PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Bangalore Trunk Road, Varadharajapuram,
Poonamallee, Chennai – 600 123.

OPEN ELECTIVES

Department of Electrical and Electronics Engineering
B.E- Electrical and Electronics Engineering

REGULATION-2023

(For the Students admitted during 2023-24)

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E- Electrical and Electronics Engineering CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABUS - R 2023

OPEN ELECTIVE – I

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	23IT1001	Web Design and Management	OE	3	3	0	0	3
2	23CB1002	Mobile Application Development	OE	3	3	0	0	3
3	23CS1001	Fundamentals of Data Base Management Systems	OE	3	3	0	0	3
4	23ME1935	Industrial Safety and Maintenance	OE	3	3	0	0	3
5	23EC1009	IoT Concepts and Applications	OE	3	3	0	0	3
6	23ME1009	Power Plant Engineering	OE	3	3	0	0	3
7	23EE1001	Energy storage systems	OE	3	3	0	0	3
8	23EC1010	Drone Technologies	OE	3	3	0	0	3
9	23GE1005	Principles of Management	OE	3	3	0	0	3

OPEN ELECTIVE – II

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	23CB1001	Introduction to C programming	OE	3	3	0	0	3
2	23AD1402	Basics of Data Science	OE	3	3	0	0	3
3	23ML1001	Data Structures and Algorithms	OE	3	3	0	0	3
4	23EC1012	VLSI Design	OE	3	3	0	0	3
5	23EE1008	Energy Conservation and Management	OE	3	3	0	0	3
6	23EE1002	Hybrid Energy Technology	OE	3	3	0	0	3
7	23GE1002	Human Resource Management	OE	3	3	0	0	3
8	23CS1003	Cloud Computing	OE	3	3	0	0	3

23IT1001	WEB DESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development
- To highlight the web frameworks in Web 2.0
- To Design a Website with HTML, JS, CSS / CMS - Word press
- To implement the project using CSS and open source.

UNIT - I WEB DESIGN – HTML MARKUP FOR STRUCTURE AND CSS 10

Working of Web - HTML Markup for Structure - Creating simple page - Marking uptext - Adding Links -Adding Images - Table Markup - Forms - HTML5, CSS -Formatting text - Colours a Background - Padding, Borders and Margins – Floatingand positioning - Page Layout with CSS Transition, Transforms and Animation –JavaScript - Using JavaScript.

SUGGESTED ACTIVITIES:

- Create HTML web page using CSS and JS
- Create colourful web page design using CSS box model.

SUGGESTED EVALUATION METHODS:

- Quiz on HTML basic tags and CSS layout
- Assignment submission on creating web page for different application

UNIT - II RESPONSIVE WEB DESIGN 8

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-Firstor Desktop-First –CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD- Designing small UIs by Large Finger -Images and Videos in ResponsiveWeb Design - Meaningful Typography for Responsive Web Design.

SUGGESTED ACTIVITIES:

- Create a simple web design using /Java /any language
- Design small UI

SUGGESTED EVALUATION METHODS:

- Build a responsive SaaS web page design
- Create a Code for responsive web design videos.

UNIT - III WEB FRAMEWORK 9

Django Template System - Interacting with a Database (Modules) –Django Administration Site, Form Processing, Advanced Views and Urlconfs, Generic Views - Extending the Template Engine - Generating Non-HTML Content,Sessions, Users, Registration, Caching, Other Contributed Sub Frameworks,Middleware, Integrating with Legacy Databases and Applications, Extending Django's Admin Interface, Internationalization, Security and Deploying Django.The Model Definition Reference, The Data Base API Reference, Generic ViewsReference, Settings, Built-In Template Tags and Filters, The Django– AdminUtility and Request and Response Objects. – Web App - Ruby Language –Ruby on Rails – Framework – Action Controller and Action View - RDF, Rdfa,OWL and Jena.

SUGGESTED ACTIVITIES:

- Use web application framework software like Django, Flask to designand support theweb application.
- Build web application using Ruby language

SUGGESTED EVALUATION METHODS:

- Assignment on web framework tool

UNIT - IV WEB PROJECT MANAGEMENT 9

Project Life Cycle - Project Definition - Discovery and Requirements – ProjectSchedule and Budgeting- Running the project - Technical Documentation -Development, Communication, Documentation – QA and testing -Deployment -Support and operations.

SUGGESTED ACTIVITIES:

- Case studies on Technical documentation
- Real world domain specific problems involving project life cycle.

SUGGESTED EVALUATION METHODS:

- Student assignment on case studies related to healthcare, climatechange,ecommerce,retail business, manufacturing etc.

UNIT - V PRODUCTION, MAINTENANCE AND EVALUATION 9

Design and Construction – Testing, Launch and Handover – Maintenance –Review and Evaluation-Case Study: Using the Skills and Concepts Learn with theADOBE IMAGE READY, DREAM WEAVER, FLASH, and Scripts, Develop Portfoliosin the Form of Web Pages which have to be uploaded in Free Public Domains.

SUGGESTED ACTIVITIES:

- Case studies on applications involving concept of adobe image ready.
- Demonstration of develop portfolio in form of web page.

SUGGESTED EVALUATION METHODS:

- Quiz on Testing and develop portfolio

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Design Website using HTML CSS and JS.

CO2 Design Responsive Sites

CO3 Identify the suitable web framework to support the development of web applications.

CO4 Manage, Maintain and Support Web Apps

CO5 Write and demonstrate simple web applications involving CSS

CO6 Create and maintain responsive websites and employ strategies with user centered design methodologies.

TEXT BOOKS:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011

REFERENCE BOOKS:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wileyand Sons,edition 2014
2. Jon Duckett, Jack Moore, "JavaScript &JQuery: Interactive Front-End WebDevelopment", John Wiley and Sons, edition 2014

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	1	3			1	2	1	2
CO2	3	2	3	2	3	2		2	2	2	3
CO3	3	3	3	2	3	2		2	2	2	3
CO4	3	2	3	3	3	2	1	3	3	3	3
CO5	3	2	3	2	3	1		1	2	2	2
CO6	3	3	3	2	3	3	2	3	3	2	3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23CB1002	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To learn how to utilize rapid prototyping techniques to design and develop sophisticated Android application.
- To understand the platform for developing mobile application
- To show their ability to deploy software to mobile devices
- To exhibit their ability to debug programs running on mobile devices

UNIT - I INTRODUCTION TO ANDROID OPERATING SYSTEM 9

Introduction to Android Operating System: Android OS design and Features –Android development framework, SDK features, Installing and running applicationson Android Studio, Creating AVDs, Types of Android applications, Best practices inAndroid programming, Android tools Android application components – AndroidManifest file, Resources for different devices and languages, Runtime ConfigurationChanges Android Application Lifecycle – Activities, Activity lifecycle, activity states,monitoring state changes.

