P D A College of Engineering
B.E. in Information Science & Engineering
Scheme of Teaching and Examinations 2022
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)

VII SEMESTER (Swappable VII and VIII SEMESTER)

Sl.No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours/Week				Examination				Credits
					Theory	Tutorial	Practical/Dra	Self-Study	Duration in	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22IS71	Virtual Reality And Augmented Reality	TD- Respective Dept. PSB- Respective Dept.	3	0	2	0	03	50	50	100	4
2	IPCC	22IS72	Business Intelligence & Analytics	TD- Respective Dept. PSB- Respective Dept.	3	0	2	0	03	50	50	100	4
3	PCC	22IS73	Cryptography & Network Security	TD-Respective Dept. PSB- Respective Dept.	4	0	0	0	03	50	50	100	4
4	PEC	22IS74X	**Professional Elective-III**	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
5	OEC	22ISOE75X	**Open Elective-II**	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
6	PROJ	22ISP76	**Major Project Phase-II**	TD-Respective Dept. PSB- Respective Dept.	0	0	12	0	03	50	50	100	6
				Total	16	0	16			300	300	600	24

Professional Elective Course

22IS741	Software Architecture and Design Patterns	22IS743	Mobile Computing
22IS742	Block Chain Technology		

Open Elective Course

22ISOE751	IoT & Its Application		

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course PR: Project Work, **L:**Lecture,**T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work

Note: VII and VIII semesters of IV years of the program swapping facility
Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/industry internships after the VI semester

P D A College of Engineering
B.E. in Information Science & Engineering
Scheme of Teaching and Examinations 2022
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)

VIII SEMESTER (Swappable VII and VIII SEMESTER)

Sl.No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory	Tutorial	Practical/Dra	Self-Study	Duration in	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC	22IS81X	**Professional Elective-IV (Online Courses) – NPTEL**	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
2	OEC	22ISOE82X	**Open Elective-III (Online Courses)**	TD-Respective Dept. PSB- Respective Dept.	3	0	0	0	03	50	50	100	3
3	INT	22ISINT83	**Internship(Industry/Research)(14-20weeks)**	TD-Respective Dept. PSB- Respective Dept.	0	0	12	0	03	100		100	10
				Total	06	0	12			200	100	300	16

Professional Elective Courses (Online courses)			
22IS811	Social Network analysis	22IS814	Data science for engineers
22IS812	Ethical Hacking	22IS815	Programming with generative AI
22IS813	Cloud Computing	22IS816	Information Security

Open Elective Courses(Online Courses)			
22ISOE821	Developing Soft Skills and Personality	22ISOE824	Environmental Science
22ISOE822	Soft Skills	22ISOE825	Project Planning and Control
22ISOE823	Project Management: Planning, Execution, Evaluation and Control	22ISOE826	Wastewater Treatment and Recycling

L:Lecture, **T:**Tutorial, **P:**Practical **S=SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.**TD-**Teaching Department, **PSB**:

Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work, **INT**: Industry Internship/Research Internship/Rural Internship

Professional Elective/Open Elective Course: These are the ONLINE courses suggested by the respective Board of Studies

Online Professional Course: The students need to register (anywhere between VI to VIII Semesters) NPTEL Course of 12 weeks duration (3 Credits course) and should pass the examination. The NPTEL Courses relevant to the program and need to be identified by the department and same is to be informed to the students.

Online Open Elective Course: The students need to register (anywhere between VI to VIII Semesters) NPTEL Course of 12 weeks duration (3 Credits course) and should pass the examination. The NPTEL Courses that enables skill enhancements and job opportunities need to be suggested by the department and same is to be informed to the students.

VIRTUAL REALITY AND AUGMENTED REALITY

Course Code	22IS71	CIE: 50
Credits	04	SEE: 50
Course Type	IPCC	
Number of Lecture Hours/Week (L-T-P)	3-0-2	Total Marks:100
Total Number of Lecture Hours	52 Hours (40:Theory+12:Practical)	SEE Hours: 03

Prerequisite:

The students should have the knowledge of C# programming and computer graphics.

Course Learning Objectives

To enable the students to obtain the knowledge on.

- To understand opportunities and the main issues related to designing and developing VR/AR systems architectures, both in local and in distributed (even web-based) contexts.
- To understand development of VR/AR applications with a multimodal perspective and approach.

