PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 636011.

DEGREE OF MASTER OF SCIENCE

(Choice Based Credit System)

Syllabus For

M.SC., ELECTRONICS AND COMMUNICATION

(Semester Pattern)

(For Candidates Admitted in the Colleges Affiliated to Periyar University From 2026-2027 Onwards)

M.Sc., Electronics and Communication:

Objectives:

The Postgraduate (PG) Degree in **Electronics and Communication** intends to develop new work opportunities for research-oriented technocrats and entrepreneurs, who will shape the scientific and technological area. Curriculum, course content, and assessment all plays a significant influence in the development of PG students, research scholars and engineers. As a result, it should be compromised with basic understanding of current developments in the sector. Based on this viewpoint, the expert committee created a syllabus for M.Sc. Electronics and communication programme that includes a wide range of topics in order to suit industry and research expectations.

i) Employment Opportunities:

IT Sectors /Defense/Railways/ISRO/DRDO/ Circuit Designer in Electronics /Communications /Bio Medical Sectors / Mobile Communication /Government Of Telecommunication /Air Force and Navy.

ii)Eligibility for Admission:

A Candidate Who has Passed **B.Sc., Electronics and Communication/ B.Sc., Electronics and Communication Systems / B.Sc., Electronics /B.Sc., Physics/ B.Sc., Industrial Electronics / B.Sc., IoT/ B.Sc., Computer Science/BCA/B.Sc. IT / B.Sc., Data Science Degree Of This University Or Any Of The Above Degree Of Any Other University Accepted By The Syndicate As Equivalent** there to, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the **M.Sc., Electronics and Communication degree** examination of this university after a course of study of two academic years.(as per the guidelines for the admission of post graduate (PG) students by department of collegiate education, Chennai.)

Medium of instruction: medium of instruction and examination shall be in English. Regulations duration of the course: two years divided into four semesters. Each semester will be of 90 working days.

As per the CBCS Pattern with SE (Secured External Examinations Score) and IA (Internal Assessment Score)

Outcomes of Completing M.Sc. Electronics and Communication:

Students will be able to:

1. Apply advanced concepts of electronics and communication to analyze and solve problems.
2. Design, simulate, and implement electronic circuits, embedded systems, and communication networks.
3. Utilize modern software and hardware tools for system development, testing, and validation.
4. Conduct research and innovation in emerging areas such as VLSI, IoT, signal processing, and wireless communications.
5. Pursue careers in industry, research organizations, academia, and entrepreneurship with strong technical and professional skills.

For PG Courses:

THEORY Paper Marks for Internal: 25

1. **Cycle Test and Model Exam : 15marks**
2. **Assignment : 5 Marks**
3. **Seminar/Attendance : 5marks**

Marks For External : 75(Passing Minimum: 38 Marks)

Examination Time: 3 hours for theory and practical

Theory Question paper pattern:

- **Part A (15x1=15marks), Answer All Questions, Two Questions from Each Unit**
- **Part B (2x5=10marks), Answer any TWO Questions out of FIVE.**
- **Part C (5x10=50marks), Answer All Questions, One Question from Each Unit With either or Choice.**

Blue Print for CE (75 Marks):

	Number of questions in each level						Total Marks
K-LEVELS	K1	K2	K3	K4	K5	K6	
SECTIONS							
SECTION–A (1-Mark, No choice) **Two questions from each Unit** (15 x 1 Mark =15Marks)	7	8					15
SECTION-B (5-Marks, 2 out of 5) **One question from each Unit.** (5 x 2 Marks =10 Marks)			1	1			10
SECTION-C (10 Marks, either or type) **One question from each unit** (5 x 10 Marks = 50 Marks) For courses up to K4, k5 and k6 level				1	3	1	50
Total							75

For Practical's:

Note:* ***All practical experiments may be implemented using suitable simulation tools or hardware components/devices, subject to the availability of laboratory resources*

Time: 3hours, Maximum Marks: 60(External) and 40(Internal) = 100 Marks.

Internal Marks Distribution (40 Marks)

Model Exam :20 Marks

Record Marks :10 Marks

Attendance :10 Marks

External Marks Distribution (60 Marks)

Circuit Program : 30 Marks

Tabulation, Calculation and graph : 20 Marks

Result/Output : 10 Marks

PROJECT VIVA-VOCE: Maximum Marks: 200 (IA:40 Marks And SE:160 Marks)

Internship: Duration 15- Days (Minimum)

Internship Training Requirements: At the end of the second semester (II semester vacation) students are required to undergo internship training in an industry or organization. After completing the training, they must submit a 15 to 20-page internship report.

The report should be certified and authorized by the concerned company authority. The assigned faculty guide will evaluate the report and provide remarks such as **"Commended" or "Highly Commended"** during the third semester evaluation.

PROGRAMME OUTCOMES

PO 1: Gaining the knowledge in the subject of Electronics and Communication and apply the principles of the same to the requirements of the employer or for entrepreneurship.

PO2: Acquire in-depth knowledge in the broad area of Electronics and Communication systems, with an ability to discriminate, evaluate, analyze and synthesize the acquired knowledge.

PO 3: Develop the ability to understand clearly the steps in designing communication systems which are in tune with recent technology and adaptable for future challenges.

PO 4: Learn and practice to use the engineering software, hardware, design and modeling techniques that are the latest in the field of electronics.

PO 5: Ability to design and develop practical solutions for real-time problems in the domain of Electronics and Communication.

iii) Scheme of Examinations:

S. No	Subject Code	Subject Status	List Of Courses	Hrs/ Wk	Credit	Exam Hrs	Internal	External	Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Semester-I									
1.		Core-1	Electronics Devices and Circuits	6	5	3	25	75	100
2.		Core-2	Analog and Digital Communication	6	5	3	25	75	100
3.		Core-3	Embedded Systems	6	5	3	25	75	100
4.		Elective -1	Elective -1A: Automotive Electronics (OR) Elective-1B: Computer Networks	4	3	3	25	75	100
5.		Core Practical -1	Analog and Digital Communication Lab	3	2	3	40	60	100
6.		Core Practical -2	Embedded Systems Lab	3	2	3	40	60	100
7.		Skill Enhancement Course -I	Cyber Security	2	2	3	25	75	100
Subtotal				**30**	**24**	**-**	**-**	**-**	**700**
Semester -II									
8.		Core-4	Modern Communication Systems	6	5	3	25	75	100
9.		Core-5	Power Electronics	6	5	3	25	75	100
10		Core-6	VLSI Design and VHDL Programming	5	5	3	25	75	100
11.		Elective -2	Elective –2A: Industrial Automation (OR) Elective 2B: Wearable Device and Its Applications	4	3	3	25	75	100
12.		Core Practical -3	–Power Electronics Lab	3	2	3	40	60	100
13.		Core Practical-4	–VLSI Design and VHDL Programming Lab	3	2	3	40	60	100

14.		Non- Major Elective (NME-1)	Python Programming	2	2	3	25	75	100
15		HR	Human Rights	1	1	3	25	75	100
	Subtotal			**30**	**25**	-	-	-	**800**
Semester - III									
16		Core-7	Wireless Communication	6	5	3	25	75	100
17		Core-8	Digital Signal Processing	6	5	3	25	75	100
18		Core-9	Internet of Things	6	5	3	25	75	100
19		Elective-3	Elective –3A Nano Electronics (OR) Elective -3B Renewable Energy	4	3	3	25	75	100
20		Core Practical-5	Digital Signal Processing Lab	3	2	3	40	60	100
21		Core Practical-6	IoT Applications Lab	3	2	3	40	60	100
22		Non-Major Elective (NME-2)	Industry Standard 5.0	2	2	3	25	75	100
23		Internship	Internship (Minimum Of 15 -days)	-	1	**Commended/ Highly Commended**			
Sub total				**30**	25				**700**
Semester- IV									
24		Core-10	Artificial Intelligence and Machine Learning	6	5	3	25	75	100
25		Core-11	Hybrid Electric Vehicles	6	5	3	25	75	100
26		Project Work	Project Viva- Voce	16	5	3	40	160	200
27		Skill Enhancement Course (SEC-2)	Android Development Tools and its Applications	2	2	-	25	75	100
28		-	Extension Activity	-	1		-	-	-
Sub Total				**30**	**18**				**500**
TOTAL					**92**				**2700**

M.Sc. Electronics and Communication / Semester -I / Ppr.No.1/ Core – 1

ELECTRONICS DEVICES AND CIRCUITS

OBJECTIVES:

1. Understand semiconductor devices such as diodes, transistors, FETs, and their applications in electronic circuits.
2. Analyse the operation of amplifiers, oscillators, multivibrators, and switching circuits.
3. Apply number systems, Boolean algebra, logic gates, and simplification techniques in digital electronics.
4. Design and understand arithmetic circuits, sequential circuits, flip-flops, and shift registers.
5. Study counters, D/A and A/D converters, and their role in digital communication and control systems.

UNIT I – DIODE AND FET

Introduction to Semiconductor – N-type and P-type Semiconductors – PN Junction Diode – Schottky Diode – Zener Diode – Tunnel Diode – Photodiodes – Applications of Diodes – Half-Wave and Full-Wave Rectifiers – Voltage Regulation – LED and its Applications – Bipolar Junction Transistor (BJT): Construction and Operation – Transistor Biasing – Breakdown in Transistors – Field Effect Transistor (FET): Construction and Operation – Applications of JFET – MOSFET (Enhancement and Depletion Types).

UNIT II – AMPLIFIERS

Classification of Amplifiers – Single Stage Amplifiers (CE, CB and CC Configurations) – Class A, Class B and Class C Amplifiers – Push-Pull Amplifier – Complementary Symmetry Push-Pull Amplifier – Multistage Amplifiers – Oscillators – Classification of Oscillators – Hartley Oscillator – Colpitts Oscillator – Wien Bridge Oscillator – Phase Shift Oscillator – Multivibrators: Astable, Monostable and Bistable – Schmitt Trigger.

UNIT III – NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Decimal, Binary, Octal and Hexadecimal Number Systems – Number System Conversions – 1's Complement and 2's Complement – Binary Addition and Subtraction – Binary Coded Decimal (BCD) – Excess-3 Code – Gray Code – Code Conversions – Boolean Algebra – Logic Gates – Universal Gates – De Morgan's Theorems – Karnaugh Map (K-Map) Simplification for 2, 3, 4 and 5 Variables – Quine–McCluskey (Tabulation) Method.

UNIT IV – ARITHMETIC CIRCUITS AND SEQUENTIAL LOGIC

Half Adder and Half Subtractor – Full Adder and Full Subtractor – Parallel Adder and Subtractor – 2's Complement Adder and Subtractor – BCD Adder – Binary Multiplier and Divider – Comparator – Decoder and Encoder – Multiplexer and Demultiplexer.

Sequential Logic: RS Flip-Flop – Clocked RS Flip-Flop – SR Flip-Flop – Clocked SR Flip-Flop – D Flip-Flop – T Flip-Flop – JK Flip-Flop – Shift Registers – Applications of Shift Registers.

UNIT V – COUNTERS, D/A AND A/D CONVERSION

Counters – Ripple Counter – Up/Down Counter – Variable Resistor Networks – Binary Ladder Network – Digital-to-Analog (D/A) Conversion Techniques – Accuracy and Resolution – Analog-to-Digital (A/D) Converters – Simultaneous Conversion Method – Counter Method – Continuous A/D Conversion – A/D Conversion Techniques – A/D Accuracy and Resolution.

Course Outcomes (COs): Upon successful completion of this course, students will be able to:

CO1: Explain the characteristics, operation, and applications of semiconductor devices including diodes, BJTs, FETs, rectifiers, and voltage regulators.

CO2: Analyze and design transistor amplifiers, oscillators, multivibrators, and trigger circuits for electronic applications.

CO3: Apply number system conversions, Boolean algebra, logic gates, and logic minimization techniques to design digital logic circuits.

CO4: Design and implement combinational and sequential logic circuits using arithmetic circuits, multiplexers, decoders, flip-flops, and shift registers.

