



**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)
2025-26**

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 AY2024-25-26-27 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	3SXSM	Introduction to Internet of Things	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	CSE(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 Prerequisite: Basic knowledge of Programming.

Course Learning Objectives:

The course will enable the learners to:

1. To introduce the fundamental concepts and environment of R programming
2. To develop a solid understanding of R data types, structures, and control mechanisms
3. To explore data manipulation and functional programming concepts in R.

Course Outcomes:

1. Describe basics of R and environment setup to efficiently handle packages and perform input/output operations.
2. Explain R data types, variables, and operators to solve computational problems effectively.
3. Examine decision-making structures and loops in R to solve problems requiring control flow and iteration.
4. Investigate functions in R for specific tasks, and utilize string manipulation techniques proficiently.
5. Assess text manipulation, vector operations, and list and matrix handling in R to solve complex data manipulation tasks.
6. Design 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 Golemund, 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.

B.Tech. Third Semester (Civil Engineering)

Double Minors: Specialization Minor

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

Course Prerequisite : Nil

Course Learning 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	7

	standards, Municipal wastewater treatment systems, Water pollution control.	
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.

B.Tech Third Semester (Computer Science & Engineering)

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

Course Prerequisites: Basic Computer Literacy

Course Learning Objectives

- 1) To understand the hierarchical structure of HTML elements & set up an HTML document with basic elements.
- 2) To design a web page by embedding images, videos, and forms to enhance user engagement.
- 3) To gain hands-on experience by creating and managing HTML tables with different attributes, and working with lists to structure web content effectively.
- 4) To design HTML Forms for User Input

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

1. Understand the structure of HTML documents and familiarize with basic HTML tags
2. Implement various HTML elements, attributes, tags and list.
3. Describe a web page using different tags to insert images, videos.
4. Demonstrate HTML tables utilizing various attributes
5. Organize HTML forms, utilizing various input elements
6. Apply CSS styles to a document.

	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 Formatting, Non-breaking 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. HTML LISTING :HTML Unsorted List,The type attribute,HTML Sorted List,The type attribute,	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,Colsan and Rowspan Attribtute,Table background,Table Height & Width.	7
Unit 5	HTML FORMS: Form Attribute, Text Input Button,Password Button, Check box,Selection/Dropdown Button,Radio Button.	7
Unit 6	Introduction to CSS: Benefits of using CSS, Applying Style to a Document . Linking to a Style Sheet,Embedding Style Sheets, Importing Style Sheets , Inline Styles	7
	Total	42

TEXT BOOKS

1. HTML & CSS: The Complete Reference, Fifth Edition Thomas A.Powell, McGraw Hill Publication
2. Web Technology by Uttam k. Roy Department of Information & Technology.

REFERENCES

1. HTML Goodies 2nd Edition by JOE BURNS <https://www.htmlgoodies.com/author/joe-burns/>.
2. Beginners Guide to HTML by Michael Gabriel
https://www.webdesign.org/downloads/Beginners_Guide_to_HTML.pdf

B.Tech. Third Semester Double Minor: Embedded System

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 Learning Objectives:

This course will enable the students to:

1. To study the fundamental concepts of digital electronics and understand the operation of logic gates and logic families.
2. To apply Boolean algebra techniques for the minimization of logical expressions and analyze combinational logic circuits.
3. To understand the concept and working of sequential logic elements, particularly flip-flops.

Course outcomes:

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

1. Demonstrate the basics of Digital Techniques.
2. Apply the realization of Logic Gates for digital circuit.
3. Apply Boolean algebra for optimization of logical Function.
4. Understand the various Logic Families.
5. Illustrate the basics of Combinational logic circuits.
6. Understand the performance of **flip flops**.

Unit No.	Course: Fundamentals of Digital Electronics	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.	07
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.	07
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 expressions.	07

4	LOGIC FAMILIES: Specifications, noise margin, propagation delay, fan-in, fan-out, Transistor-Transistor Logic (TTL) NAND Gate, Emitter-Coupled Logic (ECL), CMOS Inverter.	07
5	COMBINATIONAL LOGIC CIRCUITS: Definition, Universal Properties of NAND Gate and NOR Gate, Pulse operation	07
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.	07
	Total	42

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**

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

	Subject: 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” 2 nd Edition, Alexis Leon, Mathews Leon, (Leon VIKAS)

e-Learning Resources:

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

B.Tech. Third Semester CSE(IoT)

Course Code	Course Title	L	T	P	C
3SXSM	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 & develop IoT design and implementation skills.
3. 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 Name : 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	PRODUCTION PROCESSES	03	00	00	03

Pre-requisites:

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

Course Learning Objectives:

- 1: To impart the pattern making and sand casting processes.
- 2: To learn the mechanical working of metals and allied processes.
- 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: Production Processes	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	Introduction of joining processes:- Mechanical joining processes, soldering, brazing Welding, Arc welding, Gas welding, Types and purpose of	6

V	Electrodes, TIG & MIG processes	
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 AY2024-25-26-27 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	4SXSM	Industrial Sensors and Actuators	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	CSE(IoT)
IV	4SMSM	Manufacturing Processes -II	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	Mechanical Engineering

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 Prerequisite: Basic Knowledge of Programming.

Course Learning Objectives:

The course will enable the learners to:

4. Develop GUI Applications Using JFC and Swing
5. Build Java Applications with Networking, JDBC, and XML Technologies
6. Create Web Applications Using Servlets and Java Server Pages (JSP).

