



**Prof. Ram Meghe Institute of Technology And Research
Badnera –Amravati**

**An Autonomous Institute Affiliated to Sant Gadge Baba Amravati University,
Amravati, Maharashtra (India)**

**B. Tech
Specialization Minor (Double minor)
2023-24**

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches
Batch Admitted AY2023-24 SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 3rd Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
			Hours / Week			SM Applicable to	Total Hours /Week	Credits	THEORY						
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	
						Max. Marks MSE/ MSIE	Max. Marks TA								
Theory															
III	3SASM	Programming Language for Data Science	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
III	3SCSM	Environmental Pollution and Control	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
III	3SKSM	Introduction of HTML	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
III	3SESM	Fundamentals of Digital Electronics	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
III	3SNSM	Fundamentals of Information Technology	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
III	3STSM	Introduction to Internet of Things	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Industrial IoT
III	3SMSM	Manufacturing Processes- I	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Engineering

B.Tech. Third Semester (Artificial Intelligence and Data Science)
Double Minors: Specialization Minor (Advanced Programming)

Course Code	Course Title	L	T	P	C
3SASM	Programming Language for Data Science	03	00	00	03

Course Objectives:

The course will enable the learners to:

1. Understand the basics of R programming, including its advantages, R Studio environment, handling packages, and input/output operations.
2. Familiarize with R data types, variables, and operators for efficient data manipulation and computation.
3. Learn decision-making structures and loops in R for control flow and iterative tasks.
4. Master the creation and utilization of functions in R, along with string manipulation techniques.
5. Develop proficiency in text manipulation, vector operations, and list and matrix handling in R.
6. Gain proficiency in array and factor manipulation in R for efficient data handling and computation.

Course Outcomes:

1. Apply knowledge of R basics and environment setup to efficiently handle packages and perform input/output operations.
2. Analyze and differentiate between R data types, variables, and operators to solve computational problems effectively.
3. Synthesize decision-making structures and loops in R to solve problems requiring control flow and iteration.
4. Create and evaluate functions in R for specific tasks, and utilize string manipulation techniques proficiently.
5. Synthesize text manipulation, vector operations, and list and matrix handling in R to solve complex data manipulation tasks.
6. Evaluate array and factor manipulation techniques in R to perform advanced data computations and manipulations.

	Subject: (3SASM) Programming Language for Data Science	L
Unit-1	Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed. packages(), packageDescription(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.	07
Unit-2	R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables – R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R	07
Unit-3	Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop – Loop control statement: break statement, next statement.	07
Unit-4	R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings	07
Unit-5	Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction	07
Unit-6	Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().	07
	Total	42

Text Book:

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5.
2. Hadley Wickham and Garrett Grolemund, R for Data Science, O'Reilly Publishing.

Reference Books

1. Roger D. Peng, R Programming for Data Science, Lean Publishing.
2. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8.
3. Seema Acharya, Data Analytics using R, McGraw Hill Education (India), 2018, ISBN: 978-93-5260-524-8.

Course Code	Course Title	L	T	P	C
3SCSM	Environmental Pollution and Control	3	0	0	3

Course Objectives:

1. Familiarize the students with the types of environmental pollutants.
2. Prevent adverse responses by all receptor categories exposed to the atmosphere.
3. Train the students in tackling the treatments of pollutants.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand sources, nature, and health effects of air pollutants and basic control strategies and equipment
2. Fundamentals of Air Quality
3. Fundamentals of water pollution
4. Nature of sound and quantification, noise control strategies
5. Metrological aspects of air pollution
6. Solid waste, and basic strategies for proper handling of solid waste

	Subject: Environmental Pollution and Control	L
Unit-1	Air pollution - Introduction to the different aspects of air pollution, Sources and effects of particulate and gaseous air pollutants, Photochemical reactions, Air pollution sampling and measurement, Measurement of Total suspended particulate, PM ₁₀ and PM _{2.5} , Industrial dust control methods and equipment, Selection of particulate control device, Air quality standards, Meteorological aspects.	7
Unit-2	Indoor Air Quality - Indoor Air Pollutants, Sources of Indoor Pollutants, Control strategies, ventilation standards, Household smoke pollution and its effects on the residents.	7
Unit-3	Water pollution - Introduction to various aspects of water pollution and water quality standards, BOD, COD, Oxygen sag curve, Water quality standards, Municipal wastewater treatment systems, Water pollution control.	7

Unit-4	Solid waste - Characteristics of solid waste, Overview of solid waste generation and management techniques, Hazardous wastes; definition and classification, Hazardous waste management techniques.	7
Unit-5	Noise Pollution - Nature of sound, Human ear, Quantification of sound in terms of SPL and PWL, Typical noise levels at different places and effects of noise, Noise control methods.	7
Unit-6	Global Issues and Responsible Development Practices - A brief history of human civilization and development, Ozone depletion, Control of ozone-depleting substances, Causes and effects of greenhouse gases, an Indigenous system of natural resource management, water, forest, air etc, Sustainability of ecosystems and the need for responsible development practices, environmentally responsible construction, Introduction to Clean Development Mechanism (CDM) and carbon trading.	7
Total		42

Text Books:

1. Prof. N.H. Gopal Dutt, Environmental Pollution and Control, Neelkamal.
2. C. S. Rao, Environmental Pollution Control Engineering, New age International (P) Limited, Publishers, India

Reference Books:

1. Kshirsagar S. R., "Water Supply Engineering", Roorkee Pub house, Roorkee.
2. M.N. Rao and H V N Rao, Air Pollution, Tata McGraw Hill Education Pvt. Ltd.

Course Code	Course Title	L	T	P	C
3SKSM	Introduction To HTML	03			03

Course Objectives:

- 1.To Understand the fundamental concepts and components of multimedia, including its historical development and current trends.
2. To Perform multimedia authoring tools and techniques to create and manipulate graphics, images, and multimedia content.
3. To design web page using HTML Tags.

Course Outcomes:

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

1. Discuss the various components of multimedia technology recognizing its past, present, and future.
2. Identify different multimedia authoring tools, techniques and use graphics and image data representations.
3. Explain the Web history, its architecture and discuss the major issues in web solution development.
4. Apply HTML elements, attributes and tags to design web page.

	Subject:Introduction to HTML	L
Unit 1	HTML OVERVIEW: Basic HTML Documents, HTML Tags, HTML Document structure, The <!DOCTYPE>Declaration. HTML BASIC TAGS: Heading Tag, Paragraph Tags.Line Break Tag, Centering tags, Horizontal lines, Preserve Formating,Nonbreaking Spaces.	7
Unit 2	HTML ELEMENTS: HTML Tags vs Elements, Nested HTML Elements ,HTML FORMATING:Bold Text,Italic Text, Underlined Text, Strike Text, Superscript & Subscript Text,Set font size,font colour.	7
Unit 3	HTML IMAGES & VIDEO: Insert Image,Set image width/height,Set Image Border,Set Image Allignment AND image as A link.	7
Unit 4	HTML TABLE:Table Heading,Cellpadding & Cellspacing Attributes,Colspan and Rowspan Atttribute,Table background,Table Height & Width.	7
Unit 5	HTML LISTING :HTML Unsorted List,The type attribute,HTML Sorted List,The type attribute,HTML Text Link, HTML Link image & video.	7
Unit 6	HTML FORMS : Form Attribute.Text Input Button,Password Button, Check box,Selection/Dropdown Button,Radio Button.	7

TEXT BOOKS

1. Web Technology by Uttam k. Roy Department of Information & Technology.
2. HTML Goodies 2nd Edition by JOE BURNS .

REFERENCES

1. HTML Goodies 2nd Edition by JOE BURNS <https://www.htmlgoodies.com/author/joe-burns/>.
2. HTML & CSS: The Complete Reference, Fifth Edition Thomas A. Powell <https://www.dcehvp.org/E-Content/BCA/BCA-II/Web%20Technology/the-complete-reference-html-css-fifth-edition.pdf>.
3. Web Technology by Uttam k RoyDepartment of Information & Technology.<https://www.scribd.com/document/561245712/Web-technologies-uttam-kumar-roy>.

B.Tech. Double Minor: Embedded System(3rd Sem)

Course Code	Course Title	L	T	P	C
3SESM	Fundamentals of Digital Electronics	03	00	00	03

Pre-requisites:

1. Applied Mathematics
2. Applied Physics

Course Objectives:

This course will enable the students to:

1. Study the fundamental concepts and techniques used in digital electronics
2. Understand the working of Logic Gates.
3. Discuss the minimization of logical expressions using Boolean algebra
4. Understand the concept of Logic families.
5. Elaborate the fundamentals of combinational logic circuits.
6. Understand the concept of flip flops.

Course outcomes:

At the end of the course students will be able to –

CO1. Demonstrate the basics of Digital Techniques.

CO2. Apply the realization of Logic Gates for digital circuit.

CO3. Apply Boolean algebra for optimization of logical Function.

CO4. Understand the various Logic Families.

CO 5. Illustrate the basics of Combinational logic circuits.

CO6. Understand the performance of flip flops.

Unit No.	Content	No. of Lectures Required
1	INTRODUCTION TO DIGITAL TECHNIQUES Digital signal & Digital systems - Positive and Negative Logic, Advantages, Disadvantages and Applications of Digital Systems. Number System - Classification - Binary, Octal, Decimal, Hexadecimal number system, Conversion of number systems. BCD, Grey, Excess-3 & Binary code, 1's complement and 2's complement.	6
2	LOGIC GATES Basic gates (AND, OR, NOT), Universal gates (NAND, NOR), Derived gates (EX-OR, EX-NOR) - Logical symbol, logical expression and truth table of gates.	6
3	Boolean Algebra Rules and laws of Boolean Algebra, Boolean Operation (Addition and Multiplication), De Morgan's theorems. Application of Boolean laws to simplify the Boolean	6

	expressions.	
4	Logic families: Specifications, noise margin, propagation delay, fan-in, fan-out, Transistor-Transistor Logic (TTL) NAND Gate, Emitter-Coupled Logic (ECL), CMOS Inverter.	6
5	COMBINATIONAL LOGIC CIRCUITS Definition, Universal Properties of NAND Gate and NOR Gate, Pulse operation	6
6	FLIP FLOPS Latches, Type of Flip Flop, Edge triggered Flip flops (SR, D & JK FF's) & Truth Table, Pulse triggered (Master Slave) Flip flop (SR, D & JK FF's) & Truth Table.	6
	Total	36 – Lectures

Text Books:

1. R P Jain “Modern Digital Electronics” McGraw Hill Publication.
2. A.Anand Kumar “Fundamental of Digital Circuits” PHI 4th edition, 2018.n
3. Digital Electronics: Principles, Devices and Applications,

Reference Books:

1. Morris Mano, Digital Design, Prentice Hall of India, Third Edition.
2. Digital Principles and Applications - Malvino and Leach Tata McGraw Hill
3. Digital Electronics: Principles, Devices and Application - Anil K Maini, Wiley 1st 2007

B. Tech. (IT) with Multidisciplinary and Specialization Minor: Semester 3

Specialization Minor Course in Information Processing

Course Code	Course Title	L	T	P	C
3SNSM	Fundamentals of Information Technology	03	00	00	03

Course Prerequisites: Nil

Course Learning Objectives:

Student will

1. Define and recognize attributes of Information Technology
2. Understand the concept of Cyberspace, Nature of Cybercrime and E Commerce.
3. Understand IT enabled systems for E Governance and Medical systems
4. Describe development of Information System, Management Information Systems, Nature of IT Projects in India.
5. Understand the fundamentals of Embedded Systems and it's communication with Computing Systems
6. Understand applications of IT in the fields such as: Pattern Recognition, Computer Vision, NLP etc

Course Outcomes:

After successful completion of this course, the student shall be able to :

1. Understand and recognize attributes of Information Technology
2. Describe the concept of Cyberspace, Nature of Cybercrime and E Commerce.
3. Describe IT enabled systems for E Governance and Medical systems
4. Express development of Information System, Management Information Systems, Nature of IT Projects in India.
5. Express the fundamentals of Embedded Systems and it's communication with Computing Systems
6. Describe applications of IT in the fields such as: Pattern Recognition, Computer Vision, NLP etc

Syllabus

	Specialization Minor Course: Fundamentals of Information Technology	L (Hrs)
Unit-1	Introduction: Definition of IT, Attributes of Information Technology ICT and Digital Divide.	07
Unit-2	Cyberspace and Cyber crime, E-commerce	07
Unit-3	E-Governance Educational System, Medical Systems	07
Unit-4	Development of Information Systems, Management Information System, IT Projects in India	07
Unit-5	Fundamental of Embedded Systems, Advanced Methods of communication with computer.	07
Unit -6	Computer Vision, Natural Language Processing and other applications of IT	07
	Total	42

Recommended Text Books :

1. “Introduction to Information Technology” NPTEL Course recommended online Text Book
2. “Introduction to Information Technology”-ITL Education Solutions Limited, PEARSON.

Reference Books :

1. “Fundamentals of Information Technology” 2nd Edition, Alexis Leon, Mathews Leon, (Leon VIKAS)

e-Learning Resources:

1. <http://nptel.ac.in/courses.php>
2. <http://jntuk-coerd.in/>

B.Tech. Second Year (IIoT)

Course Code	Course Title	L	T	P	C
3STSM	Introduction to IoT	03	00	00	03

Pre-Requisite: Nil

Course Objectives:

1. Understand IoT fundamentals, evolution, and architectures.
2. Evaluate IoT protocols and access technologies.
3. Develop IoT design and implementation skills.
4. Analyze IoT reliability, security, and privacy issues; explore real-world applications.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the evolution of Internet of Things (IoT) and its significance in modern technological ecosystems.
2. Evaluate the functionality an of IoT protocols like BACNet and Modbus in diverse IoT applications.
3. Demonstrate proficiency in utilizing hardware platforms like Raspberry Pi and Arduino for prototyping and implementing IoT projects.
4. Analyze the middleware solutions used in WoT environments and explore their role in facilitating interoperability and data exchange.
5. Address reliability concerns in IoT networks and formulate strategies to ensure consistent and dependable operation while upholding user privacy.
6. Identify impact of IoT on various industries and opportunities for innovation and optimization through IoT-enabled solutions.