CO5: Analyze the operation of counters and evaluate the performance of D/A and A/D conversion techniques based on accuracy, resolution, and practical applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	2	3	3	2
CO4	2	3	3	3	3
CO5	2	3	2	3	3

Mapping Scale: 3 – Strong (High) **2** – Moderate (Medium)**1** – Low (Substantial)

Text Books

1. Sedha, R. S. (2000). *Applied Electronics*. S. Chand & Company Ltd.
2. Salivahanan, S., & Suresh Kumar, N. (2016). *Electronic Devices and Circuits* (5th ed.). McGraw Hill Education (India) Pvt. Ltd.
3. Puri, V. K. (2009). *Digital Electronics: Circuits and Systems*. Tata McGraw-Hill Publishing Company Ltd.
4. Leach, D. P., & Malvino, A. P. (2006). *Digital Principles and Applications* (7th ed.). Tata McGraw-Hill Publishing Company Ltd.

Reference Books

1. Mathur, B. L., Kulshreshtha, S. C., & Chadha, U. (2005). *Electronic Devices, Applications and Integrated Circuits*. Umesh Publications.

M.Sc. Electronics and Communication / Semester -I / Ppr.No.2/ Core - 2

ANALOG AND DIGITAL COMMUNICATION

Objectives:

1. Understand radio wave propagation, antennas, and their role in communication systems.
2. Analyze amplitude modulation (AM) and frequency modulation (FM) techniques and their applications.
3. Study pulse modulation methods such as PAM, PCM, PFM, PTM, PPM, and PWM.
4. Understand digital communication concepts including synchronization, carrier recovery, DPSK, and error control coding.
5. Gain knowledge of analog and digital communication systems used in modern electronic communication networks.

UNIT I – RADIO WAVE PROPAGATION AND ANTENNAS

Electronic Radiation – Fundamentals – Effects – Propagation of Waves – Ground Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Tropospheric Scatter Propagation – Extra-terrestrial Communication.

Antenna Fundamentals – Basic Considerations – Wire Radiators in Space – Terms and Definitions – Effects of Ground on Antennas – Directional High-Frequency Antennas – Microwave Antennas – Wideband Antennas – Folded Dipole Antenna – Helical Antenna.

UNIT II – AMPLITUDE AND FREQUENCY MODULATION

Amplitude Modulation (AM): Theory – Frequency Spectrum of the AM Wave – Representation of AM – Power Relations in the AM Wave – Generation of AM – Basic Requirements – Grid-Modulated Class-C Amplifiers – Modulated Transistor Amplifiers – AGC.

Frequency Modulation (FM): Theory of Frequency and Phase Modulation – Noise and Frequency Modulation – Generation of Frequency Modulation.

UNIT III – PULSE MODULATION TECHNIQUES

Introduction – Pulse Amplitude Modulation (PAM) – Pulse Code Modulation (PCM) – Pulse Frequency Modulation (PFM) – Pulse Time Modulation (PTM) – Pulse Position Modulation (PPM) – Pulse Width Modulation (PWM).

UNIT IV – DIGITAL COMMUNICATION SYSTEMS

Introduction – Synchronization – Asynchronous Transmission – Probability of Bit Error in Baseband Transmission – Noise in Digital Communication Systems – Matched Filter – Optimum Terminal Filter – Bit Timing Recovery – Eye Diagrams – Digital Carrier Systems – Carrier Recovery Circuits – Error Control Coding – Detection of Digital Signals – Channel Coding Techniques – Forward Error Correction (FEC) – Cyclic Redundancy Check (CRC).

UNIT V – DIGITAL MODULATION TECHNIQUES

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) – Phase Shift Keying (PSK) – Quadrature Phase Shift Keying (QPSK) – Differential Phase Shift Keying (DPSK) – Delta Modulation (DM) – Adaptive Delta Modulation (ADM) – Comparison of Digital Modulation Techniques – Applications of Digital Communication Systems.

Course Outcomes (COs) Upon successful completion of this course, students will be able to:

CO1: Understand the principles of radio wave propagation and **analyze** the characteristics and applications of various antenna systems used in communication.

CO2: Analyze the generation, transmission, and reception of analog modulation techniques, including AM and FM, and **evaluate** their performance.

CO3: Apply pulse modulation techniques such as PAM, PCM, PPM, PWM, PFM, and PTM in analog and digital communication systems.

CO4: Analyze digital communication systems by evaluating synchronization methods, noise performance, carrier recovery, error detection, and channel coding techniques.

CO5: Compare and evaluate digital modulation techniques including ASK, FSK, PSK, QPSK, DPSK, DM, and ADM for various communication applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	3	3	3	3	3

Mapping Scale **3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Roddy, D., & Coolen, J. (2004). *Electronic communications* (4th ed.). Prentice Hall of India Pvt. Ltd.
2. Kennedy, G. (1999). *Electronic communication systems* (3rd ed.). Tata McGraw-Hill Publishing Company Ltd.

Reference Books

1. Taub, H., & Schilling, D. L. (1986). *Principles of communication systems* (2nd ed.). McGraw-Hill Publishing Company Ltd.
2. Schonbeck, R. J. (2002). *Electronic communication: Modulation and transmission* (2nd ed.). Prentice Hall of India.
3. Lathi, B. P. (1998). *Modern digital and analog communication systems* (3rd ed.). Oxford University Press.

M.Sc. Electronics and Communication / Semester -I / Ppr.No.3/ Core – 3

EMBEDDED SYSTEMS

Objectives:

1. To understand embedded systems concepts, PIC microcontroller architecture, memory organization, and instruction sets.

2. To develop Embedded C programming skills for PIC microcontrollers using data operations, control statements, and functions.

3. To analyse and program I/O ports, timers, watchdog timers, and related control registers.

4. To understand interrupt handling and analog-to-digital conversion techniques in PIC microcontrollers.

5. To design interfacing applications using LEDs, displays, motors, DAC, RS232, and I2C communication.

UNIT I – INTRODUCTION TO PIC MICROCONTROLLER

Introduction to Embedded Systems – Harvard Architecture vs. Von Neumann Architecture – CISC vs. RISC Architectures – PIC Microcontroller Family – PIC16F87XX Device Overview – Program Memory Organization – Data Memory Organization – Status Register – Option Register – PIC Instruction Set.

UNIT II – EMBEDDED C PROGRAMMING

Introduction to Embedded C Programming – PIC16 C Data Operations – PIC16 C Sequence Control – PIC16 C Functions and Structures – Variable Types – Data Types and Storage Classes – Operators and Expressions – Control Statements – Functions – Pointers and Arrays.

UNIT III – I/O PORTS AND TIMERS

Introduction to I/O Ports – PORTA, PORTB, PORTC, PORTD and PORTE – TRIS Registers – Block Diagram of I/O Ports – Parallel Slave Port (PSP) – Timer Functions: Timer0, Timer1 and Timer2 – Watchdog Timer (WDT) – Registers Related to Timers – Timer Programming.

UNIT IV – INTERRUPTS AND ADC

Interrupts – Registers Related to Interrupts – Interrupt Operation – Interrupt Priority – Peripheral Interrupts – Interrupt Programming.

Analog-to-Digital Converter (ADC): Registers Associated with ADC – Selection of A/D Conversion Clock – A/D Acquisition Requirements – A/D Conversion Process – Procedure for Performing A/D Conversion.

UNIT V – APPLICATIONS OF PIC MICROCONTROLLER

LED Interface – Seven-Segment Display Interface – Matrix Keypad Interface – LCD Interface – DC Motor Interface – Stepper Motor Interface – Resistive Ladder DAC Interface – RS-232 Interface – I^2C Interface.

Course Outcomes (COs)

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

CO1: Explain the architecture, memory organization, registers, and instruction set of PIC microcontrollers and their role in embedded systems.

CO2: Develop Embedded C programs using appropriate data types, control structures, functions, arrays, and pointers for PIC microcontroller-based applications.

CO3: Configure and program PIC I/O ports, timers, watchdog timers, and related registers for embedded system control.

CO4: Analyze and implement interrupt handling and Analog-to-Digital Conversion (ADC) techniques for real-time embedded applications.

CO5: Design and implement PIC microcontroller-based interfacing applications using LEDs, seven-segment displays, LCDs, keypads, motors, DACs, RS-232, and I²C communication.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	2	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Microchip Technology Inc. (2003). *PIC16F87XA Data Sheet*. Microchip Technology Inc. (Modules I, III & IV).
2. Bates, M. (2008). *Programming 8-bit PIC microcontrollers in C with interactive hardware simulation*. Newnes. ISBN: 978-0750689601. (Module II)
3. Predko, M. (1997). *Programming and customizing the PIC microcontroller*. McGraw-Hill Education. ISBN: 978-0079136459. (Module V)

Reference Book

1. Peatman, J. B. (1997). *Design with PIC microcontrollers*. Pearson Education. ISBN: 978-0137592593.

Online Resources

1. PIC Microcontroller Programming Tutorials:
https://www.youtube.com/playlist?list=PL_ZVRXFDKGZQFW6EIZK5AZMWSAYLA6BLG
2. PIC Microcontroller Interface Programming Tutorials:
https://www.youtube.com/playlist?list=PL_ZVRXFDKGZPTRM99MYPGVW5JBZ6TQZIR.

M.Sc. Electronics and Communication / Semester -I / Ppr.No.4/ Elective – 1A

AUTOMOTIVE ELECTRONICS

Objectives

1. To understand fundamentals and evolution of automotive electronics in modern vehicles.
2. To study engine, ignition, starting, suspension, and braking systems.
3. To analyze electronic ignition and fuel injection systems and their operation.
4. To understand chassis electrical systems including ABS and control mechanisms.
5. To evaluate modern safety and comfort systems such as traction control, airbags, and vehicle electronics.

UNIT I – AUTOMOTIVE FUNDAMENTALS

Evolution of Automobiles – Physical Configuration of an Automobile – Automotive Systems – Four-Stroke Engine Cycle – Engine Control Systems – Ignition System – Ignition Timing – Suspension Systems – Braking Systems.

UNIT II – IGNITION AND STARTING SYSTEMS

Starting Systems – Requirements of Starting Systems – Fundamentals of Ignition Systems – Types of Ignition Systems – Generation and Timing of Ignition – Fuel Consumption Considerations – Conventional Ignition Components – Spark Plug Leads – Ignition Coil Cores – Introduction to Electronic Ignition Systems.

UNIT III – FUEL INJECTION SYSTEMS

Overview of Programmed Ignition Systems – Electronic Control of Carburetion – Fundamentals and Areas of Control – Fuel Injection Systems – System Overview – Advantages of Fuel Injection Systems.

UNIT IV – CHASSIS ELECTRICAL SYSTEMS

Anti-lock Braking System (ABS) – Introduction – Requirements of ABS – General System Description – ABS Components – Anti-lock Brake System Control – Chassis Electrical Systems.

UNIT V – TRACTION CONTROL AND SAFETY SYSTEMS

Traction Control Systems – Functions and Operation – Safety Systems – Central Locking Systems – Electric Windows – Airbags and Belt Tensioners – Automotive Wi-Fi and Connectivity Systems.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the evolution, construction, and operation of automobiles, including engine systems, suspension, braking, and ignition systems.

CO2: Analyze the working principles and performance of automotive starting systems, conventional and electronic ignition systems, and ignition timing.

CO3: Explain the operation and advantages of electronic fuel injection systems and programmed engine control systems for improved vehicle performance and fuel efficiency.

CO4: Analyze the operation of Anti-lock Braking Systems (ABS) and chassis electrical systems used to improve vehicle stability, control, and safety.

CO5: Evaluate the functions and applications of traction control systems, automotive safety features, and vehicle connectivity technologies in modern automobiles.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	2
CO2	3	3	3	2	2
CO3	2	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Ribbens, W. B. (2002). *Understanding automotive electronics* (6th ed.). Society of Automotive Engineers (SAE) International.
2. Denton, T. (2011). *Automobile electrical and electronic systems* (4th ed.). Elsevier Publications Ltd.

Reference Books

1. FlexRay Consortium. *FlexRay Communication System*. Available at: https://www.flexray.com
2. CAN in Automation (CiA). *CAN (Controller Area Network) Resources*. Available at: https://www.can-cia.org

M.Sc. Electronics and Communication / Semester -I / Ppr.No 4/ Elective-1B

COMPUTER NETWORKS

Objectives

1. To understand basics of computer networks, communication models, and architectures.
2. To study data communication techniques, transmission media, wireless communication, and multiplexing.
3. To analyze data link layer protocols, error detection/correction, and MAC techniques.
4. To understand network layer concepts like routing, congestion control, IP addressing, and protocols.
5. To learn transport layer protocols, TCP, network security, and cryptography basics.

