



**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
Multidisciplinary Minor (MDM)
2024-25**

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 *MULTI-DISCIPLINARY MINOR (MDM) BASKET OF COURSES for 4th Semester

Track Name	Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
				Hours / Week			MDM 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					
Artificial Intelligence	IV	4SAMDM1	Artificial Intelligence and Expert Systems	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
Data Science	IV	4SAMDM5	Programming for Data Science	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
Civil Engineering	IV	4SCMDM1	Introduction to Environmental Engineering	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
Construction Technology	IV	4SCMDM5	Building Planning	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
Computer Science and Engineering	IV	4SKMDM1	Fundamentals of Data Structures	3	--	--	CE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
Software Engineering	IV	4SKMDM5	Software Requirements Engineering	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
Electronics and Communication Engineering	IV	4SEMDM1	Electronic Instrumentation	3	--	--	AI&DS, CE, CSE, IT, IIoT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
Telecommunica-tion Engineering	IV	4SEMDM5	Basic Electronic Communication Systems	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
Information Technology	IV	4SNMDM1	Data Transmission and Information Technology	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
Cyber Security	IV	4SNMDM5	Introduction to Cyber Security	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
IoT	IV	4SXMDM1	Fundamentals of IoT	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	CSE(IoT)
Mechanical Engineering	IV	4SMMDM1	Energy Engineering	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Mechanical Engineering
Robotics and Automation Engineering	IV	4SMMDM5	Mechatronics	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Mechanical Engineering

* indicates that the Track for MDM will be decided by respective Board of Studies (BoS)

B.Tech. Fourth Semester (Artificial Intelligence and Data Science)
Multidisciplinary Minor (Track: Artificial Intelligence)

Course Code	Course Title	L	T	P	C
4SAMDM1	Artificial Intelligence And Expert Systems	03	00	00	03

Course Objectives:

The course will enable the learners to:

1. Understand the role of intelligent agents, perception, natural language processing, and various search strategies in AI.
2. Familiarize about adversarial search, decision-making processes, and logical reasoning using propositional and first-order logic
3. Master the concepts of uncertainty, probability notation, and probabilistic reasoning to make decisions under uncertainty.
4. Explore planning problems, partial order planning, and strategies for non-deterministic domains.
5. Develop decision trees, neural networks, and reinforcement learning techniques for knowledge acquisition.
6. Gain proficiency to Define expert systems, their features, and knowledge representation methods, and study specific expert systems like Prospector and MYCIN.

Course Outcomes:

1. Describe intelligent agents and apply uniformed and informed search strategies to solve problems in AI.
2. Analyze to Implement adversarial search techniques, make decisions using logical reasoning, and perform inference in first-order logic.
3. Synthesize probability theory and Bayes' rule to perform probabilistic reasoning and make decisions in uncertain environments.
4. Develop and implement plans using partial order planning and address challenges in nondeterministic environments.
5. Construct decision trees, apply neural networks, and use reinforcement learning methods for effective learning and decision-making.
6. Evaluate expert systems and their components, and apply knowledge representation techniques using tools like MYCIN.

	Subject: (4SAMDM1) Artificial Intelligence and Expert Systems	L
Unit-1	Introduction to AI: Intelligent agents – Perception – Natural language processing – Problem – Solving agents – Searching for solutions: Uniformed search strategies, Informed search strategies.	07
Unit-2	Knowledge and Reasoning: Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first order logic.	07
Unit-3	Uncertain Knowledge and Reasoning: Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye’s rule – Probabilistic reasoning – Making simple decisions.	07
Unit-4	Planning: Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains.	07
Unit-5	Learning: Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.	07
Unit-6	Expert Systems: Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.	07
	Total	42

Text Book:

1. Stuart Russel and Peter Norvig, “Artificial Intelligence A Modern Approach”, Second Edition, Pearson Education, 2003 / PHI.
2. Donald A. Waterman, “A Guide to Expert Systems”, Pearson Education.

Reference Books:

1. George F. Luger, “Artificial Intelligence – Structures and Strategies for Complex Problem Solving”, Fourth Edition, Pearson Education, 2002.
2. Elain Rich and Kevin Knight, “Artificial Intelligence”, Second Edition Tata McGraw Hill, 1995.
3. Janakiraman, K. Sarukesi, “Foundations of Artificial Intelligence and Expert Systems”, Macmillan Series in Computer Science.
4. W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall of India, 2003

B.Tech. Fourth Semester (Artificial Intelligence and Data Science)
Multidisciplinary Minor (Track: Data Science)

Course Code	Course Title	L	T	P	C
4SAMDM5	Programming for Data Science	03	00	00	03

Course Objectives:

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

1. Understand a strong foundational understanding of the Python programming language including its basic concepts.
2. Discuss Python data types, operators, and control flow structures.
3. Learn decision-making structures and loops in Python for control flow and iterative tasks.
4. Gain proficiency in working with strings, functions, and various data structures such as lists, tuples, and dictionaries.
5. Acquire skills in file handling, data manipulation using Pandas and NumPy, and object-oriented programming principles.

Course Outcomes:

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

1. Define the basic concepts of Python, including variables, data types, and operators.
2. Explain different string manipulation techniques and functions.
3. Use different data structures in python to perform various operations on data.
4. Implement the concepts and procedures of file handling in Python for real-world scenarios.
5. Utilize the Pandas library to manipulate and analyze data effectively.
6. Demonstrate the application of object-oriented programming principles in Python.

	Subject: (4SAMDM5) Programming for Data Science	L
Unit-1	Introduction: Basic concepts of Python, Difference between core Python and advanced Python, Variables, Data types, Operators, Conditional Statements, Control Statements, Looping statement: while loop, for loop nested loops.	07
Unit-2	Strings and Functions Strings: String Manipulation, Accessing Strings, Basic Operations, String slices. Function: Functions, defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Add documentation to functions using docstrings.	07

Unit-3	Data Structures in Python: Lists, Tuple, Dictionaries: Introduction, accessing data structure, operations related to data structure, working with data structures, function related to data structure and advance data structure.	07
Unit-4	Working with Data in Python: NumPy library and Manipulation of Data with Pandas, Install Python 3 and set up your programming environment, Run and edit python scripts, Interact with raw input from users, Find and use modules in Python Standard Library and third-party libraries.	07
Unit-5	File Handling: Opening and closing file, Reading and writing files, Date and Time with its functions, Introduction to Modules and packages, Identify and handle errors and exceptions in your code.	07
Unit-6	Classes, Objects and Django Concepts: Overview of OOP, Class Definition, Creating Objects, Objects as Arguments, Objects as Return Values, Builtin Class Attributes, Inheritance, Overloading, Overriding, Data hiding, Introduction to Django Framework and it's uses.	07
	Total	42

Text Book:

1. Martin C Brown, —Python: The Complete Reference, McGraw Hill
2. Mueller, J., & Massaron, L. (2019). Python for data science. 2nd edition. Hoboken, NJ, John Wiley & Sons, Inc

Reference Books:

1. Michał Jaworski, Tarek Ziadé, —Expert Python Programming, Packt Publishing Ltd., Third Edition, ISBN, 9781789808896, 2019 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.
2. Larry Lutz, —Python for Beginners: Step By Step Guide to Learning Python Programming, CreateSpace Independent Publishing Platform, First edition, ISBN, 1717410588, 9781717410580, 2018.
3. Nicholas Ayden, —Python Programming, Independently Published, First Edition, ISBN, 1707051933, 9781707051939, 2019.

B.Tech. Fourth Semester (CIVIL)

Course Code	Course Title	L	T	P	C
4SCMDM1	Introduction to Environmental Engineering	3	0	0	3

Course Objectives:

1. The water requirements and their estimation.
2. The different processes of water treatment.
3. Detailed study of solid wastes and air pollution.

Course Outcomes:

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

1. Explain the concept of water treatment.
2. Classify the different processes related to water treatment and wastewater treatment.
3. Apply knowledge to overcome the problem of air pollution and solid waste.
4. Discover knowledge regarding characteristics of solid waste.
5. Discover knowledge regarding air pollution and its effects.
6. Discover knowledge regarding noise pollution.

	Subject: Introduction to Environmental Engineering	L
Unit-1	Quantity Estimation of Water - Demand of water. Consumption for various purposes. Fire Demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population. Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.	7

Unit-2	Water quality - Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis- physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works.	7
Unit-3	Water Treatment Processes - Aeration, Sedimentation, Flocculation, Filtration and Disinfection, working, their uses, maintenance.	7
Unit-4	Characteristics of solid waste - Physical, chemical and biological analysis. Collection of solid waste:- Types of collection system and services, frequency of collection, methodology involved in setting up collection bins. Disposal of solid wastes:- Different methods, sanitary landfill, composting, incineration.	7
Unit-5	Air Pollution - Air pollution: Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources.	7
Unit-6	Noise Pollution - Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise	7
Total		42

Text Book:

1. “Water Supply and Sanitary Engineering” by Birde G. S., Dhanpat Rai and Sons, Delhi.
2. “Water Supply Engineering”. By Punmia B. C. Laxmi publication.
3. Water Supply Engineering, by Garg S.K. Khanna Publishers.

References:

1. “Water Supply and Sewerage” by Steel E. W, Mc-Graw Hill.
2. “Water Supply Engineering”, by Kshirsagar S. R., Roorkee Pub house, Roorkee

Course Code	Course Title	L	T	P	C
4SCMDM5	Building Planning	3	0	0	3

Course Objectives:

1. Concepts related to building components and foundation.
2. Application and use of different building components.
3. Application of different masonry.
4. Understand need of engineering drawings and methods to draw it.
5. Learn about various planning principles and able to apply on residential buildings.
6. Know regional rules regulation related to building construction.

Course Outcomes:

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

1. Understand Load bearing and Frame structure.
2. Know the types of staircase, doors, windows and other related fixtures.
3. Recognize the various bonds in brick masonry.
4. Understand layout of civil Engineering Drawing.
5. Plan Residential building using different principal of planning.
6. know about Bylaws, Town development authority rules and terms

	Subject: Building Planning	L
Unit-1	Types of Buildings - Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages. Foundation: Definition and necessity, loads on foundation. Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls & columns and Raft foundations.	7
Unit-2	Building Components - Stairs: Functions, technical terms and types of staircases, Types of Floors: Basement floor, ground floor and upper floors, Roofs: Flat & pitched roof, steel roof trusses – types and suitability, Doors: Purpose, size of door, door frames & its types, Windows: Purpose, types of windows & their suitability.	7

Unit-3	Brick Masonry - Classification of bricks, tests on bricks, properties of burnt bricks, Brick masonry construction: Technical terms, general principles, commonly used types of bonds and their suitability.	7
Unit-4	Building drawing - Importance of building drawing for Civil Engineering in construction & industry, estimation, Selection of scales for various drawings. Types of line and their application. Methods of dimensioning in architectural drawing. Abbreviations and graphical symbols used in Civil Engineering Drawing as per IS: 962. Layout of sheet for civil engineering drawing. Requirements of drawing and documents as per plan sanctioning authorities. Define FSI and TDR.	7
Unit-5	Planning of residential building - Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement. Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post-office (On Graph Paper).	7
Unit-6	Building Bye-laws - Building Bye-laws and Development Control Rules for D Class Municipal Corporations in the Maharashtra State under the provisions of the Maharashtra Regional. Conversion of land to nonagricultural lands, layout for a housing project. Types of public building and their requirements, planning of public building.	7
Total		42

Text Books:

1. Sushilkumar: Building Construction, Standard Publishers Distributors.
2. Shah, Kale & Patki, Building Planning & Drawing, Tata McGraw-Hill publication

Reference Books:

1. Mackay W.B.: Building Construction, Vol. I, Longmans.
2. Punmia B.C.: Building Construction.

Course code	Course Title	L	T	P	C
4SKMDM1	Fundamentals of Data Structures	03	00	00	03

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes:

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

1. Describe basics of Data Structures and algorithms.
2. Explain Data Structures array and link list.
3. Illustrate with example stack and queues operations.
4. Examine the binary tree traversal methods.
5. Construct Graph and shortest path algorithm in graph.
6. Inspect various sorting and searching techniques.

	Subject: Fundamentals of Data Structures	L
Unit 1	Introduction to Data Structures: Introduction to Algorithms and Data Structures, Algorithms, Asymptotic Notation, Introduction to Data Structures, Types of Data Structures, Data Structure Operations.	07
Unit 2	Array & Linked List: Arrays: Introduction, Types of Arrays, Representation of One-Dimensional Array in Memory, Array Traversal, Insertion and Deletion, Linked List: Introduction, Linked Lists - Basic Concept, Types of Linked List.	07
Unit 3	Stack and Queue: Stacks: Introduction to Stacks, Stack Operations. Queues: Introduction, Queues - Basic Concept, Queue Operations, Basics of Circular Queues and Priority Queues.	07
Unit 4	Trees: Introduction, Basic Concept, Binary Tree, Binary Tree Representation, Binary Tree Traversal.	07

Unit 5	Graphs: Introduction, Basic Concept, Graph Terminology, Graph Implementation and Graph Traversal.	07
Unit 6	Sorting and Searching: Introduction, Sorting Techniques: Selection Sort, Insertion Sort, Bubble Sort. Searching Techniques: Linear Search, Binary Search.	07

Text Books:

1. "Data Structures" by Seymour Lipschutz, Schaum's Outline Series, McGraw-Hill, International Editions.
2. "An Introduction to Data Structures with Applications" by Trembley, Sorenson, McGraw Hill.

Reference Books:

1. "Fundamentals of Data Structures" by Ellis Horowitz, Sartaj Sahni, CBS Publications.
2. "Data Structure Using C" by Balagurusamy.
3. "Data Structures in Java" by Standish, Pearson Education.

Course code	Course Title	L	T	P	C
4SKMDM5	Software Requirement Engineering	03	00	00	03

Course Objectives:

1. To gain a clear understanding of Requirement Engineering (RE), its definition, and its pivotal role in software development.
2. To differentiate between Functional and Non-Functional requirements, and comprehend their significance in software specification and design.
3. To learn the RE Process
4. To develop proficiency in various techniques such as Interviews, Surveys, Workshops, Observations, and Stakeholder Analysis for effective requirement elicitation.

