MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Department of Electronics Engineering

Data Communication (14241201)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241201	DC	Data Communication	20	20	30	30	-	-	100	3	-	-	3

Data Communication (14241201)

Course objectives: To provide an introduction to fundamental computer network architecture concepts and their applications.

Unit I Introduction to Switching Techniques: Circuit switching, Message switching, Packet switching, Protocols, Layered network architecture and architecture OSI & TCP/IP reference model, Physical layer transmission medium, RS 232 C, Modem, Topologies.

Unit II Data Link Layer: Framing BSC, HDLC. ARQ: Stop and wait, Sliding window, Efficiency, Error detection and Error correction, Hamming codes, Parity checks – CRC, Checksum, HARQ.

Unit III MAC Layer: MAC sub layer – LAN protocols, ALOHA, Slotted and pure ALOHA, CSMA, CSMA/CD, Token bus, Token Ring, TDMA, CDMA, FDMA, Ethernet, Bridge, Router, Gateway, Switch.

Unit IV Network Layer: Routing – Data gram and Virtual Circuit, Distance vector and Link state Routing, Dijkstra's Algorithms, Congestion Control: Leaky bucket algorithm, Slow start, ATM model and ATM traffic management – AAL, X.25, IP layer, IP addressing.

Unit V Transport Layer: Connection oriented transport protocol mechanism, TCP, Transport flow regulation, UDP Segmentation & Reassemble, Session and Transport Interaction, Synchronization, Session protocols, FTP, Remote login.

Text Books:

1. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
2. Data and Computer Communication – W. Stallings, Pearson

Reference Books:

1. LANs – Keiser, Tata Mc-Graw Hill
2. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
3. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stalling, Pearson

Course Outcome:

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

CO1: Apply various switching techniques in a layered network architecture.
CO2: Analyze protocols and techniques related to the Dynamic Link Layer.
CO3: Explain MAC sub-layer protocols to design and manage efficient LAN.
CO4: Analyze routing algorithms, congestion control mechanisms, and IP addressing techniques.
CO5: Explore transport-layer protocols for flow and error control.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	0	2	1	1	1	3	1	3	3	2
CO2	3	3	2	2	0	1	1	1	2	1	2	3	3	1
CO3	3	1	1	1	0	2	1	1	1	2	1	3	3	2
CO4	3	3	2	2	0	1	2	1	2	1	2	2	3	1
CO5	3	3	1	1	0	1	2	1	2	1	2	2	3	1

1 - Slightly; 2 - Moderately; 3 – Substantially

Recommended in the BoS meeting of **Electronics Engineering** held on 6th Dec 2024

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Electronic Circuits (14241202)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241202	DC	Electronic Circuits	20	20	30	30	-	-	100	2	1	-	3

Course Objective: To understand different semiconductor circuits and grab the way to design circuits andperform measurements of circuit parameters.

Unit I: Diode Circuits: Review of P-N Junction Diodes, Power supply parameters, SMPS, Zener and Avalanche Breakdown, Zener voltage regulator, series pass regulator (with feedback) and shunt voltage regulators, Short circuit protection.

Unit II: Introduction to BJT Biasing and Stability: Review of BJTs, Transistor biasing and bias stabilization, the operating point, stability factor, analysis of fixed base bias, Voltage divider bias,collector to base bias, Emitter resistance bias circuit and Bias compensation techniques.

Unit III: BJT as an Amplifier: Low frequency BJT amplifiers, equivalent circuit of BJT using h parameter for CB, CE, CC configurations, calculation of transistor parameter for CB, CE, CC using h parameters. High frequency BJT amplifier: Hybrid-pi (π) common emitter transistor model, hybrid – π conductance and capacitance, gain-bandwidth product.

Unit IV: Feedback amplifiers: Introduction to Feedback Amplifiers & their design parameters, comparison of different feedback amplifier configuration viz (gain, input impedance, output impedance, current gain, voltage gain), cascading of BJT amplifier, Darlington Pair.

Unit V: Oscillators and Tuned Amplifiers: Barkhausen criterion, Sinusoidal oscillators, L-C (Hartley- Colpitts) oscillators, RC phase shift, resonant oscillator, Wien Bridge and crystal oscillators, Clapp oscillator, Tuned

Text Books:

1. Microelectronic Circuits: Theory and Application: Sedra& Smith,7th Edition, Oxford University Press.
2. Electronics Devices and Circuits: Boylested&Nashelsky,11th Edition, Pearson Education India

Reference Books:

1. Electrical Engineering material: A.J Dekker, 1st Edition, Prentice Hall of India.
2. Micro Electronics: Millman, & Grabel,2nd Edition, McGraw Hill Education
3. Integrated Electronics: Millman & Halkias, McGraw Hill Education.