UNIT I – COMPUTER NETWORKS AND DATA COMMUNICATION FUNDAMENTALS

Introduction to Computer Networks – Network Hardware – Network Software – Reference Models – OSI Reference Model – TCP/IP Model – Example Networks: Internet, 3G Mobile Phone Networks, Wireless LANs, RFID and Sensor Networks – Physical Layer – Theoretical Basis for Data Communication – Guided Transmission Media.

UNIT II – PHYSICAL AND DATA LINK LAYER FUNDAMENTALS

Wireless Transmission – Communication Satellites – Digital Modulation and Multiplexing – Telephone Network Structure – Local Loop, Trunks and Multiplexing – Switching Techniques – Data Link Layer Design Issues – Error Detection and Correction Techniques.

UNIT III – DATA LINK LAYER AND MEDIUM ACCESS CONTROL

Elementary Data Link Protocols – Sliding Window Protocols – Example Data Link Protocols – Packet over SONET – ADSL – Medium Access Control Layer – Channel Allocation Problem – Multiple Access Protocols.

UNIT IV – NETWORK LAYER AND INTERNET PROTOCOLS

Network Layer Design Issues – Routing Algorithms – Congestion Control Algorithms – Quality of Service (QoS) – Internet Network Layer – Internet Protocol (IP) – IP Addressing – Internet Control Protocols.

UNIT V – TRANSPORT LAYER AND NETWORK SECURITY

Transport Layer – Transport Services – Elements of Transport Protocols – Addressing – Connection Establishment and Release – Error Control – Flow Control – Multiplexing –

Crash Recovery – Internet Transport Protocol – Transmission Control Protocol (TCP) – Network Security – Cryptography Fundamentals.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the fundamentals of computer networks, network architectures, reference models, transmission media, and data communication principles.

CO2: Analyze physical layer technologies, wireless transmission, modulation, multiplexing, switching techniques, and error detection and correction methods.

CO3: Apply data link layer protocols, sliding window techniques, and medium access control protocols for reliable and efficient data communication.

CO4: Analyze network layer functions, routing algorithms, congestion control, Internet Protocol (IP) addressing, and Quality of Service (QoS) mechanisms.

CO5: Evaluate transport layer services, TCP protocols, and fundamental network security and cryptographic techniques for secure communication

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	3	3	2	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Tanenbaum, A. S., & Wetherall, D. J. (2011). *Computer networks* (5th ed.). Pearson education.

Reference Books

1. Forouzan, B. A. (1998). *Introduction to data communications and networking*. Tata McGraw-Hill.
2. Halsall, F. (1995). *Data communications, computer networks and open systems* (4th ed.). Addison-Wesley.
3. Bertsekas, D., & Gallagher, R. (1992). *Data networks* (2nd ed.). Prentice Hall of India.
4. Lamarca, M. J. (2002). *Communication networks*. Tata McGraw-Hill.

M.Sc. Electronics And Communication / Semester -I / Ppr.No.5/ Core Practical – 1

ANALOG AND DIGITAL COMMUNICATION LAB

Objectives

1. To study the principles of AM modulation and demodulation.
2. To analyze the operation of FM modulation and demodulation circuits.
3. To understand the working of Automatic Gain Control (AGC).
4. To study the characteristics of a Voltage Controlled Oscillator (VCO).
5. To understand the working of digital modulation techniques such as ASK, FSK, and PSK.

Any 10 Experiments

1. Study of Amplitude Modulation (AM) and Demodulation.
2. Study of Frequency Modulation (FM) and Demodulation.
3. Automatic Gain Control (AGC).
4. Characteristics of Voltage Controlled Oscillator (VCO).
5. Pulse Amplitude Modulation (PAM).
6. Pulse Width Modulation (PWM).
7. Pulse Position Modulation (PPM).
8. Study of Pulse Code Modulation (PCM).
9. Verification of Sampling Theorem.
10. Study of Digital Phase Detector.
11. Study of Balanced Modulator.
12. Study of Ring Modulator.
13. Delta Modulation and Demodulation.
14. Amplitude Shift Keying (ASK).
15. Frequency Shift Keying (FSK).

M.Sc. Electronics and Communication / Semester -I / Ppr.No.6/ Practical – 2

EMBEDDED SYSTEMS LAB

Objectives:

1. To develop programming skills for PIC microcontroller interfacing applications.

2. To understand interfacing of LEDs, seven-segment displays, LCDs, keypads, relays, and serial communication modules.

3. To study ADC, DAC, PWM generation, and timer/counter operations in embedded systems.

4. To gain practical knowledge of motor control, RTC interfacing, and sound generation circuits.

5. To design and implement real-time embedded applications such as water level and temperature control systems.

Any 10 Experiments

1. LED / 7 -Segment Interface
2. Key / Relay Interface
3. Tone Generation
4. DAC Interface
5. ADC Interface
6. LCD Interface
7. Digital Timer / Counter
8. Up / Down Counter
9. PWM Generation
10. RTC Interface
11. Water Level Controller
12. Temperature Controller
13. Stepper Motor Controlller
13. Serial / I2C Interface

M.Sc. Electronics and Communication / Semester -I / Ppr.No.7/ SEC-1

CYBER SECURITY

Objectives:

1. To understand information systems, their components, and business process modeling.
2. To learn basics of information security, threats, and cyber risk analysis.
3. To study application security, data protection, and access control methods.
4. To understand network attacks, including denial of service and common attack methods.
5. To gain knowledge of e-commerce security, digital payments, and cryptography basics.

UNIT I – INFORMATION SYSTEMS

Introduction to Information Systems – Modeling of Business Processes – Information System Components – Information System Categories – Individuals in Information Systems – Development of Information Systems.

UNIT II – INFORMATION SECURITY

Information Security Concepts – Threats to Information Systems – Security Threat Sources – Threat Agents – Threat Motivation – Threat Intent – Information Assurance – Cyber Security – Security Risk Analysis.

UNIT III – APPLICATION SECURITY

Application Security Concepts – Data Security Considerations – Backup Considerations – Archival Storage – Data Disposal Techniques – Security Technologies – Intrusion Detection Systems – Access Control Mechanisms.

UNIT IV – NETWORK SECURITY THREATS

Network and Service Attacks – Denial of Service (DoS) Attacks – Types of DoS Attacks – Methods of Attacks – Examples of Cyber Attacks.

UNIT V – E-COMMERCE SECURITY

Security Issues in E-Commerce – Electronic Payment Systems – Credit/Debit Cards – Smart Cards – Electronic Money – Electronic Fund Transfer (EFT) – E-Commerce Models – Advantages and Disadvantages of E-Commerce – E-Commerce Security Systems – Electronic Cash – Digital Signatures – Public Key Cryptography.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the fundamentals of information systems, business process modeling, system components, and information system development methodologies.

CO2: Analyze information security concepts, cyber threats, threat agents, security risks, and information assurance techniques to protect information systems.

CO3: Apply application security principles, data protection methods, backup strategies, intrusion detection systems, and access control mechanisms to enhance system security.

CO4: Analyze network security threats, including denial-of-service (DoS) attacks and other cyber attack techniques, and recommend appropriate security measures.

CO5: Evaluate the security requirements of e-commerce systems by applying electronic payment technologies, public key cryptography, digital signatures, and electronic transaction security mechanisms.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	2	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed (Year not specified) *Fundamentals of Cyber Security*, BPB Publications.

Reference Books

1. William Stallings (2017) *Cryptography and Network Security: Principles and Practice*, Pearson Education.
2. William Stallings (2015) *Network Security Essentials: Applications and Standards*, Pearson Education.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger (2012) *Security in Computing*, Pearson Education.

M.Sc. Electronics and Communication / Semester -II / Ppr.No.8/ Core – 4

MODERN COMMUNICATION SYSTEMS

Objectives

1. To understand wireless channel models and their impact on communication system performance.
2. To learn digital modulation and diversity techniques for reliable wireless transmission.
3. To study multicarrier modulation methods such as OFDM and MC-CDMA.
4. To analyze MIMO communication systems for improved capacity and data rates.
5. To understand wireless standards and multiple access techniques used in modern communication networks.

UNIT I – WIRELESS CHANNEL MODELS

Overview of Wireless Systems – Path Loss Models for Wireless Channels – Time and Frequency Coherence – Statistical Multipath Channel Models – Capacity of Wireless Channels – Capacity of Flat Fading Channels – Channel Distribution Information – Channel State Information (CSI) at Receiver – Channel State Information at Transmitter and Receiver – Capacity with Receiver Diversity – Capacity Comparisons – Capacity of Frequency Selective Fading Channels.

UNIT II – DIGITAL MODULATION AND DIVERSITY TECHNIQUES

Performance of Digital Modulation over Wireless Channels – Fading – Outage Probability – Average Probability of Error – Combined Outage and Average Error Probability – Doppler Spread – Inter-Symbol Interference (ISI).Realization of Independent Fading Paths – Receiver Diversity Techniques – Selection Combining – Threshold Combining – Maximal Ratio Combining (MRC) – Equal Gain Combining (EGC) – Transmitter Diversity – Channel Known at Transmitter – Channel Unknown at Transmitter – Alamouti Space-Time Diversity Scheme.

UNIT III – MULTICARRIER MODULATION

Data Transmission Using Multiple Carriers – Multicarrier Modulation with Overlapping Subchannels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak-to-Average Power Ratio (PAPR) – Frequency and Timing Offsets – Case Studies: IEEE 802.11a, Orthogonal Frequency Division Multiplexing (OFDM), and Multi-Carrier Code Division Multiple Access (MC-CDMA).

UNIT IV – MIMO COMMUNICATIONS

Narrowband MIMO Channel Model – Parallel Decomposition of the MIMO Channel – MIMO Channel Capacity – MIMO Diversity Gain – Beamforming – Diversity-Multiplexing

Trade-offs – Space-Time Modulation and Coding – Space-Time Block Codes (STBC) – Space-Time Trellis Codes (STTC) – Spatial Multiplexing – BLAST Architectures.

UNIT V – WIRELESS SYSTEMS AND STANDARDS

Multiple Access Techniques – Frequency Division Multiple Access (FDMA) – Time Division Multiple Access (TDMA) – Code Division Multiple Access (CDMA) – Wideband CDMA (WCDMA) – Space Division Multiple Access (SDMA) – Hybrid Multiple Access Techniques – Random Access – Power Control – Downlink (Broadcast) Channel Capacity – Uplink (Multiple Access) Channel Capacity – Uplink–Downlink Duality – Multiuser Diversity – MIMO Multiuser Systems.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain wireless channel models, fading characteristics, channel state information (CSI), and channel capacity under different propagation environments.

CO2: Analyze the performance of digital modulation and diversity techniques, including receiver and transmitter diversity schemes, for reliable wireless communication.

CO3: Apply multicarrier modulation techniques such as OFDM and MC-CDMA to mitigate channel impairments and improve spectral efficiency in wireless systems.

CO4: Analyze MIMO communication systems, beam forming, spatial multiplexing, and space-time coding techniques to enhance wireless system capacity and reliability.

CO5: Evaluate multiple access techniques, wireless communication standards, and multiuser MIMO systems for efficient resource allocation and improved network performance.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	3	3	2	2
CO3	3	3	2	3	2
CO4	2	3	3	3	3
CO5	3	3	3	3	3

Mapping Scale **3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Goldsmith, A. (2005). *Wireless communications*. Cambridge University Press.

2. Rappaport, T. S. (2003). *Wireless communications: Principles and practice* (2nd ed.). Pearson Education.

Reference Books

1. Tse, D., & Viswanath, P. (2005). *Fundamentals of wireless communication*. Cambridge University Press.
2. Lee, W. C. Y. (2000). *Mobile communication engineering* (2nd ed.). McGraw-Hill.
3. Paulraj, A., Nabar, R., & Gore, D. (2003). *Introduction to space-time wireless communications*. Cambridge University Press.