Course Outcomes:

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

1. Define Requirement Engineering and explain its importance in software development.
2. Summarize various techniques for requirement elicitation such as Interviews, Surveys, and Workshops.
3. Apply techniques for analyzing and prioritizing requirements based on given criteria.
4. Create structured requirement specification documents, including Use Case Specifications and User Stories.
5. Analyze and critique different techniques for validating requirements, such as Prototyping and Review Processes.
6. Evaluate tools and strategies for managing changes to requirements

	Subject: Software Requirement Engineering	L
Unit 1	Introduction to Requirement Engineering , Definition and Importance of Requirements, Role of Requirement Engineering in Software Development, Types of Requirements: Functional vs Non-Functional, Requirements Engineering Process and Lifecycle	07
Unit 2	Requirement Elicitation : Techniques for Elicitation: Interviews, Surveys, Workshops, Observations, Stakeholder Identification and Analysis, Elicitation Challenges and Solutions, Use Case Modeling and Scenarios	07
Unit 3	Requirement Analysis : Analyzing and Prioritizing Requirements, Requirement Classification and Categorization, Conflict Resolution and Negotiation, Quality Attributes of Requirements	07
Unit 4	Requirement Specification , Writing Clear and Unambiguous Requirements, Requirements Specification Documents: Structure and Content, Use Case Specification, User Stories and Acceptance Criteria	07
Unit 5	Requirement Validation , Techniques for Validating Requirements, Review and Inspection Processes, Prototyping for Validation, Traceability and Change Management	07
Unit 6	Requirement Management , Managing Changes to Requirements, Requirement Traceability and Tracking, Tools for Requirement Management, Version Control and Configuration Management	07

Text Books:

- 1) "Software Requirements" by Karl Wieggers and Joy Beatty
- 2) "Requirements Engineering: From System Goals to UML Models to Software Specifications" by Axel van Lamsweerde
- 3) "Mastering the Requirements Process" by Suzanne Robertson and James Robertson

B.Tech. MDM Track 1: Electronics and Communication Engineering

Course Code	Course Title	L	T	P	C
4SEMDM1	ELECTRONIC INSTRUMENTATION	03	00	00	03

Pre-requisites: Basic Mathematics

Course Objectives: This course will enable the students to

1. Learn the characteristics of various types of measurement systems and errors in measuring instruments
2. Understand characteristics of Transducers and Bridges
3. Analyze the circuits for the measurement of Resistance, Capacitance, Inductance, and Frequency
4. Impart with the basic concepts of CRO and its usage for the measurement of various parameters
5. Understand the signal generator circuits for the generation of various waveforms
6. Understand the importance of Display Devices and Recorders in practical fields

Course Outcomes: At the end of the course students will be able to:

CO1: Analyze instrument characteristics, errors and generalized measurement system

CO2: Analyze characteristics of Transducers and Bridges

CO3: Use the Ammeters and Voltmeters for the measurement of R, L, C, F, I, V etc.

CO4: Use the CRO and DSO for measurement

CO5: Elaborate signal generator circuits for the generation of various waveforms CO6:

Understand and use different display devices and recorders

Unit No.	Content	No. of Lectures Required
1	Measurements and Statistical Parameters With Measurement Errors: Measurements: introduction, Significance of measurements, methods of measurements, instruments and measurement systems. Static characteristics: Accuracy, Precision, Sensitivity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean Average deviation Standard deviation. Probable error, Histogram.	06
2	Transducer classification: Active/Passive. Primary/Secondary. Analog/ Digital and transduction Principles. Basic Signal conditioning Circuits. Current/Voltage Sensitive Wheatstone bridges.	06

3	Ammeters, Voltmeter and Mustimeters: Introduction, DC ammeter principle, DC voltmeter, Loading, Peak responding and True RMS voltmeters. Digital Voltmeters: Dual slope integrating type (V–T), integrating type (V–F). Digital Instruments: Block diagram of a Basic Digital Multi- meter.	06
4	Oscilloscopes: Block diagram and working of Dual beam and dual trace CRO. Analog Storage Oscilloscopes: Block diagram and working of each CRT, Need for trace storage, bi-stable storage CRT, Variable persistence storage CRT. Digital storage oscilloscopes: Basic DSO operation.	06
5	Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator.	06
6	Display Devices and Recorders: Segmental Displays: Seven segmental display, dot matrices, LED and LCD. Recorders: Recording requirements, analog recorders- Graphic recorders, strip chart recorders, X-Y recorder, Magnetic & Digital tape recorders.	06
Total		36 – Lectures

Text Books:

1. “Electronic Instrumentation”, H. S. Kalsi, TMH, 2004 (Module- 2, 3 & 4)
2. “Electronic Instrumentation and Measurements”, David A Bell, PHI / Pearson Education 2006/ Oxford Higher Education, 2013. (Module 1 & 3)
3. Electrical and Electronic Measurements and Instrumentation – A. K. Sawhney, 17th Edition (Reprint 2004), Dhanpat Rai & Co. Pvt. Ltd., 2004. (Module- 1 & 5)

Reference Books:

1. “Principles of Measurement Systems”, John P. Beatley, 3rd Edition, Pearson Education, 2000
2. “Modern Electronic Instrumentation and Measuring Techniques”, Cooper D & A D Helfrick, PHI, 1998.

B.Tech. MDM Track 2: Telecommunication Engineering

Course Code	Course Title	L	T	P	C
4SEMDM5	Basic Electronic Communication Systems	03	00	00	03

Pre-requisites:

Applied Physics

Course Objectives:

This course will enable the students to:

1. Understand the basics of Electronic Communication System
2. Elaborate the AM transmitter working
3. Explain the working of AM receiver and its parameters
4. Understand the working of FM transmitter and receiver
5. Discuss basic building blocks of digital communication system
6. Explain and analyze different digital modulation techniques

Course outcomes:

At the end of the subject the students will be able to:

CO1. Demonstrate the basics of Electronic Communication systems

CO 2. Understand the working of AM transmitter

CO 3. Demonstrate the working of AM receiver

CO 4. Demonstrate the working of FM transmitter and receiver

CO 5. Understand basic building blocks of digital communication system and formatting of digital signal

CO 6. Analyze the performance of different digital modulation techniques

Unit No.	Content	No. of Lectures Required
1	Electronic Communication System: Introduction Basic block diagram of Communication System, Modulation, Need for Modulation, Noise: Internal and external Noise. (No numerical expected)	06
2	AM Transmitter: Amplitude Modulation Theory, Frequency Spectrum of AM, Representation of AM, Mathematical Expression of AM wave (derivation, Fundamental numerical). Definitions of Modulation Index, SNR.	06
3	AM Receiver: TRF Radio Receiver, Block diagram of Superheterodyne radio Receiver, Comparison. Definitions of Selectivity, Sensitivity and Fidelity	06

4	FM Transmitter and Receiver: Frequency Modulation Theory, Frequency Spectrum of FM, Wideband and Narrowband FM. Advantages of FM over AM. FM Receiver block diagram, Single Slope detector and foster seelay discriminator.	06
5	Digital Communication System: Sampling Theorem, Nyquist criteria, Types of sampling. Functional Blocks of Digital Communication System, Line Coding: Need and properties of Line Coding, Types of Line Coding.	06
6	Digital Modulation: ASK, FSK, PSK, QPSK generation and reception, Comparison of various Digital modulation systems.	06
	Total	36 – Lectures

Text Books:

1. Electronic Communication Systems, George Kennedy and Bernard Davis, Fourth Edition. Tata McGraw Hill Publishing Company Ltd.
2. Analog and Digital Communication Engineering, J. S. Chitode, Technical Publications.
3. Shanmugam K.S., “Digital & Analog Communication Systems”, John Wiley & Sons, New York, 1996.
4. Lathi B. P., “Modern Digital and Communication Systems”, Holt Rinchart and Winston Inc., New York, 1993.
5. Simon Haykin, “Digital Communication”, John Wiley and Sons, Pvt. Ltd., Singapore.

Reference Books:

1. Communication Systems, 3rd Edition, Simon Haykin, John Wiley & Sons.
2. Telecommunications Principles Circuits Systems and Experiments, S. Ramabhadran, Khanna Publishers, Sixth Edition, 1997.
3. Wayne Tomasi, “Electronic Communication Systems” Pearson Education, (Fifth Edition).
4. Wozencraft J. M. and Jacobs I. M., “Principles of Communication Engineering” John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., “Digital Communication”, Kluwer Academic Publishers, 2004.

B. Tech. Fourth Semester

Multidisciplinary Minor Course (MDM1)

IT Department Track 1: Information Technology

Course Code	Course Title	L	T	P	C
4SNMDM1	Data Transmission and Information Technology	03	00	00	03

Course Prerequisite: Nil

Course Learning Objectives: -

Students will

1. Learn the digital domain
2. Discuss fundamentals of computer hardware & software
3. Discuss concept of digital multimedia
4. Learn about the transmission of Information
5. Learn the basics of computer networking
6. Learn the telephony & wireless multimedia

Course Outcomes:

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

1. Know the digital domain
2. Understand the computer hardware and software
3. Explain the concept of digital multimedia
4. Describe the transmission information system
5. Summarize the OSI model and concepts of networking
6. Understand the telephony & wireless multimedia

Syllabus

	Course Title: Data Transmission and Information Technology	L (Hrs)
Unit-1	Introduction to Information Technology: Information Technology, Understanding the Digital Domain, Representing Number and Text in Binary and Hexadecimal number system.	07
Unit-2	Fundamentals of Computers: Computer Hardware, Introduction, Digital Logic, Fundamentals components, Factors that affect performance, Inside a Typical computer, Types of Computer & Applications, Storage Technologies. Software, Introduction, Programming Languages, Types of Software, Software Development process, Open-source software.	07
Unit-3	Creating Digital Multimedia: Creating sound, Amplitude, Frequency and Phase properties of Sound. Digitizing Sound, Analog to Digital Conversion, Pulse code Modulation, Nyquist Sampling Theorem, Quantization Error. Digital Image and Video Formats	07
Unit-4	Transmission of Information: Fundamentals of Communications, Fiber Optics, Wireless Communication.	07
Unit-5	Introduction to Computer Networking: LAN, WAN, Communication Protocols, OSI model, TCP/IP Protocol Suite.	07
Unit -6	Telephony and Wireless Multimedia: The Telephone System, Public Switched Telephone Network, Transmission Facilities, Switching, Telecommunications Principles, PCM, Multiplexing, FDM, TDM, WDM, Wireless Multimedia Devices	07
	Total	42

Recommended Text Book :-

1.Introduction to Information Technology, by Pelin Aksoy, Laura DeNardis. Course Technology, Cengage Learning.

Reference Books:-

1. Introduction to Information Technology, ITL Education Solutions Ltd. Pearson Education
2. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, fifth Edition, Pearson Education.
3. William L. Schweber: “Data Communication”, Mc-graw Hill.

B. Tech. Fourth Semester
Multidisciplinary Minor Course (MDM1)
IT Department Track 2: Cyber Security

Course Code	Course Title	L	T	P	C
4SNMDM5	Introduction to Cyber Security	03	00	00	03

Course Prerequisite: Nil

Course Learning Objectives: - Students

will

1. Understand the fundamental components of computer, network, and information security.
2. Identify various security threats, vulnerabilities, and encryption techniques used in cybersecurity.
3. Discuss the management principles, risk assessment, and compliance with security laws and standards.
4. Learn the essentials of information and network security, including IDS/IPS, firewalls, VPNs, and security in multimedia networks.
5. Understand the principles of secure system design, application security, and secure data handling techniques.
6. Identify vulnerabilities in operating systems and wireless networks, and implement appropriate security measures.

Course Outcomes:

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

1. Implement effective security policies and utilize access control matrices to enhance information security practices.
2. Apply cryptographic methods and tools to secure communication and data transmission effectively.

3. Use robust security policies and procedures to ensure organizational compliance and resilience.
4. Implement comprehensive security measures across diverse computing platforms and network environments.
5. Develop and deploy secure operating systems, applications and database solutions to mitigate cybersecurity risks.
6. Manage and secure operating systems and wireless networks to protect against emerging cybersecurity threats.

Syllabus

	Course Title: Introduction to Cyber Security	L (Hrs)
Unit-1	Basics of Communication Systems: Transmission Media, Topology and Types of Networks, TCP/IP Protocol Stacks, Wireless Networks, The Internet, Information Security Overview: Background and Current Scenario, Types of Attacks, Goals for Security, E-commerce Security, Computer Forensics, Steganography.	07
Unit-2	Security Threats, Vulnerabilities, Cryptography & Encryption: Overview of Security threats, Weak / Strong Passwords and Password Cracking, Insecure Network connections, Malicious Code, Programming Bugs, Cyber crime and Cyber terrorism, Information Warfare and Surveillance, Introduction to Cryptography / Encryption, Digital Signatures, Public Key infrastructure, Applications, Tools and techniques.	07
Unit-3	Security Management and Security Laws: Overview of Security Management, Information Classification Process, Security Policy, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices, Security Assurance, Security Laws, IPR, International Standards, Security Audit, SSE-CMM / COBIT etc	07
Unit-4	Information and Network Security: Overview of Identification and Authorization, Overview of IDS, Intrusion Detection Systems and Intrusion Prevention Systems, User Management, Overview of Firewalls, Types of Firewalls, DMZ and firewall features, VPN Security, Security in Multimedia Networks, Various Computing Platforms: HPC, Cluster and Computing Grids, Virtualization and Cloud Technology and Security.	07
Unit-5	System and Application Security: Designing Secure Operating Systems, Controls to enforce security services, Information Security Models, Desktop Security, email security: PGP and SMIME, Web Security: web authentication, SSL and SET, Database Security.	07

Unit -6	Wireless Network and OS Security: OS Security Vulnerabilities, updates and patches, OS integrity checks, Anti-virus software, Configuring the OS for security, OS Security Vulnerabilities, updates and patches, Components of wireless networks, Security issues in wireless.	07
	Total	42

Recommended Text Book :-

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies “Security in Computing ” Prentice Hall, 5th edition
2. Behrouz A Fourouzan, Debdeep Mukhopadhyay “Cryptography and Network Security ” McGraw Hill, 2nd Edition
3. William Stallings “Cryptography and Network Security: Principles and Practice ” Pearson, 5th edition

B.Tech. Fourth Semester (CSE(IoT))

Course Code	Course Title	L	T	P	C
4SXMDM1	Fundamentals of IoT	03	00	00	03

Pre-Requisite: Nil

Course Objectives:

1. To Understand fundamentals of IoT, including its definitions, characteristics, and architectures, with enabling technologies in IoT and various IoT applications.
2. To explore the predecessors of IoT and understand the emergence of IoT through concepts such as Wireless Sensor Networks, Machine-to-Machine Communications, and Cyber Physical Systems.
3. To provide a foundation in networking basics and network security, focusing on addressing, TCP/IP transport layer, and security measures relevant to IoT.
4. To understand IoT architecture, including state-of-the-art models, reference architectures, and deployment considerations.
5. To introduce students to IoT communication protocols transport protocols, sensor network topologies.
6. To explore real-world IoT applications such as Smart Home automation, Agricultural Systems, and Smart Parking.