	Course : Introduction to IoT	L
Unit-1	Introduction to IoT: Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Core IoT Functional Stack, Functional blocks of an IoT ecosystem.	07
Unit-2	IoT Protocols: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, Application Layer Protocols: CoAP and MQTT, IoT Protocols: BACNet Protocol, Modbus.	07
Unit-3	Design and Development: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT. Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details	07

Unit-4	Web of Things: Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT Platform, Middleware for WoT, Introduction to WoT Portals and Business Intelligence.	07
Unit-5	IoT Reliability, Security and Privacy: IoT Security Threats, requirements, IoT Security Overview, Security Frameworks, Privacy in IoT Networks, reliability issues and addressing reliability.	07
Unit-6	Case Studies/ Industrial Application: IoT applications in the home, infrastructures, buildings, security, Industries, Home appliances, and other IoT electronic equipment.	07
Total		42

Text Books:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Reference Books:

1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014
2. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1

B.Tech. Third Semester (Mechanical Engg) (Double Minor)

Course Code	Course Title	L	T	P	C
3SMSM	Manufacturing Processes -I	03	00	00	03

Pre-requisites:

1. Knowledge of properties of material.
2. Knowledge of fundamentals of Mechanical engineering.

Course Learning Objectives:

CLO 1: To impart the pattern making and sand casting processes.

CLO 2: To learn the mechanical working of metals and allied processes.

CLO 3: To learn the mechanical joining and welding processes.

Course Outcomes:

At the end of course, Learner will be able to understand

1. The basic concept of foundry process and related activities
2. Various sand casting processes.
3. The working of melting furnaces and advance casting processes.
4. The metal forming processes.
5. Techniques of various joining processes
6. Advance welding techniques.

	Subject: Manufacturing Processes -I	L
UNIT I	Introduction to manufacturing processes & classification; Introduction to types pattern, pattern making, Pattern materials. Moulding processes, core making. Core making and types of cores.	6
UNIT II	Sand casting Process : properties of moulding sands, Gating system, types of gates , runner and risers. Advance casting processes, permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, cleaning of castings. Continuous casting, die casting equipment and processes.	6
UNIT III	Introduction of melting, furnaces and types of furnaces, cupola furnace, pit furnace, open hearth furnace, gas fired furnace and their operation, Electric furnaces. Defects in castings and its types, Causes and remedies of casting defects	6
UNIT IV	Mechanical working of metals: Extrusion, piercing, pipe and tube production, manufacture of seamless pipe, spinning, rolling and types of rolling mills	6

UNIT V	Introduction of joining processes:- Mechanical joining processes, soldering, brazing Welding, Arc welding, Gas welding, Types and purpose of Electrodes, TIG & MIG processes	6
UNIT VI	Introduction of Welding: Submerged arc welding & resistance welding, butt welding. Friction welding, forge welding, plasma arc, thermit welding. Welding defects	6
	Total	36

Text Books :

1. Workshop Technology Vol. I by Bawa, Tata Mc-Graw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

Reference Books :

1. Workshop Technology Vol I by Raghuwanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A. Lindberg, PHI Pub 2001.
4. Manufacturing technology Vol. I, by P. N. Rao

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Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches
Batch Admitted AY2023-24 SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 4th Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
			Hours / Week			SM Applicable to	Total Hours /Week	Credits	THEORY						
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	
											Max. Marks MSE/ MSIE	Max. Marks TA			
Theory															
IV	4SASM	Advanced Java Programming	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
IV	4SCSM	Water Treatment Engineering	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
IV	4SKSM	Javascript	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
IV	4SESM	Digital System Design	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
IV	4SNSM	Database Processing	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
IV	4STSM	Industrial Sensors and Actuators	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Industrial IoT
IV	4SMSM	Manufacturing Processes -II	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Emgineering

B.Tech. Fourth Semester (Artificial Intelligence and Data Science)
Double Minors: Specialization Minor (Advanced Programming)

Course Code	Course Title	L	T	P	C
4SASM	Advanced Java Programming	03	00	00	03

Course Objectives:

The course will enable the learners to:

1. To become familiar with the advanced features of Java Language.
2. To develop Web Applications using Servlets / JSP and deploy in popular servers like Tomcat.
3. To understand Java Servlets and their life cycle
4. To develop Server-side components in a Java Web application
5. Demonstrate socket programming, remote objects, and servlet and JSP Technology
6. To discover how to write Java applications this can communicate with Relational Databases.

Course Outcomes:

1. Write sophisticated, interactive user interfaces using the Java Swing class and appropriate layout managers.
2. Discuss Networking and Data base connectivity in Java for given application.
3. Illustrate webpage with dynamic content and server-side web application using Servlet and JSP.
4. Use web application framework JSF to build user interfaces.
5. Design dynamic web applications using Java technologies such as Servlets, JSP, and JSTL, incorporating database connectivity with JDBC for data manipulation and retrieval.
6. Assess the Problem with Servlets, Life Cycle of JSP Page, JSP Processing and JSP Applications.

	Subject: (4SASM) Advanced Java Programming	L
Unit-1	Introduction to JFC and Swing: Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Toolbars, Implementing Action interface, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components, Colors and File Choosers.	07

Unit-2	Java Networking: Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URLConnection.	07
Unit-3	Java Database Connectivity (JDBC): Two-Tier Database Design, Three-Tier Database Design, The JDBC API: The API components, database operations like creating tables, CRUD (Create, Read, Update, Delete) operations using SQL, JDBC-advantages and disadvantages, JDBC drivers. JDBC-ODBC bridge, Develop java program using JDBC.	07
Unit-4	Extensible Markup Language (XML): eXtensible Markup Language (XML), Introduction to XML, Document Object Model (DOM) using JAXP, Understanding DOM, Using DOM in Java, StAX in Java, Understanding StAX, Programming with StAX.	07
Unit-5	Servlets: The life cycle of a servlet, The Java Servlet Development Kit, The Simple Servlet: create and compile servlet source code, start a web browser and request the servlet, example of echo servlet and deployment in tomcat server, The javax.servlet Package: reading database/table records and displaying them using servlet.	07
Unit-6	Java Server Pages (JSP): The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, JSP Directives, JSP Action, JSP Implicit Objects, JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking, JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing.	07
	Total	42

Text Book:

1. James Keogh, "Complete Reference J2EE", Mc-Graw Publication.
2. J. Wigglesworth and P. McMillan, "Java Programming: Advanced Topics", Third Edition, Thomson Course Technology.

Reference Books:

1. Black Book, "Java server programming", J2EE, First Edition, Dream Tech Publishers, 2008.
2. Kathy Walrath, "JDBC™ API Tutorial and Reference", Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley
3. Herbert Schildt, "The Complete Reference Java", Tata McGraw Hill Publishing Company Limited Edition 7, 2007.

Course Code	Course Title	L	T	P	C
4SCSM	Water Treatment Engineering	3	0	0	3

Course Objectives:

1. To make the students familiar with sources of water
2. To provide the knowledge on demand of water
3. To expose the students to understanding the characteristics of water and its measurement.
4. To depict the information on water treatment.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the water supply scheme and be able to estimate the quantities and quality of water for municipal use.
2. Explain the basic characteristics of water & its determination.
3. Understand the types of processes used to treat for municipal purposes.
4. Understand the fundamental engineering and science principles that are used to design and operate the **Sedimentation** processes used in treatment processes.
5. Understand the fundamental engineering and science principles that are used to design and operate the **Filtration** processes used in treatment processes.
6. Explain the disinfection processes and introduce tertiary treatment.

	Subject: Building Planning	L
Unit-1	Introduction - Need for protected water supply, Demand of Water: Types of water demands -domestic demand, industrial, institutional and commercial, public use, fire demand estimation. Factors affecting per capita demand, Variations in demand of water, Peak factor. Design period and factors governing design period.	7
Unit-2	Water Treatment - Objectives, Unit flow diagrams – significance of each unit: Sources and Characteristics of surface and subsurface sources and Suitability. Sampling: Objectives, methods and preservation techniques. Drinking water quality standards as per BIS. Effect of water quality parameters.	7
Unit-3	Intake Structure, Screening and Aeration - Types and factors to be considered in selecting sites for intake structures. Screening- Types and Objectives Aeration process- limitations, types and two film theory.	7

Unit-4	Sedimentation - Theory, settling tanks, types and design. Coagulation and flocculation, Clariflocculators (circular and rectangular). theory, types of coagulants, and coagulant feeding devices. Jar test apparatus and estimation of coagulants.	7
Unit-5	Filtration - Mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. The operation, cleaning. Operational problems in filters.	7
Unit-6	Disinfection - Theory of disinfection. Methods of disinfection with merits and demerits. Chlorination: Break point chlorination and determination of chlorine demand.	7
Total		42

Text Books:

1. Punmia B. C. "water Supply Engineering". Laxmi publication.
2. Garg S.K. Water Supply Engineering, Khanna Publishers.

Reference Books:

1. Kshirsagar S. R., "Water Supply Engineering", Roorkee Pub house, Roorkee.
2. Birde G. S. , "Water Supply and Sanitary Engineering", Dhanpat Rai and Sons, Delhi.
3. Steel E. W., "Water Supply and Sewerage", Mc-Graw Hill.

Branch: Computer Science & Engineering
Multi-Disciplinary Minor (MDM1) Course Syllabus

Course code	Course Title	L	T	P	C
4SKSM	JAVASCRIPT	03	00	00	03

Course Objectives:

1. To understand the Core Concepts.
2. To perform different operations on the Document Object Model (DOM) to dynamically update content, styles, and structure of web pages.
3. To understand various interactive web applications.
4. To understand various techniques for representation of the web applications in the real world.

Course Outcomes:

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

1. Demonstrate Proficiency in JavaScript Syntax and Concepts.
2. Manipulate web page content, structure, and styles.
3. Illustrate Handle User Interactions.
4. Implement Error Handling.
5. Build Functional Web Application.
6. Solve Real-World Problems.

	Subject: Javascript	L
Unit 1	Representing Data with Values :Value types, Creating a String Literal, Creating a Number Literal, Creating a Boolean Literal, Naming a Value with an Identifier, Creating an Object Literal, Creating an Array Literal , Creating a Function Literal	07
Unit 2	Type Conversion: String Members, Explicitly Creating Wrappers, Converting a Value to Another Type , Operators: Introducing Operator Precedence and Associativity, Using JavaScript Operators	07

Unit 3	Controlling Flow : Writing an if Condition, Taking One of Several Paths with a Switch, Writing a while Loop ,Writing a do while loop ,Writing a for Loop ,Enumerating Members with a for in Loop , Snappier Conditionals ,Snappier Loops	07
Unit 4	Member Inheritance : Creating Objects with a Constructor, Classical Inheritance , Prototypal Inheritance , Cloning Members ,Mixins.	07
Unit 5	Functions and Arrays : Why Use Functions? , Functions Are Values , Function Members , Conditional Advance Loading ,Lazy Loading , Recursion , Borrowing Methods with apply() or call() ,Currying , Chaining Methods ,Closure and Returning Functions , Passing a Configuration Object , Callback Functions , Memorization, Arrays	07
Unit 6	Traversing and Modifying the DOM Tree , Scripting CSS, Listening for Events , Scripting BOM	07

Text Books:

1. " JavaScript for Absolute Beginners " by Terry McNavage, McGraw-Hill, International Editions.
2. " Eloquent JavaScript: A Modern Introduction to Programming" by Marijn Haverbeke, No Starch Press,3rd edition.

Reference Books:

1. "You Don't Know JS (book series)" by Kyle Simpson, O'Reilly Media.
2. "JavaScript and JQuery: Interactive Front-End Web Development" by Jon Duckett, Wiley, 1st Edition.
3. "Professional JavaScript for Web Developers" by Nicholas C. Zakas, Wrox, 4th Edition

B.Tech. Double Minor Embedded System(4th Sem)

Course Code	Course Title	L	T	P	C
4SESM	Digital system design	03	00	00	03

Pre-requisites:

1. Fundamentals of Digital Electronics

Course Learning Objectives:

This course will enable the students to:

1. Illustrate reduction of logical expressions using Boolean algebra and k-map
2. Discuss various Code converters.
3. Inculcate the design procedure of combinational logic circuits.
4. Explain various Memories like RAM, ROM, PROM, EPROM
5. Understand the concept of types of register used in digital circuit.
6. Elaborate the design procedure of synchronous circuits using flip-flops

Course Outcomes:

After completion of this course the student shall be able to:

CO 1: Simplify Combinational logic circuit using K-Map.

CO 2: Design different Code converters.

CO 3: Analyze and design MSI circuit using 74xx series chip.

CO 4: Understand working of various Memories.

CO 5: Understand the basics of different registers.

CO 6: Apply the knowledge of flip-flops to design Sequential logic circuits

Unit No.	Content	No. of Lectures Required
1	Minimization of Boolean functions: Canonical and Standard Form, Karnaugh Map Method - Up to four Variables, Don't Care K-Map Entries upto 4 variables & Implementation using Logic gates.	06
2	Code Conversion: Binary to Grey, Binary to Excess-3, Binary to BCD, BCD to Grey, Excess-3 to Grey code.	06
3	Combinational Logic Circuits design using MSI 74xx ICs: Design Procedure, Adders: Half & full adder, Multiplexers, De-Multiplexers, Decoders, Encoders.	06
4	Memory devices: RAM, ROM, PROM, EPROM EEPROM, Combinational logic design using ROM, PAL & PLA.	06

5	Registers: Registers: SISI, SIPO, PISO, and PIPO. Shift Register: Bidirectional & Universal	06
6	Counter: Types of Counters, 3 bit Synchronous and Asynchronous counters (Up Counter, Down Counter & UP-Down Counter), Ripple counters	06
	Total	36 – Lectures

Text Books:

1. R P Jain “Modern Digital Electronics” McGraw Hill Publication.
2. A.Anand Kumar “Fundamental of Digital Circuits” PHI 4th edition, 2018.n
3. Digital Electronics: Principles, Devices and Applications,

Reference Books:

1. Morris Mano, —Digital Design, Prentice Hall of India, Third Edition.
2. Digital Principles and Applications.....Malvino and Leach Tata McGraw Hill
3. Digital Electronics: Principles, Devices and Applications.....Anil K Maini....Wiley 1st 2007

B. Tech. (IT) with Multidisciplinary and Specialization Minor: Semester 4

Specialization Minor Course

Course Code	Course Title	L	T	P	C
4SNSM	Database Processing	03	00	00	03

Course Prerequisites: 3SNSM Fundamentals of Information Technology

Course Learning Objectives:

Student will

1. Define Data, Information, file and file Processing
2. Understand the concept of Databases, Elements of Databases, Records, Tables etc, and Types of Databases, Database Management System, it's purpose and it's applications
3. Understand Data Models Various Types and ER Diagrams
4. Describe Relational Data Model, Normal Forms and Transaction Processing
5. Understand the fundamentals of Structured Query Language SQL in terms of Characteristics, Data types, Applications, Operators, Wild card operators, expressions SQL Commands
6. Understand SQL Clauses, SQL Aggregate Functions, SQL Join

Course Outcomes:

After successful completion of this course, the student shall be able to :

1. Describe Data, Information, file and file Processing
2. Describe the concept of Databases, Elements of Databases, Records, Tables etc, and Types of Databases, Database Management System, it's purpose and it's applications
3. Describe Various Types of Data Models and ER Diagrams
4. Express Relational Data Model, Normal Forms and Transaction Processing
5. Express the fundamentals of Structured Query Language SQL in terms of Characteristics, Data types, Applications, Operators, Wild card operators, expressions and SQL Commands
6. Describe SQL Clauses, SQL Aggregate Functions, SQL Join

Syllabus

	Specialization Minor Subject: Database Processing	L (Hrs)
Unit-1	Introduction to Data, Information, Knowledge, file structure, storage in files and file Processing	07
Unit-2	Introduction to Database: Elements of Database records Tables, types of databases, DBMS, Purpose of DBMS & its Applications, RDBMS, File System, DBMS Architecture & its types, DBMS: SQL, MYSQL	07
Unit-3	Data Models: Types of data Models: network, relational, object based data model; Data model schema, Data dependence, types of database languages, ACID properties E-R Model Concepts, E-R diagram Notations, Mapping Constraints, DBMS Keys, E-R diagram to Table conversion	07
Unit-4	Relational Data Model: Concepts, Relational algebra, Join operation, Integrity constraint and its type, relational calculus, Normalization: functional dependencies, Decomposition, Domain & data dependency, types of Normal forms: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF; Transaction processing: Operations on transaction, Properties: Atomicity, Consistency, Isolation and Durability, States, schedule, deadlock in DBMS	07
Unit-5	SQL: Characteristic, advantages, data types, operators, wildcard operators, expressions, Database commands: create, drop, select and show database, Create table, drop table, Query with Select statements, Insert statement, Update statement, Delete statement with use of where, and, or clauses, Use of like and top clause, Alter command, Distinct Command, View in SQL, Create view using one or multiple table, delete view, Index creation & Drop, Null Values, SQL sub queries rules, sub queries using select, insert, update, delete statements	07
Unit -6	SQL clauses: having, group by, order by, join, SQL Aggregate functions: Count, sum average, max, min; Date function, SQL Join: inner, left, right, full, SQL Set Operations, Cursors, triggers	07
	Total	42

Recommended Text Books :

- 1) Korth, Sudarshan : Database System Concept , Mc Graw Hill, 6th Edition

Reference Books :

1. Raghu Ramkrishnan : Database system
2. C. J. Date : Database System, 7th ed.
3. Connolly &Begg : Database System, Low Price Ed.