M.Sc. Electronics and Communication / Semester -II/ Ppr.No.9/ Core - 5

POWER ELECTRONICS

Objectives

1. To understand the operation, characteristics, and applications of thyristors and controlled rectifier circuits.
2. To study AC voltage controllers, phase control techniques, and cycloconverter operation.
3. To analyze commutation techniques used in thyristor-based power electronic circuits.
4. To understand DC choppers, static switches, and switching mode power regulators.
5. To study DC and AC motor drives and their control methods for industrial applications.

UNIT I – THYRISTORS AND CONTROLLED RECTIFIERS

Thyristors – Construction, Operation, Characteristics and Applications of SCR, LASCR, TRIAC, DIAC and UJT – Thyristor Ratings – Rectifier Circuits using SCR – Two-Transistor Model of Thyristor – Thyristor Firing Circuits – Principle of Phase-Controlled Converter Operation – Single-Phase Semi-Converters – Single-Phase Full Converters – Single-Phase Dual Converters – Single-Phase Series Converters – Three-Phase Half-Wave Converters.

UNIT II – AC VOLTAGE CONTROLLERS

Principle of ON-OFF Control – Principle of Phase Control – Single-Phase Bidirectional Controllers with Resistive Loads – Single-Phase Controllers with Inductive Loads – Three-Phase Half-Wave Controllers – Three-Phase Full-Wave Controllers – Cycloconverters.

UNIT III – THYRISTOR COMMUTATION TECHNIQUES

Natural Commutation – Forced Commutation – Self Commutation – Impulse Commutation – Resonant Pulse Commutation – Complementary Commutation – External Pulse Commutation – Load-Side Commutation – Line-Side Commutation.

UNIT IV – DC CHOPPERS AND STATIC SWITCHES

DC Choppers – Introduction – Principle of Step-Down Choppers – Principle of Step-Up Choppers – Switching Mode Regulators – Thyristor Chopper Circuits.

Static Switches – Single-Phase AC Switches – Three-Phase AC Switching – Three-Phase Reversing Switches – Solid-State Relays.

UNIT V – DC AND AC DRIVES

Basic Characteristics of DC Motors – Operating Modes – Single-Phase Half-Wave Converter Drives – Single-Phase Semi-Converter Drives – Single-Phase Full-Converter Drives – Single-Phase Dual Converter Drives – Three-Phase Half-Wave Converter Drives.

Induction Motor Drives – Performance Characteristics – Stator Voltage Control – Rotor Voltage Control – Frequency Control – Voltage and Frequency Control – Current Control – Voltage, Current and Frequency Control – Closed-Loop Control of Induction Motors.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the construction, operation, characteristics, and applications of thyristors and analyze the performance of controlled rectifier circuits.

CO2: Analyze the operation and performance of AC voltage controllers and cycloconverters for single-phase and three-phase power control applications.

CO3: Apply various thyristor commutation techniques to design and analyze efficient power electronic switching circuits.

CO4: Analyze the operation and performance of DC choppers, switching regulators, and static switches used in DC and AC power control systems.

CO5: Evaluate the operation, control methods, and performance characteristics of DC and induction motor drives using power electronic converters.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	2	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial

Text Books

1. Rashid, M. H. (1993). *Power electronics: Circuits, devices, and applications* (2nd ed.). Prentice Hall of India Pvt. Ltd.
2. Singh, M. D., & Khanchandani, K. B. (2007). *Power electronics*. Tata McGraw-Hill Publishing Company Ltd.

Reference Books

1. Sen, P. C. (1998). *Power electronics*. Tata McGraw-Hill Publishing Company Ltd.
2. Dubey, G. K., Doradla, S. R., Joshi, A., & Sinha, R. M. K. (1996). *Thyristorised power controllers*. New Age International Publishers.

M.Sc. Electronics and Communication / Semester -II/ Ppr.No.10/ Core – 6

VLSI DESIGN AND VHDL PROGRAMMING

Objectives

1. To understand CMOS technology, MOS transistors, and fabrication processes used in VLSI circuits.
2. To study the fundamentals of VHDL including entities, architectures, and basic language constructs.
3. To learn VHDL modeling techniques such as behavioral, dataflow, and structural modeling styles.
4. To analyze concurrent statements, signal assignments, and the design of basic digital circuits using VHDL.
5. To understand advanced VHDL features such as packages, libraries, configurations, and design hierarchy.

UNIT I – CMOS CIRCUITS AND PROCESSING TECHNOLOGY

MOS Transistors – Switches – CMOS Logic – CMOS Inverter – Combinational Logic – NAND Gate – NOR Gate – Compound Gates – Multiplexers – Physical Design of NAND and NOR Gates.Silicon Semiconductor Technology Overview – Wafer Processing – Oxidation – Epitaxial Deposition – Ion Implantation – Diffusion – Silicon Gate Insulator Process – CMOS Technology – N-Well Process – P-Well Process – Twin-Tub Process – Silicon-on-Insulator (SOI) Technology – CMOS Process Enhancements.

UNIT II – INTRODUCTION AND BASIC CONCEPTS OF VHDL

History of VHDL – Capabilities of VHDL – Hardware Abstraction – Basic Terminology – Entity Declaration – Architecture Body Declaration – Basic Language Elements – Identifiers – Data Objects – Data Types – Operators.

UNIT III – MODELING TECHNIQUES OF VHDL

Behavioral Modeling – Entity Declaration – Architecture Declaration – Process Statements – Variable Assignment Statements – Signal Assignment Statements – Wait Statement – If Statement – Case Statement – Null Statement – Loop Statement – Exit Statement – Next Statement – Assertion Statement – Report Statement – Multiple Processes – Postponed Processes - Dataflow Modeling – Signal Flow Representation – Concurrent Signal Assignment Techniques.

UNIT IV – CONCURRENT AND STRUCTURAL MODELING

Concurrent Signal Assignment Statements versus Sequential Signal Assignment Statements – Delta Delay Concept – Multiple Drivers – Conditional Signal Assignment Statements – Selected Signal Assignment Statements – Unaffected Value – Block Statement – Concurrent Assertion Statement – Signal Values.Structural Modeling – Component Declaration – Component Instantiation – Resolving Signal Values – Design Examples: Half Adder, Full Adder, 4-to-1 Multiplexer, Decoder, and Encoder.

UNIT V – ADVANCED FEATURES IN VHDL

Generics – Configurations – Configuration Specifications – Configuration Declarations – Default Rules – Conversion Functions – Direct Instantiation – Incremental Binding.Subprograms – Subprogram Overloading – Operator Overloading – Signatures – Default Parameter Values – Package Declaration – Package Body – Design Files – Design Libraries – Order of Analysis – Implicit Visibility – Explicit Visibility – Attributes in VHDL.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain CMOS logic circuits, MOS transistor operation, CMOS fabrication processes, and their applications in VLSI design.

CO2: Develop VHDL programs using entities, architectures, data types, operators, and basic language constructs for digital circuit modeling.

CO3: Apply behavioral and dataflow modeling techniques in VHDL to design and simulate digital systems.

CO4: Design and implement combinational and sequential digital circuits using concurrent and structural modeling techniques in VHDL.

CO5: Apply advanced VHDL features, including generics, configurations, packages, subprograms, and libraries, to develop modular, reusable, and scalable digital designs.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	3	3	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Weste, N. H. E., & Eshraghian, K. (1993). *Principles of CMOS VLSI design: A systems perspective* (2nd ed.). Addison-Wesley Publishing Company. ISBN: 978-0201533768.
2. Bhasker, J. (2001). *A VHDL primer* (3rd ed.). Prentice Hall of India. ISBN: 978-8177582957.

Reference Books

1. Roth, C. H., Jr. (2004). *Digital systems design using VHDL*. Brooks/Cole Thomson Learning. ISBN: 978-0534384624.
2. Brown, S., & Vranesic, Z. (2009). *Fundamentals of digital logic with VHDL design* (3rd ed.). McGraw-Hill Education. ISBN: 978-0077221431.
3. Perry, D. L. (2002). *VHDL programming by example* (4th ed.). McGraw-Hill. ISBN: 978-0071400702.
4. Kang, S. M., & Leblebici, Y. (2002). *CMOS digital integrated circuits: Analysis and design* (3rd ed.). McGraw-Hill. ISBN: 978

M.Sc. Electronics and Communication / Semester -II / Ppr.No.11/ Elective-2A

INDUSTRIAL AUTOMATION

Objectives

1. To understand the basics of LabVIEW programming, including front panel, block diagram, loops, and data flow concepts.
2. To study arrays, clusters, and waveform handling for data representation and signal processing in LabVIEW.
3. To understand data acquisition systems, signal conditioning, and interfacing of DAQ hardware and software.
4. To develop PLC programming skills including ladder logic, timers, counters, and mathematical operations.
5. To apply advanced PLC functions such as data handling, bit operations, and industrial automation control systems.
6.

UNIT I – INTRODUCTION TO LABVIEW AND LOOPS

Introduction to LabVIEW – Advantages of LabVIEW – Software Environment – Front Panel Controls and Indicators – Block Diagram – Data Types – Data Flow Programming.Loops in LabVIEW – For Loop – While Loop – Structure Tunnels – Shift Registers – Feedback Nodes – Timing Control – Communication among Multiple Loops – Local Variables – Global Variables. Arrays in LabVIEW – One-Dimensional Arrays - Initializing Arrays – Inserting

UNIT II – ARRAYS, CLUSTERS AND WAVEFORM

Deleting and Replacing Array Elements – Array Functions – Matrix Operations Using Arrays. Clusters – Introduction – Creating Controls, Indicators and Constants – Cluster Operations – Assembling and Disassembling Clusters – Conversion Between Arrays and Clusters - Waveforms – Waveform Charts – XY Graphs – Signal Representation and Visualization.

UNIT III – DATA ACQUISITION SYSTEMS

Introduction to Data Acquisition – Signals and Signal Conditioning – DAQ Hardware Configuration – DAQ Hardware Components – Analog Inputs – Analog Outputs – Counters - DAQ Software Architecture – DAQ Assistant – Selecting and Configuring a Data Acquisition Device – Components of Computer-Based Measurement Systems.

UNIT IV – BASIC PLC PROGRAMMING

General PLC Programming Procedures – Programming ON/OFF Inputs and Outputs – Relationship Between Digital Logic Gates and Contact/Coil Logic – Developing Ladder Diagrams from Process Control Descriptions – Logic Gates in PLC Programming.

PLC Register Basics – Timer Instructions – ON Delay Timer – OFF Delay Timer – Counter Instructions – Up Counter – Down Counter. Mathematical Instructions – Addition – Subtraction – Multiplication – Division – Number Comparison Functions – Numbering Systems – PLC Number Conversion Functions.

UNIT V – DATA HANDLING FUNCTIONS AND INDUSTRIAL CONTROL

PLC Skip Functions – Master Control Relay Functions – Jump Functions – Data Move Instructions – PLC Data Handling Functions.

Digital Bit Functions and Applications – Sequencer Functions – Robot Control Using PLC – Matrix Functions – Industrial Automation Applications.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the LabVIEW programming environment and develop virtual instruments (VIs) using loops, variables, arrays, and data flow programming concepts.

CO2: Apply arrays, clusters, waveform analysis, and matrix operations in LabVIEW for data processing and visualization.

CO3: Analyze data acquisition systems by configuring DAQ hardware, signal conditioning circuits, and computer-based measurement systems for real-time applications.

CO4: Design and implement PLC programs using ladder logic, timers, counters, mathematical operations, and number conversion functions for industrial control.

CO5: Apply PLC data handling functions, sequencing operations, and industrial automation techniques for process control, robotic systems, and manufacturing applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	2
CO2	3	3	2	2	2
CO3	2	3	3	3	2
CO4	3	3	3	3	3
CO5	2	3	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Jerome, J. (2010). *Virtual instrumentation using LabVIEW*. PHI Learning Private Limited.
2. Webb, J. W., & Reis, R. A. (2002). *Programmable logic controllers: Principles and applications* (5th ed.). Prentice Hall of India.

Reference Books

1. Petruzella, F. D. (2010). *Programmable logic controllers* (3rd ed.). Tata McGraw-Hill Education Private Limited.
2. Boyer, S. A. (2004). *SCADA: Supervisory control and data acquisition* (4th ed.). Instrument Society of America.
3. Bailey, D., & Wright, E. (2003). *Practical SCADA for industry*. Newnes.