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Course Outcomes

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

CO 1. Design different diode circuits.

CO 2. Design the biasing circuits for BJTs.

CO 3. Examine the working of BJT amplifiers.

CO 4. Analyze the different parameters of feedback amplifiers.

CO 5. Design the Oscillator and Tuned amplifier circuits.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	1	2	3	2	_	1	2	2
CO2	3	3	3	1	2	2	1	2	3	2	-	2	3	3
CO3	3	3	2	2	2	2	1	2	3	1	1	2	3	2
CO4	3	3	2	2	2	2	1	1	3	2	1	2	3	3
CO5	3	3	3	2	2	2	1	2	3	2	1	3	3	3

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Department of Electronics Engineering

Signals & Systems (14241203)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241203	DC	Signals & Systems	20	20	30	30	-	-	100	2	1	-	3

Course objective: Coverage of continuous and discrete-time signals and systems, their properties and representations and methods that is necessary for the analysis of continuous and discrete-time signals and systems.

Unit-1 Introduction: Mathematical Description of Continuous& Discrete– Time Signals Definition, Classification of signals, Complex Exponential and Sinusoidal Function; Unit Step, Signum, Unit Ramp, Unit Impulse, Periodic Impulse or Impulse Train, Rectangle, Triangle, Sinc and Gaussian pulse functions, Even and Odd Functions, Periodic and non periodic Functions, Signal Energy and Power, Scaling and Shifting, Amplitude Scaling, Time Shifting, Differential and Integration.

Unit 2 Fourier series and Fourier transform: Fourier Transform: Exponential Fourier series, and Trigonometric Fourier series, properties of Fourier series, Introduction to Fourier transform, Fourier Transforms of elementary functions. Properties of Fourier Transform.

Unit 3: Z transforms: Introduction to Z-transform, relation between Laplace and Z-transform, relation between Fourier transform and Z-transform, ROC, properties of ROC, Properties of Z-transform, Inverse Z-transform, Unilateral Z-transform.

Unit-4 Properties of Continuous and Discrete Time Systems: System Modeling, System Properties, Homogeneity, Time Invariance, Additivity, Linearity & Superposition, Stability, Incremental Linearity, Causality, Memory, Static, Nonlinearity, Inevitability, continuous & discrete LTI system.

Unit-5 Continuous and Discrete system analysis: The Convolution Integral, and Convolution Sum, Impulse Response, Convolution & Properties, System Interconnections, Stability and Impulse Response, Response of Systems to Standard Systems, Realization of Differential Equations, Analysis of discrete time LTI system using Z-transform, Analysis of continuous time LTI system using Laplace transform.

Text Books:

1. Digital Signals and Systems, 2nd Edition: Simon Haykin, Barry Van Veen, 2nd Edition, Wiley India Pvt. Ltd.
2. Signals and Systems: Hwei. P. Hsu, Schaum's outlines, 2 nd Edition, Tata Mcgraw Hill Education.

Reference Books:

1. Fundamentals of Signals & Systems: Michael J Roberts, 2 nd Edition, Mc Graw Hill Education.
2. Signal and Systems: Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, Pearson Education India.

Course Outcomes

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

CO1. Describe continuous and discrete time signals mathematically.

CO2. Determine the spectral characteristics of signals using Fourier series and Fourier transform.

CO3. Apply z-transform for analysis of discrete time signals.

CO4. Evaluate the performance parameters of LTI systems.

CO5. Analyze continuous and discrete time systems.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	1	2	2	1	2	_	3	2	2
CO2	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO3	3	3	2	3	3	3	2	1	2	2	3	3	3	3
CO4	3	3	3	3	3	3	2	1	2	2	3	3	3	3
CO5	3	3	2	1	2	3	2	1	2	2	1	3	2	2

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Digital Circuits and Systems (14241204)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241204	DC	Digital Circuits and Systems	20	20	30	30	-	-	100	2	1	-	3

Course Objective: To understand the concept of digital systems, design& analyze the combinational and sequential logic circuits.

Unit I: Boolean algebra and switching functions: Minimization of Boolean functions, Canonical & standard form, concept of prime implicant etc. Karnaugh's map method, Quine-McCluskey's method, Universal gates, NAND/NOR realization of Boolean functions.