B.Tech. Fourth Semester (IIoT)

Course Code	Course Title	L	T	P	C
4STSM	Industrial Sensors & Actuators	03	00	00	03

Pre-Requisite: NIL

Course Objectives:

1. To provide comprehensive understanding of the basic concepts and distinctions between sensors, transmitters, and transducers.
2. To introduce the selection criteria and characteristics of various measuring elements.
3. To comprehend the knowledge of different types of signal transmission and their respective characteristics, including pneumatic, hydraulic, and electronic signals.
4. To impart knowledge about the principles of operation, construction details, characteristics, and applications of various sensors and transducers, including potentiometers, strain gauges, resistance thermometers, and thermistors.
5. To provide an in-depth understanding of pneumatic, hydraulic, mechanical, and electrical actuation systems, including their types, selection criteria, and application areas.
6. To explore the principles and examples of micro sensors and actuators, emphasizing their operational mechanisms and applications in various fields.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Differentiate between sensors, transmitters, and transducers, and explain their roles in measurement systems.
2. Demonstrate the ability to select appropriate measuring elements based on range, resolution, sensitivity, error, repeatability, linearity, accuracy, impedance, backlash, response time, and dead band.
3. Identify and describe the characteristics and applications of pneumatic, hydraulic, and electronic signals in various systems.
4. Understanding principles of operation, construction details, and characteristics of various sensors and transducers, such as potentiometers, proving rings, strain gauges, and thermistors.
5. Comprehend the knowledge of different types of actuators, including pneumatic, hydraulic, and electrical actuators, and their selection criteria and applications.
6. Comprehend the knowledge of principles and applications of micro sensors and actuators.

	Course : Industrial Sensors & Actuators	L
Unit-1	Basics of Sensors: Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal.	06

Unit-2	Sensors and Transducers: Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, Strain Gauges, Resistance thermometer, Thermistor, Photo-resistive sensor. Inductive transducers: - Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer. Capacitive transducers: - Capacitive transducers: - Principle of operation, construction details, characteristics of Capacitive transducers – different types & signal conditioning- Applications:- capacitor microphone, capacitive pressure sensor, proximity sensor.	08
Unit-3	Pneumatic & Hydraulic Actuators: Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators. Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria.	07
Unit-4	Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.	07
Unit-5	Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors.	07
Unit-6	Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect.	07
Total		42

Text Books:

1. Patranabis.D, “Sensors and Transducers”, Wheeler publisher, 1994.
2. Sergej Fatikow and Ulrich Rembold, “ Microsystem Technology and Microbotics”, First edition, Springer – Verlag Newyork, Inc, 1997.
3. Jacob Fraden, “Hand Book of Modern Sensors: Physics, Designs and Application” Fourth edition, Springer, 2010.

Reference Books:

1. Robert H Bishop, “The Mechatronics Hand Book”, CRC Press, 2002.
2. Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.,
3. Massood Tabib and Azar, “Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures”, First edition, Kluwer academic publishers, Springer, 1997.
4. Manfred Kohl, “Shape Memory Actuators”, first edition, Springer.

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SMSM	MANUFACTURING PROCESSES –II	03	00	00	03

Pre-requisites:

1. Students should have brief knowledge of production processes.

Course Learning Objectives:

- 1: To study the mechanics of metal cutting, tool characteristics.
- 2: To study various machines and machining operations.

Course Outcomes:

1. Apply the knowledge of theory of metal cutting
2. Demonstrate the knowledge of capstan, turret & lathe machine.
3. Understand the working of drilling and boring operations.
4. Illustrate the working of milling machines
5. Illustrate the working of Grinding machines
6. Understand the working of shaper, planner & slotter machine

	Subject: Manufacturing Processes –II	L
UNIT I	Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Cutting forces and power consumption, Machinability, Cutting fluids	7
UNIT II	Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism	7
UNIT III	a) Drilling M/cs general purpose, Mass production and special purpose drilling M/cs. b) Boring M/c :- Horizontal, Vertical and jig Boring M/c.	7
UNIT IV	Milling M/c: - Types, Types of Milling Cutters, Dividing head, Compound and differential indexing.	7
UNIT V	Grinding Machines: Bench grinders, surface grinders, centreless grinders, types of bonds & Abrasive modification of grinding wheels.	7
UNIT VI	Study of various part & Operation of Shaper, Planer, Slotter.	7
	Total	42

Books Recomonded:

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.

2. Workshop Technology - By Hajra Choudhary Vol II.

References:-

1. Pandya & Shah, Modern Machining process, Tata McGraw Hill 1998.
2. Workshop Technology, O.P. Khanna, Dhanpatrai & Sons.
3. Workshop Technology - By Raghuwanshi. Vol II.

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches
Batch Admitted AY2023-24 SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 5th Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
			Hours / Week			SM Applicable to	Total Hours /Week	Credits	THEORY						
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	
						Max. Marks MSE/ MSIE	Max. Marks TA								
Theory															
V	5SASM	Mobile Application Development	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
V	5SCSM	Waste Water Treatment Engineering	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
V	5SKSM	Web Engineering	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
V	5SESM	Introduction to Microprocessors	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
V	5SNSM	Network Processing	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
V	5STSM	Industrial Networks	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Industrial IoT
V	5SMSM	Modern Manufacturing Techniques	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Emgineering

B.Tech. Fifth Semester (Artificial Intelligence and Data Science)

Course Code	Course Title	L	T	P	C
5SASM	Mobile Application Development	03	00	00	03

Course Prerequisite: Basic Programming Knowledge and Programming Methodology.

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Mobile Application Development by being able to do each of the following:

1. To facilitate students to understand android SDK.
2. To help students to gain a basic understanding of Android application development.
3. To inculcate working knowledge of Android Studio development tool.

Course Outcomes: After Successful completion of this course, the student will be able to:

1. Describe the Android platform, development environment, and basic application structure.
2. Discuss Android applications using core components such as Activities, Services, and Broadcast Receivers.
3. Create effective user interfaces using various layout managers, screen elements, and animation techniques.
4. Apply techniques to test and publish Android applications, manage application resources, and use shared preferences.
5. Inspect Android applications with common APIs for networking, web services, and local data storage.
6. Implement Android's security model by using and declaring permissions, working with SQLite databases.

	Subject: (5SASM) Mobile Application Development	L
Unit-1	Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.	07
Unit-2	Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Android Manifest File and its common settings.	07
Unit-3	Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	07

Unit-4	Testing Android applications: Testing & Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	07
Unit-5	Using Common Android APIs: Using Android Networking APIs, Using Android Web APIs, Using Android Data and Storage APIs, Deploying Android Application to the World.	07
Unit-6	Android Security Model: Declaring and Using Permissions, Using Custom Permission, Managing data using SQLite, Sharing Data between Applications with Content Providers.	07
	Total	42

Text Book:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011).

Reference Books:

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd.
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd.
3. Android Application Development All in one for Dummies by Barry Burd, 1st Edition.

Course ode	Course Title	L	T	P	C
5SCSM	Wastewater Treatment Engineering	03	00	00	03

Course Prerequisite: Nil

Course Learning Objectives:

Students will be taught -

1. The basics of sewage composition and its characteristics.
2. To depict the information about various sewage treatment processes.
3. Skills related to tertiary treatment of wastewater.

Course Outcomes:

After successfully completing the course, students will be able to –

1. Analyze the physical, chemical, and biological characteristics of various types of wastewater.
2. learn about the various unit operations and processes used in wastewater treatment, including primary, secondary, and tertiary treatment methods.
3. To apply engineering principles and design concepts to the development of wastewater treatment systems.
4. Understand the stages and process of wastewater treatment
5. Understand the use and working of various units of the water treatment plant
6. Acquire the knowledge of recent developments in water & wastewater treatment.

	Subject: Wastewater Treatment Engineering	L
Unit-1	Sewage Quality: Collection and conveyance of sewage, Sources of sewage, variation in sewage flow, flow quantity estimation Characteristics of Sewage: Methods of sampling, Physical Chemical and biological characteristics.	07
Unit-2	Sewage Treatment: Introduction to sewage treatment, Preliminary, Primary, Secondary and Tertiary Treatment, Unit operation and unit process, flow diagram of sewage treatment plant.	07
Unit-3	Preliminary and Primary Treatment: Screening, Grit removal, Skimming tank, flow equalization. Sedimentation, Clarification	07

Unit-4	Secondary Treatment: Principles of biological treatments, Role of microorganism in wastewater treatment, Aerobic and anaerobic processes, Activated sludge process, Trickling filter.	07
Unit-5	Low Cost Treatment Methods: Oxidation ponds- Bacteria-algae symbiosis, Advantages and disadvantages of ponds, Aerated Lagoons: Principle, Aeration method, Advantages and disadvantages of aerated lagoons,	07
Unit-6	Tertiary Treatment: Principles of tertiary treatment, chlorination, adsorption process, methods of dissolved solids removal. Basic principles of Reverse Osmosis, Ultra-filtration, Electro dialysis, and Desalination.	07
	Total	42

Textbook:

1. Sewage disposal and air pollution engineering by S.K.Garg, Khanna Publishers
2. Wastewater Engineering by B. C. Punmia.

Reference Book:

1. Wastewater Engineering: Treatment, Disposal & Reuse, By Metcalf & Eddy Inc. Sixth Ed. 2002, McGraw Hill.
2. Introduction to Environmental Engg, By. P.A. Veslind, PWS, Publishing Company, Boston, 1997.

B.Tech Fifth Semester (Computer Science & Engineering)

Course code	Course Title	L	T	P	C
5SKSM	Web Engineering	03	00	00	03

Course Prerequisites: HTML, Javascript

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of web engineering.

1. To understand web engineering foundations
2. To identify requirements for web applications
3. To explore different web technologies
4. To develop skills to design, architect, and secure web applications

Course Outcomes: After Successful completion of this course, the student will be able to:

1. Comprehend Web Application Fundamentals.
2. Study Requirements Engineering Principles.
3. Utilize Web Technologies Effectively
4. Design Robust Web Architectures
5. Create User-Centric Web Designs.
6. Implement Security Measures in Web Application.

Course: Web Engineering		L
Unit 1	An Introduction to Web Engineering: Introduction, Categories of Web Applications, Characteristics of Web application, Evolution of Web Engineering.	07
Unit 2	Requirements Engineering for Web Applications: Introduction, Fundamentals of Requirements Engineering, What is a Requirement?, Where do Requirements Originate from?, RE Activities-Process, Planning and Design, RE Specifics in Web Engineering, Principles of RE of Web Applications, Adapting RE Methods to Web Application Development, Types of Requirements, Notations for RE, Tools for RE.	07
Unit 3	Technologies for Web Applications: Introduction, Basic Internet Protocols, W3C, Hypertext Transfer Protocol (HTTP), XHTML, DHTML and XML, Cascading Style Sheet (CSS), Client-side Programming and Techniques	07
Unit 4	Web Application Architecture: Introduction, Fundamentals of Architecture,	07

	Categorizing Architectures, Components of a Generic Web Application Architecture, Layered Architectures.	
Unit 5	Web Application Design: Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design, Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Interaction Design, Link Representation, Functional Design	07
Unit 6	Security for Web Applications: Introduction, aspect of security , Security risk of site, web attack and their prevention, web security model, session management, authentication, HTTPS, certificates, Encryption, Digital Signatures.	07
	Total	42

Text Book:

1. Web Engineering, Rajiv Chopra, 2016 by PHI Learning Private Limited, Delhi.

Reference Books:

1. Roger S. Pressman, David Lowe, "Web Engineering", Tata Mc Graw Hill Publication, 2007
2. Achyut S Godbole and Atul Kahate, "Web Technologies", Tata McGraw Hill
3. Gopalan N P , Akilandeswari, "Web Technology: A Developer s Perspective" , PHI
2. C. Xavier, "Web Technology & Design ", Tata McGraw Hill.

B.Tech. Fifth Semester Double Minor: Embedded System

Course Code	Course Title	L	T	P	C
5SESM	Introduction to Microprocessor	03	00	00	03

Pre-requisites:

1. (3SE03) Digital System Design

Course Learning Objectives:

1. To understand architectural of Microprocessor.
2. To learn ALP Language Programming concepts of Microprocessor.
3. To get Knowledge of interfacing of different memories with Microprocessor.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Discuss basic operation of Microprocessor & Microcontroller.
2. Explain and classify the instruction set of 8085 microprocessor.
3. Describe the fundamentals of Advanced Instructions.
4. Distinguish the use of different instructions and apply it in assembly language programming.
5. Analyze different types Memory Interfacing using Microprocessor.
6. Elaborate the concepts of interrupts and microcontrollers.