M.Sc. Electronics and Communication / Semester -II /Ppr.No.11/ Elective-2B

WEARABLE DEVICES AND ITS APPLICATIONS

Objectives

1. To understand the fundamentals, evolution, and applications of wearable devices across different sectors.
2. To study wearable inertial sensors such as accelerometers, gyroscopes, and magnetometers for motion and activity monitoring.
3. To analyze wearable healthcare sensors for measuring vital parameters such as blood pressure, temperature, and body signals.
4. To understand wearable biochemical and gas sensors used in non-invasive medical and environmental monitoring.
5. To gain knowledge of wearable cameras, microphones, and assistive technologies for healthcare, safety, and smart applications.

UNIT I – INTRODUCTION TO WEARABLE DEVICES

Motivation for the Development of Wearable Devices – Emergence of Wearable Computing and Wearable Electronics – Types of Wearable Sensors: Invasive and Non-Invasive Sensors – Intelligent Clothing – Applications in Sports, Healthcare, Fashion and Entertainment, Military, Environmental Monitoring, Mining Industry, Public Sector, and Safety.

UNIT II – WEARABLE INERTIAL SENSORS

Accelerometers – Gyroscopic Sensors – Magnetic Sensors – Measurement Modalities – Wearable and Invisible Sensors – Applications: Fall Risk Assessment – Fall Detection – Gait Analysis – Physical Activity Monitoring – Human Kinetics – Cardiac Activity Monitoring – Energy Expenditure Measurement – Pedometers – Actigraphs.

UNIT III – WEARABLE DEVICES FOR HEALTHCARE

Flexible and Wearable Piezoresistive Sensors for Cuffless Blood Pressure Measurement – Wearable Sensors for Body Temperature Monitoring – Intermittent and Continuous Temperature Monitoring – Detection Principles: Thermistors, Infrared Radiation Sensors, Adhesive/Tattoo-Type Sensors – Conductive Textile Electrodes – Knitted Piezoresistive Fabric (KPF) Sensors.

UNIT IV – WEARABLE BIOCHEMICAL AND GAS SENSORS

Wearable Biochemical Sensors – Parameters of Interest – System Design: Textile-Based and Microneedle-Based Systems – Non-Invasive Glucose Monitoring Devices – GlucoTrack™ Systems – Pulse Oximeters – Portable and Wearable Pulse Oximeters – Wearable Gas Sensors – Metal Oxide Semiconductor (MOS) Sensors – Electrochemical Gas Sensors.

UNIT V – WEARABLE CAMERAS, MICROPHONES AND ASSISTIVE DEVICES

Wearable Cameras – Applications in Safety and Security – Navigation Systems – Sports Media Enhancement – Automatic Digital Diary Systems – Cameras in Smart Watches.

Wearable Microphones – MEMS Microphones – Bioacoustics Applications – Artificial Intelligence-Based Respiratory Diagnostics – Clinical Trial Monitoring.

Wearable Assistive Devices – Assistive Technologies for the Blind – Hearing and Touch Sensation Systems – Assistive Devices for Fingers, Hands, Wrist, Forearm and Feet – Smart Vests and Belts – Head-Mounted Devices.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the fundamentals, evolution, sensing technologies, and diverse applications of wearable devices in healthcare, sports, industry, and public safety.

CO2: Analyze the operation and applications of wearable inertial sensors, including accelerometers, gyroscopes, and magnetic sensors, for motion tracking and activity monitoring.

CO3: Apply wearable sensor technologies for monitoring physiological parameters such as blood pressure, body temperature, cardiac activity, and energy expenditure in healthcare applications.

CO4: Analyze wearable biochemical and gas sensing systems for non-invasive health monitoring, environmental sensing, and medical diagnostics.

CO5: Evaluate wearable cameras, microphones, and assistive devices for safety, communication, navigation, rehabilitation, and accessibility applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	2
CO2	3	3	3	2	2
CO3	3	2	3	3	2
CO4	2	3	3	3	3
CO5	3	3	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Tamura, T., & Chen, W. (2018). *Seamless healthcare monitoring: Advancements in wearable, attitudinal, and environmental sensing*. Springer.

2. Sazonov, E., & Neuman, M. R. (2014). *Wearable sensors: Fundamentals, implementation and applications*. Elsevier.
3. Lay-Ekuakille, A., & Mukhopadhyay, S. C. (2010). *Wearable and autonomous biomedical devices and systems for smart environment: Issues and characterization*. Springer.

Reference Book

1. Mukhopadhyay, S. C. (2015). *Wearable electronics sensors: For safe and healthy living*. Springer.

M.Sc. Electronics and Communication / Semester -II /Ppr.No.12/ Practical - 3

POWER ELECTRONICS LAB

Objectives

1. To understand the operating characteristics and switching behavior of power semiconductor devices such as SCRs, TRIACs, MOSFETs, and IGBTs.
2. To study the principles and applications of controlled rectifiers, choppers, inverters, and switching regulators used in power conversion systems.
3. To analyze various triggering and commutation techniques employed in thyristor-based power electronic circuits.
4. To design and implement power electronic circuits for motor control, voltage regulation, and power control applications.
5. To develop practical skills in testing, measurement, waveform analysis, and troubleshooting of power electronic systems.

Any 10 Experiments

1. Study of Firing Characteristics of SCR.
2. Study of Firing Characteristics of TRIAC.
3. Half-Wave Gate-Controlled Rectifier using One SCR.
4. Single-Phase Half-Wave Controlled Rectifier with R and RL Loads.
5. Illumination Control using Thyristor.
6. Voltage Regulators using IC 78XX and IC 79XX Series.
7. Single-Phase Fully Controlled Bridge Rectifier using Four SCRs.

8. Study of Switching Regulators (Buck, Boost and Buck–Boost Converters).
9. Forced Commutation Techniques of SCR.
10. Complementary Commutation Techniques of SCR.
11. Study of Zero Voltage Switching (ZVS) Circuits.
12. Speed Control of DC Motor using Power Electronic Devices.
13. Light Dependent Resistor (LDR) Applications.
14. AC Voltage Controller using TRIAC for Power Control Applications.
15. PWM Control of DC Motor.
16. Automatic Electronic Battery Charger.

M.Sc. Electronics and Communication / Semester -II /Ppr.No.13 / Practical – 4

VLSI DESIGN AND VHDL PROGRAMMING LAB

Objectives

1. To understand the fundamentals of VLSI design and Hardware Description Languages (HDL) such as Verilog for digital system modeling.
2. To design, simulate, and verify combinational logic circuits including adders, subtractors, encoders, decoders, multiplexers, and demultiplexers.
3. To implement and analyze sequential circuits such as flip-flops, shift registers, counters, and finite state machines (FSMs).
4. To develop skills in digital circuit simulation, testing, synthesis, and verification using Xilinx design tools.
5. To gain practical experience in the complete VLSI design flow for developing reliable and efficient digital systems.

Any 10 Experiments *(Using Xilinx / Verilog HDL)*

1. Basic Logic Gates (AND, OR, NOT, NAND, NOR, XOR, and XNOR Gates).
2. Half Adder and Full Adder.
3. Half Subtractor and Full Subtractor.
4. 4-bit Parallel Binary Adder.
5. 4-bit Binary Adder/Subtractor.
6. Encoder (4-to-2 Encoder and 8-to-3 Encoder).
7. Decoder (2-to-4 Decoder and 3-to-8 Decoder).
8. Multiplexer (4:1 and 8:1 Multiplexer).
9. Demultiplexer (1:4 and 1:8 Demultiplexer).
10. Magnitude Comparator.
11. D Flip-Flop and JK Flip-Flop.
12. Shift Registers (SISO, SIPO, PISO, and PIPO).
13. Synchronous and Asynchronous Counters.
14. Sequence Detector using Finite State Machine (FSM).
15. Arithmetic Logic Unit (ALU).

Software Requirement:1. Xilinx ISE Design Suite / Xilinx Vivado Design Suite 2.Verilog HDL 3.FPGA Development Board (optional for hardware implementation)

M.Sc. Electronics and Communication / Semester -II /Ppr.No.14/ NME-1

PYTHON PROGRAMMING

Objectives

1. To understand Python programming fundamentals including data types, operators, strings, lists, tuples, and dictionaries.
2. To develop programming skills using control structures, functions, arrays (NumPy), and modular programming concepts.
3. To learn object-oriented programming concepts such as classes, inheritance, polymorphism, and method handling in Python.
4. To understand exception handling, file operations, regular expressions, and data processing techniques in Python.
5. To gain basic knowledge of application development and Python-based software development tools.

UNIT I – INTRODUCTION TO PYTHON

Introduction to Python – Features of Python – Python Virtual Machine (PVM) – Memory Management in Python – Comparison between C and Python – Writing and Execution of Python Programs – Input and Output Statements.

Data Types – Built-in Types – Boolean Data Type – Sequences – Sets – Literals – Constants – Identifiers and Reserved Words – **Naming Conventions in Python.**

UNIT II – STRINGS AND OPERATOR

Strings and Characters – Creating Strings – Escape Characters – String Formatting Operators – String Formatting Functions.Operators – Arithmetic Operators – Assignment Operators – Unary Operators – Relational Operators – Logical Operators – Boolean Operators – Bitwise Operators – Membership Operators – Identity Operators – Mathematical Functions.

UNIT III – LISTS, TUPLES AND DICTIONARIES

Lists – Creating Lists – Updating List Elements – List Operators: Concatenation, Repetition and Membership – Built-in List Methods.Tuples – Creating Tuples – Accessing Tuple Elements – Basic Operations on Tuples – Functions for Processing Tuples - Dictionaries – Creating Dictionaries – Dictionary Operations – Dictionary Methods – Data Type Conversion Techniques.

UNIT IV – CONTROL STATEMENTS, ARRAYS AND FUNCTIONS

Control Statements – Conditional Statements: If, If–Else, Nested If – Looping Statements: While Loop, For Loop, Infinite Loops, Nested Loops. Loop Control Statements – Break Statement – Continue Statement – Pass Statement – Assert Statement – Return Statement.

UNIT V -ARRAYS AND FUNCTIONS

Arrays – Creating Arrays – Importing the Array Module – Indexing and Slicing Arrays – Types of Arrays – NumPy Arrays – Mathematical Operations on Arrays.

Functions – Function Definition and Function Call – Returning Values – Returning Multiple Values – Function Arguments: Positional, Keyword, Default and Variable-Length Arguments – Local and Global Variables – Passing Collections to Functions – Recursive Functions – Anonymous (Lambda) Functions.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the fundamentals of Python programming, including Python execution, data types, variables, memory management, and input/output operations.

CO2: Apply string handling techniques and Python operators to develop programs for solving basic computational problems.

CO3: Develop Python programs using lists, tuples, dictionaries, and data conversion techniques for efficient data manipulation.

CO4: Design Python programs using conditional statements, loops, and loop control statements to implement logical and iterative solutions.

CO5: Develop modular Python applications using arrays, NumPy, user-defined functions, recursion, and lambda functions for data processing and problem solving.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	3
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	2	3	3	3
CO5	2	3	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Rao, R. N. (2017). *Core Python programming*. Dreamtech Press.
2. Balagurusamy, E. (2016). *Introduction to computing and problem solving using Python*. McGraw-Hill Education.

Reference Books

1. Matthes, E. (2023). *Python crash course* (3rd ed.). No Starch Press.
2. Downey, A. B. (2015). *Think Python: How to think like a computer scientist* (2nd ed.). O'Reilly Media.
3. Lutz, M. (2013). *Learning Python* (5th ed.). O'Reilly Media.
4. Sweigart, A. (2020). *Automate the boring stuff with Python* (2nd ed.). No Starch Press.
5. Ramalho, L. (2022). *Fluent Python* (2nd ed.). O'Reilly Media.