Course Outcomes:

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

1. Understand the foundational concepts of IoT, including its definitions, characteristics, and architectures and comprehend the knowledge of various IoT applications across different domains.
2. Comprehend the knowledge about the predecessors of IoT and understand the IoT related concepts such as M2M, CPS, and WoT, and appreciate the technological dependencies shaping IoT ecosystems.
3. Acquire skills in networking basics and network security relevant to IoT, including addressing, TCP/IP transport layer, and security protocols.
4. Understand IoT architectures, including state-of-the-art models and reference architectures, and understand deployment considerations.
5. Understand IoT communication protocols such as MQTT, CoAP, and transport protocols like BLE and Li-Fi, sensor network topologies.
6. Demonstrate practical understanding real-world IoT applications such as Smart Home automation, Agricultural Systems, and Smart Parking.

	Course : Fundamentals of IoT	L
Unit-1	Introduction to IoT: Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures Enabling Technologies in IoT, IoT Applications, IoT Challenges	07
Unit-2	Predecessors & Emergence of IoT: Introduction, Wireless Sensor Networks, Machine-to-Machine Communications, Cyber Physical Systems, Architectural components of CPS, IoT versus M2M, IoT versus CPS, IoT versus WoT, Enabling IoT and the Complex Interdependence of	07
	Technologies, IoT Networking Components, Addressing Strategies in IoT	
Unit-3	Basics of Networking & Basics of Network Security: Network Types, Layered Network Models, Addressing , Internet of Things TCP/IP Transport layer, Security ,Network Confidentiality, Cryptography, Message Integrity and Authenticity, Digital signatures, Key Management, Internet Security & Firewall.	07
Unit-4	Unit IV: IoT Architecture -State of the Art Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model, and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View	07
Unit-5	IoT Communication Protocols: Messaging Protocols: MQTT, CoAP, XMPP; Transport Protocols: Introduction of BLE, Introduction to Li-Fi, Basics of Sensor Network Topologies: Point to Point Topology, Mesh topology, Ring topology, Star Topology	07
Unit-6	Applications of IoT: Overview, Block Diagram and Working of real world IoT applications : Smart Home automation, Agricultural System and Smart Parking	07
Total		42

Text Books:

1. David Hanes, Gonzelo Salgueiro, Patrick Grossetete, Robert Barton, and Jerome Hentry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, Cisco Pres, 2017.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applicationsand Protocols”, Wiley, 2012.
3. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press,2012.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet ofThings”, Springer, 2011.

Reference Books:

1. Vijay Madisetti 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’Reily Media, 2011, ISBN: 978-1- 4493-9357-1

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SMMDM1	Energy Engineering	03	00	00	03

Pre-requisites:

1. An introductory background of physics is needed.
2. An introductory background of chemistry is needed.

Course Learning Objectives:

- 1: To study the power generation scenario.
- 2: To study the components and working principle of power generation systems.
- 3: To study the Impact of Energy on Environment.

Course Outcomes:

At the end of course, Learner will be able to

1. Understand the Present Energy Scenario.
2. Analyze thermal & gas turbine power plant.
3. Analyze Nuclear & Hydro power plant.
4. Understand the concepts of Renewable energy plants.
5. Understand Non Conventional Energy Systems.
6. Understand the Impact of Energy on Environment

	Subject: Energy Engineering	L
UNIT I	Introduction to Energy: Energy and Development, Present Energy Scenario: World, India, Maharashtra and future prospects. Energy forms and Conversions, Energy and Power, Dimensions and unit of energy and power	7
UNIT II	Steam Power Plant: Layout, site selection, disposal of ash and dust, major plant components: Boiler, Turbine, condensers, pump and cooling towers	7
UNIT III	Nuclear Power Plants: Location, component of nuclear plants, types of reactors, Uranium enrichment, safety, disposal of nuclear waste, comparison with thermal plants	7
UNIT IV	Solar Power Plant: flat plate collector, solar ponds, parabolic solar collector, heliostat, solar chimney, SPV cell based plants: working principal, solar photovoltaic systems, applications	7

UNIT V	Non Conventional Energy Systems Tidal Power Plant: components, single basin and double basin systems, wind power generation and Biogas	7
UNIT VI	Energy and Environment Impact of Energy on Environment, Flow of Energy in Ecological System, Environmental Degradation due to energy and Control of Pollution from Energy	7
	Total	42

Text Books :

1. Domkundwar & Arora, Power Plant Engineering, Dhanpat Rai & Sons, New Delhi.
2. D L Klass, Biomass for Renewable Energy, Fuels, and Chemicals, Academic Press, Elsevier, 2006.
3. G.D.Rai, Non-Conventional Energy Sources, Khanna Publishers, Delhi S.P.Sukhatme, Solar Energy|| Tata McGraw-Hill Publications, New Delhi

Reference Books :

1. Frederick T. Morse “Power Plant Engineering” East West Press.
2. EI-Wakil M.M, “Power Plant Technology,” Tata McGraw-Hill
3. P.K. Nag “Power Plant Engineering” Tata McGraw Hill, New Delhi

B.Tech. Fourth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
4SMMDM5	Mechatronics	03	00	00	03

Pre-requisites:

1. An introductory background of physics is needed.

Course Learning Objectives:

1. To study various types of switches, sensors, motors and their working.
2. To study various parts of mechatronic system.
3. To study various types of valves and their working.
4. To understand and create pneumatic and hydraulic circuits for various industrial applications.

Course Outcomes:

At the end of course, Learner will be able to

1. Understand the importance and principles of various sensors
2. Understand the working & applications of actuators for pneumatic & hydraulic systems in mechatronics
3. Understand the computer processes, electronics circuits, and controllers for mechatronics system
4. Understand the working principles of various control valves in mechatronics systems
5. Design pneumatic circuits for various industrial applications.
6. Design hydraulic circuits for various industrial applications

	Subject: Mechatronics	L
UNIT I	Introduction to Mechatronics – Definition, Block diagram & Example, Basics of Sensors, Position & Speed Sensors, Proximity Sensors & Switches, LVDT, Digital optical encoder, Temperature Sensors, Piezoelectric Transducers.	7
UNIT II	Actuators- Functions, Electromagnetic Principles, Solenoids and Relays, working of DC motors and stepper motors, hydraulic and pneumatic actuators.	7
UNIT III	Data Acquisition in Mechatronic system: Analog signal processing using operational amplifier- Introduction, types of amplifiers, sample and hold circuit, introduction to data acquisition, Analog to digital conversion, Analog to digital convertor, Digital to analog conversion, sequential logic, flip-flops, application of flip-flops, micro-controllers, Programmable logic controller.	7

UNIT IV	Control Valves – Study of different control components and pneumatic & Hydraulic system- Construction, working and function of Directional control valve, Flow control valves, Pressure relief valve, pressure reducing valve, sequence valve with symbols	7
UNIT V	Pneumatic System – Design and analysis of pneumatic circuits, Synchronizing, Power chucking operations, controlling the rate of speed of piston, circuit to move with piece around a corner, circuit to move a work piece at a constant speed.	7
UNIT VI	Hydraulic System – Design analysis of Hydraulic systems-Sequencing, pneumo-hydraulic, regeneration circuit, circuit to control tool movement on lathers, grinders	7
	Total	42

Books Recommended :

TEXT BOOKS:

1. Introduction to Mechatronics and Measurement systems- 2/e by Aciatore and M.B.Histant, Tata McGraw Hill edition.
2. Pneumatics and Hydraulics by H.L.Stewart.
3. Mechatronics, M.D. Singh, J.G. Joshi, PHI 2006
4. A Textbook of Mechatronics By RK Rajput

REFERENCE BOOKS:

- 1) Introduction to Mechatronics by Appus Kuttan K.K.- Oxford University Press.
- 2) Mechatronics – A multidisciplinary approach 4/e by W.Bolton- Pearson Publication,
- 3) Automation, Production systems and CIM by M.PGroover- Pearson Publication.

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 *MULTI-DISCIPLINARY MINOR (MDM) BASKET OF COURSES for 5th Semester

Track Name	Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
				Hours / Week			MDM 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																
Artificial Intelligence	V	5SAMDM2	Applied Artificial Intelligence	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
Data Science	V	5SAMDM6	Business Intelligence and Analytics	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
Civil Engineering	V	5SCMDM2	Introduction to Water Resource Engineering	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
Construction Technology	V	5SCMDM6	Construction Materials	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
Computer Science and Engineering	V	5SKMDM2	Introduction to Algorithms	3	--	--	CE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
Software Engineering	V	5SKMDM6	Software Architecture	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
Electronics and Communication Engineering	V	5SEMDM2	Electronic Devices and Circuits	3	--	--	AI&DS, CE, CSE, IT, IIoT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
Telecommunica-tion Engineering	V	5SEMDM6	Introduction to Wireless Communication	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
Information Technology	V	5SNMDM2	Data Communication Networks	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
Cyber Security	V	5SNMDM6	Fundamentals of Cryptography	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
IoT	V	5SXMDM2	Sensors and Actuators	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	CSE(IoT)
Mechanical Engineering	V	5SMMDM2	Automobile Engineering and Electric Vehicles	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Mechanical Engineering
Robotics and Automation Engineering	V	5SMMDM6	Rapid Prototyping	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Mechanical Engineering

* indicates that the Track for MDM will be decided by respective Board of Studies (BoS)

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

Course Code	Course Title	L	T	P	C
5SAMDM2	Applied Artificial Intelligence	03	00	00	03

Course Prerequisite: Basic Programming Knowledge, Artificial Intelligence and Data Structures.

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

1. To apply Artificial Intelligence techniques to solve real-world problems.
2. To integrate Artificial Intelligence models into practical applications such as natural language processing (NLP), computer vision, and robotics.
3. To evaluate the ethical implications and societal impact of Artificial Intelligence technologies.

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

1. Describe the evolution of Artificial Intelligence and explain basic search strategies and intelligent agent behaviors.
2. Explain machine learning techniques including classification, regression, clustering, and reinforcement learning.
3. Examine deep learning models using neural networks and pre-trained architectures like CNNs.
4. Investigate NLP techniques such as text classification, sentiment analysis, and sequence modeling using LSTM or Transformers.
5. Recommend Artificial Intelligence applications in key industries and formulate planning problems with classical and real-world techniques.
6. Evaluate ethical considerations and the societal impact of AI technologies and propose strategies for responsible Artificial Intelligence use.

	Subject: (5SAMDM2) Applied Artificial Intelligence	L
Unit-1	Introduction to Artificial Intelligence: Definition and History of AI, Machine Learning vs Deep Learning, Applications of AI in the Modern World, Problem	07

	Solving Agents, Search Strategies: Depth-first, Breadth-first, Heuristic Search.	
Unit-2	Machine Learning Fundamentals: Supervised Learning (Regression, Classification), Unsupervised Learning (Clustering, Association), Reinforcement Learning, Evaluation Metrics: Accuracy, Precision, Recall, F1-Score, ROC-AUC, Overfitting and Underfitting, Cross-Validation.	07
Unit-3	Deep Learning and Neural Networks: Basics of Neural Networks and Deep Learning, Backpropagation, Convolutional Neural Networks (CNN) for Image Recognition, Transfer Learning and Pre-trained Models, Introduction to Tools and Libraries for Deep Learning.	07
Unit-4	Natural Language Processing (NLP): Text Preprocessing and Tokenization, Sentiment Analysis and Text Classification, Named Entity Recognition (NER), Sequence Models for NLP (LSTM, Transformers), NLP Applications: Chatbots, Machine Translation, and Text Summarization.	07
Unit-5	AI in Real-world Applications and Planning: AI in Healthcare: (Diagnosis, Drug Discovery, and Personalized Medicine), AI in Finance: (Fraud Detection, Algorithmic Trading, Credit Scoring), AI in Agriculture: (Crop Monitoring, Precision Farming, Pest Detection) Planning Problem Formulation, Classical Planning Techniques (STRIPS, Partial Order Planning), Planning and Acting in the Real World (Uncertainty Handling)	07
Unit-6	AI Ethics and Future Trends: Ethical Issues in AI: Bias, Privacy, and Accountability, Social and Economic Impact of AI Technologies, Autonomous Systems and Decision-Making, AI in Governance, Security, and Privacy, Future Directions in AI: AGI, AI in Robotics, AI for Sustainability.	07
	Total	42

Text Book:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education / Prentice Hall Publication, 2020, ISBN: 978-0134610993.
2. François Chollet, "Deep Learning with Python" (Second Edition), Publisher: Manning Publications, Publication Year: 2021, ISBN: 978-1617296864.

Reference Books:

1. Melanie Mitchell, Artificial Intelligence: A Guide for Thinking Humans, Farrar, Straus and Giroux Macmillan Publication, 1st Edition, 2019, ISBN: 978-0374257835
2. Mariya Yao, Adelyn Zhou and Marlene Jia, "Applied Artificial Intelligence: A Handbook for Business Leaders", TOPBOTS Publication, 1st Edition, 2018.
3. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2nd Edition, O'Reilly Media, Inc. Publication, 2019.

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

Course Code	Course Title	L	T	P	C
5SAMDM6	Business Intelligence and Analytics	03	00	00	03

Course Prerequisite: Programming for Data Science, Introduction to Python Programming and Basic Knowledge of Programming.

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Business Intelligence and Analytics by being able to do each of the following:

1. To Study and Explain the Business Intelligence, Analytics and Decision Support system.
2. To study List the technologies for Decision making, automated decision systems.
3. Illustrate multi-criteria Decision-making systems, predictive modelling techniques.