Unit	Course: Microcontroller & Applications	No. of lectures Required
Unit-1	Microprocessor 8085 Architecture: Architecture of Microprocessor 8085-Internal registers (8-bit & 16-bit)-CPU-ALU-Types of System Bus-Bus Structure- multiplexing and demultiplexing address/data bus-Instruction Register and Decode	08
Unit-2	Instruction Set-I : Addressing modes-types of instruction format-Data Transfer type instructions-Arithmetic and logical instructions–Branching instructions-looping.	07
Unit-3	Instruction Set-II: Rotate instructions-stack and subroutine related instructions-PSW peripheral instructions-I/O and Machine Control	06

	Instructions.	
Unit-4	Assembly Language Programs – Addition– Subtraction– Multiplication (8-bit) – Division (8-bit) Ascending / Descending Order, Largest/Smallest (single byte)-Addition of N numbers (single byte)	06
Unit-5	Memory/Io Interface: Memory Interface (Basics) – memory mapped I/O & I/O mapped I/O- Generating Control Signals – Interfacing 2KX8 EPROM – 2KX8 RAM	07
Unit-6	Interrupts and Introduction to Microcontrollers: Interrupts in 8085- Generation of RST codes-Hardware, software interrupts and their function -Introduction to Microcontroller –Comparison of Microprocessor and Microcontroller.	08
Total		42

Text Books:

1. Gaonkar R.S., “Microprocessor Architecture Programming and Applications with the 8085”, Penram International Pub.
2. B. Ram, “Fundamental of Microprocessor & Microcontrollers”, Dhanpat Rai Publications.

Reference Books:

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinley ,“The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson Education (2nd Ed.)
2. K. J. Ayala,“The 8051 Microcontroller”, Penram Int. Pubs., 1996
3. Furber: “ARM System on Chip Architecture”, 2nd Edition, Person India 5. Phillips NXP LPC 2148 User Mannual.

Course Code	Course Title	L	T	P	C
5SNSM	Network Processing	03	00	00	03

Course Prerequisite: Basic knowledge of Computer Networks and Operating Systems

Course Learning Objectives:

1. To understand computer networks and network devices
2. To understand the architecture and functions of network processors
3. To analyze various network processing techniques and devices.
4. To explore packet classification, scheduling, and switching mechanisms.
5. Understand network layer design principles, including addressing, routing
6. To develop skills in designing network processing systems with performance considerations.

Course Outcomes:

After successful completion of this course, students will be able to-

1. Explain the computer networks and network devices.
2. Understand the architecture and functions of network processors.
3. Discuss various network processing techniques and devices.
4. Understand packet classification, scheduling, and switching mechanisms.
5. Understand network layer design principles, including addressing, routing
6. Apply skills in designing network processing systems with performance considerations.

	Subject: Network Processing	L (Hrs)
Unit-1	Overview of computer networks and network devices: Evolution of network processors, Roles and applications of network processors, Comparison with general-purpose processors, Software and hardware-based packet processing.	07
Unit-2	Network Processor Architecture: Functional blocks of network processors, Key architectural features: pipelining, multithreading, parallelism, Memory architecture	07

	and management, Examples: Intel IXP series, EZchip, Broadcom	
Unit-3	Packet Classification and Filtering: Techniques for packet classification: Ternary Content Addressable Memory (TCAM), tries, hashing, Algorithms: HiCuts, HyperCuts, Bit vector algorithms, Packet filtering and rule sets, Performance and scalability issues.	07
Unit-4	Queuing, Scheduling, and Traffic Management: QoS principles and requirements, Queuing mechanisms: FIFO, Priority Queues, WFQ, RED, Traffic shaping and policing, Buffer management strategies	07
Unit-5	Switching and Routing in Network Processors: Switching techniques: Input/Output Queued Switches, Crossbar, Routing table design and lookup algorithms, IP lookup algorithms: Trie-based, Binary search, Bitmap-based, MPLS and hardware implementation aspects	07
Unit 6	Programming Network Processors & Case Studies: Network processor programming models, Programming tools and environments, Case studies: Intel IXP, NetFPGA, Broadcom SDKs, Real-world applications and emerging trends (e.g., SDN, NFV)	07
	Total	42

Recommended Textbook:

1. Douglas E. Comer, Network Systems Design Using Network Processors, Pearson Education.
2. Patrick Crowley, M. A. Franklin, H. Hadimioglu, P. Z. Onufryk, Network Processor Design: Issues and Practices, Volume 1, Morgan Kaufmann.
3. Deepankar Medhi and Karthikeyan Ramasamy, Network Routing: Algorithms, Protocols, and Architectures, Morgan Kaufmann.
4. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Morgan Kaufmann (for background reading).
5. George Varghese, Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices, Morgan Kaufmann.

B.Tech. Fifth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
5SMSM	MODERN MANUFACTURING TECHNIQUES	03	00	00	03

Course Prerequisites:

1. Knowledge of Manufacturing Processes

Course Learning Objectives:

1. To learn the importance of nontraditional machining processes.
2. To learn the various methods of Nano scale manufacturing & its applications.
3. To study the processes of USM, AJM& ECM.
4. To learn working of Composite Materials and its applications.

Course Outcomes:

Students will be able to –

1. Understand the concept of advanced manufacturing techniques evolved in industrial manufacturing scenario.
2. Remember, learn and understand the advanced Non-Traditional Machining
3. Understand working of Nano scale manufacturing,
4. Understand the need of a particular type of composite materials.
5. Understand the working principle of Additive Manufacturing
6. Understand technologies in smart manufacturing

	Subject: Modern Manufacturing Techniques	L
UNIT I	Approaches in Manufacturing:- Fundamental concepts of manufacturing, Principle of Non-Conventional Manufacturing Process Abrasive water jet machining: - Elements of the process of AWJM, mechanics of material removal, process parameters, applications and limitations. Ultrasonic Machining:- Elements of the process of UM, mechanics of material removal, process parameters, applications and limitations..	7
UNIT II	Thermal Metal Removal Process:- Introduction Basic working principle of applications & Limitetions of spark erosion (EDM),wire cut EDM & Electric discharge grinding process Electron Beam Machining, Laser Beam Machining	7
UNIT III	Nano scale manufacturing:- metal nanomaterial , nanolithography, Nano emulsion basic fundamentals of Nano manufacturing techniques, Applications. Nano size part manufacturing:- Nano partials Preparation of Nano particles, methods of prepretion,self assembly,vaporand electrostatic	7

	deposition	
UNIT IV	Composite Materials: Classification of composites. Manufacturing methods: spray Lay-up, Wet/Hand Lay-up, Vacuum bagging, and Resin transfer molding (RTM), Resin Film infusion and applications of composites.	6
UNIT V	Additive Manufacturing: - Introduction to CAD, CAD input devices, CAD output devices, CAD Software, applications and limitations. Study of RP relevance in precision manufacturing, sterolithography, fused deposition methods, materials, principle of prototyping and various applications and limitations	6
UNIT VI	Smart Manufacturing: - Smart materials: Types, Applications Key components and technologies in smart manufacturing Digital Twins:- Digital Twins in production, Applications of Digital Twins in manufacturing	6
	Total	39

Textbooks:

1. Advanced machining process, V.K. Jain, Allied publishers.
2. Modern machining process, Pande P.C. & Shah H.S. Tata Mc-Graw Hills.
3. Manufacturing Technology, Volume-II, Rao P.N., Tata Mc-Graw Hills
4. Manufacturing Engineering and Technology by Kalpakjian, Addison Wesley, 1995.
5. Foundation of MEMS by Chang Liu, Pearson, 2012.

Reference Books:

1. Principles of Modern Manufacturing, Mikell P. Groover, SI version, Wiley India Edition
2. Manufacturing Technology, Kalpakjian, Pearson.
3. Production Technology, Volume-II, Khanna O.P., Dhanpat Rai Publisher, New Delhi.
4. Non-Conventional Machining, Mishra P.K., Narosa Publisher, New Delhi.
5. Composite Materials –production, properties, testing and applications, K. Shrivasan, Narosa Publication.
6. Process and Materials of Manufacturing by R. A. Lindburg, 4th edition, PHI 1990.
7. Introduction to Manufacturing Processes by John A Schey, Mc Graw Hill.
8. Micro Machining of Engineering Materials by J. Mc Geough, CRC Press.
9. Non-Traditional Manufacturing Processes by Gary F Benedict, CRC Press.
10. Advanced Methods of Machining by J. A Mc Geough, Springer.

B.Tech. Fifth Semester (AI & DS/ CE/ CSE/ EXTC/ IT/ MECH)

Course Code	Course Title	L	T	P	C
5STSM	Industrial Networks	03	00	00	03

Course Pre-requisite: 1. 4STMDM1- Fundamentals of IoT
2. 4ST04- Wireless Communication

Course Objectives:

1. To understand the fundamentals of industrial network systems and communication technologies.
2. To analyze and design industrial networks with a focus on protocols, topologies, and real-time performance.
3. To explore the security measures and standards for industrial networks to ensure robust and safe operation.

Course Outcomes:

After successfully completing the course, students will be able to:

- 1 Understand the basic concepts of industrial networks and their role in industrial automation and IoT applications.
- 2 Analyze different industrial communication protocols, their features, and applications in automation systems.
- 3 Design and implement industrial network architectures, selecting appropriate technologies based on use cases.
- 4 Identify and explain real-time communication requirements and how to ensure Quality of Service (QoS) in industrial environments.
- 5 Apply security protocols and best practices to secure industrial networks against cyber threats.
- 6 Troubleshoot and optimize industrial networks for performance improvements in automation systems.

	Subject: Industrial Networks	Lect Hrs.
UNIT I	Introduction to Industrial Networks: Overview of industrial networks in automation and control systems. Role of networks in industries: Manufacturing, process control, SCADA systems, Industrial Network applications in IoT, Evolution of industrial networks and their integration with IoT.	7
UNIT II	Industrial Communication Protocols: Introduction to industrial communication protocols: Modbus, Profibus, CAN, EtherNet/IP, Device Net. Comparison of real-time and non-real-time communication protocols, Protocol stack layers and how they interact in industrial communication,	6
UNIT III	Industrial Networking Technologies: Wired communication technologies- Industrial Ethernet, PROFIBUS, and RS-485. Wireless communication technologies: Wi-Fi, Zigbee, Bluetooth, and LPWAN, Overview of Time-Sensitive Networking (TSN) and its importance in industrial automation, Emerging networking technologies and trends (e.g., 5G, IoT-enabled networks).	6
UNIT IV	Industrial Network Architectures and Topologies: Common industrial network topologies: Star, Bus, Ring, Mesh, and Hybrid. Network architecture design: Scalability, redundancy, fault tolerance, and load balancing, Industrial IoT architecture and its integration with industrial networks	6
UNIT V	Real-Time Networking and Quality of Service (QoS): Real-time networking challenges: Latency, jitter, and throughput. Techniques to ensure real-time data communication in industrial networks. Quality of Service (QoS) for industrial networks: Prioritization, traffic management and their applications.	7
UNIT VI	Security in Industrial Networks: Importance & common security threats in industrial networks- DDoS attacks, malware, insider threats, Security protocols- SSL/TLS, VPN, and IPsec. Industrial cybersecurity standards: IEC 62443, NIST, and ISO/IEC 27001, Risk management, security assessment.	7

Total : 39 hrs

Text Book:

1. "Industrial Network Security: Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Control Systems" by Eric D. Knapp and Raj Samani
2. "Industrial Communication Systems" by Bogdan M. Wilamowski and J. David Irwin.
3. Industrial Network by Gary. D. Anderson

Reference Books:

1. "Industrial Ethernet: A Pocket Guide" by Perry S. Marshall
2. "Introduction to Industrial Automation" by S. K. Soni
3. "Industrial IoT: Challenges, Design Principles, Applications, and Security" by Sabina Jeschke, Christian Brecher, and Houbing Song

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)

Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches

Batch Admitted AY2023-24 SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 6th Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
			Hours / Week			SM Applicable to	Total Hours /Week	Credits	THEORY						
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	
											Max. Marks MSE/ MSIE	Max. Marks TA			
Theory															
VI	6SASM	Introduction to Gaming	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
VI	6SCSM	Project Management and Planning	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
VI	6SKSM	Cloud Technology	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
VI	6SESM	Microcontroller and Applications	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
VI	6SNSM	Data Mining and Warehousing	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
VI	6STSM	Embedded System for Internet of Things	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Industrial IoT
VI	6SMSM	Production Management	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Emgineering

B.Tech. Sixth Semester (Artificial Intelligence and Data Science)

Course Code	Course Title	L	T	P	C
6SASM	Introduction to Gaming	03	00	00	03

Course Prerequisite: Programming Methodology and Python Programming.

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Introduction to Gaming by being able to do each of the following:

1. To introduce students to the historical evolution and foundational theories of video games and their genres.
2. To familiarize students with the video game industry, including development roles, game aesthetics, and cultural significance.
3. To explore the impact of serious games, gamification, and the societal and psychological implications of gaming.

Course Outcomes: After Successful completion of this course, the student will be able to:

7. Describe the evolution of video games across decades and explain their relevance in contemporary culture.
8. Explain key roles, structures, and processes involved in game development.
9. Examine the elements of game aesthetics such as rules, representation, and interaction across different types of games.
10. Investigate the cultural and narrative impact of video games using various theoretical perspectives.
11. Assess the use of serious games and gamification across domains like health, politics, and education.
12. Inspect the potential risks and psychological implications of video games from multiple research perspectives.

	Subject: (6SASM) Introduction to Gaming	L
Unit-1	What Is a Game? And History: General Models for Understanding Games, The Issue of Genre, A Brief Pre-History of Video Games, Does History Matter, A History of Video Games, The 1970s, The 1980s, The 1990s, The 2000s, The 2010s and Beyond, Perspectives.	07

Unit-2	Studying Video Games and The Game Industry: Who Studies Video Games?, How Do You Study Video Games?, Types of Analysis, Schools of Thought, The Size of the Game Industry, The Structure of the Big Game Industry, The Development Process, Roles in Game Development.	07
Unit-3	Video Game Aesthetics: Rules, Geography and Representation, Number of Players, Games Without Boundaries.	07
Unit-4	Video Games in Culture and Narrative: The Cultural Position of Video Games, The Players, Storytelling, Reception—The Player's Experience of a Story, A Brief History of Literary Theory and Video Games, Transmedia Games, Final Remarks.	07
Unit-5	Serious Games and Gamification: Overview and Thematic Areas, Games-for-Change, Games-for-Health, News Games, Political Games, Advertainment, Two Research Domains, Serious Games, Gamification—Conquering the World, One Point at A Time, Final Remarks.	07
Unit-6	Video Games and Risks: Two Research Perspectives, The Active Media Perspective, The Active User Perspective.	07
	Total	42

Text Book:

2. Simon Egenfeldt-Nielsen, Jonas Heide Smith, and Susana Pajares Tosca, "Understanding Video Games", Fifth Edition, Taylor and Francis Group, 2023, ISBN: 9781032255294.