M.Sc. Electronics and Communication / Semester -II /Ppr.No.15/ HR

M.Sc. Electronics and Communication / Semester -III /Ppr.No.16 / Core - 7

WIRELESS COMMUNICATION

Objectives

1. To understand the fundamentals of cellular systems, frequency reuse, handoff strategies, and system capacity planning.
2. To study radio wave propagation, path loss models, and small-scale fading effects in mobile communication.
3. To analyze digital modulation techniques, spread spectrum systems, equalization, diversity, and channel coding methods.
4. To understand multiple access techniques such as FDMA, TDMA, CDMA, SDMA, and their applications in cellular systems.
5. To gain knowledge of wireless networking, mobile communication generations, and network architectures such as PCS and UMTS.

UNIT I – THE CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS

Introduction to Cellular Systems – Frequency Reuse – Channel Assignment Strategies – Handoff Strategies – Prioritizing Handoffs – Practical Handoff Considerations -.Interference and System Capacity – Co-Channel Interference and System Capacity – Channel Planning for Wireless Systems – Adjacent Channel Interference – Power Control for Reducing

Interference – Trunking and Grade of Service (GoS).Improving Coverage and Capacity in Cellular Systems – Cell Splitting – Sectoring.

UNIT II – MOBILE RADIO PROPAGATION

Large-Scale Path Loss – Introduction to Radio Wave Propagation – Free Space Propagation Model – Propagation Mechanisms: Reflection, Diffraction, and Scattering – Brewster Angle. Small-Scale Fading and Multipath Propagation – Factors Influencing Small-Scale Fading – Doppler Shift – Coherence Bandwidth – Doppler Spread – Coherence Time.Types of Small-Scale Fading – Fading Effects Due to Multipath Time Delay Spread – Fading Effects Due to Doppler Spread.

UNIT III – MODULATION TECHNIQUES, EQUALIZATION AND DIVERSITY

Digital Modulation – Factors Influencing the Choice of Digital Modulation Techniques. Linear Modulation Techniques – Minimum Shift Keying (MSK) – Gaussian Minimum Shift Keying (GMSK). Spread Spectrum Modulation Techniques – Pseudo-Noise (PN) Sequences – Direct Sequence Spread Spectrum (DS-SS). Modulation Performance in Fading and Multipath Channels – Equalization Techniques – Fundamentals of Equalization. Diversity Techniques – Space Diversity – Polarization Diversity – Frequency Diversity – Time Diversity – Channel Coding Techniques.

UNIT IV – WIRELESS NETWORK EVOLUTION

Wireless and Fixed Telephone Networks – Public Switched Telephone Network (PSTN). Development of Wireless Networks: 1G,2G,3G,4G and5G-Fixed Network Transmission Hierarchy.

UNIT V – WIRELESS NETWORKS AND MOBILE COMMUNICATION SYSTEMS

Traffic Routing in Wireless Networks – Circuit Switching – Packet Switching- Personal Communication Services and Networks (PCS/PCN) – Packet versus Circuit Switching for PCN – Cellular Packet-Switched Architecture – Packet Reservation Multiple Access (PRMA).Network Databases for Mobility Management – Distributed Database Architecture-Universal Mobile Telecommunication System (UMTS) – Architecture and Services.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the principles of cellular communication, frequency reuse, channel assignment, handoff strategies, and methods for improving system capacity and coverage.

CO2: Analyze radio wave propagation, path loss models, multipath fading, Doppler effects, and their impact on mobile wireless communication.

CO3: Apply digital modulation, spread spectrum, equalization, diversity, and channel coding techniques to enhance the reliability and performance of wireless communication systems.

CO4: Analyze the evolution of wireless communication technologies from **1G to 5G**, including network architectures and transmission hierarchies.

CO5: Evaluate wireless network architectures, mobility management, traffic routing, packet- and circuit-switched networks, and the **Universal Mobile Telecommunication System (UMTS)** for modern mobile communication applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	2
CO2	3	3	3	2	2
CO3	3	2	3	3	2
CO4	3	3	3	3	3
CO5	3	2	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Rappaport, T. S. (2010). *Wireless communications: Principles and practice* (2nd ed.). Pearson Education.
2. Goldsmith, A. (2011). *Wireless communications*. Cambridge University Press.
3. Van Nee, R., & Prasad, R. (2000). *OFDM for wireless multimedia communications*. Artech House.

Reference Books

1. Tse, D., & Viswanath, P. (2005). *Fundamentals of wireless communication*. Cambridge University Press.
2. Dalal, U. (2009). *Wireless communication*. Oxford University Press.
3. Molisch, A. F. (2006). *Wireless communications*. John Wiley & Sons.

M.Sc. Electronics and Communication / Semester -III /Ppr.No.17/ Core - 8

DIGITAL SIGNAL PROCESSING

Course Objectives:

1. This course is designed to give students the required knowledge for DFT, FFT.
2. To make students aware about the meaning and implications of the properties of systems and signals.
3. To make the students learn, Theory of DSP, design of DSP applications and introduction to DSP Processors.
4. At the completion of this course, the student should have in depth knowledge of processing digital signals.
5. To learn the MATLAB Program.

UNIT I: INTRODUCTION TO PROGRAMMABLE DSP'S AND ARCHITECTURE

Multiplier and Multiplier Accumulator (MAC) – Modified Bus Structure and Memory Access Schemes – Multiple Access Memory – Multi Ported Memory – VLIW Architecture – Pipelining – Special Addressing Modes in PDSP's – ON Chip Peripheral – Architecture of TMS 320 C5X.

UNIT II: ASSEMBLY LANGUAGE INSTRUCTION AND PROGRAMMING

Syntax – Addressing Modes – Load / Store Instruction –Addition/Subtraction Instruction – Move Instruction – Multiplication Instruction – NORM Instruction – Program Control Instruction –Peripheral Control – Program for Familiarization of the Addressing Modes – Program for Familiarization of the Arithmetic Instruction –Real Time Signal Processing Program.

UNIT III: ARCHITECTURE AND ADDRESSING MODES

Introduction – Overview of TMS 320C3X devices – Internal Architecture – CPU – CPU Register File – Memory Organization –Cache Memory – Peripheral – Data Format – Addressing Modes –Groups of Addressing Modes – Assembly Language Instruction – Processing Real Time Signal

UNIT IV: APPLICATION PROGRAMS IN C3X

TMS320C3X Starter Kit(DSK) - Addressing Modes - Generation and Finding the Sun of Series - Convolution of Two Sequences - Processing Real time Signals with C3X Kit.

UNIT V: MATLAB WITH PROGRAMMING

Desktop Tools – Command Window – Launch Pad – Help Browser – Work space Browser – Editor/Debugger – Discrete Convolution – Stability Test – Fast Fourier Transform – Butterworth Analog Filter: Low-Pass Filter - Up Sampling a Sinusoidal Signal – Down Sampling a Sinusoidal Sequence.

Course Outcomes (COs): Upon successful completion of this course, students will be able to:

CO1: Explain the architecture, memory organization, addressing schemes, and processing features of programmable DSP processors, including the TMS320C5X.

CO2: Develop assembly language programs using DSP instructions, addressing modes, arithmetic operations, and peripheral control for real-time signal processing.

CO3: Analyze the architecture, memory organization, addressing modes, and instruction set of the TMS320C3X processor for DSP applications.

CO4: Design and implement DSP application programs such as sequence generation, convolution, and real-time signal processing using the TMS320C3X Development Starter Kit (DSK).

CO5: Apply MATLAB tools and programming techniques to perform digital signal processing operations, including convolution, Fast Fourier Transform (FFT), digital sampling, and filter design.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	2
CO2	3	3	3	2	2
CO3	3	2	3	3	2
CO4	3	3	3	3	3
CO5	2	2	3	3	3

Mapping Scale 3 – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Book

1. Venkataramani B., Bhaskar M. (2003) *Digital Signal Processors – Architecture, Programming and Applications*, First Reprint, Tata McGraw Hill.

Reference Books

1. Salivahanan S., Vallavaraj A., Gnanapriya C. (2003) *Digital Signal Processing*, Tata McGraw Hill Publishing.
2. Rudra Pratap (2004) *Getting Started with MATLAB*, Version 6, Oxford University Press.

M.Sc. Electronics and Communication / Semester -III /Ppr.No.18/ Core – 9

INTERNET OF THINGS

Course Objectives:

1. Discuss the architecture, operation, and business benefits of an Arduino
2. Understand the definition and significance of the Internet of Things
3. Students will be explored to the interconnection and integration of the physical world and the cyber space.
4. Explore the relationship between IoT, cloud computing, and big data
5. They are also able to design & develop IoT Devices.

UNIT I: ARDUINO PLATFORM

Introduction - Functional block diagram of Arduino - Arduino family of boards - Pin function of Arduino UNO .

UNIT II: SENSORS AND ACTUATORS

Sensor Classification - Potentiometer - Hall-effect sensor - Accelerometer sensors - Strain-gauge sensor - Proximity sensor - LED - DC motor – Servo motor.

UNIT III: INTERNET OF THINGS (IoT)

Definition and Application of IoT- Characteristics of IoT- Design principles of IoT- IoT architecture – IoT Protocols.

UNIT IV: ETHERNET SHIELD AND IOTCLOUD PLATFORMS

Arduino Ethernet Shields - Connecting the Ethernet Shield to Arduino board - Working with Arduino Ethernet.

UNIT V: IoT APPLICATIONS

Blinking of LED - Key interfacing - Interfacing LCD - Controlling LED using IoT.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the architecture, features, pin configuration, and programming environment of the Arduino platform for embedded system development.

CO2: Interface and program various sensors and actuators, including LEDs, motors, and transducers, using Arduino.

CO3: Explain the concepts, architecture, design principles, and communication protocols of the Internet of Things (IoT).

CO4: Configure Arduino Ethernet shields and utilize IoT cloud platforms for network communication and remote monitoring applications.

CO5: Design and implement Arduino-based IoT applications such as LED control, key interfacing, LCD interfacing, and remote device control through IoT technologies.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	3	2
CO2	3	3	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Mapping Scale **3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Ashwin Pajankar (2018) Internet of Things with Arduino and Bolt, BPB Publications, First Edition. ISBN: 9789387284265 (Units – 1, 4)
2. Subir Kumar Saha (2014) Introduction to Robotics, McGraw-Hill Education, Second Edition. ISBN: 9789332902800 (Units – 2)
3. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain (2019) Internet of Things with Raspberry Pi and Arduino, CRC Press, First Edition. ISBN: 9780367248215 Units – 3, 5)

Reference Books

1. Michael McRoberts (2013) *Beginning Arduino*, Apress, Second Edition. ISBN: 9781430250166.
2. Arshdeep Bahga, Vijay Madisetti (2015) *Internet of Things – A Hands-on Approach*, Universities Press, First Edition. ISBN: 9780996025522.

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.19/ Elective-3A

NANO ELECTRONICS

Objectives:

1. To understand the fundamentals of nanostructures, quantum mechanics, and scaling effects in nano-electronic systems.
2. To study carbon nanotubes, their synthesis, properties, and applications in Nano electronic devices and interconnects.
3. To analyse quantum electronic devices including MOSFETs, mesoscopic structures, and quantum cellular automata.
4. To understand resonant tunnelling devices and single-electron devices used in memory and logic applications.
5. To explore Nano-bio devices, molecular electronics, and applications of nanotechnology in biomedical and logic systems.

UNIT I – INTRODUCTION TO NANOTECHNOLOGY

Region of nanostructures, scaling of devices in silicon technology, estimation of technology limits, uncertainty principle, experiments on duality, Schrödinger's equation and its applications to square well potential, square potential barrier (1D), infinite array of potential wells, barrier penetration, applications to tunnel diode, Josephson effect, perturbation theory and its applications, scattering. Binomial and related distributions, phase space, statistical ensembles, applications of classical statistical mechanics, quantum statistics, Brownian motion, random walk problem.

UNIT II – CARBON NANOTUBES

Carbon nanotube – fullerenes – types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – nanotube for memory applications – prospects of carbon nanotube nano electronics.

UNIT III – QUANTUM ELECTRONIC DEVICES

Concept of chemical potential, partition function and its applications in computing thermodynamic quantities. Quantum electronic devices, electrons in mesoscopic structures, short channel MOSFET, split-gate transistor, electron wave transistor, electron spin transistor, quantum cellular automata.

