



**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)
2025-26**

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches
Batch Admitted AY2024-25-26-27 *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. MichałJaworski, 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.