and CrPC - Electronic Communication Privacy ACT - Legal Policies. Digital, Indian IT Act

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

 CO6: To have various ideas about cybercrime.
 CO7: To have knowledge of the various issues of cybercrime.
 CO8: To understand various types of attacks.
 CO9: To investigate and find the cybercrime.
CO10: To have clear idea of the various laws and acts.

TEXT AND REFERENCE BOOKS:

4. Bernadette H Schell, Clemens Martin, Cybercrime, ABC, CLIO Inc, California, 2004.
5. Understanding Forensics in IT, NIIT Ltd, 2005.
6. Nelson Phillips and Enfinger Steuart, Computer Forensics and Investigations, Cengage Learning, New Delhi, 2009.
7. Kevin Mandia, Chris Prosise, Matt Pepe, Incident Response and Computer Forensics, Tata McGraw -Hill, New Delhi, 2006.
8. Robert M Slade, Software Forensics, Tata McGraw - Hill, New Delhi, 2005.

MULTIMEDIA TECHNOLOGY

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Multimedia Technology			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand the characteristics of different multimedia systems.
2. To identify the encoding and quantization mechanisms for images.
3. To explore the audio and video processing mechanisms.
4. To know the practical applications of multimedia systems.

UNIT - II

Basics of Multimedia Technology: Computers, communication and entertainment; multimedia an introduction; framework for multimedia systems; multimedia devices; CD- Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools; LANs and multimedia; internet, World Wide Web & multimedia distribution network-ATM & ADSL; multimedia servers & databases; vector graphics; 3D graphics programs; animation techniques; shading; anti-aliasing; morphing; video on demand.

UNIT - II

Image Compression & Standards: Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3D drawing and rendering; JPEG-objectives and architecture; JPEG-DCT encoding and quantization, JPEG statistical coding, JPEG predictive lossless coding; JPEG performance; overview of other image file formats as GIF, TIFF, BMP, PNG etc.

UNIT - III

Audio & Video: Digital representation of sound; time domain sampled representation; method of encoding the analog signals; sub band coding; Fourier method; transmission of digital sound; digital audio signal processing; stereophonic & quadraphonic signal processing; editing sampled sound; MPEG Audio; audio compression & decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface; digital video and image compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery.

UNIT - IV

Virtual Reality: Applications of multimedia, intelligent multimedia system, desktop virtual reality, VR operating system, virtual environment displays and orientation making; visually coupled system requirements; intelligent VR software systems. Applications of environment in various fields.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Get familiar with the characteristics of different multimedia systems.
CO2: Learn the encoding and quantization mechanisms for images.
CO3: Understand the audio and video processing mechanisms.
CO4: Learn the practical applications of multimedia systems.
CO5: Implement the concepts of multimedia to develop the real-time multimedia network applications.
CO6: Explain the technical characteristics and performance of multimedia system and terminal.

TEXT AND REFERENCE BOOKS:

1. An introduction, Villamil & Molina, Multimedia Mc Milan, 1997
2. multimedia: Sound & Video, Lozano, 1997, PHI, (Que)
3. Multimedia: Production, planning and delivery, Villamil & Molina,Que, 1997
4. Multimedia on the PC, Sinclair,BPB
5. Multimedia: Making it work, Tay Vaughan, fifth edition, 1994, TMH.
6. Multimedia in Action by James E Shuman, 1997, Wadsworth Publ.,
7. Multimedia in Practice by Jeff coate Judith, 1995,PHI.
8. Multimedia Systems by Koegel, AWL
9. Multimedia Making it Work by Vaughar, etl.

WEB MINING

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Web Mining			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To understand the architecture of web, mining the data, issues, challenges.
2. To study the methods of extracting knowledge from web data, text and unusual data.
3. To understand and use data mining language like R, Python etc.
4. To understand the optimization of web and its applications.