SUGGESTED ACTIVITIES:

- Understanding the Android OS
- Acquire knowledge on basic building blocks of Androidprogramming required for App development.

SUGGESTED EVALUATION METHODS

- Quizzes
- Assignments

UNIT - II CONTROLS AND USER INTERFACE 9

Measurements – Device and pixel density independent measuring units – LayoutsLinear, Relative, Grid and Table Layouts - User Interface (UI) Components –Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons,Checkboxes, Spinners, Dialog and pickers -Event Handling – Handling clicks orchanges of various UI components Fragments – Creating fragments,Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding,removing and replacing fragments with fragment transactions, interfacing betweenfragments and Activities, Multi-screen Activities

SUGGESTED ACTIVITIES:

- Acquire the knowledge on Android devices and Platform.
- Understanding the UI components

SUGGESTED EVALUATION METHODS:

- Pedagogical tools
- Assignments

UNIT - III **INTENTS AND BROADCASTS** **9**

Intent – Using intents to launch Activities, Explicitly starting new Activity, ImplicitIntents, Passing data to Intents, Getting results from Activities, Native Actions,using Intent to dial a number or to send SMS -Broadcast Receivers –Using Intentfilters to service implicit Intents, Resolving Intent filters, finding and using Intentsreceived within an Activity Notifications – Creating and Displaying notifications,Displaying Toasts- Accessing Databases

SUGGESTED ACTIVITIES:

- Understanding the working principle of Android for app development.
- Develop and publish Android applications in to Android Market

SUGGESTED EVALUATION METHODS

- Quizzes
- Crossword puzzles

UNIT - IV **INTRODUCTION TO iOS** **9**

Introduction to iPhone, MVC Architecture, View Controller - Building the UI andEvent handling, Application life cycle, Tab Bars, Story Boards and NavigationControllers, Table View, Push Notification, Database handling, Introduction toicloud, Webkit framework in iOS8, Deploying and publishing application.

SUGGESTED ACTIVITIES:

- Understand the concepts of iOs.
- Develop and publish applications using iOS

SUGGESTED EVALUATION METHODS

- Assignments
- Crossword puzzles

UNIT - V **WINDOWS MOBILE APP DEVELOPMENT** **9**

Introduction to Windows Phone 8, Application Life cycle, UI Designing and events,Building, Files and Storage, Network Communication, Push Notification,Background Agents, Maps and Locations, Data Access and storage, Introductionto Silverlight and XAML, Data Binding, Deploying and Publishing.

SUGGESTED ACTIVITIES:

- Understand the windows phone concepts.
- To learn the concepts of data binding, deploying and publishing

SUGGESTED EVALUATION METHODS

- Assignments
- Quizzes

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Learn and understand the technology and business trends impacting mobile application.

CO2 Understand and remember the components of android, iOS, and windows mobile application.

CO3 Learning the techniques for developing mobile applications

CO4 Create the mobile applications with compelling user interface and database connectivity forreal time applications.

CO5 Apply and develop mobile application with iOS platform

CO6 Develop and deploy mobile applications using Silverlight.

TEXT BOOKS:

1. Reto Meier, “Professional Android Application Development”, Wrox, 2010.
2. David Mark, Jack Nutting and Jeff LaMarche, “Beginning iOS 6 Development Exploring theiOS SDK”, Apress, 2013

REFERENCE BOOKS:

1. “Beginning Android 4 Application Development”, Wei-Meng Lee, Wiley India (Wrox), 2013
2. Baijian Yang, Pei Zheng, Lionel M. Ni, “Professional Microsoft SmartphoneProgramming”,Wrox Edition

WEB REFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	2		2	2	2	3
CO2	3	2	2	2	3	2		1	1	1	2
CO3	3	3	3	2	3			2	2	2	3
CO4	3	3	3	3	3	2	1	2	3	2	3
CO5	3	2	3	2	3	2		1	2	1	2
CO6	3	2	3	2	3	2	1	2	2	1	2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23CS1001	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the basic concepts and the applications of database systems.
- To understand the various data models
- To learn the relational database design principles.
- To know the basics of SQL and construct queries using SQL.
- To familiar with the basic issues of transaction processing and concurrencycontrol

UNIT - I DATABASE FUNDAMENTALS 9

Introduction: Database System Applications, Purpose of Database Systems, View ofData, components and structure, Database Users and Administrator, History ofDatabase Systems.

UNIT - II DATA MODELS 9

ER model, Entities, Attributes and Entity sets, Relationships and Relationship sets,Additional features of ER Model, Conceptual Design with the ER Model, Enhanced ERModel.

UNIT - III RELATIONAL DATABASE 9

Relational Data Model - Concept of relations, schema-instance distinction, keys,referential integrity and foreign keys, relational algebra operators, Normalization (1NF,2NF, 3NF, BCNF).

UNIT - IV STRUCTURED QUERY LANGUAGE 9

Introduction, data definition in SQL, table, key and foreign key definitions, updatebehaviours. Querying in SQL, notion of aggregation, aggregation functions group byand having clauses, embedded SQL

UNIT - V TRANSACTION MANAGEMENT AND CONCURRENCY 9

Control Transaction management: ACID properties, serializability and concurrencycontrol, Lock based concurrency control (2PL, Deadlocks), Time stamping methods,optimistic methods, database recovery management.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Remember the Structure of a Database

CO2 Understand an Entity Relational Model for a database.

CO3 Apply Relational database concepts to design a database.

CO4 Analyze the importance of normalization and functional dependencies indatabase design

CO5 Understand transaction processing and concurrency control

CO6 Create a database design using Relational models

TEXT BOOKS:

1. "Data base System Concepts", A. Silberschatz, Henry. F. Korth, S.Sudarshan, McGrawHill India Private Limited, 7th edition.