Unit II: Combinational Logic circuits: Half adder, Half subtractor, Full adder, Full subtratctor circuits. Serial and parallel adder, BCD adders, look-ahead carry generator, Code Converters, Decoders, Encoders, Multiplexers & demultiplexers.

Unit III: Sequential Circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave, Characteristic table and equation, Application table, Edge triggering, Level Triggering, Realization of one flip flopusing other flip flops, Multivibrators: Monostable, Astable, Bistable (transistorized).

Unit IV: Registers and Counters: Asynchronous Ripple or serial counter, Asynchronous Up/Down counter, Synchronous counters, Synchronous Up/Downcounters, Programmable counters, Design of Synchronous counters: State diagram, State table, State minimization, State assignment, Excitation table and Maps Circuit, Implementation: Modulo-n-counter, Registers:Shift registers, Universal shift registers, Shift register counters, Ring counter, Shift counters, Sequence generators.

Unit V: Logic Families: RTL, DTL, all types of TTL circuits, ECL, HTL and PMOS, NMOS & CMOS logic etc. Comparison of various logic families, ROM organization- PROM, EPROM, EEPROM, EAPROM, RAM organization- Static RAM, Dynamic RAM.

Text Books:

1. Digital Design: M. Mano,4th Edition, Prentice Hall of India.
2. Logic & Computer Design Fundamental: M.Mano, 5th Edition, Pearson Education India.
3. Digital Circuits and Design: S. Salivahanan,5th Edition, Oxford University Press.

Reference Books:

1.Digital Electronics: W.H. Gothman, Prentice Hall of India.
2.Digital System Principles & Applications: R.J. Tocci,11th Edition, Pearson Education India.
3.Pulse, Digital & Switching Waveforms: Millman&Taub, McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:
CO1. Develop/implement the Boolean expression using logic gates.
CO2. Design different combinational logic circuits such as adder, subtractor, decoder etc.
CO3. Analyze sequential circuits such as flip-flops, latches etc.
CO4. Design shift registers and counters using flip-flops.
CO5. Compare logic families, semiconductor memories, & multivibrators.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	1	2	1	2	1	2	2	3	3	3
CO2	3	3	3	3	2	3	1	2	2	1	3	3	2	2
CO3	3	3	3	3	2	2	1	-	1	2	1	2	3	3
CO4	3	3	2	2	2	2	2	-	2	1	1	2	3	3
CO5	3	3	3	2	3	3	1	1	1	1	2	3	2	3

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B.Tech. II Semester (Electronics Engineering)

Digital Logic Design Lab (14241206)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241206	DLC	Digital Logic Design Lab					70	30	100	-	-	2	1

Course Objective: Develop skills in designing and testing electrical and electronic circuits.

List of Experiment

1. To verify the truth tables for logic gates – AND, OR, NOT, EX-OR, EX- NOR, NAND, NOR
2. To realize basic logic gates using universal gates
3. To verify the truth table of half adder and full adder
4. To verify the truth table of half subtractor and full subtractor
5. To design R-S Flip-Flop
6. To design J-K Flip-Flop
7. To examine parity generator/checker
8. To design ripple counter using J-K Flip-Flop.

Course Outcomes:

After completing the lab, students will be able to

CO1. Verify the De Morgan's theorem.
CO2. Design the basic and universal gates.
CO3. Design adder & subtractor circuits.
CO4. Verify the truth table of flip-flops.
CO5. Design Counters and Registers

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B.Tech. II Semester (Electronics Engineering)

Problem Solving through Python Programming (14241207)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241207	DLC	Problem Solving through Python Programming					70	30	100	-	-	2	1

Course Objectives: Develop skills in modular programming by writing reusable functions and dividing the code into logical modules.

List of Experiments

1. Write python programming to declare various data type and display its data type.
2. Write python programming to declare sequential data types and display its data type.
3. Write python programming to perform addition and subtraction and display the result.
4. Write python programming to perform multiplication and division and display the result.
5. Write a python programming to perform Boolean operation and display the result.
6. Write a python programming to perform logical operations and display the result.
7. Write a python programming to declare a string, display its different index position and also change the letter of string with some other letter.
8. Write python programming to declare array and display its different index position.
9. Write python programming to declare a string then (a) Capitalize it, (b) convert into title format, (c) Swap the case of string.
10. Write a python programming to declare a string use slice object to slice the given sequence to perform addition, subtraction, multiplication and division of integer and floating values.

Course Outcomes

After completing the lab, students will be able to:

CO1. Write basic programs in Python.

CO2. Visualize data using Python packages.

