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

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.