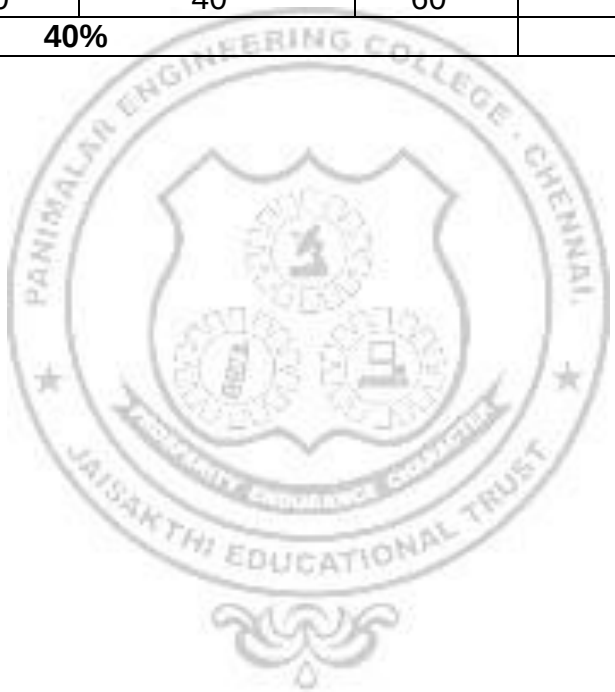
REFERENCE BOOKS:

1. "Data base Management Systems", Raghu Ramakrishnan, JohannesGehrke, McGrawHill Education (India) Private Limited, 3rd Edition.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**2**	**1**	**2**						**2**
CO2	**3**	**2**	**2**	**2**	**2**						**2**
CO3	**3**	**3**	**3**	**2**	**3**						**3**
CO4	**3**	**3**	**3**	**2**	**2**						**3**
CO5	**3**	**3**	**2**	**2**	**2**						**2**
CO6	**3**	**3**	**3**	**2**	**3**						**3**

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %



23ME1935	INDUSTRIAL SAFETY AND MAINTENANCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Identify unsafe conditions and recognize unsafe alerts.
- Interpret the rules and regulations for safety operations.
- Capable of solving problem of accidents
- Capable of solving the present for criticizing the present for improved safety.
- Collaborate and modify processes / procedures for safety

UNIT - I INTRODUCTION 9

Evolution of modern safety concepts – Fire prevention – Mechanical hazards –Boilers, Pressure vessels, Electrical Exposure.

UNIT - II CHEMICAL HAZARDS 9

Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizingRadiation - Industrial Hygiene – Industrial Toxicology

UNIT - III ENVIRONMENTAL CONTROL 9

Industrial Health Hazards – Environmental Control – Industrial Noise – Noisemeasuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT - IV HAZARD ANALYSIS 9

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modesand Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT - V SAFETY REGULATIONS 9

Explosions – Disaster management – catastrophe control, hazard control, FactoriesAct, Safety regulations Product safety – case studies.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Identify and prevent chemical, environmental mechanical, fire hazard.

CO2 Collect, analyze and interpret the accidents data based on various safetytechniques.

CO3 Apply proper safety techniques on safety engineering and management

CO4 Able to perform hazard analysis

CO5 Aid to design the system with environmental consciousness by implementing

TEXT BOOKS:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCE BOOKS:

1. David L.Goetsch, “Occupational Safety and Health for Technologists”,Engineers and Managers, Pearson Education Ltd. 5th Edition, 2005.
2. Deshmukh L M, “Industrial Safety Management”, Tata McGraw-HillPublishing Company Ltd.,2005
3. “Safety Manual”,EDEL Engineering Consultancy, 2000.

WEB REFERENCES:

1. https://www.asme.org/codes-standards/publications-information/safetycodes-standards
2. https://www.nfpa.org/Codes-and-Standards/All-Codes-and-Standards/List-of-Codes-and-Standards
3. https://link.springer.com/chapter/10.1007/978-1-84882-472-0_22

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/110105094
2. http://www.nitttrc.edu.in/nptel/courses/video/110105094/L51.html
3. https://www.digimat.in/nptel/courses/video/110105094/L01.html

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2	3	3				2
CO2	3	3	2	3	2	2	2				2
CO3	3	3	3	3	3	3	3				3
CO4	3	3	3	3	3	3	3				3
CO5	3	2	3	2	3	3	3				3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23EC1009	IOT CONCEPTS AND APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand Smart Objects and IOT Architectures
- To learn about various IOT-related protocols
- To build simple IOT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IOT
- To develop IOT infrastructure for popular applications.

UNIT - I FUNDAMENTALS OF IOT 9

Evolution of Internet of Things - Enabling Technologies - IOT Architectures: oneM2M,IOT World Forum (IOTWF) and Alternative IOT models - Simplified IOT Architectureand Core IOT Functional Stack - Fog, Edge and Cloud in IOT - Functional blocks ofan IOTecosystem - Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT - II IOT PROTOCOLS 9

IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11 ah and Lora WAN - Network Layer:IP versions, Constrained Nodes and Constrained Networks - Optimizing IP for IOT:From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – ApplicationTransport Methods: Supervisory Control and Data Acquisition - Application LayerProtocols: CoAP and MQTT.

UNIT - III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips- IOT system building blocks - Arduino - Board details, IDE programming – RaspberryPi - Interfaces and Raspberry Pi with Python Programming.

UNIT - IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest - Role of MachineLearning - No SQL Databases - Hadoop Ecosystem - Apache Kafka, Apache Spark -Edge Streaming Analytics and Network Analytics - Xively Cloud for IOT, Python WebApplication Framework - Django -AWS for IOT - System Management withNETGONF-YANG

UNIT - V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IOT system - IBM Watson IOT platform - Manufacturing - Converged Plantwide Ethernet Model (CPwE) - Power Utility Industry – Grid Blocks Reference Model- Smart and Connected Cities: Layered architecture, Smart Lighting, Smart ParkingArchitecture and Smart Traffic Control

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Explain the concept of IOT

CO2 Analyze various protocols for IOT.

CO3 Design a Poe of an IOT system using Rasperry Pi/Arduino

CO4 Apply data analytics and use cloud offerings related to IOT.