UNIT - II
Data Mining Foundations: Basic concepts in data Mining, Web mining versus Data mining, discovering knowledge from Hypertext data; An overview of web mining: What is Web mining, Web mining taxonomy, Web mining subtasks, issues, challenges

UNIT - II
Web Search and Information Retrieval: Information Retrieval Models, Web Search and IR, Text Mining, Latent Semantic Indexing, Web Spamming, Clustering and Classification of Web Pages, Information Extraction, Web Content Mining;

UNIT - III
Optimization: Introduction to Models and Concept of Computational Intelligence, Social Behavior as Optimization: Discrete and Continuous Optimization Problems, Classification of Optimization Algorithms, Evolutionary Computation Theory and Paradigm, Swarm and Collective intelligence

UNIT - IV
Swarm Intelligence Techniques: Particle Swarm Optimization, Ant Colony Optimization, Artificial Bees and Firefly Algorithm etc., Hybridization and Comparisons of Swarm Techniques, Application of Swarm Techniques in Different Domains and Real-World Problems

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO1: Analyse the power of web search engine by classifying the web documents and identifying the web pages

CO2: Learn how the Web mining helps to improve the power of web search engine by classifying the web documents and identifying the web pages.
CO3: How to predict user behaviour in the web.
CO4: For a given data set how the optimization will be performed.
CO5: Understand the working logic of swarm intelligence techniques.

TEXT AND REFERENCE BOOKS:
1. Witton Frank, Data Mining, Morgan Kauffan Publishers.
2. Kennedy, J. and Eberhart, R.C., Swarm Intelligence, Morgan Kaufmann Publishers, 2001
3. Bonabeau, E., Dorigo, M. and Theraulaz, G., Swarm Intelligence: From Natural to Artifical Systems, Oxford University Press, 1999
4. Dorigo, M., Stutzle, T., Ant Colony Optimization, MIT Press, 2004
5. Parsopoulos, K.E., Vrahatis, M.N., Particle Swarm Optimization and Intelligence: Advances and Applications, Information Science Reference, IGI Global, 2010
6. Clerc, M., ParticleSwarm Optimization, ISTE, 2006
7. Nature Inspired Metaheuristic Algorithms, Xin-She Yang, Luniver Press, 2010

MATERIAL SCIENCE

Semester	VII				
Course code					
Category	Open Elective Courses				
Course title	Material Science				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Crystal structure and defects in solids.
2. Classification of different solids.
3. Properties of semiconductor, dielectric and magnetic materials.

UNIT - II

Crystal Structure: Space lattice and translation vectors, Unit cell, Bravais lattice, Closed packed structures, Miller indices, Diffraction of electromagnetic waves by crystals: X-rays, electrons and neutrons, Bragg's law, X-ray diffraction (Laue and Powder method), Point defects in solids - Schottky and Frenkel defects.

UNIT - II

Electrical Properties: Classification of solids into conductors, semiconductors and insulators, Semiconductor Materials: intrinsic and extrinsic, Fermi level and electron & hole concentrations at equilibrium, Carrier transport: diffusion and drift, p-n junction, Zener and Avalanche breakdown.

UNIT - III

Magnetic Properties: Atomic magnetic moments and origin of magnetization, Types of magnetic materials, Ferromagnetism: molecular field, Curie temperature, Domain theory, Hysteresis and its applications.
Superconductivity: Properties of superconductors, Meissner effect, London equations, Elements of BCS Theory, Applications of superconductors.

UNIT - IV

Dielectric Properties: Molecular theory, Polarization, Electric displacement vector, susceptibility, dielectric constant, permittivity and various relations between these parameters, Gauss's law in the presence of a dielectric, Energy stored in a uniform electric field, Concept of local molecular fields and Claussius - Mossotti relation.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Segregate crystals based on their structure and apply effects of defects on manipulating properties of solids.

CO2: Distinguish between insulator, conductor and semiconductor. They should know the difference between intrinsic and extrinsic semiconductors and about the fermi level position in these semiconductors.

CO3: Understanding metals and their use in industries.

CO4: Select various dielectric, magnetic materials for specific applications in different fields.

CO5: Students will get to know the different classes of materials used in engineering applications and would be able to choose the right materials for specific applications.