Modules	Teaching Hours
Module I Introduction: The threel's of virtual reality, commercial VR technology and the five classic components of a VR system. Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.	08
Module II Output Devices: Graphics displays, sound displays & haptic feedback.	08
Module III Modeling: Geometric modeling, kinematics modeling, physical modeling, behavior modeling, model management.	08
Module IV Human Factors: Methodology and terminology, user performance studies, VR health and safety issues.	08
Module V Applications: Medical applications, military applications, robotics applications	08

Question paper pattern:

1. The question paper will have TEN questions.

2. There will be TWO questions in each module, covering all the topics.

3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Augmented Reality: A Practical Guide by Stephen Cawood and Mark Fiala.

2.Augmented Reality Principles and Practices by Dieter Schmalstieg and TobiasHollerer

Reference Books:

1. Understanding Virtual Reality, interface, Application and Design, William R. Sherman, Alan Craig, Elsevier(Morgan Kaufmann).

2. 3DModeling and surfacing ,Bill Fleming, Elsevier(Morgan Kauffman).

 3. 3DGameEngineDesign,DavidH.Eberly,Elsevier. 4. Virtual Reality Systems, John Vince, Pearson Education. 5.
WhatisVirtualReality?http://vr.isdale.com/WhatIsVR/frames/WhatIsVR4.1.html. 6.
AugmentedandMixedReality,http://www.mic.atr.co.jp/~poup/research/ar/

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
	CO1	Describe the components of the virtual reality system.
	CO2	Describe various input and output devices used for virtual Reality
22IS71	CO3	Apply the different modeling concepts to visual virtualization
	CO4	Analyze the performance of given simple applications related to virtual reality.
	CO5	Design3D technology with virtual programming concepts in different applications.

VIRTUAL REALITY AND AUGMENTED REALITY LAB EXPERIMENTS

COURSE OBJECTIVES:
 The objective of this course is to explore the concepts of Augmented reality and Virtual reality to develop 3D virtual environment.

1	Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.
2	Develop a simple UI(User interface) menu with images, canvas, sprites and button
3	Develop a scene in Unity that includes: a cube, plane and sphere, apply transformations on the 3 game objects.
4	Develop a scene in Unity that includes a sphere and plane . Apply Rigid body component, material and Box collider to the game Objects. Write a C# program to grab and throw the sphere using vr controller.
5	Create an immersive environment with only static game objects.
6	Include animation and interaction in the immersive environment created above.
7	Develop a scene in Unity that includes a sphere and plane . Apply Rigid body component, material and Box collider to the game Objects.
8	Develop a VR game in Unity such that on each gun trigger click, destroy the cubes placed on the plane and gain a score point
9	Develop a VR Ball Game. The scene should contain a play area surrounded by four walls and a ball that acts as a player. The objective of the game is to keep the ball rolling without colliding with the walls. If it collides with either of the walls, the wall color should change and a text should display on the screen indicating the collision.
10	Develop a VR game in Unity such that on each gun trigger click, destroy the cubes placed on the plane and gain a score point . Make a score UI and display it on the screen
11	Develop a VR Golf Game. The scene should contain a play area (golf course), which consists of a series of cups/holes each having different scores. Display the score card.
12	Develop a VR Basketball Game. The scene should contain a basketball court. The developed game should be a single player game. The objective of the game is to let the player put the ball in the basket maximum number of times. Display the score card.

Business Intelligence & Analytics		
Course Code	22IS72	CIE: 50
Credits	04	SEE: 50
Course Type	IPCC	
Number of Lecture Hours/Week (L-T-P)	3-0-2	Total Marks:100
Total Number of Lecture Hours	52 Hours (40:Theory+12:Practical)	SEE Hours: 03

Prerequisite:

The students should have the knowledge of data management systems & Analytics

Course Objectives:

To enable the students to obtain the knowledge on.

- Explain the Business Intelligence, Analytics and Decision Support system
- List the technologies for Decision making, Automated decision systems
- Explain sentiment analysis techniques
- Illustrate Multi-criteria Decision making systems, predictive modelling technique

Modules	Teaching Hours
Module-I An Overview of Business Intelligence, Analytics, and Decision Support Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics	08
Module-II Decision Making Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components.	08
Module-III Neural Networks and SentimentAnalysis Basic Concepts of Neural Networks, Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process Based Approach to the Use of SVM, Nearest Neighbor Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process,, Sentiment Analysis, Speech Analytics	08

Module-IV Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets,Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pairwise Comparisons	08
Module-V Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems.	08

Question paper pattern:

1. The question paper will have TEN questions.

2. There will be TWO questions in each module, covering all the topics.

3. The student need to answer FIVE full questions, selecting ONE full question from each module..

Text Books:

1: Han, J., Pei, J. & Tong H. (2023). Data Mining Concepts and Techniques, 4th ed, New Delhi: Elsevier.