UNIT IV – QUANTUM BASED RTDs

Quantum transport devices based on resonant tunneling – electron tunneling – resonant tunneling diodes (RTDs) – three terminal RTDs – RTD based memory. Single electron

devices for logic applications – single electron devices – applications of single electron devices to logic circuits.

UNIT V – NANO-BIO DEVICES

Bioelectronics, molecular processor, DNA analyser as biochip, molecular electronics, fullerenes, nanotubes, switches based on fullerenes and nanotubes, basic logic gates and dynamic logic gates, principle of single electron transistor, Coulomb blockade.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the principles of nanotechnology, quantum mechanics, statistical mechanics, and their applications in nanoscale electronic devices.

CO2: Analyze the structure, synthesis, electronic properties, and applications of carbon nanotubes and fullerenes in nanoelectronic systems.

CO3: Evaluate the operating principles and applications of quantum electronic devices, mesoscopic structures, and nanoscale transistors.

CO4: Analyze the characteristics and applications of resonant tunneling devices (RTDs), quantum transport devices, and single-electron devices used in nanoelectronics.

CO5: Evaluate nano-bio devices, molecular electronics, fullerenes, nanotube-based logic circuits, and single-electron transistor technologies for advanced electronic applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2
CO2	3	3	2	2	2
CO3	3	2	3	3	2
CO4	3	3	3	3	3
CO5	2	3	3	3	3

Mapping Scale **3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Book

1. Goser K., Glosekotter P., Dienstuhl J. (2005) *Nanoelectronics and Nanosystems*, Springer.

Reference Books

1. Schiff L. I.*Quantum Mechanics*.
2. Reif F.*Fundamentals of Statistical Mechanics and Thermal Physics*.

3. Wilson M., Kannangara K., Smith G., Simmons M., Raguse B. (2002) *Nanotechnology: Basic Science and Emerging Technologies*, Chapman & Hall / CRC.

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.19/ Elective-3B

RENEWABLE ENERGY

Objectives

1. To know the present status of Indian and global energy scenario.
2. To educate the various wind energy technologies.
3. To learn the various solar energy technologies and its applications.
4. To explore the various bio-energy technologies.
5. To study the ocean and geothermal technologies

UNIT – I: RENEWABLE ENERGY RESOURCES

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources

UNIT – II: WIND ENERGY

Power in the Wind – Types of Wind Power Plants (WPPs)–Components of WPPs-Working of WPPs- Siting of WPPs-Grid integration issues of WPPs.

UNIT–III: SOLAR PV AND THERMAL SYSTEMS

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems :Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photo voltaiccell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications

UNIT-IV: BIOMASS ENERGY

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydropower: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT – V: OTHER ENERGY SOURCES

Tidal Energy: Energy from the tides, Barrage and Non-Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)-Hydrogen Production and Storage- Fuel cell : Principle of working- various types – construction and applications. Energy Storage System- Hybrid Energy Systems.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the importance of renewable energy resources, sustainable energy development, and the environmental impacts of conventional energy sources.

CO2: Analyze the operation, performance, and grid integration of wind energy conversion systems and their applications.

CO3: Evaluate the principles, characteristics, and applications of solar photovoltaic and solar thermal energy systems, including maximum power point tracking (MPPT) and energy storage techniques.

CO4: Analyze biomass, geothermal, and mini/micro hydropower systems for efficient and sustainable energy generation.

CO5: Evaluate the principles and applications of tidal, wave, ocean thermal, hydrogen, fuel cell, energy storage, and hybrid renewable energy systems.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	2	3	3	2
CO4	3	3	2	3	3

CO / PO	PO1	PO2	PO3	PO4	PO5
CO5	2	3	3	3	3

Mapping Scale **3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. David M. Buchla., "Renewable Energy Systems", pearson education publication, Hard M.Sc., Energy Science Syllabus 2023-2024 onwards42cover/Paperback-2017.

2. Mehmet Kanoglu "Fundamentals and Applications of Renewable Energy", Indian edition McGraw Hill Publication, Hard cover/Paperback-2020

Reference Books

1. TiwariG.N.,"Solar Energy–Fundamentals Design, Modelling and applications", Alpha ScienceIntl Ltd, 2015

2. Sukhatme.S.P., "Solar Energy: Principles of Thermal Collection and Storage",Tata McGraw HillPublishing Company Ltd., New Delhi,2009.

3. Twidell,J.W.&WeirA.,"Renewable Energy Resources", EFN Spon Ltd., UK, 2015.

M.Sc. Electronics and Communication / Semester -III /Ppr.No.20 / Core Practical – 5

DIGITAL SIGNAL PROCESSING LAB

Objectives:

1. To implement linear and circular convolution.
2. To implement FIR and IIR filters.
3. To understand the mathematical operations on discrete-time signals.
4. To enable students to develop DSP algorithms for convolution, correlation, DFT, and filtering of signals.
5. To sketch and analyze the magnitude and phase response of DFT, inverse DFT, and FFT of discrete-time signals.

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Any 10 Experiments:

1. Arithmetic Operations
2. DFT Computations
3. FFT Computations
4. Convolution of Two Discrete Signals
5. Correlation of Two Discrete Signals
6. Waveform Generation
7. ADC and DAC.
8. Generation of Signals
9. Amplitude Modulation & FFT Response
10. Impulse, Step, Exponential & Ramp Functions
11. Frequency Sampling Method.
12. Sampling Storing Method.
13. Design of FIR Filter
14. Design of IIR Filter

M.Sc. Electronics and Communication / Semester -III/Ppr.No.21/ Core Practical – 6

IoT APPLICATIONS LAB

Objectives:

1. To understand HTTP web server concepts in IoT using Access Point and Station modes.

2. To develop and deploy a basic web server for IoT applications.

3. To interface I/O devices with Wi-Fi-enabled microcontrollers for real-time control and monitoring.

4. To work with IoT cloud platforms such as MQTT, Thing Speak, Freeboard, Pub Nub, and AT&T for data communication.

5. To implement IoT applications like SMS alerts, email notifications, weather updates, and time-based services.

Any 10 Experiments (Using ESP32)

1. Understanding HTTP Web Server – Access Point Mode
2. Creating Own Web Server
3. Interfacing I/O Devices with Wi-Fi Microcontroller
4. Experiment with MQTT Eclipse Cloud Mobile App
5. Experiment with Http Thing speak Cloud Server
6. Experiment with Freeboard I/O Cloud Server
7. Experiment with HTTP Pub nub Cloud Server
8. Experiment With AT&T Cloud Server
9. Experiment on SMS Alert
10. Experiment on Sending Email
11. Experiment on Weather Application
12. Experiment on Get Time Application
13. Understanding HTTP Web Server – Station Mode

M.Sc. Electronics and Communication / Semester -III / Ppr.No.22/ NME-2

INDUSTRY STANDARD 5.0

Objectives:

1. To understand the fundamentals and evolution of Industry 4.0 and Industry 5.0 concepts and technologies.

2. To study cyber-physical systems, their components, integration, and security challenges.

3. To analyze IoT, AI, and industrial applications including smart manufacturing and predictive maintenance.

4. To understand advanced manufacturing technologies such as additive manufacturing, digital twin, VR, and AR.

5. To explore human-centric, sustainable, and intelligent industrial systems including smart supply chains and wearable technologies.

UNIT I – INDUSTRY 4.0

Introduction – Overview of Industry 4.0 – Industrial Revolution – Evolution – Characteristics and Principles of Industry 4.0 – Components and Technologies of Industry 4.0.

UNIT II – INDUSTRY 5.0

Introduction to Industry 5.0 – Evolution – Essence – Challenges and Issues – Key Technologies and Principles of Industry 5.0 – Product Life Cycle Management – Digital Transformation – Human-Centric Systems – Resilient and Sustainable Systems.

UNIT III – CYBER–PHYSICAL SYSTEMS APPLICATIONS

Cyber–Physical Systems – Components of Cyber-Physical Systems – Integration Of Physical and Virtual Systems – Cyber Security – Risks – Strategies And Technologies for Securing Cyber-Physical Systems – Privacy and Ethical Considerations.

UNIT IV – IoT, AI AND INDUSTRIAL APPLICATIONS

Introduction to IoT and IIoT– Sensor Networks and Data Collection – Applications of IoTIn Manufacturing – Big Data and Analytics – Data Acquisition And Storage – Data Analytics for Process Optimization and Predictive Maintenance – Fundamentals of Artificial Intelligence and Machine Learning – Ai Techniques For Quality Control and Optimization – Robotics and Automation in Manufacturing.

UNIT V – ADVANCED MANUFACTURING TECHNOLOGIES

Principles and Techniques of Additive Manufacturing And 3d Printing – Applications Of 3d Printing – Concept of Digital Twin – Virtual Reality (VR) And Augmented

Reality (AR) – Benefits and Challenges of Digital Twin Technology – Supply Chain Transformation – Digitization and Optimization of Supply Chains – Human–Machine Interfaces and Wearable Technologies – Ergonomics and User Experience Considerations – Cognitive Computing and Natural Language Processing.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the evolution, principles, components, and enabling technologies of **Industry 4.0** and their impact on modern manufacturing systems.

CO2: Analyze the concepts, key technologies, and human-centric, resilient, and sustainable approaches of **Industry 5.0** for next-generation industrial applications.

CO3: Evaluate the architecture, integration, cybersecurity, privacy, and ethical considerations of **Cyber–Physical Systems (CPS)** in smart industries.

CO4: Apply **IoT, IIoT, Artificial Intelligence (AI), Machine Learning (ML), big data analytics, and robotics** to improve industrial automation, predictive maintenance, and process optimization.

CO5: Analyze advanced manufacturing technologies such as **3D printing, digital twins, virtual reality (VR), augmented reality (AR), cognitive computing, and intelligent supply chain systems** for smart manufacturing applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	2
CO2	2	3	3	2	3
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	2

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Klaus Schwab (2017) The Fourth Industrial Revolution, Portfolio.
2. Alasdair Gilchrist (2016) Industry 4.0: The Industrial Internet of Things, Wiley.

Reference Books

1. Darrell M. West (2018) *The Future of Work: Robots, AI and Automation*, Brookings Institution Press.

2. Alp Ustundag, Emre Cevikcan (2017) *Industry 4.0: Managing the Digital Transformation*, Springer.
3. Richard Susskind, Daniel Susskind, *The Future of the Professions: How Technology is Transforming Human Work*.

M.Sc. Electronics and Communication / Semester -III /Ppr.No.23/Internship.

INTERNSHIP

A **15-day Internship** is a short-term training program where students gain **basic practical knowledge and industry exposure** in a limited time.

Objectives of 15 Days Internship

1. **Gain** basic practical experience **in a chosen field**
2. **Understand** real-time industry/work environment
3. **Learn** tools, software, or equipment usage
4. **Improve** technical and communication skills
5. **Get exposure for** future internships or placements

Outcomes

- Basic industrial exposure
- Internship certificate
- Simple project experience
- Skill improvement for resume

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.24 / Core 10

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Objectives

1. To understand the fundamental concepts of Artificial Intelligence, problem solving, and search strategies in AI systems.
2. To study heuristic search techniques such as hill climbing, best-first search, constraint satisfaction, and problem reduction.
3. To learn the basics of machine learning, its types, applications, and foundational concepts.
4. To analyze linear models including regression, classification, neural networks, and support vector machines.
5. To understand distance-based and ensemble learning methods such as clustering, k-NN, k-means, random forests, and boosting.

UNIT I – INTRODUCTION

AI problems – AI techniques – criteria for success. Problems, problem spaces, search: state space search – production systems – problem characteristics – issues in design of search.

UNIT II – HEURISTIC SEARCH TECHNIQUES

Generate and test – hill climbing – best-first search – problem reduction – constraint satisfaction – means-end analysis.

UNIT III – MACHINE LEARNING

Machine learning foundations – overview – applications – types of machine learning – basic concepts in machine learning – examples and applications.

UNIT IV – LINEAR MODELS

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – logistic regression – perceptrons – multilayer neural networks – learning neural network structures – support vector machines – soft margin SVM – generalization and overfitting – regularization – validation.

UNIT V – DISTANCE-BASED MODELS

Nearest neighbor models – k-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning – bagging and random forests – boosting – meta learning.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the fundamental concepts of Artificial Intelligence, problem representation, production systems, and search techniques for intelligent problem solving.