Reference Books:

4. Matt Fox, "The Video Games Guide", McFarland, 2013, ISBN: 9780786472579.
5. Brian J. Wardyga, "The Video Games Textbook: History • Business • Technology", CRC Press, 2018, ISBN: 9781138578211.
6. Katie Salen and Eric Zimmerman, "Rules of Play: Game Design Fundamentals", MIT Press, 2003, ISBN: 9780262240451.
7. Jesse Schell, "The Art of Game Design: A Book of Lenses", Fourth Edition, CRC Press, 2023, ISBN: 9780367899946.
8. Clara Fernández-Vara, "Introduction to Game Analysis", Second Edition, Routledge, 2019, ISBN: 9781138499639.

B.Tech. Sixth Semester (Civil Engineering)

Course ode	Course Title	L	T	P	C
6SCSM	Project Management and Planning	03	00	00	03

Course Prerequisite : Nil

Course Learning Objectives:

1. Students should be able to understand Project Life Cycle and Project Development Steps.
2. Students should be able to carry out project planning using tools like BAR chart, Networking methods like CPM, PERT etc.
3. Students should know the process and need of Resource Smoothing / Leveling.
4. Students should be able to develop planning using Project Planner software.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects.
2. Solve and apply various planning tools like BAR chart, Milestone Chart, to compare and control the project at the time of execution.
3. Demonstrate their capability for preparing the project networks to work out the best possible time for completing the project.
4. To understand the concept of PERT.
5. Develop the various management techniques for successful completion of construction projects.
6. To understand the importance and application of various management like Quality, Safety , Risk handling and Inventory.

	Subject: Project Management & Planning	L
Unit-1	Project Project, Project life cycle - Conceptual Phase, Planning Phase, Execution Phase, Termination phase, Project Stakeholders. Project planning- Steps, Scheduling, DPR	07

Unit-2	Introduction on Bar Chart Work break down structure, Project Monitoring & Controlling, Planning Tools: Basic concept of Gantt Chart, Bar Chart, their advantage, limitations and overcoming measures	07
Unit-3	Networking Networking – Activity, Event, Dummy Activity, Fulkerson’s numbering rule. Introduction of Critical Path Method. Numerical on Floats.	07
Unit-4	PERT PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, Standard Deviation, Variance, Numerical on Probability computation	07
Unit-5	Management Organization & Management: Concept & Types of Organization, Fayol’s Principles of Management, Safety Management.	07
Unit-6	Introduction to Software Introduction to planning and Scheduling Software MSP and Primavera, resource allocation for construction project using software.	07
	Total	42

Text Book:

1. Kumar Neeraj Jha, “Construction Project Management- Theory and Practice”, Pearson Education, New Delhi ,17..

Reference Book:

1. K. K. Chitkara, “Construction Project Management- Planning, schedule and controlling”, second edition”, Tata McGraw Hill Education pvt. Ltd, New Delhi.

2. John M. Nicholas and Herman Steven, "Project management for engineers, business and technology", fourth edition, Routledge Publication, New York.
3. Prasanna Chandra, "Projects Planning, analysis, selection, financing, implementation and review", 7th edition, McGraw Hill Education India Pvt. Ltd., New Delhi.
4. Harold Kerzner, "Project Management system approach to planning, scheduling and controlling, second.

B.Tech Sixth Semester (Computer Science & Engineering)

Course code	Course Title	L	T	P	C
6SKSM	Cloud Technology	03	00	00	03

Course Prerequisites: Basic Networking

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Cloud Technology

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a foundation of Cloud Computing, Cloud Computing services and tools in real life scenarios.
3. To enable students to explore some important Cloud Computing driven commercial systems and applications.
4. To provide students with essentials of Cloud Computing architecture, Virtualization, Storage concepts

Course Outcomes: After Successful completion of this course, the student will be able to:

1. Describe the fundamental concept, architecture and applications of Cloud Computing.
2. Discuss the problems related to cloud deployment models.
3. Examine the concept of virtualization.
4. Identify the role of network connectivity in the cloud.
5. Assess different Cloud service providers.
6. Inspect the security issues in cloud service models.

Course: Cloud Technology (6SKSM)		L
Unit-1	Cloud Computing Fundamental, Architecture and Management:- Computing Paradigm and various computing types, Cloud Computing Fundamentals: Motivation for Cloud Computing, the need for Cloud Computing, Principles of Cloud Computing, Requirements of Cloud Services, Cloud Applications, Benefits and Drawbacks	07
Unit-2	Cloud Deployment and Service Models:- Cloud Deployment Models: Introduction, Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud. Cloud Service Models: Introduction, Infrastructure as a Service, Platform as a Service, Software as a Service	07
Unit-3	Unit III: Operating System and Virtualization:- Types of Operating Systems, Role of OS in Cloud Computing, Features of Cloud OS. Virtualization: Introduction, Virtualization Opportunities, Approaches to Virtualization,	07

	Hypervisors, Virtualization to Cloud Computing.	
Unit-4	Unit IV: Software Development in Cloud and Networking for Cloud Computing:- Introduction, Different Perspectives on SaaS Development, New Challenges Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs.	07
Unit-5	Cloud Service Providers:- Introduction to Google cloud: Platform, Storage, Cloud connects, Cloud Print and App Engine, Amazon Web Services: Elastic Compute Cloud, Simple storage, Simple Queue Service, Microsoft: Windows Azure, IBM Cloud models and IBM Smart Cloud.	07
Unit-6	Unit VI: Open-Source Support for Cloud Computing:- Open-Source Support for Cloud: Introduction, Open Source Tools for IaaS, Open Source Tools for PaaS, Open Source Tools for SaaS, Open Source Tools for Research, Distributed Computing Tools for Management of Distributed Systems.	07
	Total	42

Text Book: K. Chandrasekaran: Essentials of Cloud Computing, Edition, CRC Press Taylor & Francis Group.

Reference Book:

1. Robert K. Wysocki —Effective Software Project Management , Wiley Publication, 2011.
2. Walker Royce: —Software Project Management- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, —Managing Global Software Projects , McGraw Hill Education (India), Fourteenth Reprint 2013

B.Tech. Six Semester Double Minor: Embedded System

Course Code	Course Title	L	T	P	C
6SESM	Microcontroller & Applications	03	00	00	03

Pre-requisite:

1. Digital System Design (3SE03)

Course Learning Objectives:

1. To understand the architectural difference between Microprocessor and Microcontroller.
2. To learn C Language Programming concepts of Microprocessor & Microcontroller.
3. To get knowledge of interfacing of different peripheral devices with Microprocessor and Microcontroller.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Discuss basic operation of Microprocessor & Microcontroller.
2. Elaborate the concept and interfacing of 8255 PPI with 8085Microprocessor.
3. Describe the fundamentals of microcontroller systems.
4. Explain the concept of programming microcontrollers using the C language.
5. Analyze different type's peripheral devices with Microcontroller.
6. Apply the concepts of Serial Communication.

Unit	Course: Microcontroller & Applications	No. of lectures required
Unit-1	Introduction to Microprocessor: 8085: Pin Diagram and Architecture, Addressing Modes and Instruction Set of data transfer, Arithmetic and Logical group.	08
Unit-2	I/O Interfacing & Programming of 8085: Block diagram of 8255, interfacing with 8085, IO Mapped IO & Memory Mapped IO technique.	07
Unit-3	Introduction to 8051 Microcontroller: Architecture, Signal description, Register set , Timer structure and their modes.	08
Unit-4	8051 programming in C : Data types and time delay in 8051 , IO programming in 8051, Logic operations in 8051.	06

Unit-5	Interfacing and programming of 8051 using C: ADC 0809, DAC 0808, Relays and Opto-isolators, Interfacing of Stepper Motor & DC motor.	07
Unit-6	Serial Communication: Basics of Serial Data Communication, RS232 standard, 9 pin RS232 signals, Simple Serial Port programming in C to transmit a message and to receive data serially.	06
Total		42

Text Books:

1. Gaonkar R.S., “Microprocessor Architecture Programming and Applications with the 8085”, Penram International Pub.
2. B. Ram, “Fundamental of Microprocessor & Microcontrollers”, Dhanpat Rai Publications.

Reference Books:.

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinley, “The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson Education (2nd Ed.)
2. K. J. Ayala, “The 8051 Microcontroller”, Penram Int. Pubs., 1996 .
3. Furber, “ARM System on Chip Architecture”, 2nd Edition, Person India 5. Phillips NXP LPC 2148 User Mannual.

Course Code	Course Title	L	T	P	C
6SNSM	Data Mining and Warehousing	03	00	00	03

Course Learning Objectives:

1. To understand the principles of Data warehousing, Architecture and Implementation.
2. To be familiar with the basic concepts of data mining and various methods for data pre-processing.
3. To study different association rules and algorithms for finding hidden and interesting patterns in data.
4. To impart the knowledge of various classification tools.
5. To understand types of data in cluster analysis and classical partitioning.
6. To understand complex data with respect to spatial and web mining.

Course Learning Outcomes:

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

1. Describe basic concepts of Data Warehousing and OLAP operations.
2. Understand the principal of data warehousing and data pre-processing
3. Identify appropriate data mining algorithm to solve real world problems.
4. Characterize the kind of patterns that can be discovered by association rules.
5. Understand various classification and clustering technique and tools.
6. Describe complete data types with respect to spatial and web mining.

	Subject: Data Mining and Warehousing	L (Hrs)
Unit-1	Data Ware Housing: Data Ware House, A Multidimensional Data Model, Data Warehouse	07

	Architecture, Data Warehouse Implementation.	
Unit-2	Introduction to Data Mining: Introduction to Data Mining, Data Mining Functionalities Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehousing System, Major issues in Data Mining. Data Preprocessing: Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction.	07
Unit-3	Patterns, Associations Rules: Basic Concepts and Road Map: Market base analysis, frequent item sets, closed item set and association rules, frequent pattern mining. Efficient and scalable frequent item set mining methods: the Apriori algorithm, generation association rules from frequent item sets, improving the efficiency of Apriori, Mining frequent item sets, Mining closed item sets.	07
Unit-4	Classification: Problem definition, classification by decision tree induction, Bayesian classification, Rule Based classification, KNearest Neighbor classifiers, K's Based Reasoning.	07
Unit-5	Clustering: Problem Definition, types of data in cluster analysis, Classical partitioning: K-Means and K-Medoids methods, Hierarchical Methods, Density based Methods, Outlier Analysis.	07
Unit-6	Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.	07
	Total	42

Text books:

[1] Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Second Edition.

References:

[1] Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

[2] G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

[3] Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education.

B.Tech. Six Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
6SMSM	Production Management	03	00	00	03

Course Prerequisites:

1. Students should have knowledge of General management principles.
2. Students should have brief knowledge of production process.

Course Learning Objectives:

- 1: To study the new product design & manufacturing processes.
- 2: To study the objectives and methods of sales forecasting.
- 3: To study objectives and functions of Production Planning and Control.
- 4: To study inventory control & quality management.

Course Outcomes:

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

1. Apply the knowledge of production management and its applications in industrial environment.
2. Apply the knowledge of sales forecasting in industrial environment.
3. Apply the knowledge of Value analysis & its applications in industrial environment.
4. Demonstrate the knowledge of Production Planning & Control.
5. Demonstrate the importance of inventory control, JIT in manufacturing.
6. Apply the basic concept of quality management, TQM, Kaizen, QFD etc.

	Production Management	L
UNIT I	Designing products and manufacturing processes; Product development & design, product analysis, tools for product development(standaization,simplification,specialization, diversification), manufacturing process (Job Shop, Batch, Mass & continuous manufacturing)	7
UNIT II	Sales Forecasting: objectives of forecasting, Types of forecasting, process of sales forecasting, factors affecting forecasting, methods of sales forecasting, numerical based on moving average & exponential smoothing method.	7
UNIT III	Origin of value engineering, meaning of value, definition of V.E, Value analysis & value engineering, uses of value engineering, when to apply value engineering, reasons for unnecessary costs, steps in value analysis, ten commandments (Principles) of value analysis.	6

UNIT IV	Production planning and control: Objectives and functions of PPC, types of production systems, Routing, scheduling, machine loading, dispatching, principles of sound production control system.	6
UNIT V	Inventory Control: Classification of inventory, inventory functions, inventory cost, economic order quantity, optimum lot size, reordering system, ABC analysis, material requirement planning. Just-in-time manufacturing.	7
UNIT VI	Quality Management: Costs of quality, TQM, Kaizen, quality function development (QFD), Taguchi's philosophy, and six sigma, kanban & Pull system.	6
	Total	39

Textbooks:

1. Production and operations management- concepts models and Behavior by Everett E. Adam,Jr., & Ronald J. Ebert (Prentice- Hall of India)
2. Industrial engineering & production Management by M. Mahajan(Dhanpat Rai & Co.)

References Books:

1. Production and operations management - Total Quality and responsiveness by Hamid Noori & Russell Radfort (Mc Graw Hill, Inc.)
2. Industrial engineering & management by O. P. Khanna (Dhanpat Rai& Co.)
3. Production and Operations Management; J.P. Saxena; McGraw Hill
4. Production and operations management by S.N Chary (Mc Graw Hill, Inc.)
5. Industrial engineering & production management Martand Telsang (S.Chand)

B.Tech. Six Semester (IoT)

Course Code	Course Title	L	T	P	C
6STSM	Embedded System for Internet of Things	03	00	00	03

Course Pre-requisite: - 3SX03 Object Oriented Programming, 4SX02 Microcontroller and Applications

Course Learning Objectives:

1. Understand embedded systems, microcontrollers and compare with general-purpose systems and learn key hardware fundamentals.
2. Learn embedded C, work with Arduino, ESP32/ESP8266, and Raspberry Pi and understand GPIO and serial protocols like UART, SPI, and I2C.
3. Explore IoT architecture, ADC/DAC, and sensor-actuator interfacing and evaluate wireless protocols: MQTT, Wi-Fi, Bluetooth, Zigbee, and LoRa.

Course Outcomes:

After successfully completing the course, students will be able to

- 1 Explain the characteristics and applications of embedded systems and differentiate them from general-purpose systems and microprocessors.
- 2 Identify and describe basic electronic components, PCB layout, power supply design, and distinguish between analog and digital signals.
- 3 Compare Arduino, ESP32/ESP8266, and Raspberry Pi platforms and explain GPIO pin configurations and functions.
- 4 Develop and execute basic embedded C programs using Arduino IDE and implement UART, SPI, and I2C communication protocols.
- 5 Describe the architecture of IoT and evaluate various communication protocols including Wi-Fi, Bluetooth, Zigbee, LoRa, and MQTT.
- 6 Interface sensors and actuators with microcontrollers, acquire data, and control devices using ADC and DAC functionalities.