TEXT AND REFERENCE BOOKS:

1. Concepts of Modern Physics- Arthur Beiser (TMGH)
2. Solid State Physics- S.O. Pillai (New Age Int. Ltd. Pub.)
3. Modern Physics for Engineers- S.P. Taneja (R. Chand)
4. Engineering Physics- Satya Prakash (Pragati Prakashan)
5. Engineering Physics- Malik & Singh (McGraw Hill)
6. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & Sons, 2008.
7. S O Pillai, Solid State Physics, 8th edition, New Age international Publishers,2018

Open Elective Course - IV

NANOSCIENCE AND NANOTECHNOLOGY

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Nanoscience And Nanotechnology			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To initiate the student in the area of development of new materials/nanomaterials for novel applications and devices.
2. To impart foundational knowledge of nanoscience and related fields.
3. To make the students acquire an understanding of the analytical techniques in nanoscience and nanotechnology fields.
4. To help them understand in broad application areas of nanoscience and nanotechnology in engineering.

UNIT - II

Types of materials; bonding in materials; crystal structures and defects; amorphous materials; origins of properties of materials; Effect of nanostructures on properties of materials.
The science of materials – materials science; Historical use of nanoparticles; discovery of the carbon nanotubes; fullerenes; nanostructured materials

UNIT - II

Particle-wave duality; de-Broglie waves; Schrodinger equation in 1-Dimension; Superposition; Energy eigenstates; Interpretation of wave function; Fermions and Bosons; Electron density of states; Energy bandgaps; Fermi energy; Excitons and Bohr radius.

UNIT - III

AFM; STM; Transport in nanostructures; 0,1 and 2 dimensional nanostructures; Bandgap engineering; Molecular motors; MEMS and NEMS devices. Biomaterials and nano-biotechnology.

UNIT - IV

Synthesis of Nanomaterials – ZnO and Fe_3O_4. Characterization of phases and quantification of phases. Applications of Nanomaterials: In textile industry, in catalytic operations, in energy generation, in energy storage, in environmental remediation and in sensors and devices.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Learn about the background on nanoscience and give a general introduction to different classes of nanomaterials.

CO2: Develop an understanding of the science behind the nanomaterial properties.

CO3: Apply their learned knowledge to study and characterize nanomaterials.

CO4: Familiarize themselves with the variety of nanotechnology applications, and know how to approach the synthesis of nanomaterials with a set of desirable properties.

TEXT AND REFERENCE BOOKS:

1. NANO: The Essentials Understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill Publishing Company Limited, 2007, 0-07-154830-0.
2. Material Science and Engineering, 7thed. , William D. Callister, Johan Wiley & Sons, Inc.
3. Nanostructured Materials and Nanotechnology, Hari Singh Nalwa, Academic Press, 2002.
4. Nanostructures and Nanomaterials, synthesis, properties and applications., Guozhong Cao, Imperial College Press, 2004.
5. Introduction to Nanoscience, S.M. Lindsay, Oxford University Press, 2010, ISBN: 978–019–954421–9 (Pbk).
6. Nanoscience, Hans-Eckhardt Schaefer, Springer, 2010, ISBN 978-3-642-10558-6.

SOFTWARE PROJECT MANAGEMENT

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Software Project Management			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. To explain needs for software specifications and to study different types of software requirements gathering techniques.
2. To convert the requirements model into the design model and demonstrate use of software and user interface design principles.
3. To justify the role of SDLC in Software Project Development and to study risks associated with a project.
4. To generate project schedule and can construct, design and develop network diagram for different type of Projects.

UNIT - II
Introduction to Software Project Management (SPM): Definition of a Software Project (SP), SP Vs. other types of project's activities covered by SPM, Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, project as a system, management control, requirement specification, information and control in organization, Project management and CMM.

Stepwise Project planning: Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan.

UNIT - II
Project Evaluation & Estimation:- Cost benefit analysis, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project approacht;, structured methods, rapid application development, water fall-, V-process-, spiral-models. Prototyping, delivery. Albrecht function point analysis.

Project Scheduling:- Objectives of activity planning, project schedule, projects and activities, Identifying activities, sequencing and scheduling activities, network planning model, Network

Diagrams, CPM**,** representation of lagged activities, backward and forward pass, identifying critical path, activity throat, shortening project , precedence networks.

Risk Management:- Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values.

UNIT - III

Project Monitoring & control:- identifying resource requirements, scheduling resources, PERT, Gantt Charts, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

Managing contracts and people-: Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behavior, organizational behavior: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises.

UNIT - IV

Software quality Assurance and Testing:- Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean room process.

Software Project Management Tools:- CASE Tools, Planning and Scheduling Tools, MS-Project.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Explain needs for software specifications and different types of software requirements gathering techniques.