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

1. Explain the components and architecture of Business Intelligence systems and their integration with decision support systems.
2. Describe the phases of decision-making to solve business problems using data-driven approaches.
3. Examine data warehousing solutions and use ETL tools effectively for business analytics.
4. Use data mining techniques and sentiment analysis tools to generate actionable insights for business applications.
5. Assess mathematical and spreadsheet-based models for model-driven decision support in uncertain environments.
6. Demonstrate the use of automated decision systems and expert systems in real-world business scenarios, including knowledge representation and inference techniques.

	Subject: (5SAMDM6) Business Intelligence and Analytics	L
Unit-1	Overview of Business Intelligence and Analytics: Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics.	07

Unit-2	Decision Making: Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components.	07
Unit-3	Descriptive and Predictive Analytics: Data Warehousing Definitions and Concepts, Process Overview, Architectures, ETL Process, Data Warehouse Development and Implementation Issues. Data Mining Concepts, Applications, Process, Methods.	07
Unit-4	Business Reporting and Performance Management: Business Reporting Definitions and Concepts, Data and Information Visualization, Different Types of Charts and Graphs, Emergence of Data Visualization and Visual, Performance Dashboards, Business Performance Management and measurement, Balanced Scorecards, Six Sigma as a Performance Measurement System.	07
Unit-5	Model-Based Decision Making: Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making with Pairwise Comparisons.	07
Unit-6	Automated Decision Systems and Expert Systems: Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems, Introduction to Knowledge Management.	07
	Total	42

Text Book:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, J.E. Aronson, Ting-Peng Liang and David King, "Business Intelligence and Analytics: System for Decision Support", 10th Edition, Pearson Global Edition, 2013.

Reference Books:

1. Edward Mize, "Data Analytics: The Ultimate Beginner's Guide to Data Analytics", Venture Ink Publication, 2017.
2. Rick Sherman, "Business Intelligence Guidebook: From Data Integration to Analytics", Morgan Kaufmann Publication.
3. Ralph Kimball and Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling", Wiley Publication.
4. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publication.
5. Russell Glass and Sean Callahan, "The Big Data-Driven Business: How to Use Big Data to Win Customers, Beat Competitors, and Boost Profits", Wiley Publication.

B.Tech. Fourth Semester (Civil)
Multidisciplinary Minor (Track: Civil Engineering)

Course Code	Course Title	L	T	P	C
5SCMDM2	Introduction To Water Resources Engineering	03	00	00	03

Course Prerequisite : Nil

Course Objectives:

Students will be taught -

1. To study the different hydrological parameters.
2. To understand crop irrigation.
3. To understand the various types of Dams.

Course Outcomes:

Students will be able to -

1. Estimate hydrological parameters.
2. Estimate crop water requirements of a command area.
3. Maintain irrigation structures.
4. Execute the Minor and Micro Irrigation Schemes.
5. Select the relevant Diversion Head works for the specific site conditions.
6. Design, construct and maintain simple Canal structures.

	Subject: Introduction To Water Resources Engineering	L
Unit-1	Introduction: Irrigation and its Classification on the basis of purpose and surface. Hydrology: Definition and Hydrological cycle, Rain Gauge: Symons rain gauge, automatic rain gauge, Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Thiessen polygon method. Runoff, Factors affecting Run off, Computation of run-off. Maximum Flood Discharge measurement: Rational method and empirical methods.	07

Unit-2	Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty. Methods of application of irrigation water and its assessment. Surveys for irrigation project, data collection for irrigation project. Area capacity curve. Silting of reservoir: Rate of silting, factors affecting silting and control measures. Control levels in reservoir. Numerical problems on Fixing Control levels.	07
Unit-3	Dam and its classification: Earthen dams and Gravity dams (masonry and concrete). Earthen Dams -Components with function, typical cross section, seepage through embankment and foundation and its control. Methods of construction of earthen dam, types of failure of earthen dam and preventive measures. Gravity Dams -Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam.	07
Unit-4	Bandhara irrigation: Layout, components, construction and working, solid and open bandhara. Percolation Tanks - Need, selection of site. Lift irrigation scheme-Components and their functions, lay out. Drip and Sprinkler Irrigation-Need, components, Layout, operation and Maintenance. Farm ponds, Jalayukt shivar schemes. Well irrigation: types of wells, yield of well, advantages and disadvantages of well irrigation.	07
Unit-5	Weirs: components parts, types. K.T. weir-components and construction. Diversion head works - layout, components and their function. Barrages - components and their functions. Difference between weir and Barrage.	07
Unit-6	Canals Classification: alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth. Design of most economical canal section. Canal lining - Purpose, material used and its properties, advantages. Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets. Canal maintenance.	07
	Total	42

Text Books:

1. Irrigation and Water Power Engineering by B.C. Punmia - Brij Basi Lal Pande

Reference Books:

1. Irrigation Engineering by Sharma, R. K. and Sharma T. K.
2. Irrigation Engineering by Basak, N.N.
3. Irrigation and Water resource Engineering by Asawa, G.L.

B.Tech. Fourth Semester (Civil)
Multidisciplinary Minor (Track: Construction Technology)

Course Code	Course Title	L	T	P	C
5SCMDM6	Construction Materials	3	0	0	3

Course Prerequisite : Nil

Course Learning Objectives:

1. Identify various building materials and their structural requirements.
2. Explain the significance of cement and lime in construction.
3. Identify the suitable material for construction and various building components.
4. Review different types of Cement concrete.

Course Outcomes:

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

1. Describe important properties of building materials used in civil engineering construction
2. Identify clay based products for use in building constructions based on its properties.
3. Select appropriate rock / stone products for different uses in building construction
4. Appreciate the uses of lime and Pozzolan products in building construction
5. Select appropriate ingredients of proper quality for cement concrete as per required BIS codes
6. Explain different types of advanced building materials and their uses in construction.

	Subject: Construction Materials	L
Unit-1	Introduction: Physical, chemical and engineering properties of building materials. Application of building materials Alternative materials for the given items in building construction.	7

Unit-2	Clay Products: Classification of clay, Types of bricks, manufacturing process of bricks, Test on bricks, Standard requirements and grades of bricks as per BIS, Types of clay tiles and its uses.	7
Unit-3	Rocks And Stones: Classification of rocks, Rock products, Characteristics of stones - Structure, texture , strength , gravity , porosity, absorption, hardness, durability, weight.. etc. Important stones used in construction with its suitability.	7
Unit-4	Lime and Pozzolana: Sources and classification of Lime, Uses of lime with specific field situation, Types of pozzolanic materials, Advantages of addition of pozzolonic material.	7
Unit-5	Cement Concrete: Types of cement with their specific use, Grade of cement as per BIS, Engineering properties of cement, Field and laboratory test of cement as per BIS, Methods of storing the cement, Types of aggregate as per BIS, Engineering properties of aggregate, Test on aggregate.	7
Unit-6	Timber and Miscellaneous Construction Materials : Types of timber, Uses and application of timber, Defects in timber and wood, specific uses Plastics and PVC, Ceramic products, Paints and Varnish, Materials for damp proofing, water proofing, Materials for anti termite treatment, Glass and fiber, Steel and iron materials, Materials used for false ceiling, Asbestose, Concrete blocks.	7
Total		42

Text Books:

1. Building materials, S. K. Duggal, New Age International Publication

Reference Books:

1. Construction material, Agrawal & Arora
2. Building construction, Sushil Kumar, standard publisher.

B.Tech Fifth Semester (Computer Science & Engineering)

Course code	Course Title	L	T	P	C
5SKMDM2	Introduction to Algorithms	03	00	00	03

Course Prerequisite: Data Structures

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Design and Analysis of Algorithms by being able to do each of the following:

1. To understand asymptotic analysis of algorithms.
2. To apply algorithmic strategies while solving problems.
3. Ability to analyze time and space complexity.
4. Demonstrate a familiarity with major algorithms.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Understand and identify different algorithms for calculating time and space complexity using asymptotic notations.
2. Implement the divide-and-conquer strategy for design and analysis of various algorithms.
3. Apply greedy methods to various algorithms in order to compute optimal solutions and devise asymptotic notation.
4. Interpret and analyze dynamic programming approach for designing graph and matrix-based algorithms.
5. Demonstrate the concept of backtracking for search and traversal algorithms.
6. Utilise the knowledge gained to infer the efficiency of algorithms considering time and space trade off.

	Course: Introduction to Algorithms	L
Unit-1	Iterative Algorithm Design Issue Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies	07
Unit-2	Divide and Conquer Introduction, Multiplication Algorithm and its analysis, Merge sort, Quick sort algorithms Where D & C Fails , Characteristics for which D&C is unsuitable.	07
Unit-3	Greedy Methods Introduction , Knapsack Problem, Job sequencing with deadlines, Minimum Spanning Trees, Prim's Algorithms, Kruskal's Algorithm,	07
Unit-4	Dynamic Programming Introduction, Multistage Graphs, Traveling Salesman, Matrix multiplication, Single Source Shortest Paths.	07
	Backtracking	

Unit-5	Combinational Search, Search & Traversal, Backtracking Strategy, Backtracking Framework, efficiency of backtracking and examples .	07
Unit-6	Efficiency of Algorithm Worst and Average case Behavior, Time Analysis of Algorithm, Efficiency of Recursion, Various Sorting algorithms: Bucket, Radix, Quick, Heap, Merge	07
	Total	42

Text Book: Dave and Dave: “Design and Analysis of Algorithms” Pearson Education.

Reference Books:

1. Aho, Hopcroft & Ullman “The Design & Analysis of Computer Algorithms”, Addison-Wesley
2. G. Brassard, P. Bratley: “Fundamentals of Algorithmics”, PHI
3. Horowitz & Sahani: “Fundamental Algorithms”, Galgotia.
4. Cormen, T.H, Lierson & Rivest: “Introduction to Algorithms”, Mc Graw-Hill

B.Tech Fifth Semester (Computer Science & Engineering)

Course code	Course Title	L	T	P	C
5SKMDM6	Software Architecture	03	00	00	03

Course Prerequisites: Software Requirements Engineering

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

1. Explain the role of software architecture in the software development life cycle and distinguish between different architectural styles such as layered, microservices, and event-driven.
2. Create multiple architectural models for a software system to support stakeholder communication.
3. Evaluate the effectiveness of a software architecture using quality attributes such as performance, scalability, modifiability, and security.

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

1. Recall key concepts and quality attributes of software architecture.
2. Explain software development methodologies and architecture evolution.
3. Apply architectural styles to develop structural and process models.
4. Analyze implementation technologies and ADLs in software architecture.
5. Evaluate economic and tradeoff analysis methods for architecture design.
6. Relate principles and templates for software architecture document

	Course: Software Architecture	L
Unit-1	Introduction to software architecture:- What Software Architecture Is and What It Isn't, Architectural Structures and Views, Architectural Patterns, What Makes a "Good" Architecture?, Software architecture Important: Inhibiting or Enabling a System's Quality Attributes, Reasoning About and Managing Change Predicting System Qualities, Enhancing Communication among Stakeholders, Carrying Early Design Decisions, Defining Constraints on an Implementation, Influencing the Organizational Structure, Enabling Evolutionary Prototyping	07
Unit-2	Software architecture methodology :- Overview of Software development methodology and software quality model, different models of software development and their issues. evolution of software architecture, software components and connectors, common software architecture frameworks, Architecture business cycle, reference model.	07
Unit-3	Software architecture models:- Structural models, framework models, dynamic models, process models. Architectures styles: dataflow architecture, pipes and filters architecture, call-and return architecture, data-centered architecture, layered architecture, agent based architecture, Micro-services architecture, Reactive Architecture, Representational	07

	state transfer architecture etc.	
Unit-4	Software architecture implementation technologies:- Software Architecture Description Languages (ADLs), Struts, Hibernate, Node JS, Angular JS, J2EE – JSP, Servlets, EJBs; middleware: JDBC, JNDI, JMS, RMI and CORBA etc. Role of UML in software architecture.	07
Unit-5	Software Architecture analysis and design:- Requirements for architecture and the life-cycle view of architecture design and analysis methods, architecture-based economic analysis: Cost Benefit Analysis Method (CBAM), Architecture Tradeoff Analysis Method (ATAM). Active Reviews for Intermediate Design (ARID), Attribute Driven Design method (ADD), architecture reuse, Domain specific Software architecture.	07
Unit-6	Software Architecture documentation:- Principles of sound documentation, refinement, context diagrams, variability, software interfaces. Documenting the behavior of software elements and software systems, documentation package using a seven-part template.	07
	Total	42

Text Books

1. Bass, L., P. Clements, & R. Kazman, “Software Architecture in Practice”, 2 Ed, Prentice-Hall.
2. Jim Keogh, “J2EE – Complete Reference”, Tata McGraw Hill.
3. Dikel, David, D. Kane, and J. Wilson, “Software Architecture: Organizational Principles and Practices”, Prentic -Hall.

Reference Books

1. Bennett, Douglas, “Designing Hard Software: The Essential Tasks”, Prentice-Hall, 1997.
2. Clements, Paul, R. Kazman, M. Klein, “Evaluating Software Architectures: Methods and Case Studies”, Addison Wesley, 2001.
3. Albin, S. “The Art of Software Architecture”, Indiana: Wiley, 2003.
4. Robert Mee, & Randy Stafford, “Patterns of Enterprise Application Architecture”, Addison-Wesley, 2002.
5. Witt, B., T. Baker and E. Meritt, “Software Architecture and Design: Principles, Models and Methods”, Nostrand Reinhold, 1994.

B.Tech. MDM Track 1: Electronics and Communication Engineering

Course Code	Course Title	L	T	P	C
5SEMMDM2	Electronics Devices and Circuits	03	00	00	03

Pre- Requisites:

1. Basic knowledge of Semiconductor Physics

Course Learning Objectives:

1. To understand the characteristics and applications of PN junction diode, and various types of transistors including BJT, JFET, and MOSFET.
2. To analyze the configurations and stabilization techniques of BJT, and explore the role of feedback in amplifier circuits.
3. To study the working of BJT as a single-stage amplifier and oscillator, and evaluate the construction and operation of field-effect transistors.