CO5 Analyze applications IOT in real time scenario

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete. Rob Barton and JeromeHenry, "IOT Fundamentals: Networking Technologies, Protocols and UseCases for Internet of Things", Cisco Press, 2017
2. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-onapproach", Universities Press, 2015
3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things– Key applications and Protocols", Wiley, 2012

REFERENCE BOOKS:

1. Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis , arnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architectingthe Internet of Things", Springer, 2011.
3. Michael Margolis, Arduino Cookbook, "Recipes to Begin, Expand, andEnhance your projects", 2nd Edition, O'ReillyMedia,2011.

WEB REFERENCES:

1. https://www.ibm.com/smarterplanet/us/en/?ca=v smarter planet

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2				2					2
CO2	3	3		2	3						2
CO3	3	3	3	3	3						3
CO4	3	3	3	3	3						3
CO5	3	2	3	2	2	3	2				2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23ME1009	POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To provide an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance

UNIT - I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle – improvisations, Layout of modern coal power plant, Super CriticalBoilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems ofthermal power plants – Fuel and ash handling, Draught system, Feed watertreatment and Binary Cycles. Cogeneration systems.

UNIT - II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual &Brayton Cycle – Analysis & Optimization. Components of Dieseland Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifierbased Combined Cycle systems.

UNIT - III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants,Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized WaterReactor (PWR), CANada Deuterium- Uranium reactor (CANDU), Breeder, GasCooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT - IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associatedcomponents including Turbines. Principle, Construction and working of Wind, Tidal,Ocean current power generation, Solar Photo Voltaic (SPV), Solar Thermal, GeoThermal, Biogas and Fuel Cell power systems.

UNIT - V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of siteselection criteria, relative merits & demerits, Capital & Operating Cost of differentpower plants. Pollution control technologies including Waste Disposal Options for Coaland Nuclear Power Plants.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Discuss the layout, construction and working of the components inside athermal power plant
CO2	Analysis the layout, construction and working of the components inside aDiesel, Gas and Combined cycle power plants
CO3	Understand the layout, construction and working of the components insidenuclear power plants.
CO4	Understand the layout, construction and working of the components insideRenewable energy power plants.

CO5	Analysis the applications of power plants while extend their knowledge topower plant economics and environmental hazards and estimate the costs ofelectricalenergy production.

TEXT BOOKS:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCE BOOKS:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.
4. Domundwar, AroraDomkundwar.,"Power Plant Engineering",DhanpatRai&Co., 2016.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=iWWyI8CZhUw

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/112107291

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**2**								**2**
CO2	**3**	**3**	**2**	**2**	**2**						**2**
CO3	**3**	**2**				**2**	**3**				**2**
CO4	**3**	**2**				**3**	**3**				**2**
CO5	**3**	**3**		**2**	**2**	**3**	**3**				**2**

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23EE1001	ENERGY STORAGE SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand the various types of energy storage Technologies.
- Analyze thermal storage system
- Analyze different battery storage technologies
- Analyze the thermodynamics of Fuel Cell
- Study the various applications of energy storage systems.

UNIT - I INTRODUCTION 9

Necessity of energy storage – types of energy storage – comparison of energystorage technologies – Applications.

UNIT - II THERMAL STORAGE SYSTEM 9

Thermal storage – Types – Modeling of thermal storage units – Simple water androck bed storage system – pressurized water storage system – Modelling of phasechange storage system – Simple units, packed bed storage units - Modelling usingporous medium approach, Use of TRNSYS.

UNIT - III ELECTRICAL ENERGY STORAGE 9

Fundamental concept of batteries – measuring of battery performance, charging anddischarging, power density, energy density, and safety issues. Types of batteries –Lead Acid, Nickel – Cadmium, Zinc Manganese dioxide, Li-ion batteries -Mathematical Modelling for Lead Acid Batteries – Flow Batteries.

UNIT - IV FUEL CELL 9

Fuel Cell – History of Fuel cell, Principles of Electrochemical storage – Types –Hydrogen oxygen cells, Hydrogen air cell, Hydrocarbon air cell, alkaline fuel cell,detailed analysis – advantages and disadvantages.

UNIT - V ALTERNATE ENERGY STORAGE TECHNOLOGIES 9

Flywheel, Super capacitors, Principles & Methods – Applications, Compressed airEnergy storage, Concept of Hybrid Storage – Applications, Pumped Hydro Storage –Applications.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Understand different types storage technologies
CO2 Design a thermal storage system
CO3 Model battery storage system
CO4 Analyze the thermodynamics of fuel cell
CO5 Analyze the appropriate storage technologies for different applications
CO6 Explore the alternate energy storage technologies.

TEXT BOOKS:

1. IbahimDincer and Mark A. Rosen, "Thermal Energy Storage Systems andApplications", John Wiley & Sons, 3rdEdition, 2021.
2. Ru-shi Liu, Lei Zhang and Xueliang sun, "Electrochemical technologies forenergy storage and conversion", Wiley publications, 2ndVolume set, 2012.
3. James Larminie and Andrew Dicks, "Fuel cell systems Explained", Wileypublications, 3rdEdition, 2018

REFERENCE BOOKS:

1. Lunardini.V.J, "Heat Transfer in Cold Climates", John Wiley and Sons 1981, 1stEdition.
2. Schmidt.F.W. and Willmott.A.J.,"Thermal Energy Storage and Regeneration", Hemisphere Publishing Corporation, 1981, 1stEdition.

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/113105102
2. https://nptel.ac.in/courses/112105221.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2					2				2
CO2	3	3	3	2	2						2
CO3	3	3	3	2	2						2
CO4	3	2	2				2				2
CO5	3	3	2	2	2	3	3				2
CO6	3	3	2	2	2	3	3				2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23EC1010	DRONE TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To make the students to understand the basic concepts of UAV dronesystems.
- To introduce the stability and control of an aircraft

UNIT - I INTRODUCTION TO DRONES 9

Introduction to Unmanned Aircraft Systems, History of UAV drones, classification ofdrones, System Composition, applications.

UNIT - II DESIGN OF UAV DRONE SYSTEMS 9

Introduction to Design and Selection of the System, Aerodynamics and AirframeConfigurations, Characteristics of Aircraft Types, Design Standards and RegulatoryAspects-India Specific, Design for Stealth.