CO2: Convert the requirements model into the design model and demonstrate use of software and user interface design principles.

CO3: Justify the role of SDLC in Software Project Development and identify the risks associated with a project.

CO4: Generate project schedule and can construct, design and develop network diagram for different type of Projects.

TEXT AND REFERENCE BOOKS:
1. Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH
2. Software Engineering – A Practitioner's approach, Roger S. Pressman (5th edi), 2001, MGH
3. Software Project Management, Walker Royce, 1998, Addison Wesley.
4. Project Management 2/c. Maylor
5. Managing Global software Projects, Ramesh, 2001, TMH.
6. S. A. Kelkar, Software Project Management, PHI Publication.

ELECTRONIC PRINCIPLES

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Electronic Principles			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Study the basic principles of electronic systems.
2. Understand working of Digital electronics.
3. Understand the working of Display devices.

UNIT - II

SEMICONDUCTOR DIODE: P-N junction and its V-I Characteristics, P-N junction as a rectifier, Switching characteristics of Diode. Diode as a circuit element, the load-line concept, half - wave and full wave rectifiers, clipping circuits, clamping circuits, filter circuits, peak to peak detector and voltage multiplier circuits.

UNIT - II

ELECTRONIC DEVICES: LED, Zener Diode as voltage regulator, BJT, UJT, MOSFET, Thyristor, DIAC, TRIAC.

UNIT - III

DISPLAY DEVICES: LED, LCD, Seven Segment, Sixteen Segment.

UNIT - IV

DIGITAL ELECTRONICS: Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates, Difference between combinational circuits and sequential circuits, Introduction to flipflops (S-R & J-K).

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
CO1: Understand the working of electronic components.
CO2: Understand the Digital System and various displays.

TEXT AND REFERENCE BOOKS:

1. Integrated Electronics: Millman & Halkias ; McGraw Hill
2. Modren Digital Electronics: R.P. Jain; McGraw-Hill
3. Electronics Principles: Malvino ; McGrawHill
4. Electronics Circuits: Donald L. Schilling & Charles Belove ; McGraw Hill
5. Electronics Devices & Circuits: Boylestad & Nashelsky ; Pearson.

FUNDAMENTALS OF MANAGEMENT

Semester	VII
Course code	
Category	Open Elective Courses
Course title	Fundamentals of Management
Scheme and Credits	L T P Credits
	3 0 0 3
Classwork	30 Marks
Exam	70 Marks
Total	100 Marks
Duration of Exam	03 Hours

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Evolution of Management and contribution of Management thinkers.
2. The importance of staffing and training
3. The concept of material management and inventory control
4. The components of marketing and advertising, various sources of finance and capital structure.

UNIT - II

Meaning of management, Definitions of Management, Characteristics of management, Management vs. Administration. Management-Art, Science and Profession. Importance of Management. Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions. Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

UNIT - II

Production Management: Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

UNIT - III

Marketing Management: Definition of marketing, marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

UNIT - IV

Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

CO1: Evolution of Management and contribution of Management thinkers.

CO2: Importance of staffing and training

CO3: The concept of material management and inventory control

CO4: The components of marketing and advertising 5. Various sources of finance and capital structure

TEXT AND REFERENCE BOOKS:

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S.Bhalla.(Kalyani Publishers)
2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)
3. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
4. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
5. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
6. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
7. Management - James A.F. Stoner & R.Edward Freeman, PHI.

WIRELESS ADHOC AND SENSOR NETWORKS

Semester	VII			
Course code				
Category	Open Elective Courses			
Course title	Wireless Adhoc and Sensor Networks			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Classwork	30 Marks			
Exam	70 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:
1. Learn Ad hoc network and Sensor Network fundamentals
2. Understand the different routing protocol
3. Have an in-depth knowledge on sensor network architecture and design issue.
4. Understand the transport layer and security issues possible in Ad hoc and Sensor networks
5. Have an exposure to mote programming platforms and tool

UNIT - II

Introduction to Ad Hoc Networks: Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT - II

Data Transmission: Broadcast storm problem, Broadcasting, Multicasting and GeocastingTCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - III

Basics of Wireless, Sensors and Applications: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT - IV

Data Retrieval in Sensor Networks: Routing layer, Transport layer, High-level application layer support; Adapting to the inherent; dynamic nature of WSNs; Sensor Networks and mobile robots. Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms - Operating System: TinyOS–

Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns2 and its sensor network extension, TOSSIM.