Course Outcomes: After completion of this course the students should able to,

1. Understand the fundamentals and working of PN junction diode, application of diode as rectifier.
2. Learn the working of BJT and its characteristics.
3. Analyze various stabilization techniques
4. Learn the concept of Feedback
5. Learn the concept of Amplifier and Oscillator
6. Understand the working of JFET and MOSFET

Unit No	Course: Electronics Devices and Circuits	No. of lectures required
1	PN Junction Diode: Formation of P-N junction, biasing the diode, its V-I characteristics, Application of diode as Half wave rectifier (HWR), Full wave rectifier (FWR) Introduction to Various LC & RC filters circuits. Zener diode.	08
2	Bipolar Junction Transistor: Operation of PNP and NPN transistor, CB,CE and CC configuration, transistor as switch, Transistor as an Amplifier.	06
3	Biasing & Stabilization Techniques in BJT: its need, various biasing methods of stabilization.	06
4	Feedback: Feedback concept, types of feedback, effect of Negative feedback on various parameters of Amplifier like Gain, Bandwidth, Distortion etc.	08
5	Sinusoidal Oscillators: Barkhausen criteria for oscillation, LC oscillators (Hartley and Colpitts) RC oscillators (Wein Bridge & RC phase shift) and Crystal oscillator	08
6	JFET & MOSFET: Construction, characteristics and comparison.	06
	Total	42

Text Books:

1. V.K.Mehta: "Principle of Electronics" S. Chand & Company, Delhi
2. Milimam and Halkies: "Integrated Electronics", Tata McGraw Hill, New Delhi

Reference Books:

1. Robert L. Boylestad " Electronics Devices and Circuit Theory" Pearson Education.
2. Donald A Neamen " Electronics Circuit analysis and Design" Tata McGraw Hill, New Delhi

B.Tech. MDM Track 2: Telecommunication Engineering

Course Code	Course Title	L	T	P	C
5SEMDM06	Introduction to Wireless Communication	03	00	00	03

Pre-requisites:

1. Wireless Communication Fundamentals

Course Learning Objectives:

1. To be aware of evolution in wireless technology.
2. To study the fundamentals of cellular radio system.
3. To understand operation of various 2nd and 3rd generation cellular systems; GSM, IS95, CDMA2000, WCDMA.
4. To study wireless data communication networks.

Course Outcomes:

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

1. To understand basics of wireless communication system.
2. To understand basics of cellular communication system.
3. To understand mobile communication standard GSM.
4. To understand operation of various 2, 3 generation cellular systems; GSM, IS95, CDMA2000, WCDMA
5. To study various wireless data communication networks WLAN.
6. To study various wireless personalised area networks Bluetooth.

Unit No.	Course: Introduction to Wireless Communication	No. of Lectures Required
1	Overview of Wireless Networks: Evolution of voice oriented and data oriented wireless networks, different generations of wireless networks (1G, 2G, 3G & beyond), comparison of wired and wireless media, radio propagation mechanism, Effects of multipath and Doppler: multipath fading, multiple delay spread, Doppler spectrum.	07
2	Cellular Technology: Cellular Topology- cellular concept, cellular hierarchy, cell fundamentals, Evolution of Mobile Systems (1G, 2G, 3G), Signal-to-interference ratio. Capacity Expansion: cell splitting and cell sectoring. Channel allocation techniques: Fixed, Dynamic & Hybrid channel allocation, channel borrowing technique. Handoff	07

	Management: Architectural issues in handoff, types of handoff, handoff algorithms.	
3	GSM System: GSM Network Architecture, GSM Call Procedures: Registration procedure, call establishment, Handoff in GSM, GSM Signalling Protocol Architecture: Physical layer: power and power control, physical packet burst, frame hierarchy in GSM, Hand Off Procedures, Logical channels in GSM.	07
4	CDMA Digital Cellular Standard (IS-95): IS-95 Forward Channel, IS-95 Reverse Channel, packet and frame formats, mobility and radio resource management: soft handoff and power control. CDMA2000 and WCDMA: Forward and Reverse Channel in CDMA2000 and WCDMA, Hand Off and Power Control in CDMA2000 and WCDMA.	07
5	Wireless Local Area Network (WLAN): IEEE 802 architecture, IEEE 802.11 architecture and Services, IEEE 802.11 medium access control, MAC frame format, 802.11 physical layer, 802.11 standards.	07
6	Wireless PAN (WPAN-802.15): Overview of 802.15, Bluetooth, Bluetooth protocol stack, usage models, piconets and scatternets, radio specification, baseband specifications: physical links, packets, payload format, error correction, logical channels, channel control, link manager specification.	07
	Total	42

Text Books:

1. Theodore S. Rappaport, "Wireless Communications: Principles & Practice", Second edn., Pearson Edn. (2002).
2. K. Pahlavan and P. Krishnamurthy, "Principles of Wireless Networks", Pearson Educn. Asia Publication (2002)
3. T. L. Singal, "Wireless Communication". McGraw Hill Education.
4. A. F. Molisch, "Wireless Communications", Second Edition, Wiley Publication.

Reference Books:

1. G. S. Rao, "Mobile Cellular Communication", Pearson Education.
2. Upena Dalal, "Wireless communication", Oxford University Press.
3. William CY Lee, "Mobile Cellular Telecommunications", (second edition) McGraw Hill Inc.

B.Tech. Fifth Semester (IT Department)

Multidisciplinary Minor (Track: Information Technology)

Course Code	Course Title	L	T	P	C
5SNMDM2	Data Communication and Networks	03	00	00	03

Course Prerequisite: Computer Network

Course Learning Objectives:

1. Understand the fundamental concepts of Data Communication and computers
2. Familiarize the students with basic taxonomy and terminology of data communication.
3. Discuss types of signals, Transmission Impairment, Data Rate Limits & Line coding Schemes
4. Study Multiplexing and Logical addressing, DNS, Remote logging and HTTP.

Course Outcomes:

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

1. Understand the principles and fundamental concepts of computer networks.
2. Understand and explain data communication systems with its techniques and applications.
3. Identify types of signals, Transmission Impairment, Data Rate Limits.
4. Evaluating the Line coding Schemes.
5. Understand Multiplexing and Logical addressing.
6. Understand DNS, Remote logging and HTTP.

	Subject: Data Communication and Network	L (Hrs)
Unit-1	Introduction: Data Communications, Networks; The Internet, Protocols and Standards, Transmission Media.	07
Unit-2	Network Models: Layered Tasks, The OSI model, Layers in the OSI model, TCP/IP Protocol Suite, Addressing	07
Unit-3	Data and Signals: Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance	07
Unit-4	Digital Transmission: Line Coding, Line coding Schemes (Unipolar, Polar, Bipolar), Analog to Digital Conversion, Transmission modes, Analog to analog conversion	07
Unit-5	Multiplexing, Frequency division, Wavelength and Time Division Multiplexing, Statistical TDM Network Layer: Logical Addressing: IPV4 Addresses, IPV6 Addresses	07

Unit -6	Domain Name System: Name Space, Domain Name Space, DNS in the Internet Layout, Remote Logging, Electronic mail and File Transfer. WWW and HTTP.	07
	Total	42

Recommended Textbook :

1. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw-Hill, Publications.
2. Andrew S. Tenenbaum, "Computer Networks", PHI, ISBN 81-203-2175-8.

Reference Books:

1. William Stallings, "Data & Computer Communications", (6/e) Pearson Education.
2. Wehrle, Klaus, Gunes, Mesut, Gross, James, "Modeling and Tools for Network Simulation", Springer, ISBN: 978-3-642-12330-6
3. J.Freey, "Computer Communication & Networks", AEW Press.
4. Bhushan Trivedi, "Computer Networks" OXFORD.

B.Tech. Fifth Semester (IT Department)

Multidisciplinary Minor (Track: Cyber Security)

Course Code	Course Title	L	T	P	C
5SNMDM6	Fundamentals of Cryptography	03	00	00	03

Course Prerequisite: Computer Network

Course Learning Objectives:

1. Understand the basic concepts and principles of cryptography techniques
2. Analyze and evaluate the security of cryptographic techniques to real-world problems.
3. To Learn various Authentication protocols
4. Understand the importance key management and distribution

Course Outcomes:

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

1. Explain the fundamental concepts of cryptography, including confidentiality, integrity, and authenticity
2. Describe and analyze various cryptographic algorithms, including symmetric and asymmetric encryption, digital signatures, and hash functions
3. Evaluate the security of cryptographic systems and protocols
4. Apply cryptographic techniques to design and implement secure communication systems and protocols
5. Describe and analyze various Authentication protocols
6. Understand the key management and distribution

	Subject: Fundamentals of Cryptography	L (Hrs)
Unit-1	Introduction to Cryptography: - Overview of cryptography, Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques	07
Unit-2	Block Ciphers and the Data Encryption Standard: - Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES, Block Cipher Design Principles, Advanced Encryption Standard: - Finite Field Arithmetic, AES Structure, AES Transformation Functions, AES Key Expansion, An AES Example, AES Implementation.	07
Unit-3	Public-Key Cryptography and RSA: - Principles of Public-Key Cryptosystems, The RSA Algorithm, Other Public-Key Cryptosystems: - Diffie-Hellman Key Exchange	07

Unit-4	Cryptographic Hash Functions: - Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3	07
Unit-5	Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Digital Signatures, NIST Digital Signature Algorithm.	07
Unit -6	Key Management and Distribution:- Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure.	07
	Total	42

Recommended Textbook :

Textbook

1. "Cryptography and Network Security: Principles and Practice" by William Stallings.

References

1. "Introduction to Cryptography with Java Applets" by David Bishop
2. "Cryptography: Theory and Practice" by Douglas R. Stinson
3. "Handbook of Applied Cryptography" by Alfred J. Menezes, Paul C. van Oorschot, and Scott A. Vanstone
4. Various online resources and research papers on cryptography and network security

B.Tech Fifth Semester CSE(IoT)

Course Code	Course Title	L	T	P	C
5SXMDM2	Sensors and Actuators	03	00	00	03

Course Pre-requisite: 4SXMDM1 - Fundamentals of IoT

Course Objectives:

1. Understand the fundamental principles of sensors and actuators, including their working mechanisms and applications.
1. Analyze the performance characteristics of various sensors and actuators, focusing on their behaviour in real-world scenarios.
2. Design and interface sensor-actuator systems with embedded controllers, integrating signal conditioning and power management techniques.

Course Outcomes:

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

Sr. no.	CO ID	Description	Blooms Level
1	5STMDM2.1	Identify and describe various types of sensors and actuators, including their principles and applications.	Understanding
2	5STMDM2.2	Analyze the static and dynamic characteristics of measurement systems, including response times and accuracy.	Analyzing
3	5STMDM2.3	Evaluate the performance metrics of digital and semiconductor-based sensors, considering factors like sensitivity and noise.	Applying
4	5STMDM2.4	Understand the principles, components, and applications of smart sensors in various systems.	Understanding
5	5STMDM2.5	Analyze the role and implementation of sensors in diverse applications such as automotive, healthcare, and environmental monitoring.	Analyzing
6	5STMDM2.6	Evaluate the functioning and applications of various actuators, including pneumatic, hydraulic, mechanical, and electrical systems.	Evaluating

	Course Name: Sensors and Actuators	Lect Hrs.
UNIT I	Introduction to Sensors and Actuators: Overview of measurement systems and terminology, Classification of sensors and actuators, Static and dynamic characteristics of measurement systems, Signal conditioning fundamentals.	7

UNIT II	Resistive and Reactive Sensors: Potentiometers, strain gauges, and thermistors, Capacitive and inductive sensors, Signal conditioning techniques for resistive and reactive sensors.	7
UNIT III	Self-Generating Sensors: Thermoelectric, piezoelectric, and photovoltaic sensors, Signal conditioning for self-generating sensors, Applications in real-world systems.	7
UNIT IV	Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface, the Automation.	7
UNIT V	Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Medical Diagnostic Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.	7
UNIT VI	Actuators: Pneumatic and Hydraulic Actuation Systems, Valves, Rotary actuators, Mechanical Actuation Systems Electrical Actuation Systems.	7
	Total	42

Text Book:

1. Nathan Ida, *Sensors, Actuators, and their Interfaces*, 1st ed., SciTech Publishing, 2014.
2. Prof. Banibrata Mukherjee, *Embedded Sensing, Actuation and Interfacing Systems*, NPTEL Course, IIT Kharagpur.

Reference Books:

1. Patranabis-Sensors and Actuators- 2nd Ed., PHI, 2013.
2. Jacob Fraden, *Handbook of Modern Sensors: Physics, Designs, and Applications*, 4th ed., Springer, 2010.
3. Robert H. Bishop-The Mechatronics Handbook, 2nd Ed., Mechatronic Systems, Sensors and Actuators, fundamentals and modelling.

B.Tech. Fifth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
5SMMDM2	Automobile Engineering and Electric Vehicles	03	00	00	03

Course Prerequisites:

1. Basic knowledge of Physics

Course Learning Objectives:

1. To study the Introduction of automobiles and types of fuel feed system and cooling system.
2. To study the electrical system, transmission system, suspension system and Basics of lubrication.
3. To study the braking system and steering system and understand the concept of Electric Vehicle

Course Outcomes:

Students will be able to –

1. Understand the basics of automobile engineering and its components.
2. Analyze & develop the cooling system, fuel feed system and its function.
3. Understand basic concept of Electrical system and lubrication used in automobile.
4. Apply the knowledge of suspension and transmission system.
5. Understand the working of braking system and basic concept of steering system
6. Understand the concept of Electric vehicle.