UNIT - III AVIONICS HARDWARE OF DRONES 9

Autopilot, AGL-pressure sensors servos-accelerometer–gyros-actuators- powersupply-processor, integration, installation, configuration.

UNIT - IV COMMUNICATION, PAYLOADS AND CONTROLS 9

Payloads, Telemetry, Tracking, controls-PID feedback, radio control frequency range,modems, memory system, simulation, ground test-analysis-trouble shooting.

UNIT - V NAVIGATION AND TESTING 9

Waypoints navigation, ground control software, System Ground Testing, System InflightTesting, Future Prospects and Challenges

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Ability to design UAV drone system

CO2 To understand working of different types of engines and its area ofapplications.

CO3 To understand static and dynamic stability dynamic instability and controlconcepts

TEXT BOOKS:

1. Reg Austin, “Unmanned Aircraft Systems UAV design, development anddeployment”, Wiley, 2010.
2. Robert C. Nelson, “Flight Stability and Automatic Control”, McGraw-Hill, Inc,1998.

REFERENCE BOOKS:

1. Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of theArt and the Road to Autonomy”, Springer, 2007
2. Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998
3. Dr. Armand J. Chaput, “Design of Unmanned Air Vehicle Systems”,Lockheed Martin Aeronautics.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	2	2						2
CO2	3	2	2	–	1						2
CO3	3	3	2	2	2						2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23GE1005	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To enable the students to know about the evolution, functions and principlesof Management.
- To make the students understand about planning, setting up of objectives &Decision Making.
- To enable students, understand about organisation structure, delegation ofauthority, HRM, Training & Development.
- To enable students know about effective communication in the organization
- To study the system and process of effective controlling and application ofthe principles in the organization

UNIT - I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types ofmanagers - managerial roles and skills – Evolution of Management – Scientific,human relations , system and contingency approaches – Types of Businesorganization - Sole proprietorship, partnership, company-public and private sectorenterprises - Organization Environment – Current trends and issues in Management.

UNIT - II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives– setting objectives – policies – Planning premises – Planning Tools and Techniques– Decision making steps and process.

UNIT - III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart –organization structure – types – Line and staff authority – departmentalization –delegation of authority – centralization and decentralization – Job Design – HumanResource Management – HR Planning, Recruitment, selection, Training andDevelopment, Performance Management, Career planning and management.

UNIT - IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types andtheories of leadership – communication – process of communication – barrier incommunication – effective communication – communication and IT.

UNIT - V CONTROLLING 9

Controlling and its types & Process – budgetary and non-budgetary controltechniques – use of computers and IT in Management control – Productivityproblems and management – control and performance – direct and preventivecontrol – reporting.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Have clear understanding of managerial functions like planning, organizing,staffing, leading & controlling.

CO2 Have some basic knowledge on Communication & Motivation.

CO3 Have the ability to apply the principles of management in the organization.

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert, "Management", 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009

REFERENCE BOOKS:

1. Harold Koontz & Heinz Weihrich, "Essentials of Management", Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management", 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 2010

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2		2			2	1	3	3	3	2
CO2	2		1			2	1	3	3	2	2
CO3	2	2	3	1		3	1	3	3	3	3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

OPEN ELECTIVE-II

23CB1001	INTRODUCTION TO C PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To acquire knowledge to write an algorithm and flowchart for problems
- To study and develop C programs using operators, expressions and control flow
- To learn the concept for functions and pointers
- To gather knowledge about structure and I/O
- To learn about processing of files

UNIT - I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms, Art of Programming through Algorithms and Flowcharts-History and importance of C - Applications of C Language - Structure of C program – Basics: Data Types – Constants –Variables - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers.

SUGGESTED ACTIVITIES:

- Understanding the constructs of C Language.
- Control the sequence of the program and give logical outputs
- Understanding the uses of pre-processors and various memory models

SUGGESTED EVALUATION METHODS:

- Tutorial on conditionals and loops.
- Assignments

UNIT - II ARRAYS 9

Introduction to Arrays – One dimensional array: Declaration – Initialization - Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Read – Print – Sum – Transpose – Multiplication- Exercise Programs: Print the number of positive and negative values present in the array – Sort the numbers using bubble sort - Find whether the given is matrix is diagonal or not.

SUGGESTED ACTIVITIES:

- Understanding the purpose of array
- Design and implement applications using arrays
- Develop an application to perform matrix operations using multidimensional arrays

SUGGESTED EVALUATION METHODS:

- Pedagogical tools
- Assignments

UNIT - III **STRINGS & POINTERS** **9**

Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement – Array of strings – Pointers: Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names.

SUGGESTED ACTIVITIES:

- Understanding the purpose of strings
- Developing C programs using strings

SUGGESTED EVALUATION METHODS:

- Quizzes
- Tabulate the different strings functions and its purpose

UNIT - IV **FUNCTIONS** **9**

Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by ‗n' devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function)

SUGGESTED ACTIVITIES:

- Apply code reusability with functions and pointers
- Develop and implement modular applications in C using functions.

SUGGESTED EVALUATION METHODS:

- Assignments
- Pedagogical Techniques

UNIT - V **STRUCTURES, UNIONS AND FILE MANAGEMENT** **9**

Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – typedef – Union - Storage classes and Visibility. Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions) - Defining and opening a file, closing a file, Input/output and Error Handling on Files.

SUGGESTED ACTIVITIES:

- Demonstration of real-world applications using file operations.
- Implementing applications using Unions, Enumerations and typedef.
- Understanding the basics of file handling mechanisms

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Ability to implement the algorithms and flow chart for solving mathematical and engineering problems
CO2	Develop C programs for real world/technical application using basic constructs
CO3	Implement C programs using control structures
CO4	Explore the usage of arrays, pointers and functions in C.
CO5	Implement Programs with structures and union in C.
CO6	Design applications using sequential and random access file processing

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, "Let us C", 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum‘s Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

WEB REFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

ONLINE COURSES / RESOURCES:

1. https://www.programiz.com/c-programming 2
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.geeksforgeeks.org/c-programming-language/
5. https://en.wikibooks.org/wiki/C_Programming

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2		2				1		2
CO2	3	2	3		3				1		2
CO3	3	2	3		2				1		2
CO4	3	2	3		3				1		2
CO5	3	2	3		2				1		2
CO6	3	2	3		3				1		2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23AD1402	BASICS OF DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To gain knowledge in the basic concepts of Data Analysis
- To acquire skills in data preparatory and pre-processing steps
- To understand the mathematical skills in statistics
- To learn the tools and packages in Python for data science
- To gain understanding in classification and Regression Model
- To acquire knowledge in data interpretation and visualization techniques

UNIT - I INTRODUCTION 9

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

SUGGESTED ACTIVITIES

- Developing a framework for cleansing, integrating, and transforming data
- Simple program exploratory data analysis

SUGGESTED EVALUATION METHODS

- Quizzes on data science process.
- Assignments on data analysis.