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to
 CO1: Understand the needs of Wireless Adhoc and Sensor Network in current scenario.
 CO2: Describe current technology trends for the implementation and deployment of wireless Adhoc/sensor networks.
 CO3: Discuss the challenges in designing MAC, routing.
 CO4: Transport protocols for wireless Ad-hoc/sensor networks.
 CO5: Explain the principles and characteristics of wireless sensor networks.

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

8TH SEMESTER

B.Tech. (Computer Science Engineering - (Internet of Things and Cyber security Including Blockchain Technology))
Scheme of Studies/Examination w.e.f. 2023-24

Semester - VIII

S. No.	Category	Course Code	Course Title	Hours Per week			Total Contact Hrs. per week	Credits	Examination Schedule (Marks)			
				L	T	P			Marks of classwork	Theory	Practical	Total
4.	ESC		MOOC-1 (Essential)	3	-	-	-	3	-	-	-	100
5.	ESC		MOOC-2 (Essential)	3	-	-	-	3	-	-	-	100
6.	PROJECT		Industrial Project/ Project – III	0	0	16	16	8	150		150	300
			Total	6	0	16	22	14	150	-	150	500

NOTE: At the end of the 8th semester, each student has to submit the certificate of MOOCs (Essential).

MOOC -1

Semester	VIII				
Course code					
Category	Engineering Science Course				
Course title	MOOC - 1				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	-				
Practical	-				
Total	100 Marks				
Duration of Exam	-				

A student has to complete NPTEL/SWAYAM Courses of 12 Weeks respectively through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL/SWAYAM Site http://nptel.ac.in/ as per the NPTEL/SWAYAM policy and norms. The students can register for these courses through NPTEL/SWAYAM directly as per the course offering in Odd/Even Semesters at NPTEL/SWAYAM. These NPTEL/SWAYAM courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCS courses the students, shall, provide their successful completion NPTEL/SWAYAM status/certificates to the University (COE) through their college of study only.

MOOC - 2

Semester	VIII				
Course code					
Category	Engineering Science Course				
Course title	MOOC - 2				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	-				
Practical	-				
Total	100 Marks				
Duration of Exam	-				

A student has to complete NPTEL/SWAYAM Courses of 12 Weeks respectively through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL/SWAYAM Site http://nptel.ac.in/ as per the NPTEL/SWAYAM policy and norms. The students can register for these courses through NPTEL/SWAYAM directly as per the course offering in Odd/Even Semesters at NPTEL/SWAYAM. These NPTEL/SWAYAM courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCS courses the students, shall, provide their successful completion NPTEL/SWAYAM status/certificates to the University (COE) through their college of study only.

PROJECT – III

Semester	VIII
Course code	
Category	Professional Core Courses
Course title	Project - III

Scheme and Credits	L	T	P	Credits	
	0	0	20	10	

Classwork	150 Marks
Practical	150 Marks
Total	300 Marks
Duration of Exam	03 Hours

COURSE OBJECTIVE

1. To allow students to demonstrate a wide range of the skills learned during their course of study by asking them to deliver a product that has passed through the design, analysis, testing and evaluation
   To encourage multidisciplinary research through the integration learned in a number of courses.
2. To allow students to develop problem solving, analysis, synthesis and evaluation skills.
3. To encourage teamwork.
4. To improve students' communication skills by asking them to produce both a professional report and a professional poster and to give an oral presentation

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.
The project will have 4 stages:
(*Marks for internal evaluation are given in brackets)
5. Synopsis submission (10 marks)
6. 1st mid-term progress evaluation (10 marks)
7. 2nd mid-term progress evaluation (10 marks)
8. Final submission evaluation (20 marks)

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and/or publication and viva.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to
 CO1: Demonstrate a sound technical knowledge of their selected project topic.
 CO2: Undertake problem identification, formulation and solution.
 CO3: Design engineering solutions to complex problems utilising a systems approach.
 CO4: Conduct an engineering project.
 CO5: Communicate with engineers and the community at large in written an oral form.
 CO6: Demonstrate the knowledge, skills and attitudes of a professional engineer.