	Subject: Automobile Engineering and Electric Vehicles	L
UNIT I	Introduction, Classification of automobiles, chassis layout, basic working of SI and CI engines, engine parts, Multiple cylinder engines	07
UNIT II	Fuel feed systems- fuel feed systems for petrol and diesel engines, Basic principles of Multipoint Fuel Injection Systems (MPFI) and Common Rail Diesel Injection Systems (CRDI). Cooling system: purpose, Air cooling and water cooling system, antifreeze mixtures.	07
UNIT III	The electrical system:- Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive. Introduction to Ignition system. Introduction of charging unit for electric vehicle. Lubrication: Types of lubricants and their applications in automobile.	06
UNIT IV	Transmission system:- Layout, Working principle of clutch, working of Gear Box:- Sliding mesh, Propeller shaft, Principle of differential. Suspensions system: shock absorbers and independent suspension system.	07
UNIT V	Braking system: Working of Mechanical and hydraulic brakes. Steering system:- Function. Introduction of camber, castor, king pin inclination, toe-in& toe-out & their effects. Introduction to power	07

	steering.	
UNIT VI	Introduction to Electric Vehicle, need, Types of Electric vehicle, components, working, advantages, limitations	06
	Total	40

Text Books :

- 1 Automobile Engineering- Vol. I & II; Kirpal Singh; Standard Publishers Distributors
- 2 Automobile Engineering; R.K. Rajput; Laxmi Publications, New Delhi
- 3 Electric and Hybrid Vehicles; Husain, I. CRC Press

Reference Books :

- 1 Automotive Mechanics; Crouse & Anglin; TMH
- 2 Automotive Mechanics; J. Heitner; East West Press
- 3 Automotive Mechanics; S. Srinivasan; TMH. 4. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

B.Tech. Fifth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
5SMMDM6	Rapid Prototyping	03	00	00	03

Course Prerequisites:

1. Basic knowledge of Manufacturing Processes.
2. Preliminary knowledge of Engineering Graphics and Solid Modelling.

Course Learning Objectives:

1. Comprehend the Fundamentals and Evolution of Rapid Prototyping.
2. Explore the RP Processes, Data Formats, and Software Tools.
3. Explore the RP Processes, Data Formats, and Software Tools.

Course Outcomes:

Students will be able to –

1. Understand a prototype and its types also the importance of compression in product development timelines.
2. Comprehend the fundamental principles of Rapid Prototyping including pre-processing, processing, and post-processing.
3. Understand the process physics and principle of material deposition in different RP systems also Compare the applications, limitations, and advantages of various RP processes.
4. Familiarize with Data Formats and software tools used in RP.
5. Explore Virtual prototyping, Computer Aided Engineering and concept of Reverse Engineering.
6. Explore the use of RP in the in functional, testing models and Rapid Toolings

	Subject: Rapid Prototyping	L
UNIT I	Introduction: Definition of Prototype, Types of prototype, Need for the compression in product development time span, History of Rapid Prototyping (RP) systems, Survey of applications, Growth of RP industry, and classification of RP systems.	6
UNIT II	Introduction to Rapid Prototyping: Fundamentals of Rapid Prototyping, Process Chain, Classification of RP systems, Dawn of slice age, benefits, applications, important issues in Rapid Prototyping. Traditional Prototyping Vs. Rapid Prototyping. Pre and Post Processing in RP. Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors.	7
UNIT III	RP Processes: Process Physics, Tooling, Process Analysis, Material and technological aspects, Applications, limitations and comparison of various rapid manufacturing processes, Photopolymerization (Stereolithography, SL), Powder Bed Fusion (Selective laser Sintering (SLS), Electron Beam melting (EBM)), Extrusion Based	8

	RP Systems,3D Printing, Sheet Lamination (Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC)), Beam Deposition (Laser Engineered Net Shaping process(LENS))	
UNIT IV	Rapid Prototyping Data Formats and Software: STL format, STL file problems, consequences of building valid and invalid tessellated models, STL file repairs: Generic solution, other translators, newly proposed formats. Software for RP: Overview of Solid view, magics, mimics, magic communicator, Velocity2, Rhino, View expert,3D Doctor. etc. Internet based software, Collaboration tools.	7
UNIT V	Virtual Prototyping and Testing: Difference between physical prototype and virtual prototype. Geometric modeling: Types of Geometric models and Solid Models Reverse engineering: Acquiring Point Data, Constructing 3D model and Applications. Virtual augmented reality: Requirement of devices and technologies and applications Computer Aided Engineering: Application of FEA in Engineering, the concept of discretization, steps in FEA and automatic mesh generation. Design for X: Design for manufacture and design for assembly and other facets of DFX.	7
UNIT VI	Application of Rapid Prototyping and Technology: Functional models, pattern for investment and Vacuum casting, medical models, Art models, Engineering analysis models. Rapid Tooling: Introduction, Conventional tooling Vs Rapid tooling, need for Rapid tooling. Direct and Indirect Rapid toolings. Soft and Hard Toolings.	7
	Total	42

Textbooks:

1. Rapid Prototyping by Amitabh Ghosh, Affiliated East-West Press Pvt.Ltd.
2. Additive Manufacturing Technologies 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Straker, First Edition, Springer, 2010
3. Rapid Prototyping Technology : Selection and Application by Cooper K. G. Prentice Hall of India

Reference Books:

1. Rapid Prototyping: Principles and Applications, Chua CK, Leong KF and Lim CS, 2nd Edition, World Scientific Publishers, 2003
2. Rapid Prototyping: Principles and Applications in manufacturing, Noorani R, John Wiley and Sons

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 *MULTI-DISCIPLINARY MINOR (MDM) BASKET OF COURSES for 6th Semester

Track Name	Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme						Offered by the Department of
				Hours / Week			MDM 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																
Artificial Intelligence	VI	6SAMDM3	Generative Artificial Intelligence	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
Data Science	VI	6SAMDM7	Data Engineering	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Artificial Intelligence and Data Science
Civil Engineering	VI	6SCMDM3	Introduction to Transportation Engineering	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
Construction Technology	VI	6SCMDM7	Basics of Surveying	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Civil Engineering
Computer Science and Engineering	VI	6SKMDM3	Database Management System	3	--	--	CE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
Software Engineering	VI	6SKMDM7	Software Project Management	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Computer Science and Engineering
Electronics and Communication Engineering	VI	6SEMDM3	Analog and Digital Communication	3	--	--	AI&DS, CE, CSE, IT, IIoT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
Telecommunica-tion Engineering	VI	6SEMDM7	Introduction to Mobile Computing	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Electronics and Telecommunication Engineering
Information Technology	VI	6SNMDM3	E-Commerce	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
Cyber Security	VI	6SNMDM7	Basics of Ethical Hacking	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	Information Technology
IoT	VI	6SXMDM3	Single Board Computers	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	CSE(IoT)
Mechanical Engineering	VI	6SMMDM3	Industrial Engineering	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	Mechanical Engineering
Robotics and Automation Engineering	VI	6SMMDM7	Automation Engineering	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	Mechanical Engineering

* indicates that the Track for MDM will be decided by respective Board of Studies (BoS)

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

Course Code	Course Title	L	T	P	C
6SAMDM3	Generative Artificial Intelligence	03	00	00	03

Course Prerequisite: Discrete Mathematics, Data Structures, Python Programming, Artificial Intelligence and Expert System Design.

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

1. To introduce the foundational concepts of artificial intelligence, neural networks, and natural language processing relevant to generative models.
2. To explore advanced architectures such as GANs, VAEs, LSTMs, and Transformers, and understand their role in generative AI systems.
3. To provide knowledge of real-world applications, training strategies, and challenges in deploying large-scale generative models, including GPT-based architectures.

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

1. Describe the evolution of Artificial Intelligence and deep learning.
2. Explain Advanced Neural Network Architectures for tasks like image recognition and sequence modeling.
3. Analyze data preprocessing and training techniques for neural networks.
4. Investigate practical solutions using advanced neural networks for diverse applications.
5. Inspect the performance and limitations of large language models.
6. Design and Test GPT-based applications in tasks such as text generation and intelligent customer support systems.

	Subject: (6SAMDM3) Generative Artificial Intelligence	L
Unit-1	Foundations of AI and Neural Networks History and evolution of AI/ML, Deep learning revolution, Transfer learning, History of Neural, Natural Language Processing, Structure of Artificial Neural Networks, Steps in Training an Artificial Neural Network, Parameters and Hyperparameters, Backpropagation.	07

Unit-2	Advanced Neural Network Architectures Generative Artificial Intelligence (Generative AI): Concepts and Comparison with Traditional AI, (GANs): Architecture and Working Principle, Components of GANs: Generator and Discriminator, Challenges, and Performance Issues in GANs, Applications of GANs in Image, Video Generation, and Other Real-World Domains	07
Unit-3	Data Preprocessing Variational Autoencoders (VAEs), Transformers, Attention Mechanism in detail Long Short-Term Memory Networks (LSTMs). Probability and Statistics, Data Preprocessing Techniques, Model Training Techniques	07
Unit-4	Generative AI Applications Applications in Various Fields: Art and Creativity, Image and Video Generation, Text Generation, Music Composition, Healthcare Finance. Real-world use cases and challenges in deploying generative AI models	07
Unit-5	Introduction to Large Language Models Overview of Generative AI and Large Language Models. Basics of attention mechanisms and Transformer architecture. Pre-training techniques and transfer learning strategies.	07
Unit-6	GPT Models and Applications Study of GPT architecture and variants. Applications of GPT models in text generation and dialogue systems. Case study-based implementation of GPT-based tasks. GPT-based chatbot enhances E-Shop's customer support service	07
	Total	42

Text Book:

1. Altaf Rehmani, "Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology", Independently Published, 2023, ISBN: 9798392038019
2. Numa Dhamani, "Introduction to Generative AI", Kindle Edition, 2024, ASIN: B0CVRDXF1T.

Reference Books:

1. Josh Kalin, "Generative Adversarial Networks Cookbook: Over 100 Recipes to Build Generative Models Using Python, TensorFlow, and Keras", Packt Publishing, 2018, ISBN: 9781789139907.
2. Jesse Sprinter, "Generative AI in Software Development: Beyond the Limitations of Traditional Coding", Independently Published, 2024, ISBN: 9798321819017.
3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer, 2018, ISBN: 9783319944623.
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 2017, ISBN: 9780262035613.

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

Course Code	Course Title	L	T	P	C
6SAMDM7	Data Engineering	03	00	00	03

Course Prerequisite: Basic Programming Knowledge, Python Programming and Business Intelligence and Analytics.

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

1. Understand the foundational concepts of data-intensive applications, including scalability, reliability, and maintainability of modern data systems.
2. Analyze different data models (relational, document, graph) and their appropriate use cases in real-world applications.
3. Explore the internals of storage engines, indexing methods, and transaction mechanisms that drive high-performance databases.

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

1. Describe the fundamental principles of data engineering, including data ingestion, storage, transformation, and pipeline orchestration using Python.
2. Explain techniques for data ingestion from APIs and web scraping, and work with SQL and NoSQL databases.
3. Illustrate data cleaning and transformation using Python libraries such as Pandas.
4. Identify data modeling techniques and utilize databases (relational and NoSQL) for efficient data storage and retrieval.
5. Inspect datasets using Python libraries to derive meaningful insights for data-driven decision-making.
6. Design and deploy end-to-end data engineering solutions addressing real-world problems while adhering to best practices in data governance and security.

	Subject: (6SAMDM7) Data Engineering	L
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Unit-1	Introduction to Data Engineering: What is Data Engineering? Data lifecycle and data-driven decision-making, Introduction to databases and file formats (CSV, JSON, Parquet)	07
Unit-2	Data Collection and Storage: Data ingestion techniques, Working with APIs and Web scraping (basic), Introduction to SQL and NoSQL databases (MongoDB, PostgreSQL).	07
Unit-3	Data Cleaning and Transformation: Handling missing and inconsistent data, Data wrangling with Pandas, Introduction to ETL pipelines.	07
Unit-4	Data Warehousing and Cloud Storage: Introduction to data warehouses, Basics of cloud storage (Google BigQuery, AWS S3 – concept only), Structured vs unstructured data.	07
Unit-5	Data Pipelines and Automation: Building simple pipelines with Python, Introduction to Airflow and basic scheduling, Introduction to stream vs batch processing.	07
Unit-6	Applications and Tools: Real-world applications in different domains (healthcare, IoT, etc.), Overview of tools: Tableau/Power BI, Jupyter Notebooks, Ethics and privacy in data handling.	07
	Total	42

Text Book:

1. Paul Crickard, "Data Engineering with Python", Publisher: Packt Publishing.

Reference Books:

1. Tyler Akidau, Slava Chernyak and Reuven Lax, "Streaming Systems: The What, Where, When, and How of Large-Scale Data Processing", Publisher: O'Reilly Media.
2. Martin Kleppmann, "Designing Data-Intensive Applications", O'Reilly Media.
3. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Publisher: Pearson.
4. Rajkumar Buyya, Rodrigo N. Calheiros and Amir Vahid Dastjerdi, "Big Data: Principles and Paradigms", Publisher: Morgan Kaufmann.

B.Tech. Fourth Semester (Civil)
Multidisciplinary Minor (Track: Civil Engineering)

Course Code	Course Title	L	T	P	C
6SCMDM3	Introduction to Transportation Engineering	03	00	00	03

Course Prerequisite : Nil

Course Learning Objectives:

1. About basics of Road construction like surveys, alignment principles, types of roads.
2. Study and understand various road studies for safe road design principles and essential geometry.
3. Learn about various road pavements, its construction and maintenance procedure.
4. Learn about railway transportation and terms related to it.

Course Outcomes:

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

1. Identify type of roads and its utility.
2. Understand the application of various road studies at time of survey and actual construction.
3. Design the various types of road pavements.
4. Understand rules regulations, signals, type of gauges and railway sleepers density.
5. Recognize the airport features and design concept of components for aero plains movement.
6. Identify types and components of tunnels and bridges and its design components.

	Subject : Introduction to Transportation Engineering	L
Unit-1	Highway: Road Transport characteristics, classification of Roads, Road Patterns, Alignment principles, Survey for highway.	07
Unit-2	Geometric Design: Cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting,	07

	PIEV Theory, stopping sight distance, overtaking sight distance, super elevation.	
Unit-3	Pavement and Traffic Engineering: Components of Flexible and Rigid pavement, Traffic Characteristics, Traffic Studies, Road parking system, traffic control devices and 3 E's of traffic.	07
Unit-4	Railway: Railway transportation, Embankment & cutting. Points and crossing Left & right Hand turnouts. Permanent way, gauges, components of permanent way, Sleeper density, Rail fixtures & fastening. Rail types and functions.	07
Unit-5	Airport: Agencies controlling national & international aviation, various surveys to be conducted, airport site selection, Aeroplane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, wind rose diagram, Apron layout, Aircraft parking & parking system.	07
Unit-6	Tunnel & Bridge Engineering: Tunnels- necessity, types, tunnel alignment, Size and shape of tunnels, and Tunnel Lining. Tunnel drainage, ventilation & lighting of tunnels. Bridge Engineering-Components, classification and identification, abutments, piers and wing wall.	07
Total		42

Text Books:

1. Khanna S.K. & Justo C.E.: Highway Engineering
2. Rao G.V.: Principles of Transportation & Highway Engg.
3. Dr.Kadiyali L.R. : Traffic Engg. & Transport Planning.