2: James, G., Witten, D., Hastie, T. and Tibshirani,R. (2013) An Introduction to Statistical Learning with Applications in R, Springer: NY

Reference Books:

Silge and Robinson, Text Mining with R, A Tidy Approach: O'reilly:
www.tidytextmining.com/index.html

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22IS72	**CO1**	Able to analyze Business Intelligence, Analytics and Decision Support
	CO2	Explain the technologies for Decision making
	CO3	Apply predictive modeling techniques
	CO4	Apply sentiment analysis techniques
	CO5	Able to use data from the enterprise databases and other sources for business decisions

List of Experiments -

1	To familiarize with and compare the functionalities of Tableau and Power BI for data visualization and analysis.
2	Creating Interactive Dashboards and Reports
3	Data Storytelling and Communicating Insights Effectively.
4	Developing a Comprehensive Business Analysis Solution.
5	Briefly explain various data aggregation and statistical functions used in Tableau.
6	Different visualization operations performed on data in Tableau.
7	Create a visually appealing and informative report that summarizes key findings from your data analysis. Include relevant charts, tables, and titles using Tableau
8	Create a bar chart to visualize total sales by product category. Explore sorting options to highlight top-selling categories using Tableau.
9	Develop a tailored dashboard for different audiences (e.g., management vs. sales team) to emphasize relevant insights for each group using Tableau.
10	Create a scatter plot to analyze the relationship between sales amount and product price. Consider adding a trend line to identify any correlations.

Cryptography & Network Security		
Course Code	22IS73	CIE: 50
Credits	04	SEE: 50
Course Type	PCC	
Number of Lecture Hours/Week (L-T-P)	4-0-0	Total Marks:100
Total Number of Lecture Hours	52 Hours (Theory)	SEE Hours: 03

Prerequisite:

The students should have the knowledge of Computer Networks & Information Security.

Course Objectives:

To enable the students to obtain the knowledge on.

- This Course focuses towards the introduction of network security using various cryptographic algorithms. Underlying network security applications.

- It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Modules	Teaching Hours
Module-I Introduction to the Concepts of Security: The need for security, Security Approaches, Principles of Security, Types of Attacks. Cryptographic Techniques: Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography.	10
Module-II Steganography, Key Range and Key Size, Possible Types of Attacks. Computer-based Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes, An overview of Symmetric Key Cryptography, DES. International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis.	11
Module-III International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis, Computer-based Asymmetric Key Cryptography: Brief History of Asymmetric Key Cryptography, An overview of Asymmetric Key Cryptography, The RSA Algorithm.	11

Module-IV	
Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms, Public Key Infrastructure: Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards, XML, PKI and Security	10
Module-V	
Internet Security Protocols: Basic Concepts, Secure Socket Layer, SHTTP, Time Stamping Protocol, Secure Electronic Transaction, SSL versus SET, 3-D Secure Protocol, Electronic Money, E-mail Security, Wireless Application Protocol (WAP) Security, Security in GSM.	10

Question paper pattern:

1. The question paper will have TEN questions.

2. There will be TWO questions in each module, covering all the topics.

3. The student need to answer FIVE full questions, selecting ONE full question from each module

Text Books:

1. Cryptography and Network Security – by Atul Kahate – TMH.

2. Data Communications and Networking- by Behourz A Forouzan

Reference Books:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition.

 2. V. K Pachghare: Cryptography and Information Security, PHI 2nd Edition

3. Behrouz A.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
	CO1	Understand the most common type of cryptographic algorithm
	CO2	Understand the Public-Key Infrastructure.
22IS73	**CO3**	Understand security protocols for protecting data on networks.
	CO4	Be able to digitally sign emails and files.
	CO5	Implement configure simple firewall architectures · Understand Virtual Private Networks

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

Course Code	22IS741	CIE: 50
Credits	03	SEE: 50
Course Type	PEC -III	
Number of Lecture Hours/Week (L-T-P)	3-0-0	Total Marks:100
Total Number of Lecture Hours	42 Hours (Theory)	SEE Hours: 03

Prerequisites: The students should have the knowledge of Software Engineering

Course Learning Objectives

To enable the students to obtain the knowledge of on

- Learn How to add functionality to designs while minimizing complexity.
- What code qualities are required to maintain to keep code flexible?
- To Understand the common design patterns.
- To explore the appropriate patterns for design problems.