CO2: Analyze heuristic search algorithms, constraint satisfaction methods, and problem reduction techniques for solving AI problems efficiently.

CO3: Explain the principles, types, and applications of Machine Learning and apply appropriate learning techniques to practical problems.

CO4: Apply linear regression, logistic regression, neural networks, and support vector machines to solve classification and prediction problems while evaluating model performance.

CO5: Analyze and apply distance-based models, clustering techniques, nearest neighbor methods, and ensemble learning algorithms for intelligent data analysis.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	3	3	2	2
CO3	3	3	2	3	2
CO4	2	3	3	3	3
CO5	3	3	3	2	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Elaine Rich & Kevin Knight (1991) *Artificial Intelligence*, Tata McGraw Hill, Second Edition.

Reference Books

1. Stuart Russell, Peter Norvig (2021) *Artificial Intelligence: A Modern Approach*, Pearson Education.
2. Ethem Alpaydin (2020) *Introduction to Machine Learning*, MIT Press, Fourth Edition.
3. Dan W. Patterson (2007) *Introduction to Artificial Intelligence and Expert Systems*, Pearson Education.

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.25 / Core – 11

HYBRID ELECTRIC VEHICLES

Objectives

1. To understand fundamentals of electric and hybrid electric vehicles and their components.
2. To study vehicle architecture, design concepts, and propulsion system requirements.
3. To learn energy storage systems including batteries, fuel cells, and ultracapacitors.
4. To analyze electric drives, motor types, and power electronic controllers used in EVs.
5. To understand sensors, embedded systems, and communication protocols used in modern vehicles.

UNIT-I ELECTRIC VEHICLES

Electric vehicles, hybrid electric vehicles, EV components, vehicle mass and performance, motor and engine ratings, EV history, well-to-wheel analysis, EV vs ICE vehicle comparison, vehicle kinetics and propulsion system design.

UNIT-II VEHICLE ARCHITECTURES AND DESIGN

EV architectures, plug-in hybrid electric vehicles, skateboard chassis design, mass analysis, vehicle packaging, mission-based design, autonomous driving levels and safety enhancements.

UNIT-III ENERGY STORAGE SYSTEMS

Battery fundamentals and parameters, - BMS and its Architecture - lead-acid, NiCd, NiMH, lithium-ion batteries, battery pack management systems, fuel cells, ultracapacitors, and flywheels.

UNIT-IV ELECTRIC DRIVES AND CONTROLLERS

DC machines, AC machines, induction motors, permanent magnet machines, power electronic switches, DC-DC converters, EV powertrain converters.

UNIT-V SENSORS AND EMBEDDED PROTOCOLS

Ultrasonic sensors, inertial sensors, LiDAR (LADAR), RADAR, vision sensors, GNSS systems, in-car communication networks (CAN, LIN, FlexRay), AUTOSAR architecture.

Course Outcomes (COs):Upon successful completion of this course, students will be able to:

CO1: Explain the fundamentals of electric and hybrid electric vehicles, vehicle performance parameters, propulsion systems, and the advantages of EVs over conventional internal combustion engine (ICE) vehicles.

CO2: Analyze electric vehicle architectures, vehicle packaging, mission-based design, autonomous driving levels, and safety enhancements for modern electric mobility.

CO3: Evaluate the characteristics, performance, and management of energy storage systems, including batteries, battery management systems (BMS), fuel cells, ultracapacitors, and flywheels used in electric vehicles.

CO4: Analyze the operation of electric drives, power electronic converters, DC and AC machines, induction motors, and permanent magnet machines used in EV powertrains.

CO5: Apply automotive sensing technologies and embedded communication protocols, including CAN, LIN, FlexRay, GNSS, LiDAR, RADAR, and AUTOSAR architecture, in intelligent electric vehicle systems.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	3	3	2	2
CO3	3	2	3	3	2
CO4	3	3	2	3	3
CO5	3	3	3	3	2

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Textbooks

1. Iqbal Husain (2021) *Electric and Hybrid Vehicles: Design Fundamentals*, CRC Press, 3rd Edition. ISBN: 978-0-429-49092-7
2. Nicolas Navet, Françoise Simonot-Lion (2009) *Automotive Embedded Systems Handbook-Industrial Information*, CRC Press.ISBN: 978-0-8493-8026-6

Reference books

1. Mehrdad Ehsani, Yimin Gao, Stefano Longo, Kambiz M. Ebrahimi (2018) *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles*, CRC Press, Taylor & Francis Group.ISBN: 978-1-4987-6177-2
2. Ali Emadi (2015)*Advanced Electric Drive Vehicles*, CRC Press, Taylor & Francis Group.ISBN: 978-1-4665-9770-9
3. K. T. Chau (2016)*Energy Systems for Electric and Hybrid Vehicles*, The Institution of Engineering and Technology (IET), London.ISBN: 978-1-78561-009-7

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.26 / Project VIVA VOCE

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.27 / SEC-2

ANDROID DEVELOPMENT TOOLS AND ITS APPLICATIONS

Objectives

1. To understand the fundamentals of Android architecture, SDK, and mobile application development framework.
2. To develop skills in setting up Android development tools and building basic Android applications.
3. To understand Android application structure, lifecycle, manifest files, and embedded device considerations.
4. To learn multimedia handling in Android including audio, video, camera, and media storage operations.
5. To design and develop real-time Android applications using connectivity features like Bluetooth, Wi-Fi, NFC, and internet services.

UNIT I – INTRODUCTION TO ANDROID

Background – Platform for mobile development – Native Android applications – Android SDK features – Open Handset Alliance – Android in mobile computing. Introducing the development framework: Android software stack – Dalvik Virtual Machine – Android application architecture.

UNIT II – DEVELOPING FOR ANDROID

Downloading and installing Android SDK – Developing with Eclipse – Android Developer Tools (ADT) plugin – Support package. First Android application: New Android project – Android Virtual Device (AVD) – Launch configurations – Running and debugging Android applications – Types of Android applications – Android development tools.

UNIT III – MOBILE AND EMBEDDED DEVICES

Hardware-imposed design considerations – User environment – Developing for Android – Introduction to Android development tools. Applications and activities: Role of Android applications – Application manifest file – Manifest editor – Application lifecycle – Application priority and process states.

UNIT IV – AUDIO, VIDEO AND CAMERA

Playing audio and video – Manipulating raw audio – Creating a sound pool – Using audio effects – Camera for taking pictures – Recording video – Adding media to media store.

UNIT V – REAL TIME APPLICATIONS

Bluetooth – Network and internet connectivity – Wi-Fi – Data transfer using Wi-Fi Direct – Near Field Communication (NFC). Applications: Online ticket booking – Online payment systems – E-learning & simulations – Online shopping – Government applications – Banking applications – Other real-time applications.

Course Outcomes (COs): Upon successful completion of this course, students will be able to:

CO1: Explain the Android software stack, application architecture, development framework, and core features of the Android platform.

CO2: Develop, deploy, debug, and test Android applications using the Android SDK, Android Studio/Eclipse, Android Virtual Device (AVD), and related development tools.

CO3: Analyze Android application components, activity lifecycle, manifest configuration, and process management for efficient mobile application development.

CO4: Design Android applications that integrate multimedia features such as audio, video, and camera functionalities for interactive mobile applications.

CO5: Develop Android applications that utilize Bluetooth, Wi-Fi, NFC, and internet connectivity for real-time applications such as online payment, e-learning, e-commerce, banking, and e-governance.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	3	3	3	3

Mapping Scale**3** – Strong (High) **2** – Moderate (Medium) **1** – Low (Substantial)

Text Books

1. Reto Meier (2012) *Professional Android 4 Application Development*, Wiley India Pvt. Ltd.

Reference Books

1. Paul Deitel, Harvey Deitel, Abbey Deitel, Michael Morgano ,*Android for Programmers: An App-Driven Approach*.

2. Frank Ableson, W. Sen, Chris King, Enrique Ortiz (2012) *Android in Action*, 3rd Edition, Manning Publications.
3. Charlie Collins, Michael Galpin (2012) *Android in Practice*, Manning Publications Co.
4. Zigurd Mednieks, Laird Dornin (2011) *Programming Android*, O'Reilly Media.

M.Sc. Electronics and Communication / Semester -IV /Ppr.No.28 / Extension Activity

Extension Activity

An **Extension Activity** is a learning activity where college students go beyond the **class room to serve society and gain practical experience.**

Objectives:

1. Develop **social responsibility** among students
2. Apply **theoretical knowledge in real-life situations**
3. Improve **communication and leadership skills**
4. Create **awareness about social issues**
5. Encourage **community service and teamwork**

Examples of Extension Activities

- Tree plantation drives
- Teaching in nearby schools (literacy programs)
- Awareness programs (health, environment, safety)

Outcome

- Better personality development
- Practical experience outside academics
- Social awareness and discipline

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பெரியார் பல்கலைக்கழகம்
PERIYAR UNIVERSITY
State University-NAAC A++ Grade-NIRF 94,
State Public University Rank 40-SDG Institutions Rank Band-11-50
Salem- 636011, Tamil Nadu

Dr.K.JAYARAMAN
DEAN

PU/AD-1/BOS MEETING/006458/2026, Date:04.05.2026
BOARD OF STUDIES - MEETING NOTICE

I am, by direction, to state that the meeting of the Board of Studies in **Electronics and Communication - PG (Affiliated College)** is scheduled to be held on 19.05.2026 at 10.30 a.m. at Kalaingar Research Centre, Periyar University, Salem-11.

AGENDA

1. To Frame the syllabus for **M.Sc. Electronics and Communication** under Choice Based Credit System (CBCS) and Outcome Based Education (OBE) from the academic year 2026-2027 and thereafter.
2. To Prepare the Scheme of Examination, Question Paper Pattern, Model Question Paper, List of Examiners, Question Paper Setters, etc.
3. Any other item.

Members of the Board:

Sl.No.	Name & Address	Designation of the Board
1.	Dr.P.Thirumoorthy Associate Professor, Dept.of Electronics and Communication, Govt.Arts College, Dharmapuri-636705.Ph:8610769508 e-mail: tmoo@rediffmail.com	Chairman
2.	Dr. P. Thamaraiselvan Associate Professor,Dept.of Electronics and Communication,Selvamm Arts & Science college (Autonomous),Pappinaickenpatti Namakkal – 637 003. Ph.9597940910,9894668790 e-mail: thamaraiselvanphd@gmail.com	Member
3.	Dr. P. Gowrisankar Assistant Professor Muthayammal College of Arts & Science (Autonomous), Kakkaveri, Rasipuram – 637 408, Namakkal - Dt. Ph. 9364154283 e-mail: pgsankar3@rediffmail.com	Member
4.	Dr.K.A.Ramesh Kumar Professor & Head, Dept.of Energy Science and Technology, Periyar University,Salem-11 Ph.No:9976766000 E.Mail:karameshkumar77@periyaruniversity.ac.in	University Nominee

5.	Dr. R. Sakthivel Associate Professor in Electronics PSG Arts and Science College Coimbatore-46, Ph.No:9865153311 E.Mail: rsgvel@gmail.com	External Member
6.	Dr.O.M.Saravanakumar Associate Professor and Head Department of Electronics and Communication Sri Krishna Arts and Science College Sugunapuram, Kuniamuthur 641008 Ph.No: 9488350744/9123587717 E.Mail: saravanakumarom@skasc.ac.in	External Member
7.	Mr.Sudheesh S Senior R&D Developer-Electronics Doodil 2r IT solutions Pvt.Ltd RH 18 Orchids, SF No:114/23, VIB Engg College Road, Arivoli nagar, Kovaipudur Coimbatore-641042, Ph:9961100975,7708296143 E.Mail: sudheesh.madhav@gmail.com	Industrial Expert
8.	Mrs. Mohana Priya Assistant Professor, Dept.of Electronics and Communication, Sri Ganesh College of Arts & Science (Autonomous), Kumaragiri Bye-Pass Ammapet, Salem - 14. Ph. 9344028031 E.Mail: anbupriya568@gmail.com	Alumni

I request you to make it convenient to attend the above meeting on 19.05.2026. TA/DA and Honorarium will be paid as per Periyar University Rules through ECS only.

DEAN (FAC)

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