	Subject: Embedded System And IOT	L
UNIT I	Introduction to Embedded system, Embedded system vs General purpose computing system, Microcontroller vs Microprocessor, Types of Embedded system(Stand alone, Real Time, Networked), Role of Embedded system in IoT	7
UNIT II	Basic Electronic component, Power supply design and basics of PCB, Introduction to sensors and Actuators, Analog vs Digital signals	7
UNIT III	Introduction to Arduino, ESP32/ESP8266, Comparison of Arduino vs raspberry pi vs ESP32, GPIOs and pin configuration basics.	7
UNIT IV	Introduction to Embedded C and Arduino IDE, Basic programming, Delays in Embedded systems, Serial communication UART, SPI, I2C.	7
UNIT V	Basics of IoT , Architecture of IoT, Communication protocols overview: Wi-Fi, Bluetooth, Zigbee, LoRa, Basics of MQTT protocol and implementation.	7
UNIT VI	Sensors, Actuators and Data Acquisition: Interfacing Temperature, Humidity and Motion sensor, Reading Sensor data, Controlling Relays, Motors and LEDs via Microcontroller, ADC and DAC in Embedded system	7
	Total :	42

Text Books:

1. **Goyal, Pravin.** Internet of Things and Embedded Systems. TechKnowledge Publications.
2. **Raja, R. Vinston.** *Embedded Systems and IoT*. Paperback edition.

Reference Books:

1. **Vijay Kumar, G., & Srujan Chandra Reddy, D.** *Embedded Systems and IoT: A Theoretical Approach*. Paperback edition.
2. **Pethuru Raj, A., & Anupama C. Raman.** *Designing Embedded Systems and the Internet of Things (IoT) with the ARM mbed*. Wiley–IEEE Press.

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches
Batch Admitted AY2023-24 SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 7th Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
			Hours / Week			SM Applicable to	Total Hours /Week	Credits	THEORY						
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	
Theory															
VII	7SASM	Introduction to Software Development Platform (GitHub)	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
VII	7SCSM	Construction Material Management	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
VII	7SKSM	Distributed Database	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
VII	7SESM	Advanced Microcontrollers	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
VII	7SNSM	Data Visualaization	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
VII	7STSM	Edge and Fog Computing	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Industrial IoT
VII	7SMSM	Productivity Techniques	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Emgineering

B.Tech. Seventh Semester (Artificial Intelligence and Data Science)

Course Code	Course Title	L	T	P	C
7SASM	Introduction to Software Development Platform (GitHub)	03	00	00	03

Course Prerequisite: Programming Fundamentals, Programming Methodology, Data Structures, Software Engineering basics, and Computer Systems and File Management.

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Introduction to Software Development Platform (GitHub) by being able to do each of the following:

1. Understand the concepts of version control systems, Git, and distributed software development.
2. Apply Git and GitHub tools for repository management, branching, collaboration, and project maintenance.
3. Analyze and utilize advanced Git features to support efficient and secure software development workflows.

Course Outcomes: After successful completion of this course, the student will be able to:

1. Recall the basic concepts, commands, and features of Git and version control systems.
2. Explain Git repositories, commits, branches, and collaboration workflows.
3. Apply Git commands to manage repositories, branches, and remote projects.
4. Analyze branching strategies, distributed workflows, and GitHub collaboration practices.
5. Evaluate Git tools, hosting platforms, and project management approaches for software development.
6. Design and maintain collaborative software projects using GitHub and advanced Git features.

	Subject: (7SASM) Introduction to Software Development Platform (GitHub)	L
Unit 1	Introduction to Version Control and Git About Version Control Systems, Short History and Evolution of Git, What is Git? Features and Advantages, Using the Command Line for Git, Installing Git on Different Platforms, First-Time Git Setup and Configuration, Getting Help and Git Documentation	07
Unit 2	Git Fundamentals Creating and Getting a Git Repository, Recording Changes to the Repository (add, commit, status), Viewing and Understanding Commit History, Undoing Changes in Git, Working with Remote Repositories, Tagging Versions in Git, Using Git Aliases for Efficiency	07
Unit 3	Git Branching and Workflow Branch Concepts and Branches in Git, Creating, Switching, and Deleting Branches, Basic Branching and Merging Branch Management Techniques, Branching Workflows used in Software Development, Remote Branches and Collaboration, Introduction to Rebasing	07

Unit 4	Git Server and Distributed Development Git Protocols and Communication, Setting up Git on a Server, Generating SSH Public Key for Authentication, Git Server Setup and Management, Git Daemon and Smart HTTP, Git Web Interfaces and Hosting Platforms, Introduction to GitLab and Third-Party Git Hosting Services	07
Unit 5	Distributed Git and GitHub Collaboration Distributed Workflows in Software Development, Contributing to Open Source Projects, Maintaining a Software Project, GitHub Account Setup and Configuration, Contributing to Projects using GitHub, Maintaining a Project on GitHub, Managing Organizations and Teams on GitHub, Introduction to GitHub Automation and Scripting	07
Unit 6	Advanced Git Tools and Customization Revision Selection and Git Internals, Interactive Staging Techniques, Stashing and Cleaning Working Directory, Signing Commits and Security Practices, Searching and Debugging in Git, Rewriting History and Reset Concepts, Advanced Merging Techniques, Git Submodules and Bundling, Credential Storage in Git, Git Configuration, Attributes, and Hooks, Git-Enforced Policies and Customization.	07
	Total	42

Text Book:

1. Scott Chacon and Ben Straub, “Pro Git”, 2nd Edition, Apress (2014) ISBN:978-1-4842-0077-3.

Reference Books:

1. Jon Loeliger and Matthew McCullough,” Version Control with Git “ (3rd Edition), O’Reilly Media (2022) ISBN:978-1-098-13847-9
2. Richard E. Silverman,” Git Pocket Guide: A Working Introduction “, O’Reilly Media (2013) ISBN:978-1-449-32019-1
3. Joachim Schmitz,” Learning Git “, O’Reilly Media (2022) ISBN:978-1-098-13291-0.

B.Tech. Seventh Semester (Civil Engineering)

Course Code	Course Title	L	T	P	C
7SCSM	Construction Material Management	03	00	00	03

Course Objectives:

Students will be taught

1. To understand the role and importance of materials in construction projects.
2. To learn methods of estimating, planning, and procurement of materials.
3. To study inventory management techniques in construction.
4. To explore the logistics and transportation of construction materials.

Course Outcomes:

After successfully completing the course, students will be able to

1. Identify various construction materials and their uses.
2. Estimate material requirements for construction projects.
3. Apply inventory management techniques to control material flow.
4. Plan procurement and delivery schedules efficiently.
5. Implement best practices in material handling and storage.
6. Analyze and reduce material-related costs and wastage on-site.

	Subject: Construction Material Management	L
Unit-1	Introduction to Construction Materials: Types of materials used in construction (cement, steel, aggregates, etc.) , Properties and selection of materials, Environmental and economic impact of materials	07
Unit-2	Material Planning and Estimation: Material requirement planning (MRP), Estimation techniques for materials, Bar chart and CPM/PERT basics in material planning	07
Unit-3	Procurement of Materials: Purchasing systems (local and centralized), Tendering and supplier selection, Purchase order and contract management	07
Unit-4	Inventory Management : Types of inventories in construction, EOQ (Economic Order Quantity), ABC analysis, Inventory control methods	07
Unit-5	Transportation and Handling of Materials: Modes of transportation and their suitability, Equipment used in handling construction materials, Safety measures in transportation and handling	07
Unit-6	Storage, Waste Management & Cost Control: Site storage systems and layout, Material wastage – causes and control, Techniques for cost reduction and sustainability in material usage	07
	Total	42

Text Book:

1. **"Construction Materials, Methods and Techniques"** – William P. Spence & Eva Kultermann
2. **"Building Materials"** – S.K. Duggal

Reference Book:

1. **"Construction Management and Equipment"** – R.L. Peurifoy, Clifford J. Schexnayder
2. **"Materials Management"** – Prem Vrat, G.D. Sardana, B.S. Sahai

B.Tech. Seventh Semester (Computer Science and Engineering)

Course code	Course Title	L	T	P	C
7SKSM	Distributed Database	03	00	00	03

Course Learning Objectives:

1. To understand the concepts, architecture, and design principles of distributed database systems.
2. To analyze and apply data fragmentation, allocation, query processing, and transaction management techniques in distributed environments.
3. To evaluate distributed database solutions with respect to security, integrity, reliability, and real-world application requirements.

Course Outcomes After Successful completion of this course, the student will be able to:

1. Understand and describe the theoretical foundations and architectural models of distributed database systems.
2. Design and implement effective data fragmentation and replication strategies to optimize distributed data access.
3. Develop and optimize distributed queries using query decomposition and cost-based optimization methods.
4. Implement transaction management protocols, including concurrency control and recovery in a distributed environment.
5. Evaluate distributed database systems in terms of consistency, availability, and fault tolerance using appropriate algorithms.
6. Analyze distributed database applications and case studies to address real-world data management challenges

	Course:	L
Unit-1	Distributed Data Processing: What is a Distributed Database System, Data Delivery Alternatives, Promises of DDBSs: Transparent Management of Distributed and Replicated Data, Reliability Through Distributed Transactions, Improved Performance, Easier System Expansion. Complications Introduced by Distribution, Design Issues: Distributed Database Design, Distributed Directory Management, Distributed Query Processing, Distributed Concurrency Control, Distributed Deadlock Management, Reliability of Distributed DBMS	07
Unit-2	Distributed DBMS Architecture: ANSI/SPARC Architecture, A Generic Centralized DBMS Architecture, Architectural Models for Distributed DBMSs, Autonomy, Distribution, Heterogeneity, Architectural Alternatives, Client/Server Systems, Peer-to-Peer Systems, Multidatabase System Architecture. Overview of Relational DBMS: Relational Database Concepts, Normalization, Relational Data Languages.	07

Unit-3	Distributed Database Design: Top-Down Design Process, Distribution Design Issues: Reasons for Fragmentation, Fragmentation Alternatives, Degree of Fragmentation, Correctness Rules of Fragmentation, Allocation Alternatives, Information Requirements. Fragmentation: Horizontal Fragmentation, Vertical Fragmentation, Hybrid Fragmentation.	07
Unit-4	Allocation: Allocation Problem, Information Requirements, Allocation Model, Solution Methods, Data Directory. Database Integration: Bottom-Up Design Methodology, Schema Matching: Schema Heterogeneity, Linguistic Matching Approaches, Constraint-based Matching Approaches, Learning-based Matching, Combined Matching Approaches.	07
Unit-5	Schema Integration, Schema Mapping: Mapping Creation, Mapping Maintenance. Data Cleaning, View Management: Views in Centralized DBMSs, Views in Distributed DBMSs, Maintenance of Materialized Views.	07
Unit-6	Applications and Case Studies of Distributed Database Systems : Distributed Databases in Banking and Financial Systems, Distributed Databases for E-Commerce and Online Transaction Processing, Distributed Databases in Healthcare Information Systems, Cloud-Based Distributed Database Systems, Big Data and Distributed Data Management, Challenges in Distributed Database Deployment, Case Studies on Real-World Distributed Database Applications. .	07
	Total	42

Text Book:

1. Author M. Tamer Özsu, Patrick Valduriez, “Principles of Distributed Database Systems”, Springer publications
2. Author Stefano Ceri; Guiseppe Pelagatti, “Distributed Databases- Principles and Systems”, Tata McGraw Hill publication

Reference Books:

1. Data Base Management System; Leon & Leon; Vikas Publications

B.Tech. Seventh Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
7SESM	Advanced Microcontrollers	03	00	00	03

Pre-requisite:

1. Digital System Design (3SE03)
2. Fundamentals of Digital Electronics (3SESM)
3. Introduction to Microprocessors (5SESM)
4. Microcontroller and Applications (6SESM)

Course Learning Objectives:

1. To understand the architectural difference between ARM Microprocessor and MSP430 Microcontroller.
2. To learn assembly language programming concepts of ARM Microprocessor and MSP430 Microcontroller.
3. To get knowledge of interfacing ARM and MSP430 based embedded systems.

Course Outcomes:

After successfully completing the course, students will be able to:

1. Discuss basic operation of ARM Microprocessor.
2. Elaborate the concept of ARM RISC architecture with Assembly Language Programming.
3. Describe the fundamentals of ARM Memory management Technique.
4. Explain the Architectural concept of MSP430 Microcontroller and its peripheral modules.
5. Analyze the interfacing techniques and performance of ARM and MSP430-based embedded systems for real-time applications.
6. Apply the knowledge of interfacing of ARM and MSP430 to develop the applications.

Unit	Course: Advanced Microcontrollers	No. of lectures required
Unit-1	ARM Processor Fundamentals: Registers, CPU, Pipeline, Exceptions, Interrupts, Vector table, Core extensions, ARM architecture, ARM organization, ARM Processor families	08
Unit-2	High Performance RISC Architecture and Programming: Data Process instruction, Branch and Load instruction, Software interrupts, Thumb instruction set, Thumb register usage, ARM thumb network, Stack instructions, Basic ARM Assembly language programs	07
Unit-3	Memory Management: Memory Hierarchy, Coprocessor and Cache memory, Memory management, ARM CPU cores	06
Unit-4	MSP430 Microcontroller Overview: Functional Block diagram of MSP430F2003-Memory Mapped, CPU, Exceptions, Architecture of MSP430 Processor.	06

Unit-5	Instruction Set and Peripheral Programming of MSP430: Addressing Modes of MSP430, Instruction Set Architecture, Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Program Control Instructions, Interrupt Handling, Digital Input/ Output Ports, Timer Module.	07
Unit-6	ARM and MSP430 Interfacing, Applications: ARM Development Environment and Tool Chain, MSP430 Development Tools and Programming Environment, ARM and MSP430 Programming Flow, GPIO Interfacing, LED, Switch and LCD Interfacing, Timer and Counter Application.	08
Total		42

Text Books:

1. K. M. Bhurchandi and A. K. Ray, "Advanced Microprocessors and Peripherals-with ARM and an Introduction to Microcontrollers and Interfacing ", Tata McGraw Hill, 3rd edition 2015.

Reference Books:

1. Andrew N. Sloss, Dominic Symes, Chris Wright and John Rayfield, "ARM System Developer's Guide, Designing and Optimizing System Software", Elsevier, 2004.
2. John H. Davies, "MSP430 Microcontroller Basics", Elsevier, 2008

B.Tech. Seventh Semester (Information Technology)

Course Code	Course Title	L	T	P	C
7SNSM	Data Visualization	03	00	00	03

Course Prerequisite: Introduction to Python

Course Learning Objectives:

1. To understand the basic concepts, importance, and applications of data visualization in decision-making.
2. To learn different chart types and select appropriate visualization techniques based on data characteristics.
3. To develop skills in creating visualizations using Python libraries such as Matplotlib and Seaborn.
4. To apply Microsoft Excel for generating charts, pivot tables, and interactive dashboards.
5. To explore Tableau for data preparation, visualization, and worksheet management.
6. To design interactive dashboards and present data effectively for analysis and business insights.