UNIT - II DESCRIBING DATA ANALYSIS I 9

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions –frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – inter quartile range –variability for qualitative and ranked data.

SUGGESTED ACTIVITIES

- Developing a framework for basic statistics
- Simple program on inter quartile range

SUGGESTED EVALUATION METHODS

- Quizzes on basic statistics.
- Assignments on Variability.

UNIT - III PYTHON FOR DATA HANDLING 9

Basics of Numpy arrays – Aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets –aggregation and grouping –pivot tables.

SUGGESTED ACTIVITIES

- Developing simple programs on structured array
- Programs on hierarchical indexing
- Simple programs on numpy

SUGGESTED EVALUATION METHODS

- Quizzes on algorithms and basic python.
- Assignments on hierarchical indexing.
- Quizzes on simple python programs.

UNIT - IV DESCRIBING DATA ANALYSIS II 9

Normal distributions – z scores – normal curve problems – finding proportions – finding scores –more about z scores – correlation – scatter plots – correlation coefficient for quantitative data –computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – Population – Analysis of variance.

SUGGESTED ACTIVITIES

- Developing simple programs on Normal distributions
- Simple programs on regression

SUGGESTED EVALUATION METHODS

- Quizzes on Normal distributions.
- Assignments on regression.

UNIT - V PYTHON FOR DATA VISUALIZATION 9

Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh.

SUGGESTED ACTIVITIES

- Developing a visualization framework using matplotlib
- Developing programs for data analysis using statmodels and seaborn

SUGGESTED EVALUATION METHODS

- Quizzes on matplotlib.
- Assignments on data analysis using statmodels and seaborn.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Apply the skills of data inspecting and cleansing.

CO2 Determine the relationship between data dependencies using statistics

CO3 Can handle data using primary tools used for data science in Python

CO4 Represent the useful information using mathematical skills

CO5 Can apply the knowledge for data describing and visualization using tools.

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Chapters 1–7 for Units II and IV)
3. Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016. (Parts ofchapters 2–4 for Units III and V)

REFERENCE BOOKS:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	3				1		2
CO2	3	3	2	3	2				1		2
CO3	3	2	3	2	3				1		2
CO4	3	3	2	3	2				1		2
CO5	3	2	3	3	3				1		2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23ML1001	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the concepts of ADTs
- To design linear data structures–lists, stacks, and queues
- To understand sorting algorithms
- To understand the concept of searching and hashing algorithms
- To apply Tree and Graph structures

UNIT - I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

SUGGESTED ACTIVITES:

- Developing and application (student‘s choice using all the linear data structures

SUGGESTED EVALUATION METHODS:

- Programs and Demonstration on applications of linear data structures.
- Checking output of programs implemented.
- Assignments.

UNIT - II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations – Circular Queue-Priority Queue – deQueue – applications of queues- Job Scheduling- Josephus problem.

SUGGESTED ACTIVITES:

- Demonstrating stack for Towers of Hanoi application.

SUGGESTED EVALUATION METHODS:

- Programs on applications of Stacks and Queues
- Quiz on various topics of the unit
- Assignments

UNIT - III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – Representation of Trees- Binary Tree –Tree traversal– expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree B+ Tree –Trie - Heap – Applications of heap

SUGGESTED ACTIVITES:

- Solving expressions using expression trees by determining infix, prefixand postfix expressions.
- Developing any application using trees.

SUGGESTED EVALUATION METHODS:

- Programs using tree traversal and binary tree
- Programs on binary search trees.
- Programs and Demonstration using AVL tree applications.
- Assignments

UNIT - IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth- first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs- Shortest path algorithms- Minimum spanning trees- Prims and Kruskal Algorithms Applications of BFS: Graph Coloring.

SUGGESTED ACTIVITES:

- External learning- Applications of graphs.
- Practical- To choose and apply a suitable graph algorithm for solving a real time problem /scenario such as Network Routing.

SUGGESTED EVALUATION METHODS:

- Assignments on representation of graphs for a given problem
- Quizzes on basics of graphs.
- Programs and Demonstration using application of graph and topological sort

UNIT - V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting –Quick Sort - Bubble sort - Selection sort - Heap Sort –Merge Sort - Insertion sort – Bucket sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing

SUGGESTED ACTIVITES:

- External learning- Applications of graphs.
- Practical-To choose and apply a suitable graph algorithm for solving a real time problem/scenario such as Network Routing.

SUGGESTED EVALUATION METHODS:

- Tutorials on external sorting.
- Tutorials on hashing.
- Check output of programs implemented

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Implement abstract data types for linear data structures.

CO2 Apply the different linear data structures to problem solutions.

CO3 Model problems as Tree problems and implement efficient Tree algorithms to solve them.

CO4 Model problems as graph problems and implement efficient graph algorithms to solve them.

CO5 Critically analyze the various sorting algorithms.

CO6 Analyze the various searching and hashing algorithms

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson education, 2011.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press,2011

REFERENCE BOOKS:

1. Thomas H.Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms”, Second Edition, McGraw Hill,2002
2. Aho,Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983
3. Stephen G.Kochan, “Programming in C”, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press,2008

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**3**	**2**	**3**				**1**		**2**
CO2	**3**	**3**	**3**	**2**	**3**				**1**		**2**
CO3	**3**	**3**	**3**	**3**	**3**				**1**		**2**
CO4	**3**	**3**	**3**	**3**	**3**				**1**		**2**
CO5	**3**	**3**	**2**	**3**	**3**				**1**		**2**
CO6	**3**	**3**	**2**	**3**	**3**				**1**		**2**

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23EC1012	VLSI DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To explain the basic concepts of CMOS.
- To introduce the IC fabrication methods.
- To introduce the Reconfigurable Processor technologies.
- To introduce the basics of analog VLSI design and its importance.
- To learn about the programming of Programmable device using Hardware description Language.