Reference Books:

1. Bindra S.P. : Principles & Practice of Bridge Engg.
2. Saxena & Arora : Railway Engineering.
3. Agrawal M.M. : Railway Engineering.
4. Khanna S.K., Arora M.G., Jain S.S.: Airport Planning & Design,
5. Sharma S.K. : Principles, Practice & Design of Highway Engg.
6. Duggal A.K. & Puri V.P. : Laboratory Manual in Highway Engg.

B.Tech. Fourth Semester (Civil)

Multidisciplinary Minor (Track: Construction Technology)

Course Code	Course Title	L	T	P	C
6SCMDM7	BASICS OF SURVEYING	3	0	0	3

Course Prerequisite : Nil

Course Learning Objectives:

1. The term surveying, various instruments and possible error.
2. The Linear Measurement methods and way of conduction.
3. The measurement at elevation and of Directions, contour development process.
4. The principle of Plane table surveying.

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Course Outcomes:

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

1. Develop a sound knowledge of fundamental principles of Surveying.
2. Find out the vertical, horizontal, linear and angular measurements to arrive at solutions to basic surveying problems.
3. Determine the reduced levels of the points from staff readings using auto level and create contour maps.
4. Make use of magnetic bearings for traversing using compass.
5. Determine angle measurement, distance measurement, and co-ordinate measurement by Traversing.
6. To perform survey at elevation and conduct Plane Table survey.

	Subject: Basics of surveying	L
Unit-1	Introduction: Plane and geodetic surveys. Methods of location of a point- classification of surveys; principles of surveying, Errors in measurements- sources, types of errors and their treatment. Surveying instruments-temporary and permanent adjustment concept, principle of reversal. conventional symbols, and generalization.	7

Unit-2	Linear Measurements Direct and indirect methods; Chain and tape measurements- corrections to tape measurements; Electronic methods- EDMs, Introduction and purpose of total stations.	7
Unit-3	Measurement of Elevations: Various terms; Methods of height determination; Spirit leveling- different types of levels and staves; booking and reduction of data, classification and permissible closing error; profile leveling and cross sectioning; curvature & refraction and collimation errors; reciprocal leveling.	7
Unit-4	Measurement of Directions: Bearings and angles; Compass surveying- magnetic bearings, declination, local attraction errors and adjustments.	7
Unit-5	Traversing: Purpose and classifications; Compass and theodolite traverses, theodolites- different types, uses, methods of observation and booking of data.	7
Unit-6	Plane Tabling: Merits and demerits, accessories; orientation and resection; methods of plane tabling; three-point problem and solutions.	7
Total		42

Text Books:

1. T.P. Kanetkar& Kulkarni: Surveying & Levelling, Part I & II.
2. B.C. Punmia : Surveying I & II.

Reference Books:

1. N.N. Basak : Surveying & Levelling
2. D. Clarke: Plane and Geodatic Surveying, Volume I & II

Course code	Course Title	L	T	P	C
6SKMDM3	Database Management System	03	00	00	03

Course Learning Objective

1. To study the ER model which provides a high level view of the issues in database design, to capture the semantics of realistic applications within the constraints of a data model.
2. To study the primary data model (relational model) for commercial data processing applications.
3. To study the standard structured query language and retrieve the information from the database in various ways.
4. 4. To study the integrity and security constraints of the database by enforcing constraints.

Course Outcomes:

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

1. Understand and apply the theoretical concept of database management system
2. Differentiate DDL, DML, DCL and TCL SQL commands to store and retrieve.
3. Describe normal forms with various integrity constraints
4. Explain query processing and query optimization
5. Apply ACID properties to ensure consistency of system
6. Analyze concurrency control protocol for error free transaction

	Subject:Database Management System	L
Unit-1	Introduction to DBMS: Database System Applications, Purpose of database systems, View of Data, Database Languages Database Architecture, Database Users and Administrators	07
Unit-2	SQL: Structure of Relational Databases, Database schema, keys, SQL data definition, Basic Structure of SQL queries, Set Operations, Null Values, Aggregate Functions, Modification of the Database , Joins	07
Unit-3	Relational Database Design: Integrity Constraints, Authorization,Features of good relational designs, Functional dependency theory, atomic domains and First Normal Form, Second Normal Form, Third Normal Form, BCNF, decomposition using functional dependencies,	07
Unit-4	Query Processing Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Evaluation of Expressions	07
Unit-5	Transaction Management: Transaction Concept, Simple transaction model, ACID properties, Serializability: Conflict and View, Recoverability.	07

Unit-6	Concurrency Control and recovery system: Lock-Based Protocols, 2PL, Types of 2PL, Deadlock Handling, Multiple Granularities, Timestamp- Based Protocols	07
	Total	42

Text Book: Abraham Silberschatz, Henry F. Korth, S. Sudarshan, DATABASE SYSTEM CONCEPTS, Sixth Edition, McGraw Hill

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill
2. Shamkant B. Navathe, RamezElmasri, Database Systems, Pearson Higher Education

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B.Tech Sixth Semester (Computer Science & Engineering)

Course code	Course Title	L	T	P	C
6SKMDM7	Software Project Management	03	00	00	03

Course Prerequisites: Software Architecture

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Software Project Management.

1. To understand the fundamental principles of software project management.
2. To be familiar with the different methods and techniques used for software project management.
3. To have a good knowledge of the responsibilities of a project manager.

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

1. Recall the principles, methodologies, and steps involved in software project evaluation and planning.
2. Explain software process models, effort estimation techniques, and productivity models.
3. Apply activity planning, scheduling, and risk management techniques to software projects
4. Analyze project progress using cost monitoring, earned value analysis, and configuration management.
5. Demonstrate effective team management, communication, and leadership strategies in software projects.
6. Implement software deployment processes and methodologies following best practices.

	Course:Software Project Management	L
Unit-1	Software Project Evaluation and Planning :- Importance of SPM ,Activities, Methodologies, Categorization of Software Projects, Setting Objectives, Management Principles, Management Control, Project Portfolio Management, Cost-benefit Evaluation Technology, Risk Evaluation , Strategic Program Management , Stepwise Project Planning.	07
Unit-2	Software Project Life Cycle and Effort Estimation : Software process and Process Models, Choice of Process models, Rapid Application development, Agile Methods, Dynamic System Development Method, Extreme Programming, Managing interactive processes, Basics of Software estimation ,Effort and Cost estimation techniques , COSMIC Full function points , COCOMO II , a Parametric Productivity Model.	07
Unit-3	Activity Planning and Risk Management : Objectives of Activity planning , Project schedules , Activities , Sequencing and scheduling , Network Planning models , Formulating Network Model , Forward Pass & Backward Pass techniques , Critical path	07

	(CRM) method , Risk identification , Assessment , Risk Planning , Risk Management , PERT technique , Monte Carlo simulation , Resource Allocation , Creation of critical paths , Cost schedules.	
Unit-4	Software Project Management and Control: Framework for Management and control Collection of data Visualizing progress , Cost monitoring Earned Value Analysis , Prioritizing Monitoring , Project tracking , Change control Software Configuration Management , Managing contracts , Contract Management.	07
Unit-5	Staffing in Software Projects : Managing people , Organizational behavior , Best methods of staff selection,Motivation , The Oldham Hackman job characteristic model , Stress , Health and Safety , Ethical and Professional concerns , Working in teams Decision making Organizational structures Dispersed and Virtual teams , Communications genres, Communication plans, Leadership.	07
Unit-6	Software Deployment:- Software Deployment,Importance of Software Deployment,Software Deployment vs Software Release,Software Deployment Methodologies,Software Deployment Processes, Best Practices for Software Deployment.	07
	Total	42

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management , Fifth Edition, McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki —Effective Software Project Management , Wiley Publication, 2011.
3. Walker Royce: —Software Project Management- Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, —Managing Global Software Projects , McGraw Hill Education (India), Fourteenth Reprint 2013

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B.Tech. MDM Track 1: Electronics and Communication Engineering

Course Code	Course Title	L	T	P	C
6SEMDM3	Analog and Digital Communication	03	00	00	03

Pre-requisites:

1. Applied Mathematics-III,
2. Base Band Signals

Course Learning Objectives:

1. To understand and analyze various analog and digital modulation and demodulation techniques, including AM, FM, and pulse modulation systems.
2. To study the fundamental concepts of digital communication systems, including sampling, quantization, baseband transmission, and digital modulation techniques.
3. To explore the building blocks of digital communication systems

Course Outcomes:

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

1. Understand the necessity of modulation and identify the various components of analog and digital communication systems.
2. Understand different modulation and demodulation schemes in analog communication systems and to compare the strengths and weaknesses of various analog communication systems.
3. Analyze the performance of various pulse modulation schemes.
4. Understand basic building blocks of digital communication system and function of each one.
5. To understand the different functional blocks of digital communication system.
6. To analyze and compare the performance of studied digital modulation techniques.

Unit No.	Course: Analog and Digital Communication	No. of Lectures Required
1	AM Transmitters and Receivers: Modulation, need of modulation, AM Modulation (Mathematical expression) concept of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSB-FC Transmitter. Super-heterodyne receiver, Types of AGC & its need, Receiver Characteristics: Selectivity, Sensitivity & Fidelity.	08
2	FM Transmitters and Receivers: FM Modulation, FM generation using	08

	FET. Narrow Band and Wide Band FM, their comparison, Pre-emphasis and De-emphasis. FM Discriminator: FM Receiver block diagram, Single Slope, Balanced slope detector and Ratio detectors.	
3	Analog Pulse Modulation: Band limited & time limited signals, Sampling Theorem statement, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect, PAM, PWM & PPM.	08
4	Pulse Code Modulation: Digital representation of Analog signal, PCM Generation and Reconstruction, Quantization (basic working), Quantization Noise, Companding, Delta Modulation, Adaptive Delta Modulation.	07
5	Introduction to Digital Communication System: Functional Blocks of Digital Communication System, and working of each block	05
6	Digital Modulation: BPSK, BFSK and ASK generation and reception, QPSK Transmitter and Receiver, Comparison of Digital modulation systems	06
	Total	42

Text Books:

1. Kennedy G. "Electronic Communication System" Tata Mc-Graw Hill Co., New Delhi (Third Ed).
2. Taub and Schilling D.L., "Principles of Communication Systems", Mc-Graw Hill Co., New Delhi (Second Ed.).
3. Shanmugam K.S., "Digital & Analog Communication Systems", John Wiley & Sons, New York, 1996.
4. Lathi B. P., "Modern Digital and Communication Systems", Holt Rinchart and Winston Inc., New York, 1993.
5. Simon Haykin, "Digital Communication", John Wiley and Sons, Pvt. Ltd., Singapore.

Reference Books:

1. Proakis J. K., "Digital Communication", Mc-Graw Hill Book Co., London (Second Edition).
2. Glover and Grant, "Digital Communication", Prentice Hall Publication
3. Collins Dennis, Collins John, "Electronic Communications" PHI.
4. Wayne Tomasi, "Electronic Communication Systems" Pearson Education, (Fifth Edition).
5. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering" John Wiley, 1965.
6. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004

B.Tech. MDM Track 2: Telecommunication Engineering

Course Code	Course Title	L	T	P	C
6SEMDM7	Introduction to Mobile Computing	03	00	00	03

Pre-requisites:

1. Wireless Communication Fundamentals

Course Learning Objectives:

1. To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
2. To understand the Cellular Concept and typical mobile networking infrastructure through a popular GSM, GPRS protocols.
3. To understand the platforms and protocols used in mobile environment

Course Outcomes:

After completion of this course, student will be able

1. To understand concepts of Mobile Computing.
2. To comprehend various Cellular concepts of Mobile Communication..
3. To analyze Telecommunication System using GSM & GPRS protocol.
4. To understand IP and TCP layers of Mobile Communication.
5. To Analyze Wireless Application Protocol for mobile communication networks.
6. To understand concept of 5G in Mobile Communication.

Unit No	Course: Introduction to Mobile Computing	No. of Lectures Required
Unit I	Introduction of Mobile Computing: History, Types, Benefits, Application, Evolution, Security Concern regarding Mobile Computing, Different Propagation Modes, Wireless Architecture and its types, needs of mobile user	07
Unit II	The cellular concept: Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies, Distance to frequency reuse ratio	07
Unit III	Telecommunication System: GSM: - Channel allocation; call routing Architecture, PLMN interface, addresses and identifiers, authentication and security, Handoffs Technique. GPRS: network operation, data services, Applications, Billing and charging	07
Unit IV	Mobile Network Layer & Transport Layer Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics. Traditional TCP, Mobile TCP	07
Unit V	Wireless Application Protocol:	07

	Introduction of WAP, WAP applications, WAP Architecture, WAP Protocol Stack, Challenges in WAP	
Unit VI	Introduction to 5G : Introduction, features and challenges, Applications of 5G, 5G network architecture	07
	Total	42

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2002.

REFERENCE BOOKS:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007
4. Asoke K. Talukdar, “Mobile Computing”, Tata McGraw-Hill Education, 2010.
5. Mohammad Ilyas, Imad Mahgoub, “Mobile Computing Handbook”, AUERBACH, 2004.
6. Vilas S. Bagad, “Mobile Computing Introduction”, Technical Publications, 2014
7. DR SANJAY Sharma, “Mobile Computing”, S.K. Kataria & Sons Publication, 2014.
8. Dr. Ashish N. Jani, Dr. N.N. Jani, Neeta Kanabar, “Mobile Computing - Technologies and Applications”, 2010
9. Pattnaik, Prasant Kumar, Mall, Rajib, “Fundamentals Of Mobile Computing”, Second Edition, PHI Learning Pvt. Ltd., 2015.