Course Outcomes:

After successful completion of this course, students will be able to

1. Understand the fundamental concepts of data visualization, chart selection, and storytelling techniques for effective data representation.
2. Apply Matplotlib for creating basic and advanced visualizations from structured datasets.
3. Use Seaborn to generate statistical and aesthetically effective visualizations for data analysis.
4. Create and customize charts, pivot tables, and dashboards using Microsoft Excel for business insights.
5. Utilize Tableau for data preparation, worksheet management, and creating simple visualizations.
6. Design interactive dashboards using Tableau by integrating charts, filters, and dashboard elements for decision-making.

	Subject: Data Visualization	L (Hrs)
Unit-1	Introduction to Data Visualization: What is data visualization? Importance in business decision-making, Types of data and charts ,Choosing the right chart, Introduction to storytelling with data Common Chart Types and Their Uses: Bar chart, Line chart, Pie chart, Scatter Plot, Histogram, Heatmap, Area Chart, Box Plot, Bubble Chart, Column chart.	07
Unit-2	Data Visualization with Python Library Matplotlib: Introduction to Python ,Jupyter Notebook basics ,Variables, data types, lists ,Reading data (CSV/Excel) ,Basic data handling,Introduction to Matplotlib, Pyplot in Matplotlib, Matplotlib – Axes Class, Data Visualization With Matplotlib.	07
Unit-3	Effective Data Visualization With Python Library Seaborn: Key Features of Seaborn, Difference between Matplotlib & Seaborn,	07

	Creating simple plots: Bar plot, Histogram, Scatter plot, Introduction to pairplot	
Unit-4	Data Visualization using Excel: Creating charts in Excel Formatting charts ,Pivot Tables , Interactive dashboards: Slicers, Filters	07
Unit-5	Introduction to Tableau & Basic Data Handling: Overview of Tableau and its applications ,Tableau interface and basic navigation ,Connecting Excel data and understanding data types, Basic data preparation: cleaning, renaming, splitting, and combining data , Working with worksheets: creating, renaming, and duplicating , Creating simple visualizations (charts, graphs, and tables), Basic formatting and dashboard introduction	07
Unit-6	Creating Basic Charts: Bar chart, Line chart, Pie chart, Intermediate Charts: Scatter plot, Histogram, Box plot, Building Dashboards What is a dashboard? Creating a dashboard, Adding sheets to dashboard, Adding Elements to Dashboard: Text object, Image object, Basic layout arrangement, Interactivity: Adding filters, Using filters in dashboard	07
	Total	42 hrs

Recommended Textbook:

1. Storytelling with Data: A Data Visualization Guide for Business Professionals By Cole Nussbaumer Knaflic, Wiley, 1st Edition.
2. Communicating Data with Tableau By Ben Jones, O'Reilly Media, 1st Edition.

Reference Books:

1. Practical Statistics for Data Scientists By Peter Bruce, Andrew Bruce, Peter Gedeck, O'Reilly Media, 2nd Edition.
2. Tableau Your Data! By Daniel G. Murray, Wiley, 3rd Edition.
3. Fundamentals of Data Visualization By Claus O. Wilke, O'Reilly Media, 1st Edition.

B. Tech Seventh Semester Industrial IoT

Course Code	Course Title	L	T	P	C
7STSM	Edge and Fog Computing	3	-	-	3

Course Pre-requisite: NIL

Course Objectives:

1. To understand the evolution and impact of computing paradigms including parallel, distributed, cluster, grid, edge, and fog computing.
2. To learn the architecture and components of Edge Computing, including devices, servers, IoT sensors, and networking models.
3. To understand the fundamentals of Fog Computing, its characteristics, and its relationship with cloud and edge computing.
4. To study fog computing architecture, communication models, and integration with IoT ecosystems.

Course Outcomes:

After completing the course, students will be able to

1. Understand various computing paradigms such as parallel, distributed, Cluster, grid, edge, and fog computing.
2. Describe the architecture and working of edge computing systems, including IoT devices and networking components.
3. Comprehend knowledge of middleware, interfaces, and simulation tools (e.g., PureEdgeSim, iFogSim) for edge computing environments.
4. Analyze the need for fog computing and differentiate between cloud, edge, and fog paradigms.
5. Illustrate fog computing architecture, communication models, and its Integration with IoT systems.
6. Evaluate resource management strategies in fog computing such as task scheduling; load balancing, and computation offloading based on QoS parameters.

Course Name: Edge and Fog Computing		Hrs
Unit-1	Introduction to Computing: The Major Impacts of Computing, Parallel Computing: Shared Memory Computing, Distributed Memory System, Hybrid Model, Distributed Computing, Cluster Computing: High Performance Cluster, Load Balance Clusters, High Availability Clusters, Utility Computing, Grid Computing	7
Unit-2	Edge Computing and Its Essentials: Introduction, Edge Computing Architecture: Edge Devices, Edge Server Cluster, Cloud Server, Background Essentials: IoT Devices Mobile Phone-Based Sensors, Medical Sensors, Neural Sensors, Environmental and Chemical Sensors, Radio Frequency Identification, Actuators	7

Unit-3	Edge Interfaces, Middleware & Simulators: Edge Computing State-of-the-Art Interfaces and Devices, Middleware, Application Interfaces, Edge Computing Simulators: PureEdgeSim, IoT Sim-Edge, iFogSim, Edge CloudSim	7
Unit-4	Introduction to Fog Computing: Evolution of computing: Cloud → Edge → Fog, Limitations of cloud computing in IoT, Definition and characteristics of Fog Computing, Fog vs. Cloud vs. Edge computing, Fog computing architecture overview, Enabling technologies: Virtualization, Containers, IoT	7
Unit-5	Fog Computing Architecture: Layered fog architecture (Device—Fog — Cloud), Fog nodes and their functionalities, Communication models in fog systems, Fog orchestration and service provisioning, Integration with IoT ecosystems, Comparison with distributed and grid computing	7
Unit-6	Resource Management in Fog: Resource allocation in fog environment, Task scheduling techniques, Load balancing strategies, Computation offloading (cloud ↔ fog ↔ edge), QoS parameters (latency, bandwidth, energy efficiency), Optimization techniques in fog computing	7
	Total Hrs	42

Text Books:

1. Edge Computing: Concepts, Technologies and Applications -Jie Cao, Quan Chen
2. Edge/Fog Computing Technologies for IoT Infrastructure, edited by Taehong Kim, Seong-eun Yoo and Youngsoo Kim, MDPI, 2022

References Books:

1. Edge Computing: Fundamentals, Advances and Applications - K. Anitha Kumari, G. Sudha Sadasivam, D. Dharani, M. Niranjanamurthy.
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps - Daniel Drescher
3. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things - Kai Hwang, Geoffrey C. Fox, Jack Dongarra

B.Tech. Seventh Semester (Mechanical Engineering)

Course Code	Course Title	L	T	P	C
7SMSM	Productivity Techniques	03	00	00	3

Course Prerequisites:

1. Knowledge of production processes and manufacturing techniques

Course Learning Objectives:

CLO1. To measure and evaluate productivity

CLO2. To Plan and implement various productivity techniques

CLO3. Reengineer the process for improve productivity

Course Outcomes:

Students will be able to –

1. Explain the concepts of productivity, productivity measures, and productivity improvement techniques
2. **Apply** method study techniques and motion economy principles
3. **Analyze** work measurement techniques to establish standard time for industrial operations
4. **Analyze** ergonomic principles and man–machine systems to improve workplace safety and efficiency
5. **Evaluate** performance rating methods, wage payment systems, and incentive plans
6. Evaluate Business Process Re-engineering (BPR) methodologies to recommend process improvements

	Subject: Productivity Techniques	L
Unit-1	Productivity Definition, Concept and Importance of productivity, Difference between Production and Productivity, Tools of productivity, Reasons for low productivity, Factors that help increasing productivity, Productivity index, Productivity ratio, Kinds of productivity measurement, Causes of low productivity and techniques of their elimination, Factors affecting productivity, Technical methods to improve productivity, Main contributors to productivity improvement, Advantages from increased productivity.	7
Unit-2	Method Study Definition, Concept , Objectives and Procedure of method study, Process chart symbols, recording techniques like Flow process charts, Operation, Flow and Two handed Process charts, Flow	7

	diagram, String diagram, Multiple Activity chart, Operation Analysis, Analysis of motion, Motion economy, Design of work place layout, Therbligs, SIMO chart.	
Unit-3	Work Measurement Definition, Concept and Objectives of work measurement, Stop watch procedure for collecting time study data, Time estimating techniques like analytical estimating, Predetermine Motion Time System-PMTS, Elemental Motion Time System, Basic Motion Time System, Method Time Measurement, Work factor.	7
Unit-4	Ergonomics Introduction, Principles, Work system design, Man-machine system, Human behavior and equipment design, Tools, Techniques and applications, Effect of environment on performance of worker.	7
Unit-5	Performance Rating, Wage Payment & Incentive Plans Introduction, Various incentive schemes, Performance Rating. Contemporary Issues in Productivity Activities of National Productivity Council and other organizations, Productivity Scenario and changes.	7
Unit-6	Business Process Re-engineering (BPR) Introduction, Development of Business Process Re-engine, BPR is not for everyone, Advantages of BPR, Steps involved in BPR, Application of BPR, Training for BPR, When to reengineer, Ways to fail at BPR, Requirements of BPR, Human Resource Engineering, Fundamentals of BPR, Implementation methodology of BPR, Organizational re-engineering, Organizational reengineering process, Reengineering values, Approach to reengineering, Re-engineering tools, What re-engineering is not, Kinds of changes that occurs in re-engineering, succeeding.	7
	Total	42

Text Books:

1. Work Study, Khanna , Dhanpat Rai Publications
2. Total Quality Management , K.C.Arora, Katsons
3. Industrial Engineering and Management, Khana, Dhanpat Rai.

Reference Books:

1. Introduction to Work study, ILO, Oxford
2. Industrial Engineering and Management, Reddy, New Age
3. Industrial Engineering and Management, Verma.

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches
Batch Admitted AY2023-24 SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 8th Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
			Hours / Week			SM Applicable to	Total Hours /Week	Credits	THEORY						
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	
						Max. Marks MSE/ MSIE	Max. Marks TA								
Theory															
VIII	8SASM	Databases and SQL for Data Science	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
VIII	8SCSM	Construction Quality Management	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
VIII	8SKSM	User Experience Design	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
VIII	8SESM	Embedded System and RTOS	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
VIII	8SNSM	Big Data Processing	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
VIII	8STSM	Internet of Things Security	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Industrial IoT
VIII	8SMSM	Computer Integrated Manufacturing	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Emgineering

B.Tech. Eighth Semester (Artificial Intelligence and Data Science)

Course Code	Course Title	L	T	P	C
8SASM	Database and SQL for Data Science	03	00	00	03

Course Prerequisite: Basic knowledge of programming, data structures, and database fundamentals is recommended. Familiarity with data handling and tabular data representation.

Course Learning Objectives: Throughout the course students will be expected to demonstrate their understanding of Database and SQL for Data Science by being able to each of the following.

- To understand relational databases and SQL concepts used in data science workflows.
- To develop skills for extracting, transforming, and analyzing datasets using SQL queries.
- To enable students to design and build analytical datasets for data science applications.

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

1. Explain database concepts and data sources used in data science.
2. Write SQL queries to retrieve and filter data from relational databases.
3. Apply joins and aggregation techniques to analyze datasets.
4. Use advanced SQL constructs such as window functions and subqueries.
5. Prepare analytical datasets using SQL for reporting and data science tasks.
6. Manage and manipulate data using SQL statements for data science pipelines.

	Subject:- Database and SQL for Data Science	L
Unit 1	Introduction to Databases for Data Science: Data Sources, Relational Databases, Structure of Database Tables, Introduction to Analytical Databases, Introduction to the Farmer's Market Database	7
Unit 2	SQL Fundamentals: The SELECT Statement, Selecting Columns, Limiting Returned Rows, Sorting Query Results, The WHERE Clause and Filtering Data	7
Unit 3	Conditional Queries and Data Analysis : CASE Statements, SQL JOINS, Combining Data from Multiple Tables, Inner Join, Outer Join	7
Unit 4	Aggregation and Advanced SQL: Aggregating Results for Analysis, GROUP BY Clause, HAVING Clause, Window Functions and Subqueries	7

Unit 5	Data Preparation for Data Science: Date and Time Functions, Exploratory Data Analysis with SQL, Building SQL Datasets for Analytical Reporting	7
Unit 6	Advanced Analytical SQL and Data Management: More Advanced Query Structures, Creating Machine Learning Datasets Using SQL, Analytical Dataset Development Examples, Storing and Modifying Data	7
	Total	42

Textbook:

1. Renee M. P. Teate, “SQL for Data Scientists: A Beginner’s Guide for Building Datasets for Analysis”, Wiley, 2021.

B.Tech. Eighth Semester (Civil Engineering)

Course Code	Course Title	L	T	P	C
8SCSM	Construction Quality management	03	00	00	03

Course Learning Objectives

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

1. Understand the basic concepts of quality and its importance in construction & the role of inspection, testing, and audits in quality assurance.
2. Learn various quality standards and management systems used in the industry.
3. Analyze quality planning and control methods & the implementation of Total Quality Management (TQM) in construction.
4. Apply quality tools and techniques to improve construction processes.

Course Outcomes:

After successfully completing the course, students will be able to

1. Define key terms and principles of construction quality management.
2. Identify quality standards like ISO 9001 and their application.
3. Develop basic quality plans and perform quality control activities.
4. Apply quality assurance techniques on-site.
5. Utilize TQM principles in real-world construction projects.
6. Recommend improvements using quality tools like checklists, flowcharts, and control charts.

Unit	Subject: Construction Quality management	L
Unit-1	Introduction to Quality in Construction Definition and concept of quality, Importance of quality in construction, Quality vs cost and time, Factors affecting quality	07
Unit-2	Quality Standards and Systems Quality management system (QMS), Benefits of QMS in construction, Documentation and procedures	07
Unit-3	Quality Planning and Control Quality planning process, Preparing quality plans, Inspection and test plans (ITP), Quality control vs Quality assurance	07

Unit-4	Inspection, Testing, and Auditing Role of inspection and testing, Third-party inspections, Internal and external quality audits, Non-conformance reports (NCR)	07
Unit-5	Total Quality Management (TQM) Principles of TQM, TQM in construction industry, Continuous improvement and Kaizen, Role of leadership and teamwork	07
Unit-6	Quality Tools and Techniques Seven basic quality tools: Checklist, Flowchart, Histogram, Control Chart, Scatter Diagram, Cause-Effect Diagram, Pareto Chart, Benchmarking, Case studies in construction quality improvement.	07
	Total	42

Text Book:

1. Jha, K.N., *Construction Project Management: Theory and Practice*, Pearson Education
2. Oakland, John S., *Total Quality Management and Operational Excellence*, Routledge

Reference Book:

1. Arditi, David & Gunaydin, H. Murat, *Total Quality Management in Construction Process*, McGraw Hill
2. ISO 9001:2015 Standards – *International Organization for Standardization*

B.Tech. Eighth Semester (Computer Science and Engineering)

Course code	Course Title	L	T	P	C
8SKSM	User Experience Design	03	00	00	03

Course Learning Objectives:

1. To understand the principles, processes, and methodologies of User Experience (UX) Design.
2. To analyze user needs and behaviors through research, information architecture, and interaction design techniques.
3. To design and evaluate user-centered digital interfaces using modern UX and UI design practices.