UNIT - I CMOS BASICS 9

MOSFET Scaling - CMOS logic design- Dynamic CMOS –Transmission Gates- BiCMOS.

UNIT - II IC FABRICATION 9

CMOS IC Fabrications: n well, p well, twin tub, SoI - Design Rules and Layout.

UNIT - III PROGRAMABLE LOGIC DEVICES 9

PAL, PLA, CPLD architecture and application.

UNIT - IV RECONFIGURABLE PROCESSOR 9

FPGA- Architecture, FPGA based application development- Introduction to FPAA

UNIT - V HDL PROGRAMMING 9

Verilog HDL- Overview - structural and behavioural modeling concepts-Design examples- Carry Look ahead adders, ALU, Shift Registers.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Develop CMOS design techniques.
CO2	Learn and build IC fabrication.
CO3	Explain the need of reconfigurable computing with PLDs.
CO4	Design and development of reprogrammable FPGA.
CO5	Illustrate and develop HDL computational processes with improved design strategies.

TEXT BOOKS:

1. M.J.S Smith, “Application Specific integrated circuits”, Addition Wesley Longman Inc. 1st Edition 2010.
2. Kamran Eshraghian, Douglas A.pucknell and Sholeh Eshraghian, “Essentials of VLSI circuits and system”, Prentice Hall India, 2005, 1st Edition.

REFERENCE BOOKS:

1. Donald G. Givone, “Digital principles and Design”, Tata McGraw Hill, 2002, 1st Edition.
2. Charles H. Roth Jr., “Fundamentals of Logic design”, Thomson Learning, 7th Edition 2013.
3. Nurmi, Jari (Ed.), “Processor Design System-On-Chip Computing for ASICs and FPGAs”, Springer, 2007, 1st Edition.
4. Joao Cardoso, Michael Hübner, "Reconfigurable Computing: From FPGAs to Hardware/Software Codesign", Springer, 2011, 1st Edition.
5. Pierre-Emmanuel Gaillardon, “Reconfigurable Logic: Architecture, Tools, and Applications”, 1st Edition, CRC Press, 2018.

WEB REFERENCES:

1. https://www.tutorialspoint.com/vlsi_design/vlsi_design_vhdl_introduction.htm#:~:text=VHDL%20stands%20for%20very%20high,DoD)%20under%20the%20VHSIC%20program.

ONLINE COURSES / RESOURCES:

1. https://archive.nptel.ac.in/courses/108/107/108107129/
2. http://gn.dronacharya.info/ECEDept/Downloads/QuestionPapers/7th_Sem/VLSIDESIGN/UNIT-1/Lecture-3.pdf
3. https://web.itu.edu.tr/~ateserd/vlsi2/2007/FPGAs&CPLD.pdf
4. https://kanchiuniv.ac.in/coursematerials/GSK_Notes_on_PLD_in_VLSI_design.pdf
5. https://www.xilinx.com/products/silicon-devices/resources/programming-anfpga-anintroduction-to-how-it-works.html
6. https://www.allaboutcircuits.com/technical-articles/what-is-an-fpgaintroduction-toprogrammable-logic-fpga-vs-microcontroller

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**3**	**2**	**3**				**1**		**2**
CO2	**3**	**2**	**2**	**2**	**3**						**2**
CO3	**3**	**2**	**2**	**2**	**3**						**2**
CO4	**3**	**2**	**3**	**3**	**3**				**1**		**2**
CO5	**3**	**3**	**3**	**3**	**3**				**1**		**2**

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23EE1008	ENERGY CONSERVATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings
- Utilise the available resources in optimal ways

UNIT - I INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT - II ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors – Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT - III THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and Encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT - IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems –Cooling Towers – D.G. sets.

UNIT - V ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Remember the knowledge for Basic combustion and furnace design and selection of thermal and mechanical energy equipment.
CO2	Study the Importance of Stoichiometry relations, Theoretical air required for complete combustion.
CO3	Skills on combustion thermodynamics and kinetics
CO4	Apply calculation and design tube still heaters.
CO5	Studied different heat treatment furnace.
CO6	Practical and theoretical knowledge burner design.

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) available at ww.energymanagertraining.com. a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCE BOOKS:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, ¯"Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981
3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982
5. Murphy. W.R. and G. Mc KAY, "Energy Management" complete combustion., Butterworths, London 1987

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2		2				2
CO2	3	2		2							2
CO3	3	3		3	2						2
CO4	3	3	3	3	2						2
CO5	3	2	3	2	2						2
CO6	3	2	2	3	2						2

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23EE1002	HYBRID ENERGY TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To provide knowledge about different types of hybrid energy systems.
- To analyze the various electrical Generators used for the Wind Energy Conversion Systems
- To design the power converters used in SPV Systems.
- To analyze the various power converters used in hybrid energy systems and to understand the importance of standalone and grid-connected operation in Hybrid renewable energy systems.
- To design the power converters used in SPV Systems
- To analyze the performance of the various hybrid energy systems

UNIT - I INTRODUCTION TO HYBRID ENERGY SYSTEMS 9

Hybrid Energy Systems – Need for Hybrid Energy Systems – Solar-Wind-Fuel Cell- Diesel, Wind- Biomass-Diesel, Micro-Hydel-PV, Ocean and geyser energy - Classification of Hybrid Energy systems – Importance of Hybrid Energy systems – Advantages and Disadvantages - Environmental aspects of renewable energy - Impacts of renewable energy generation on the environment - Present Indian and international energy scenario of conventional and RE sources - Ocean energy, Hydel Energy – Wind Energy, Biomass energy, Hydrogen energy - Solar Photovoltaic (PV) and Fuel cells: Operating principles and characteristics.

UNIT - II ELECTRICAL MACHINES FOR WIND ENERGY CONVERSION SYSTEMS (WECS) 9

Review of reference theory fundamentals –Construction, Principle of operation and analysis: Squirrel Cage Induction Generator (SCIG), Doubly Fed Induction Generator (DFIG) - Permanent Magnet Synchronous Generator (PMSG).