Modules	Teaching Hours
Module-I Introduction: what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. A Notation for Describing Object-Oriented Systems. Textbook 1: Chapter 1 and 2.7 Analysis a System: overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading Textbook 1: Chapter 6	10
Module-II Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy. Textbook 2: chapter 4..	08
Module-III Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method Textbook 2: chapter 5	08

Module-IV		08
Interactive systems and the MVC architecture: Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete items, adding a new feature, pattern-based solutions. Textbook 1: Chapter 11		
Module-V		08
Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays. Textbook 1: Chapter 12		

Question paper pattern:
1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
   3. The student need to answer FIVE full questions, selecting ONE full question from each module

Text Books:

1. Brahma Dathan, Sarnath Rammath, Object-oriented analysis, design and implementation, Universities Press.

2. Erich Gamma, Richard Helan, Ralph Johman, John Vlissides , Design Patterns, Pearson Publication.

Reference Books:

1. Frank Bachmann, RegineMeunier, Hans Rohnert "Pattern Oriented Software Architecture" –Volume 1.

2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wile.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22IS741	**CO1**	Design and implement codes with higher performance and lower complexity
	CO2	Be aware of code qualities needed to keep code flexible.
	CO3	Experience core design principles and be able to assess the quality of a design with respect to these principles.
	CO4	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary
	CO5	Be able to select and apply suitable patterns in specific contexts

Block Chain Technology		
Course Code	22IS742	CIE: 50
Credits	03	SEE: 50
Course Type	PEC -III	
Number of Lecture Hours/Week (L-T-P)	3-0-0	Total Marks:100
Total Number of Lecture Hours	42 Hours (Theory)	SEE Hours: 03

Prerequisite: The students should have the basic knowledge of Big Data Analytics and Cryptography.

Course Objectives:

To enable the students to obtain the knowledge of on.

- Understand the Block Chain environment and the distributed data base aspects.

- Understand the importance of cryptography and Block chain networking

- Understand the Bitcon Protocols, Mining Strategy and rewards

- Understand Navie Block chain construction

- Understand Block chain applications and Digital Transactions

Modules	Teaching Hours
Module-I Block chain overview, working procedure of the Block chain technology, Brief-view of Distributed Data Base, Hadoop Distributed File System, Distributed Hash Table, Advantages of Block Chain over conventional distributed database	10
Module-II Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm. Block chain network, Mining Mechanism, Distributed Consensus.	08
Module-III Cryptocurrency : History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	08

Module-IV	
Naive Block chain construction, Memory Hard algorithm - Hash cash implementation	08

Module-V	
Block chain in a Nutshell, Block chain use cases, applications, advantages, disadvantages, cyber laws in India, Modes of Digital Transactions, Advantages of Digital Transactions.	08

Question paper pattern:

1.The question paper will have TEN questions.

2.There will be TWO questions in each module, covering all the topics.

3.The student need to answer FIVE full questions, selecting ONE full question from each module

Text Books:

1.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Gold feder, Bit coin and Crypto currency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books:

1. Antonopoulos, Mastering Bit coin: Unlocking Digital Crypto currencies

2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System

3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.

4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
	CO1	Demonstrate the Block Chain environment and the distributed data base aspects.
	CO2	Analyze the importance of cryptography and Block chain networking
	CO3	Implement the Bitcon Protocols, Mining Strategy and rewards
22IS742	CO4	Analyze The Navie Block chain construction
	CO5	Analyze Block chain applications and Digital Transactions

Mobile Computing			
Course Code	22IS743		CIE: 50
Credits	03		SEE: 50
Course Type	PEC -III		
Number of Lecture Hours/Week (L-T-P)	3-0-0		Total Marks:100
Total Number of Lecture Hours	42 Hours (Theory)		SEE Hours: 03

Prerequisites: The students should have the knowledge of Computer Networks & its organization

Course Objectives:

To enable the students to obtain the knowledge of on

- Understand the basic concepts of mobile computing

- Be familiar with the network protocol stack

- Learn the basics of mobile telecommunication system

- Be exposed to Ad-Hoc networks

- Gain knowledge about different mobile platforms and application development

Modules	Teaching Hours
Module-I Introduction- Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols –Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	10
Module-II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization – Overview of TCP/IP – Architecture of TCP/IP – Adaptation of TCP Window – Improvement in TCP Performance.	08
Module-III MOBILE TELECOMMUNICATION SYSTEM In Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).	08

Module-IV	
MOBILE AD-HOC NETWORKS Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.	08
Module-V	
MOBILE PLATFORMS AND APPLICATIONS Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues	08

Question paper pattern:

1.The question paper will have TEN questions.