B.Tech. Fifth Semester (IT Department)

Multidisciplinary Minor (Track: Information Technology)

Course Code	Course Title	L	T	P	C
6SNMDM3	E-Commerce	03	00	00	03

Course Prerequisite: Nil

Course Learning Objectives:

1. Understand the Fundamentals of E-Commerce.
2. Analyse E-Commerce Business Models.
3. Understand E-Commerce Infrastructure.
4. Design and Develop E-Commerce Websites.

Course Outcomes:

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

1. Develop an Understanding of E-Commerce and E-Business.
2. Evaluate Different E-Commerce Business Models.
3. Understand E-Commerce Infrastructure.
4. Design and Build E-Commerce Websites.
5. Implement Security Measures and Payment Systems.
6. Apply E-Commerce Marketing Strategies.

	Subject: E-Commerce	L (Hrs)
Unit-1	E-Commerce: The difference between E-commerce and Business, Why study E-commerce? Eight unique features of Ecommerce Technology, Types of E-Commerce, Growth of the Internet and the web, Origins and Growth of E-commerce, Ecommerce - A brief History.	07
Unit-2	E-commerce Business Models and Concepts: E-Commerce business Model-eight Key elements of a Business Model, Major Business-to-Consumer (B2C) Business Models, Major Business -Business (B2B) Business Models: Business Models emerging E-Commerce areas, How the Internet and the WEB change Business; Strategy, Structure and Process.	07
Unit-3	E-Commerce Infrastructure: The Internet: Technology Background, The Internet Today, Internet II; The future infrastructure, The World Wide Web, The Internet and the Web Features.	07
Unit-4	Building an E-Commerce Web Site: Building and E-Commerce Web Site- A strategic approach, Choosing Server Software, Choosing the Hardware for an E-Commerce site, Other Ecommerce Site Tools.	07

Unit-5	Online Security and payment Systems: The E-Commerce Security Environment, Security threads in the E-commerce environment, Technology solutions, Management Policies, business procedures and public laws, payment systems.	07
Unit -6	E-Commerce Marketing Concepts: Cosumer online; The Internet Audience and Consumer behaviour, Basic Marketing Concepts, Internet Marketing Technologies, B2C and B2C E-Commerce marketing and Branding strategies.	07
	Total	42

Text Book:

1. Keneth C. Laudon, Carol Gurcio Trave”e-commerce, business, technology, Society” (Pearson)

References:

1. Dave Chaffley “E-Business and E-commerce management” (3rd Edition) Pearson.
2. Kalkakofa Whirttoton, “Frontiers of E-Commerce” Pearson.

B.Tech. Fifth Semester (IT Department)

Multidisciplinary Minor (Track: Cyber Security)

Course Code	Course Title	L	T	P	C
6SNMDM7	Basics of Ethical Hacking	03	00	00	03

Course Prerequisite: Basic concepts in networking and programming

Course Learning Objectives:

1. To learn about the hacker mindset and the history of hackers.
2. To understand basic networking and security technologies.
3. To gain a basic understanding of security policy.
4. To explore various vulnerability analysis techniques & firewalls.

Course Outcomes:

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

1. Develop the core foundations of ethics and cryptography in regards to computer security.
2. Analyze the vulnerability with respect to hacking.
3. Analyze DDOS attack and session hijacking.
4. Classify various types of malware and sniffing attacks on network.
5. Analyze various attacks scenario and remedies.
6. Detecting the attack with IDS.

	Subject: Basics of Ethical Hacking	L (Hrs)
Unit-1	Introduction and Ethics: Ethical Hacking, Types of Hackers, Phases of Ethical Hacking, Fundamentals of computer networking. TCP/IP protocol stack, IP addressing and routing, Common Network Threats/Attacks	07
Unit-2	Cryptography: Introduction to cryptography, private-key encryption, public-key encryption, Key exchange protocols, cryptographic hash functions, applications, Digital signatures, Attacks on cryptosystems	07
Unit-3	Vulnerability Analysis & System Hacking: Vulnerability Analysis, Types of Vulnerability Analysis, Vulnerability Assessment Tools, System Hacking, Password Cracking, Penetration testing, Hiding Files, Clearing logs	07
Unit-4	DoS and Session Hijacking: DoS attack, DDoS attack, Common symptoms of DoS/DDoS attack, Categories of DoS/DDoS Attack Vectors, session hijacking, Application and Network level session hijacking	07

Unit-5	Sniffing: Malware and its propagation ways, Malware components, Types of malware, Concept of sniffing, Types of sniffing, Types of sniffing attacks	07
Unit -6	IDS & Firewall: Intrusion Detection System (IDS), Types of Intrusion Detection Systems, Introduction to Firewalls, Types of Firewalls, Introduction to Honeypots, Case studies: various attacks scenarios and their remedies.	07
	Total	42

Recommended Textbooks:

1. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Patrick Engebreston, ISBN: 0124116442

Reference Books:

1. Penetration Testing: A Hands-On Introduction to Hacking, Georgia Weidman, ISBN: 1593275641
2. ETHICAL HACKING: A Comprehensive Beginner's Guide to Learn and Master Ethical Hacking, Hein Smith, Hilary Morrison

B.Tech Sixth Semester CSE(IoT)

Course Code	Course Title	L	T	P	C
6SXMDM3	Single Board Computers	03	00	00	03

Course Pre-requisite: 1. 4SXMDM1 Fundamentals of IoT
2. 5SXMDM2 Sensors and Actuators

Course Objectives:

1. To understand the fundamentals of Single Board Computers (SBCs).
2. To comprehend the knowledge of the architectures and components of various SBCs.
3. To evaluate the applications and limitations of SBCs in real-world scenarios.

Course Outcomes:

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

- 1 Define Single Board Computers and explain their evolution and applications in IoT.
- 2 Discuss the features and functionalities of various Arduino models, including UNO, Mega, and Nano.
- 3 Explain the System on Chip (SoC) architecture of Raspberry Pi and its core components.
- 4 Analyze the performance of SBCs in various IoT scenarios.
- 5 Evaluate and mitigate security vulnerabilities in SBCs to ensure robust and ethical deployment in real-world applications.
- 6 Assess the scalability and interoperability of SBC-based IoT systems in real-world scenarios.

	Course Name: Single Board Computers	Lect Hrs.
UNIT I	Introduction to Single Board Computers: Definition and evolution of SBCs, Comparison with traditional desktop computers, Overview of: Raspberry Pi, Arduino, BeagleBone, Tinker Board, Compare Arduino and Raspberry Pi.	7
UNIT II	Arduino Architecture and Components : Overview of Arduino Models: UNO, Mega, Nano, ATmega328 microcontroller architecture & their features, Digital and analog input/output pins functions, Serial communication (UART, I2C, SPI).	7
UNIT III	Raspberry Pi Architecture and Components : Comparative analysis of different Rpi models. System on Chip (SoC) Architecture: Understanding the core components, Peripheral Interfaces and networking, Operating Systems: Raspberry Pi OS and alternatives	7

UNIT IV	Internet of Things (IoT) with SBCs: Introduction to IoT concepts, Connecting SBCs to the internet, Using MQTT and HTTP protocols, Cloud platforms and data visualization, Building IoT applications.	7
UNIT V	Challenges and Considerations: Security Concerns: Address vulnerabilities in SBCs and strategies for securing devices, Scalability Issues, Interoperability (Examine the need for standardization and compatibility among different SBCs and systems), Regulatory and Ethical Implications.	7
UNIT VI	Applications of SBCs: Overview, Block Diagram and Working of real world applications with the use of SBCs: Healthcare, Smart home automation, in industry and in Education.	7
	Total	42

Text Book:

1. "Arduino Cookbook" by Michael Margolis
2. "Raspberry Pi User Guide" by Eben Upton and Gareth Halfacree

Reference Books:

1. "Getting Started with Arduino" by Massimo Banzi, a comprehensive introduction to the Arduino platform.
2. "The Internet of Things: A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti
Explores the integration of SBCs in IoT applications.
3. "An Internet of Things" by Rahul Dubey (Cengage).

B.Tech. Sixth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
6SMMDM3	Industrial Engineering	03	00	00	03

Course Prerequisites:

1. Basic knowledge of Industrial Management.
2. Knowledge of general mathematics.

Course Learning Objectives:

1. To learn the basics of Industrial Engineering, plant location and plant layout.
2. To study the importance of ergonomics in designing of products and production planning.
3. To study the concepts of quality control and total quality management.

Course Outcomes:

Students will be able to –

1. Understand the concepts productivity and productivity measurement approaches.
2. Apply the knowledge on the basic principles in facilities planning and plant location.
3. Understand and apply the sales forecasting techniques.
4. Understand and analyze the various material handling problems.
5. Apply and analyze work study and ergonomic principles to design workplaces for the improvement of human performance.
6. Understand and evaluate the value of Statistical Process Control, Total Quality Management and six sigma limits.

	Subject: Industrial Engineering	L
UNIT I	INTRODUCTION : Concepts of Industrial Engineering, History and development of Industrial Engineering, Applications of Industrial Engineering, Production Management Vs Industrial Engineering, Production System, Input Output Model, Productivity, Factors affecting Productivity, Increasing Productivity of resources, Kinds of Productivity measures.	7
UNIT II	PLANT LOCATION AND LAYOUT: Factors affecting Plant location – Objectives of Plant Layout – Principles of Plant Layout – Types of Plant Layout – Methods of Plant and Facility Layout– Plant Layout procedure – Line Balancing	6
UNIT III	PRODUCTION PLANNING AND CONTROL: Objectives of sales forecasting- Types of forecasting- Factors affecting forecasting- Methods of sales forecasting – Types of production – Economic Batch Quantity– Loading – Scheduling and control of production	7
UNIT IV	MATERIAL HANDLING EQUIPMENTS:- Scope and functions of material handling, Manual mechanical handling ratio, Principles of material handling, Analysis of material handling problem, Classification of material handling system, Salient features and	7

	applications of general purpose material handling Equipments, Material handling in stores and warehouses, Optimum allocation of material handling equipment.	
UNIT V	WORK STUDY & ERGONOMICS: Definition and Concept of work study, Principles of Motion Economy, Method study, Recording techniques of method study, Work Measurement procedures, Time Study, Ergonomics and its areas of application in the work system.	7
UNIT VI	STATISTICAL QUALITY CONTROL: Definition and Concepts, Fundamentals of Control Charts for variables, Control Charts for attributes, Acceptance Sampling, Single sampling plan- Double sampling plan. TOTAL QUALITY MANAGEMENT: Total Quality Management (TQM)- philosophical concepts. Concept of six sigma and its application, Concept and applications of Kaizen and Quality Circle.	6
	Total	40

Textbooks:

1. O.P.Khanna, 2018, Industrial Engineering and Management, Dhanpat Rai Publications
2. Martand Telsang, 2006, Industrial Engineering and Production Management, S. Chand and Company

Reference Books:

1. Ravi Shankar, 2009, Industrial Engineering and Management, Galgotia Publications & Private Limited
2. C.Natha Muni Reddy, Industrial Engineering (IE) and Management, New age international Publishers
3. Industrial engineering & production Management by M. Mahajan (Dhanpat Rai & Co.)
4. Production and operations management- concepts models and Behavior by Everett E. Adam, Jr., & Ronald J. Ebert (Prentice- Hall of India)

B.Tech. Sixth Semester (Mechanical Engg)

Course Code	Course Title	L	T	P	C
6SMMDM7	Automation Engineering	03	00	00	03

Course Prerequisites:

1. Preliminary knowledge of production processes and manufacturing techniques.
2. Basic knowledge of computer languages and logic.

Course Learning Objectives:

1. To learn the concepts of Automation in industries.
2. To study the NC/CNC systems and its applications.
3. To study the functioning of FMS and CIM.

Course Outcomes:

Students will be able to –

1. Understand the concepts of automation and its importance in industries.
2. Apply the knowledge of NC/CNC programming.
3. Understand and apply the knowledge of robotics in industries.
4. Understand the concept of Group Technology and apply the knowledge of CAPP.
5. Understand the concepts of FMS and ASRS and apply the knowledge of AGVS.
6. Understand the concept of CIM.

	Subject: Automation Engineering	L
UNIT I	INTRODUCTION: Automation & its types, Automation for mass manufacturing and assembly, Reasons for automating, Automation strategies, Automated flow lines, Control function, General terminology and analysis of automated flow line, Partial automation, Line balancing.	6
UNIT II	NC/CNC:- Basic concept, N.C. controls- point to point , straight cut and continuous path control, machine control units, open and closed loop system, NC machine components, CNC & DNCs, Manual part programming formats, Various Programming codes, Manual part programming for drilling, Milling and turning operations.	7
UNIT III	ROBOTICS:- Evolution of industrial robots, Robots anatomy, Arm geometry, drive system and end efforts, sensors, Evolution of geometrical configurations for robots, Programming techniques of Robots, Applications of Robots in manufacturing- part handling, part processing and part building.	7
UNIT IV	GROUP TECHNOLOGY AND PROCESS PLANNING: Introduction-Part families, part classification and coding systems, Group technology machine cells, advantage of group technology, the planning function, retrieval type process planning system, Generative process planning systems, Benefits of CAPP, Expert systems and expert system approach to CAPP.	7

UNIT V	FLEXIBLE MANUFACTURING SYSTEMS (FMS): Introduction, schematic of FMS, FMs cells, Components of FMS, Relation of Group Technology, with FMS, Planning, Simulation and analysis of FMS, Applications of FMS. Material handling : Automated storage and Retrieval system (ASRS), Automated Guided Vehicle (AGV)etc.	6
UNIT VI	COMPUTER INTEGRATED MANUFACTURING (CIM): Introduction, Sequence of functions in CIM, elements of CIM system, CIM Wheel, Structure of CIM database system. Guidelines for CIM development, Benefits of CIM, Introduction to automated inspection, Advantages over traditional method, On-line & offline inspection, CMM construction, types & working.	7
	Total	40

Textbooks:

1. Production system, Automation and CIM, Mikhal Groover, Pearson Publications.
2. CNC Machines; M.Adithan & B.S.Pabla; New Age International.
3. Robotics; Yarem Koren, Mcgraw Hill

Reference Books:

1. Industrial Robotics by M.P. Groover, McGraw Hill
2. CAD/CAM/CIM ; Radhakrishnan & Subramanium; New age International.
3. Computer aided Manufacturing; P.N.Rao, N.K.Tiwari and & T.K.Kundra; Tata Mcgraw Hill