Course Outcomes After Successful completion of this course, the student will be able to:

1. Explain the concepts, principles, and processes of User Experience (UX) Design.
2. Apply user research techniques to identify user needs and requirements.
3. Develop information architecture artifacts such as personas, user journeys, sitemaps, and wireframes.
4. Design interactive user experiences using usability principles and prototyping techniques.
5. Create user interfaces by applying visual design principles and responsive design practices.
6. Evaluate user experience design solutions and case studies for real-world digital products and services.

	Course: User Experience Design	L
Unit-1	Introduction to User Experience Design: What is UX Design, History and Evolution of UX, Importance of User-Centered Design, The UX Design Process (e.g., Waterfall, Agile), Key UX Roles (e.g., UX Researcher, UX Writer, UI Designer)	07
Unit-2	User Research & Analysis : User Interviews and Surveys, User Observations (e.g., Contextual Inquiry, Ethnography), Usability Testing (e.g., Think Aloud Protocols, Heuristic Evaluation), Data Analysis and Synthesis (e.g., Personas, User Journeys, Empathy Maps), Accessibility Considerations	07
Unit-3	Information Architecture: Organizing Information for Findability, Card Sorting and Tree Testing, Creating Sitemaps and Wireframes, Navigation Design (e.g., Menus, Search), Information Architecture Patterns	07
Unit-4	Interaction Design: Usability Principles (e.g., Nielsen's Heuristics, Jakob's Law), Interaction Styles (e.g., Direct Manipulation, Command Line), Designing for	07

	Touch and Gesture, Prototyping Techniques (e.g., Paper Prototyping, Interactive Prototyping), Affordances and Constraints	
Unit-5	User Interface (UI) Design: Visual Design Principles (e.g., Gestalt Principles, Color Theory), Typography and Iconography, Layout and Composition, Responsive Design and Mobile-First Approach, UI Design Tools (e.g., Figma, Sketch)	07
Unit-6	UX Design in E-Commerce Applications, UX for Mobile Applications, UX in Healthcare and Educational Systems, UX for Social Media and Digital Platforms, Accessibility and Inclusive Design Case Studies, UX Design for Emerging Technologies (AR/VR, Voice Interfaces, Smart Devices), Case Studies of Successful UX Implementations and Redesign Projects.	07
	Total	42

Text Book:

1] "Designing for the Digital Age" by Kim Goodwin. Remember to supplement the textbook with real-world projects, case studies, and guest lectures to enrich the learning experience.

Reference Books:

- [1] Blockchain – Blueprint for new Economy Melanie Swan - O'reilly
- [2] Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
- [3] Sainul Abideen, Blockchain-ebook,Cybrosys Private Limited

B.Tech. Eighth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
8SESM	Embedded System and Real Time Operating System	03	00	00	03

Pre-requisite:

1. Introduction to Microprocessors (5SESM)
2. Microcontroller and Applications (6SESM)
3. Advanced Microcontroller (7SESM)

Course Learning Objectives:

1. To get knowledge of the architecture of Embedded System
2. To develop understanding of the hardware and software aspects of Embedded System.
3. To understand the role and functions of Real Time Operating System

Course Outcomes:

After successful completion of this course, students will be able to-

1. Discuss basic constituent units of Embedded System
2. Describe the Processor and Memory selection criteria
3. Elaborate the I/O units of Embedded System and communication using them.
4. Explain the Hardware software co-design in Embedded System.
5. Describe the fundamental concepts of Operating system and Real-Time Operating System.
6. Apply the programming and Debugging tools for Real-Time Operating System development.

Unit	Course: Advanced Microcontroller	No. of lectures required
Unit-I	Introduction to Embedded Systems : An Embedded System, Processor in the system, Other Hardware Units, Software Embedded into a System, Exemplary Embedded Systems	06
Unit-II	Processor and Memory Organization: Structural Units in a processor and there functions, Processor Selection for an embedded system, Memory Devices, Memory Selection for an Embedded system, Allocation of memory for program segments.	08
Unit-III	I/O Devices and communication: I/O Devices and communication on them, Timer and counting devices, Serial communication using I2C. CAN and USB, Parallel communication using ISA and PCI buses.	07
Unit-IV	Hardware Software Co-design: Fundamental Issues in Hardware Software Co-design, Computational Models in Embedded Design,	07

	Introduction to Unified Modelling Language (UML), Hardware Software Trade-offs	
Unit-V	Introduction of Real Time Operating System: Operating system Basics, Types of Operating Systems, Tasks Processes and Threads, Multiprocessing and Multitasking, Task Scheduling, Thread Processes and Scheduling, Task Communication, Task Synchronization.	08
Unit-VI	Real Time Operating System Programming Tools: Need of Well tested and debugged Real-Time Operating System (RTOS), Use of μ C/OS-II and function calls, Use of VxWorks and function calls.	06
Total		42

Text Books:

1. Raj Kamal , “ Embedded Systems: Architecture, Programming and Design” Tata McGraw Hill, 3rd Edition 2003
2. Shibu K. V. , “Introduction to Embedded Systems”, McGraw Hill Education,2009

Reference Books:

1. James W. S. Liu, “ Real Time Systems” , Pearson Education, India Low price edition
2. Jonathan Valvano, “ Embedded Systems: Real Time Operating System for ARM Cortex-M Microcontrollers” Vol-3, 4th Edition Jan 2017 Amazon

B.Tech. Eighth Semester (Information Technology)

Course Code	Course Title	L	T	P	C
8SNSM	Big Data Processing	03	00	00	03

Course Learning Objectives:

1. To describe the fundamentals, characteristics and challenges of Big Data.
2. To explain Big Data architecture, ecosystem and infrastructure requirements.
3. To discuss Hadoop framework, HDFS and MapReduce processing model.
4. To introduce Big Data storage techniques and NoSQL-based data management.
5. To elaborate Big Data processing paradigms & large-scale data processing approaches.
6. To explain Big Data applications, security issues and privacy challenges.

Course Outcomes:

After successful completion of this course, students will be able to

1. Explain Big Data concepts, characteristics and challenges.
2. Describe Big Data architecture, ecosystem and infrastructure.
3. Understand Hadoop framework, HDFS and MapReduce model.
4. Apply knowledge of NoSQL databases and Big Data storage techniques.
5. Explain Big Data processing paradigms and distributed processing approaches.
6. Identify Big Data applications, security issues and privacy challenges.

Syllabus

	Big Data Processing	L (Hrs)
Unit-1	Introduction to Big Data: Definition of Big Data, characteristics of Big Data, 5V's of Big Data, types of data (structured, semi-structured & unstructured), Big Data challenges, Big Data paradigm and applications of Big Data.	07
Unit-2	Big Data Architecture and Infrastructure: Big Data ecosystem, Big Data computing paradigms, Big Data infrastructure, data generation, data collection, data storage, data management and data processing requirements.	07
Unit-3	Hadoop Framework and MapReduce: Introduction to Hadoop, Hadoop architecture, Hadoop Distributed File System (HDFS), distributed storage, MapReduce Framework, Working of MapReduce with examples.	07
Unit-4	Big Data Storage and Management: Big Data Storage: NoSQL databases, types of NoSQL data models, scalable data management, Hadoop ecosystem	07

	components, Hive, Pig, HBase, and Big Data storage approaches.	
Unit-5	Big Data Processing Paradigms: Batch processing, stream processing, large-scale data processing frameworks, parallel and distributed processing, in-memory computing and Big Data processing platforms.	07
Unit -6	Big Data Applications, Security and Privacy: Big Data applications in different domains, Big Data security challenges, privacy issues, data protection and future directions of Big Data computing.	07
	Total	42

Text Book:

Rajkumar Buyya, Rodrigo Calheiros, Amir Vahid Dastjerdi, “Big Data: Principles and Paradigms”
Morgan Kaufmann / Elsevier

Reference Books

1. Radha Shankarmani, M Vijayalakshmi, “Big Data Analytics”, Wiley Publications
2. Arshdeep Bahga, Vijay Madisetti, “Big Data Science & Analytics: A Hands-On Approach” VPT
Seema Acharya, Subhashini Chellappan, “Big Data and Analytics” Wiley India

B.Tech. Eighth Semester (Industrial IoT)

Course Code	Course Title	L	T	P	C
8STSM	Internet of Things Security	03	00	00	03

Course Pre-requisite: Nil

Course Objectives:

1. Understand the IoT Security Landscape.
2. Develop Robust Security Management Skills.
3. Apply Authentication, Access Control & Protocol Security.

Course Outcomes:

After successfully completing the course, students will be able to:

1. Identify & Analyze IoT Security Threats.
2. Design Secure IoT Architectures.
3. Implement Identity & Access Management Solutions.
4. Classify & Mitigate IoT Attacks.
5. Secure Communication Protocols & Manage Keys.
6. Evaluate Standards & Real-World Solutions.

	Internet of Things Security	Lect Hrs.
UNIT I	Security Issues: Definition of IoT Security, overview of Security Issues, Data security, Infrastructure Security, IoT Security Challenges. IoT Security Requirements, Security in Enabling Technologies.	7
UNIT II	Security Management: Primary challenges in security maintenance, Confidentiality, Integrity, Availability, Non-Repudiation, Vulnerabilities, attacks, countermeasures, threat modeling, CPS attack vectors, IoT Security architectures.	7
UNIT III	Identity & Access control solutions for IoT : Identity lifecycle, Authentication credentials, IoT IAM infrastructure, Authorization with Publish/Subscribe schemes, Access control	7
UNIT IV	Attacks and Implementation of Internet of Things: Denial of Service, Sniffing, Phishing, DNS Hijacking, Pharming, Defacement, Firmware of the device, Web Application Dashboard , Mobile Application Used to Control, Configure and Monitor the Devices.	7
UNIT V	Security Protocols and Management: Firmware of the device, Web Application Dashboard , Mobile Application Used to Control, Configure and Monitor the Devices, Key Management	7
UNIT VI	Standards, Certification & Case Studies: IoT security frameworks (e.g. PSA Certified, SESIP/EN 17927), reference architectures; real-world case studies smart homes, healthcare, smart cities, industrial IoT	7
	Total	42

Text Book:

1. Russell, B. (2016). Practical Internet of Things Security. Packt Publishing Limited
2. FeiHu (2016). Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations. CRC Press

Reference Books:

1. Hersent, O., Boswarthick, D., & Elloumi, O. (2015). The Internet of Things: Key Applications and Protocols. Wiley
2. Introduction to IoT by Sudip Misra (Author), Anandarup Mukherjee (Author), Arijit Roy (Author)"Introduction to Industrial Automation" by S. K. Soni

B.Tech. Eighth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
8SMSM	Computer Integrated Manufacturing	03	00	00	3

Course Prerequisites:

1. Knowledge of production processes and manufacturing techniques

Course Learning Objectives:

CLO1. To apply technical knowledge of manufacturing processes to the fabrication of mechanical parts.

CLO2. To understand the various CAD/CAM and CNC processes.

CLO3. To understand the associatively between design and manufacturing.

Course Outcomes:

Students will be able to –

1. Explain the fundamentals of Computer-Aided Design (CAD), geometric modeling techniques, and transformations.
2. Describe the principles of Computer-Aided Manufacturing (CAM), automation systems, NC/CNC machines, and their applications in modern manufacturing industries.
3. Develop manual and computer-assisted CNC part programs using G-codes, M-codes.
4. Analyze the configuration, components, programming techniques, and industrial applications of robotic systems.
5. Illustrate the concepts of Group Technology (GT), Flexible Manufacturing Systems (FMS), and Computer-Aided Process Planning (CAPP) for improving manufacturing productivity.
6. Explain the architecture and components of Computer Integrated Manufacturing, automated inspection, ASRS, and AGV systems.

	Subject: Computer Integrated Manufacturing	L
UNIT I	Computer Aided Design: Fundamentals of CAD, Design process, Application of computer for Design, The design of workstation, Function of graphic package , constructing the geometry, Transformation (2D), wire frame , Surface , Solid modeling, Benefits of CAD.	7
UNIT II	Computer aided manufacturing:- Automation and its types, Numerical control, Basic concept, NC Control- point to point, Straight line, Continuous path control, Machine control unit, Drives in NC/CNC- Servo and Stepper motors, CNC & DNC types.	7

UNIT III	CNC Part Programming: Part programming manual, Computer assisted part programming, Programming formats, Programming codes, Programming for drilling, milling, turning. Programming with APT: MACRO statements, Subroutine and loops in programming.	7
UNIT IV	Robotics: Technical features of robots, Geometric configurations of robots, Robot anatomy, Arm geometry, End effectors, Drives system, sensors- tactile, proximity range finder, machine vision, work cell controller and interlocking sensor commands, programming technique for robot, Application of robots in manufacturing, Economic justification of robots (Payback, Returns on Investment methods).	7
UNIT V	Flexible Manufacturing System: Basic concept, group technology, part families, part classification and coding system, GT machine cells, Types of FMS, FMS layout configurations, Planning of FMS, Types of CAPP.	7
UNIT VI	Industry 4.0 and Smart Manufacturing: Introduction to Industry 4.0, Digital Twin and Digital Thread, Cloud Manufacturing, Big Data Analytics, Artificial Intelligence (AI) and Machine Learning (ML) in manufacturing, Predictive Maintenance, Smart Factory, Additive Manufacturing (3D Printing), Future trends in digital manufacturing.	7
	Total	42

Textbooks:

1. Production system, Automation and CIM, Mikell P. Groover, Pearson Publications.
2. CNC Machines; M.Adithan & B.S.Pabla; New Age International.
3. John W. Webb and Ronald A. Reis, “Programmable Logic Controllers: Principles and Applications”, 5th Edition, Prentice Hall Inc., New Jersey, 2003

Reference Books:

1. Robotics; Yarem Koren, Mcgraw Hill.
2. CAD/CAM/CIM ; Radhakrishnan & Subramaniam; New age International.
3. Computer aided Manufacturing; P.N.Rao, N.K.Tiwari and & T.K.Kundra; Tata Mcgraw Hill