2.There will be TWO questions in each module, covering all the topics.

3.The student need to answer FIVE full questions, selecting ONE full question from each module

Text Books:

1 - Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi .

Reference Books:

1 - Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi.

2 - Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, .

3 - Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
	CO1	Explain the basics of mobile telecommunication system
	CO2	Choose the required functionality at each layer for given application
22IS743	CO3	Identify solution for each functionality at each layer
	CO4	Use simulator tools and design Ad hoc networks.
	CO5	Develop a mobile application

IoT & its Application		
Course Code	22ISOE751	CIE: 50
Credits	03	SEE: 50
Course Type	OEC - II	
Number of Lecture Hours/Week (L-T-P)	3-0-0	Total Marks:100
Total Number of Lecture Hours	42 Hours (Theory)	SEE Hours: 03

Prerequisite: The students should have basic knowledge of computer networks and organization

Course Objectives: To enable the students to obtain the knowledge of

- Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.

- Understand the recent application domains of IoT in everyday life

- Understand the protocols and standards designed for IoT and the current research on it.

- Improve their knowledge about the various cutting-edge technologies in the field IoT and machine learning applications

Modules	Teaching Hours
Module-I What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	10
Module-II **Smart Objects:**The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	08
Module-III IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	08

Module-IV	
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment	08

Module-V	
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.	08

Question paper pattern:

1.The question paper will have TEN questions.

2.There will be TWO questions in each module, covering all the topics.

3.The student need to answer FIVE full questions, selecting ONE full question from each module

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

2. Srinivasa K G, "Internet of Things",CENGAGE Leaning India,

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 stEdition, VPT. (ISBN: 978-8173719547)

2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1 st Edition, McGraw Hill Education, . (ISBN: 978-9352605224)

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
	CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
	CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.

22ISOE753	CO3	Appraise the role of IoT protocols for efficient network communication.
	CO4	Elaborate the need for Data Analytics and Security in IoT.
	CO5	llustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Major Project Phase - II		
Course Code	22ISP76	CIE: 50
Credits	06	SEE: 50
Course Type	PROJ	
Number of Lecture Hours/Week (L-T-P)	0-0-12	Total Marks:100
Total Number of Lecture Hours	42 Hours (Theory)	SEE Hours: 03

Course Objectives:

- Gain and revise the knowledge of contemporary issues through literature surveys.

- Design and implement the solution for real world problems.

- To apply programming skills for module implementation.

- Apply modern technologies and engineering tools.

- To enhance the project management skills.

- Work individually and as a team member in multidisciplinary domains with ethical standards.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22ISP76	CO1	Apply the basic engineering knowledge and identify the real world problem.
	CO2	Apply the engineering skills to solve problems which require engineering applications.
	CO3	Gain insights and evaluate the knowledge through literature survey and formulate the problems.
	CO4	Design and develop effective solution to the problem using software methodology.
	CO5	Prepare a well organized report and presentation.

Internship (Industry / Research)			
Course Code	22ISINT83		CIE: 50
Credits	10		SEE: 50
Course Type	INT		
Number of Lecture Hours/Week (L-T-P)	0-0-12		Total Marks:100

Course Objectives:

- Facilitate opportunities to enhance and apply advanced technical and managerial skills in real-time scenarios, preparing students to become industry-ready professionals.
- Expose students to cutting-edge technological developments in Artificial Intelligence, Machine Learning, Data Science, and related fields to ensure relevance in a rapidly evolving domain.
- Encourage the application of knowledge and experience gained during industrial internships or projects in classroom discussions to deepen conceptual understanding and critical thinking.
- Foster a research-driven academic environment that promotes curiosity, innovation, and the practical application of knowledge to real-world problems.
- Provide platforms for students to implement their expertise in real industrial use-cases, including model deployment, data engineering, and automation workflows.
- Train students in the effective communication of technical content through structured documentation and reporting of AI/ML models, experiments, and project outcomes.
- Introduce students to the ethical responsibilities of practitioners, emphasizing fairness, transparency, data privacy, and the societal impact of intelligent systems.
- Promote holistic development by integrating academic knowledge with career-focused learning and personal growth opportunities through mentorship, workshops, and capstone projects.

Guidelines:

The duration of the Internship shall be of 14-20 weeks.

Internship must be completed in the VII/VIII semester.

Students undergoing internship training are advised to report their progress and submit periodic progress reports to their respective guides

The student must prepare and submit the hard copy of the final internship report along the internship certification provided by the industry.