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B.Tech. II Semester (Electronics Engineering)

Micro Project-II

Course Objectives: To design an application-based project.

1. LED Blinking Circuit – Blink an LED using a 555 timer or microcontroller.
2. Light-Activated Switch – Use an LDR to turn devices on/off based on light intensity.
3. Water Level Indicator – Monitor and display water levels using LEDs and float sensors.
4. Automatic Night Lamp – Automatically turn on a lamp in low light using an LDR.
5. Battery Level Indicator – Indicate battery levels using LEDs and voltage dividers.
6. Clap-Activated Switch – Control devices with a clap using a sound sensor.
7. Temperature-Controlled Fan – Adjust fan speed based on temperature using a thermistor.
8. Rain Detector – Detect rainfall using a rain sensor and trigger an alert.
9. Traffic Light Controller – Simulate traffic signals using LEDs and timers.
10. Digital Thermometer – Measure temperature using a thermistor and display it on an LCD.
11. Burglar Alarm System – Trigger an alarm when motion is detected using a PIR sensor.
12. IR Obstacle Detection System – Detect obstacles using IR sensors and LEDs.
13. Soil Moisture Sensor Circuit – Monitor soil moisture to automate irrigation systems.
14. Electronic Dice – Create an electronic dice using LEDs and a random generator circuit.
15. Heartbeat Monitor – Measure and display heart rate using a pulse sensor.
16. DC Motor Speed Controller – Control motor speed using a potentiometer and PWM.
17. Power Supply Regulator Circuit – Design a stable voltage supply using regulators.
18. Solar Mobile Charger – Use solar panels to charge mobile devices.
19. Line Follower Robot – Build a robot that follows a black line using IR sensors.
20. Metal Detector – Detect metallic objects using an inductive sensor circuit.
21. To-Do List Application – Create a task management system for adding, viewing, and deleting tasks.
22. Temperature Converter – Convert temperatures between Celsius, Fahrenheit, and Kelvin.
23. Quiz Application – Develop a multiple-choice quiz with scoring and result display.
24. Random Password Generator – Generate secure random passwords using Python's random module.
25. Dice Rolling Simulator – Simulate the rolling of dice with random number generation.
26. Currency Converter – Convert between different currencies using an API.
27. Simple Chatbot – Build a rule-based chatbot for basic conversation using conditionals.

28. Age Calculator – Calculate age from the user's date of birth.
29. File Renaming Tool – Automate renaming multiple files in a directory.
30. Basic Alarm Clock – Set a timer to trigger an alarm using time and sound libraries.
31. Temperature and Humidity Monitor – Use a DHT11 sensor to display real-time temperature and humidity.
32. Obstacle Avoiding Robot – Employ an ultrasonic sensor to detect and avoid obstacles.
33. Light-Activated LED – Use an LDR to turn an LED on/off based on light intensity.
34. Soil Moisture Detection System – Monitor soil moisture levels and trigger a water pump when dry.
35. Motion-Activated Security Alarm – Use a PIR sensor to detect motion and trigger an alarm.
36. Fire Detection System – Detect fire using a flame sensor and sound an alert.
37. Smart Dustbin – Open a dustbin lid automatically using an ultrasonic sensor.
38. Gas Leakage Detection System – Use an MQ-2 sensor to detect gas leaks and trigger a buzzer.
39. Heartbeat Monitoring System – Measure heart rate using a pulse sensor and display the results.
40. Simple Calculator – Perform basic arithmetic operations to understand input/output and operators.
41. Number Guessing Game – Implement a random number guessing game using loops and conditionals.
42. Student Grade Calculator – Calculate grades based on input marks using decision-making statements.
43. Library Management System – Manage book records using file handling and structures.
44. Tic-Tac-Toe Game – Build a two-player game to practice arrays and game logic.
45. Bank Account Management System – Simulate banking operations using classes and OOP concepts.
46. Prime Number Finder – Identify prime numbers in a range using loops and mathematical logic.
47. Contact Management System – Store and manage contacts using structures and file handling.
48. Simple Voting System – Create a voting system with counters and conditional statements.
49. Rock, Paper, Scissors Game – Develop a game using random number generation and control flow.

Course Outcomes:

CO1: Analyze the electronic components, measuring instruments, and tools.
CO2. Design and simulate the schematic, layout using CAD software.
CO3. Design and fabricate PCBs for various electronic circuits individually and in a team.
CO4. Troubleshoot the program or circuit individually and in a team.
CO5. Implementation of e mini project that benefits society.