Course Outcomes:

7. Write sophisticated, interactive user interfaces using the Java Swing class and appropriate layout managers.
8. Discuss Networking and Data base connectivity in Java for given application.
9. Illustrate webpage with dynamic content and server-side web application using Servlet and JSP.
10. Use web application framework JSF to build user interfaces.
11. Design dynamic web applications using Java technologies such as Servlets, JSP, and JSTL, incorporating database connectivity with JDBC for data manipulation and retrieval.
12. 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,	07

	Understanding DOM, Using DOM in Java, StAX in Java, Understanding StAX, Programming with StAX.	
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:

3. James Keogh, “Complete Reference J2EE”, Mc-Graw Publication.
4. 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.

B.Tech. Fourth Semester (Civil Engineering)

Double Minors: Specialization Minor

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

Course Prerequisite : Nil

Course Learning 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.

B.Tech Fourth Semester (Computer Science & Engineering)

Course Code	Course Title	L	T	P	C
4SKSM	Javascript	03			03

Course Prerequisites: Basic Scripting

Course Learning 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 web applications in the real world.

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

1. Recall and identify various JavaScript literal types
2. Explain type conversion mechanisms and operator behavior
3. Apply conditional and loop constructs to control program flow
4. Analyze JavaScript's inheritance patterns
5. Evaluate and construct modular JavaScript code using functions and arrays
6. Develop interactive web pages by manipulating the DOM.

	Subject: Introduction to HTML	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	7
Unit 2	Type Conversion: String Members, Explicitly Creating Wrappers, Converting a Value to Another Type , Operators: Introducing Operator Precedence and Associativity, Using JavaScript Operators	7
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 .	7
Unit 4	Member Inheritance : Creating Objects with a Constructor, Classical Inheritance , Prototypal Inheritance , Cloning Members ,Mixins.	7
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	7
Unit 6	Traversing and Modifying the DOM Tree , Scripting CSS, Listening for Events , Scripting BOM	7
	Total	42

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.

REFERENCES

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. Fourth Semester Double Minor: Embedded System

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. To illustrate the reduction of logical expressions using Boolean algebra and Karnaugh maps, and to design combinational logic circuits including code converters.
2. To understand and explain various memory types such as RAM, ROM, PROM, and EPROM, and explore the use of different types of registers in digital circuits.
3. To elaborate on the design methodology of synchronous sequential circuits using flip-flops.

Course Outcomes:

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

1. Simplify Combinational logic circuit using K-Map.
2. Design different Code converters.
3. **Analyze** and design MSI circuit using 74xx series chip.
4. **Understand working of various Memories.**
5. **Understand the basics of different registers.**
6. Apply the knowledge of flip-flops to design **Sequential logic circuits**

Unit No.	Course: Digital System Design	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.	07
2	Code Conversion: Binary to Grey, Binary to Excess-3, Binary to BCD, BCD to Grey, Excess-3 to Grey code.	07
3	Combinational Logic Circuits design using MSI 74xx ICs: Design Procedure, Adders: Half & full adder, Multiplexers, De-Multiplexers, Decoders, Encoders.	07
4	Memory devices: RAM, ROM, PROM, EPROM EEPROM, Combinational logic design using ROM, PAL & PLA.	07

5	Registers: Registers: SISI, SIPO, PISO, and PIPO. Shift Register: Bidirectional & Universal.	07
6	Counter: Types of Counters, 3 bit Synchronous and Asynchronous counters (Up Counter, Down Counter & UP-Down Counter), Ripple counters.	07
	Total	42

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, its purpose and its 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, its purpose and its 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

	Specialization Minor Course Name: 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 CSE(IoT)

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

Pre-Requisite: NIL

Course Objectives:.

1. Understand and Analyze Sensor Fundamentals.
2. Master Operation & Application of Diverse Sensors and Transducers.
3. Design and Select Appropriate Actuation Systems.

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: - 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. 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 on lathe, drilling & Boring machines
- 3: To learn working principles & applications of Grinding machine, shaper, planer & miller

Course Outcomes:

1. Understand & 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, orthogonal and oblique cutting, Mechanics of chip formation, Tool materials, Cutting tool classification, Tool life, Tool wear, machinability, Cutting fluids	7
UNIT II	Lathe Machine: Types of lathe machine, Construction, and Operations of centre lathe, accessories of centre lathe- Work holding, supporting, and driving devices & Cutting tool holding devices, Introduction of capstan & turret lathe	7
UNIT III	a) Drilling Machines: Types of drilling machines, general purpose, Mass production and special purpose drilling M/cs. b) Boring Machines:- Types of boring machines, construction working & applications of Horizontal, Vertical and jig Boring Machines	7
UNIT IV	Milling Machines: - Types of milling machine, up milling vs down milling, Types of Milling Cutters, applications of milling machines	7
UNIT	Grinding Machines: Types of grinding machines, construction & working of Bench grinders, surface grinders, centreless grinders, selection of	7

V	grinding wheels, Dressing & Truing of grinding wheels	
UNIT VI	Shaper, Planer, Slotter: Types of shaper machines, construction , working & applications of various shaper machines Types of Planer machines, construction , working & applications of Planer machines Construction , working & applications of Slotter machines	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 Choudhaury 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.