UNIT - III POWER CONVERTERS AND ANALYSIS OF SOLAR PV SYSTEMS 9

Power Converters for SPV Systems - Line commutated converters (inversion-mode) - Boost and buck- boost converters- selection of inverter, battery sizing, array sizing - Analysis of SPV Systems – Block diagram of the solar PV systems - Types of Solar PV systems: Stand-alone PV systems.

UNIT - IV ANALYSIS OF POWER CONVERTERS FOR HYBRID ENERGY SYSTEMS 9

Introduction to Power Converters – Stand-alone Converters -AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters - Bi-Directional Converters - Grid-Interactive Inverters - Matrix converter – Merits and Limitations.

UNIT - V CASE STUDIES FOR HYBRID RENEWABLE ENERGY SYSTEMS 9

Hybrid Systems- Range and type of Hybrid systems – Performance Analysis – Cost Analysis – Case studies of Diesel-PV, Wind-PV-Fuel-cell, Micro-hydel-PV, Biomass-Diesel-Fuel-cell systems.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Analyze the impacts of hybrid energy technologies on the environment and demonstrate them to harness electrical power.

CO2 Select a suitable Electrical machine for Wind Energy Conversion Systems and simulate wind energy conversion system.

CO3 Design the power converters such as AC-DC, DC-DC, and AC-AC converters for SPV systems.

CO4 Analyze the power converters such as AC-DC, DC-DC, and AC-AC converters for Hybrid energy systems

CO5 Interpret the hybrid renewable energy system

TEXT BOOKS:

1. Bahman Zohuri, “Hybrid Energy Systems”, Springer, First Edition, 2018.
2. S.M. Muyeen, “Wind Energy Conversion Systems”, Springer First Edition, 2012
3. Md. Rabiul Islam, Md. Rakibuzzaman Shah, Mohd Hasan Ali, "Emerging Power Converters for Renewable Energy and Electric Vehicles", CRC Press, First Edison, 2021

REFERENCE BOOKS:

1. Ernst Joshua, “Wind Energy Technology”, PHI, India, 2018, 3rd Edition.
2. S.N.Bhadra, D. Kastha, & S. Banerjee, “Wind Electrical Systems”, Oxford University Press, 7th Impression, 2005
3. Rashid.M. H, “Power electronics Hand book”, Academic press, 4th Edition, 2018.
4. Rai. G.D, “Non-conventional energy sources”, Khanna publishers, 6th Edition, 2017.
5. Gray, L. Johnson, “Wind energy system”, Prentice Hall of India, 2nd Edition, 2006.

WEB REFERENCES:

1. https://www.sciencedirect.com/topics/engineering/hybrid-energy-system
2. https://www.sciencedirect.com/topics/engineering/wind-energy-conversionsystem

ONLINE COURSES / RESOURCES:

1. https://www.intechopen.com/chapters/64317

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2	3	3				2
CO2	3	3	2	3	2		2				2
CO3	3	2	3	3	3		2				2
CO4	3	2	3	3	3		2				2
CO5	3	2	2	2	2	2	3				3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23GE1002	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To provide knowledge about management issues related to staffing,
- To provide knowledge about management issues related to training
- To provide knowledge about management issues related to performance
- To provide knowledge about management issues related to compensation
- To provide knowledge about management issues related to human factors consideration and compliance with human resource requirements.

UNIT - I INTRODUCTION TO HUMAN RESOURCE MANAGEMENT 9

The importance of human resources – Objective of Human Resource Management - Human resource policies - Role of human resource manager

UNIT - II HUMAN RESOURCE PLANNING 9

Importance of Human Resource Planning – Internal and External sources of Human Resources - Recruitment - Selection – Socialization.

UNIT - III TRAINING AND EXECUTIVE DEVELOPMENT 9

Types of training and Executive development methods – purpose – benefits.

UNIT - IV EMPLOYEE COMPENSATION 9

Compensation plan – Reward – Motivation – Career Development - Mentor – Protege relationships

UNIT - V PERFORMANCE EVALUATION AND CONTROL 9

Performance evaluation – Feedback - The control process – Importance – Methods – grievances – Causes – Redressal methods.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1 Students would have gained knowledge on the various aspects of HRM

CO2 Students will gain knowledge needed for success as a human resources professional.

CO3 Students will develop the skills needed for a successful HR manager.

CO4 Students would be prepared to implement the concepts learned in the workplace.

CO5 Students would be aware of the emerging concepts in the field of HRM

TEXT BOOKS:

1. Decenzo and Robbins, "Human Resource Management", 8th Edition, Wiley, 2007
2. John Bernardin. H., "Human Resource Management – An Experimental Approach", 5th Edition, Tata McGraw Hill, 2013, New Delhi.

REFERENCE BOOKS:

1. Luis R, Gomez-Mejia, DavidB. Balkin and Robert L. Cardy, “Managing Human Resources", 7th Edition, PHI, 2012
2. Dessler, "Human Resource Management", Pearson Education Limited, 2007.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2					2	2			2	2
CO2	2	2	2			2	2			2	2
CO3	2	2	3	2		2	2	2	3	3	2
CO4	3	2	3	2		3	3	3	3	3	2
CO5	2	2	2	2		2	3	2	2	2	3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23CS1003	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm

UNIT - I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT - II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT - III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds- IaaS – PaaS – SaaS – Architectural Design Challenges.

UNIT - IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security –Application Security – Virtual Machine Security.

UNIT - V CASE STUDIES 9

Google App Engine (GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services (AWS) – GAE-Open Stack.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

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

CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
CO2	Learn the key and enabling technologies that help in the development of cloud.
CO3	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
CO4	Explain the core issues of cloud computing such as resource management and security.
CO5	Be able to install and use current cloud technologies.
CO6	Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud

TEXT BOOKS:

1. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", First Edition, John Wiley and Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, And Security", CRC Press, 2017.

REFERENCE BOOKS:

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", OReilly, 2009.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3					2					2
CO2	3	2				2					2
CO3	3	2	3	2	3	2					2
CO4	3	3	3	3	3	3	2				2
CO5	2	2	3	2	3						2
CO6	3	3	3	3	3	2					3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %