Tumkur University
Department of Electronics

Subject: ELECTRONICS

Proposed Curriculum for 5th and 6th semester B.Sc. as per Revised NEP

May 2026

Proceedings of UG-BoS in Electronics

(**Ref:** TU/Academic Section/2026-27/397 dated 30/04/2026)

The meeting of UG-BOS in Electronics was held on 29th and 30th May 2026 at the Department of Electronics, Tumkur University, Tumakuru. **The following members were present.**

1. Prof. Devaraju J. T. - Chairman
2. Dr. Manjunatha D - Member
3. Dr. Kusuma Kumari B M - Member
4. Dr. Shwetha D - Member
5. Dr. Swetha - Member

Chairman extended a warm welcome to the members and following agenda were taken up for discussion.

1. Syllabus for 5th sem and 6th sem UG Electronics were prepared, scrutinized and approved.
2. Question paper pattern for SEC was prepared and approved.

The meeting concluded with vote of thanks.

(Dr. Manjunatha D) (Dr. Kusuma Kumari) (Dr. Shwetha D) (Dr. Swetha)

Prof. Devaraju J.T

Chairman (UG-BoS in Electronics)

Tumkur University

COURSE PATTERN AND SCHEME OF EXAMINATION FOR B.Sc. AS PER REVISED NEP SCHEME

SUBJECT: ELECTRONICS

SEMESTER	PAPER	TITLE OF THE PAPER	HRS/ WEEK	CREDITS	IA MARKS	SEE MARKS	MAX. MARKS
V	ELEDSC05	Electronic Instrumentation and IoT	3	3	20	80	100
	ELEDSC05P	Electronic Instrumentation and IoT Lab	4	2	10	40	50
	ELEDSC06	Advanced Communication and Robotics	3	3	20	80	100
	ELESEC-1	Sensors and Actuators for Robotics	1L + 2P	2	10	40	50
	ELESEC-2	Blockchain Technology	1L + 2P	2	10	40	50
VI	ELEDSC07	Power Electronics and E - Vehicles	3	3	20	80	100
	ELEDSC07P	Power Electronics and E – Vehicles Lab	4	2	10	40	50
	ELEDSC08	Artificial Intelligence and Machine Learning	3	3	20	80	100
	ELESEC-3	Robotics and IoT Applications	1L + 2P	2	10	40	50
	ELESEC-4	Prolog Programming	1L + 2P	2	10	40	50

N. Sowmya

Basis for Awarding Theory Internal Assessment Marks:

Sl.No	Particulars	IA Marks
1	Minimum of Two internal Tests	**10**
2	Assignments / Seminar / Case Study/Project work / Reports on - visits to industries / exhibitions / science centres / active participation in Electronics competitions etc.	**10**
TOTAL Theory IA Marks		**20**

Basis for Awarding Practical Internal Assessment Marks:

Sl.No	Particulars	IA Marks
1	Practical Test	**05**
2	Project work / Seminar on electronics experiments / Active participation in practical classes etc.	**05**
TOTAL Practical IA Marks		**10**

Question Paper Pattern for Skill Enhancement Course

PART-A	Any FIVE Questions out of SEVEN (5 x 6 =30) (Each question carries 6 marks)	**30**
PART-B	Any FIVE Questions out of SEVEN (5 x 2 =10) (Each question carries 2 marks)	**10**
	TOTAL	**40**

N. Sumetha

III B.Sc. SEMESTER - V

ELEDSC-05: Paper - 5 : Electronic Instrumentation and IoT

(Credits: Theory – 03)
Total Teaching: 48 Hrs

Hours of Teaching: 3 Hrs / Week

Unit-1 10 Hrs

Measurement System: Introduction to general measurement system – Block diagram, significance of measurements, methods of measurements, instruments and measurement systems, Functions of instruments and measurement systems, Applications of measurement systems.

Instruments Performance Characteristics: Definitions and problems as applicable. Static Characteristics-Static error, static correction, scale range and scale span, reproducibility and drift, repeatability, Signal to noise ratio, sources of noise, accuracy, precision, linearity, hysteresis, threshold, dead time. Dynamic Characteristics-Fidelity, frequency response, dynamic error, etc.,

PMMC-Voltmeter, Ammeter, Loading effect

Unit -2 14 Hrs

Transducers: Classification of transducers, basic requirement of transducers, selection criteria, principle of operation and construction details of resistive, inductive, capacitive, temperature, ultrasonic, photoelectric, pressure, fiber optic and MEMS based transducers. Measurement techniques for motion, seismic, flow, level, humidity, pH, viscosity.

Demonstration: Sensors-Introduction to sensors, types of sensors, typical application of sensors, basic principles and operations of Thermal Sensors, Optical Sensors, Acoustic Sensors, MEMS, Nano-sensors, Ultrasonic Sensors, Thin Film Sensors, Liquid Level Sensors, Magnetic Sensors, Radiation Sensor, etc.

Oscilloscope, Function Generator, Biomedical Instruments – Various instruments, Working, Applications

Unit-3 12 Hrs

Internet of Things (IoT): Definition, evolution of the IoT, simplified IoT architecture, components, characteristics of sensors used in IoT applications. IoT communication protocols: MQTT, CoAP, HTTP, LORa, XMPP, IoT application domains and use cases. Key IoT technologies - Wi-Fi, Bluetooth, Zigbee, LoRaWAN, etc.

Unit-4 12 Hrs

Network security: Introduction to security, Network confidentiality. IoT network topologies: star, mesh, and hybrid networks. IoT data management and storage. IoT protocols for device to-device and device-to-cloud communication.

IoT application development platforms and frameworks: Design and implementation of IoT applications.

Broad categories IoT applications: Consumer IoT, Commercial IoT, Industrial IoT, Infrastructure IoT and Military things (IoMT). Introduction to Raspberry Pi.

Reference Books

1. Electronic Instrumentation, H S Kalsi, TMH, 2nd Edition, 2010
2. Electronic Instrumentation and Measurements, David A Bell, PHI/ Pearson Education, 2nd

Edition, 2012.
3. Modern Electronic Instrumentation and Measurement techniques, Albert D Helfrick, William D Cooper, PHI, 2007.
4. Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, DhanpatRai & sons, 18th Edition
5. Patranabis D, "Sensors and Transducers", Wheeler publisher, 1994
6. Instrumentation measurement and analysis, Nakra, Choudhary
7. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004
8. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.
9. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
10. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, NewnDelhi, 2003.
11. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGra-Hill Publisher 2003
12. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
13. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
14. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill HigherEducation

ELEDSC-05P: Paper - 5 : Electronic Instrumentation and IoT Lab

(Credits: Practical – 02) Hours of Practical: 4 Hrs / Week

PART-A (Instrumentation Systems Practical)

1. Study of the characteristics of thermistors
2. Study of the characteristics of LDR
3. Study of the piezo electric transducer
4. Construction and study the VI characteristics of solar cell
5. Conversion of basic ammeter into multimeter and calibration of voltage, resistance and current
6. Calibration of thermistors for temperature measurement.
7. Characterize the Temperature sensor (RTD)
8. Simulate the performance of a bio Sensor.
9. Measurement of level in a tank using capacitive type level probe.
10. Characterize the LVDT
11. Design an orifice plate for a typical application.
12. Simulate the performance of a chemical sensor.
13. Characterize the strain guage sensor.
14. Characterize the temperature sensor (Thermocouple).

PART-B (IOT- Lab)

1. Starting Raspbian OS, Familiarization with Raspberry Pi components and interface, Connecting to Ethernet, Monitor, USB.
2. Displaying different LED patterns with Raspberry Pi.
3. Displaying Time over 4-Digit 7-Segment display using Raspberry Pi.
4. Raspberry Pi based Oscilloscope.
5. Controlling Raspberry Pi with WhatsApp.
6. Setting up wireless Access point using Raspberry Pi.
7. Fingerprint Sensor interfacing with Raspberry Pi.
8. Raspberry Pi GPS module interfacing.
9. IoT based Web Controlled Home Automation using Raspberry Pi.
10. Visitor Monitoring with Raspberry Pi and Pi Camera.

ELEDSC-06: Paper - 6 : Advanced Communication and Robotics

(Credits: Theory – 03)
Total Teaching: 48 Hrs Hours of Teaching: 3 Hrs / Week

Unit - 1 14 Hrs

Microwave Devices: RF/Microwaves, EM spectrum, Wavelength and frequency, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators, GUNN diode, READ diode, IMPATT diode, BARITT diode, PIN diodes, Schottky barrier diodes, Multi cavity Klystron, Magnetron, block diagram of Microwave communication and working, Applications.

RADAR Communication Systems: RADAR principles, block diagram of pulsed RADAR system, RADAR range equation, MTI RADAR-block diagram, working, CW RADAR-block diagram, working, advantages, applications and limitations,

Unit - 2 12 Hrs

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, Absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, Multiplexing, FDMA, WCDMA, TDMA, OFDMA, GSM- Qualitative analysis.

Bluetooth, Zigbee, Wi-Fi, MIMO, LTE, 5G technology and CV2X- qualitative analysis. Simplified block diagram of cellular phone handset. Wireless channel characteristics.

Unit - 3 10 Hrs

Robotics and Automation

Introduction to Robots, Robotics; Laws of robot, Brief history of robotics, Basic components of robot, Types of Robots: Industrial, Mobile, Humanoid, Aerial, Medical, etc., Applications of Robots: medical, mining, space, defence, security, domestic, entertainment, Industrial Applications-Material handling, welding, Spray painting, Machining.

Unit - 4 12 Hrs

Robot Components and Kinematics

Anatomy of a robotic manipulator- links, joints, actuators, sensors, controller. Degrees of Freedom, Robot considerations for an application- number of axes, work volume, capacity & speed, stroke & reach, Repeatability, Precision and Accuracy, Operating environment. Classification of End effectors - mechanical grippers, special tools, Magnetic grippers, Vacuum grippers, adhesive grippers, Active and passive grippers, selection and design considerations of grippers in robot.

Kinematic Chains: Open & Closed, Introduction to direct and inverse kinematics, transformations and rotation matrix, DH Parameter Representation.

Reference Books

1. B. P. Lathi and ZhiDing, "Modern Digital and Analog Communication Systems", Oxford University Press,4thEdition, 2010
2. Bernard S k la 'Digital Communications: Fundamentals and Applications" Pearson Education, 2nd edition, 2009.
3. David T se,Pramod Viswanath 'Fundamentals of Wireless Communication', Cambridge University Press,1stedition,2005

4. Wayne Tomasi "Advanced Electronic Communication Systems", -6th edition, Low priced edition-Pearson Education
5. Wayne Tomasi–"Electronic Communication Systems, Fundamentals through Advanced", 5th edition
6. Introduction to Robotics, S K Saha, Mc Graw Hill Education, 3rd Edition
7. Fundamentals of robotics – Analysis and control, Robert. J. Schilling, Prentice Hall of India, 2nd Edition
8. Robotics and Control, R K Mittal and I J Nagrath, Mc Graw Hill Education , 1st Edition
9. Introduction to Robotics- Analysis, Systems, Applications, Saeed B Niku, PHI, Eastern Economy Edition

Skill Enhancement Course

ELESEC-1 : Sensors and Actuators for Robotics

(Credits: 02)

Total Teaching: 48 Hrs — Hours of Teaching: (1 + 2P) Hrs / Week

Unit - 1 — 16 Hrs

Sensors for Robotics : Sensor classification- touch, force, proximity, vision sensors. Internal sensors-Position sensors, velocity sensors, acceleration sensors, Force sensors; External sensors-contact type, noncontact type; Vision - Elements of vision sensor, Selection of sensors.

Unit - 2 — 16 Hrs

Actuators for robots- classification-Electric, Hydraulic, Pneumatic actuators, Electric actuators- Stepper motors, DC motors, DC servo motors, AC motors, Linear actuators, Hydraulic actuators- Components and typical circuit, advantages and disadvantages; Pneumatic Actuators- Components and typical circuit, advantages and disadvantages.

Unit - 3 — 16 Hrs

Raspberry Pi: Introduction to Raspberry Pi, Comparison of various Raspberry Pi Models, Understanding SoC architecture and SoCs used in Raspberry Pi, Pin Description of Raspberry Pi , On-board components of Raspberry Pi. Booting up Raspberry Pi - operating System and Linux Commands, Linux- Introduction, Architecture, File System, Raspbian Operating System - Introduction, Tools like Leaf pad Editor, Installing Raspbian on Pi, First boot and Basic Configuration of Pi, Popular Linux Commands.

Reference Books

1. K. Bhatia, "Robotics & IoT (Internet of Things)", 1st Edition, Hardcover, 1 January 2024.
2. "The Official Raspberry Pi Beginner's Guide: How to Use Your New Computer", 5th Edition, Paperback, 31 October 2023.
3. Joaquin Salgado, "Fun with Raspberry Pi: A Practical Guide to Raspberry Pi Hardware
4. Interfacing, Python Programming, and IoT System Development", 1st Edition, Paperback, 12 March 2025
5. Introduction to Robotics (Mechanics and control) , John. J. Craig , Pearson Education Asia, 2002
6. Robotics-Fundamental concepts and analysis , Ashitava Ghosal , Oxford University press
7. Robotics Technology and Flexible Automation , S. R. Deb, Tata Mc Graw Hill Education , 2nd Edition

ELESEC-2 : Blockchain Technology

(Credits: 02)
Total Teaching: 48 Hrs

Hours of Teaching: (1 + 2P) Hrs / Week

Unit - 1

16 Hrs

Introduction to Blockchain: Evolution of digital transactions, Centralized vs decentralized systems, Distributed ledger technology (DLT), History of Blockchain – Bitcoin, Electronic cash, Key features of blockchain - transparency, immutability, decentralization, Security; Types of blockchain – Public, Private, Consortium; Applications of blockchain, Introduction to blockchain explorers.

Cryptography Fundamentals: Basics of cryptography, Symmetric and asymmetric cryptography, Hash functions, SHA algorithms, Public key and private key cryptography, Digital signatures, Merkle trees, transactions, Hash generation using tools/Python.

Unit - 2

14 Hrs

Blockchain Architecture: Blockchain by layers, Structure of a block, block creation and validation, Chain formation, Nodes and peer-to-peer networks, Consensus mechanisms - Proof of Work (PoW) – with Bitcoin as example, Proof of Stake (PoS) – with Etherium as example, Delegated PoS – with Tron as example, Byzantine Fault Tolerance; Mining process, miners; Simulating blockchain using Python (basic implementation).

Unit - 3

18 Hrs

Introduction to smart contracts, Ethereum blockchain, Smart contract development using Ethereum, Solidity programming basics, writing basic contracts using Solidity, Ether, Gas fees and transaction lifecycle, criteria for a decentralized application (DApp), operation of a DApp, design of DApp.

Blockchain Development Tools and Platforms: Blockchain development frameworks, Introduction to – Ganache, Remix IDE, MetaMask, Truffle.

Hyperledger overview, Ethereum ecosystem, Wallets and nodes, Tokens, classification of tokens, NFTs and token standards (ERC-20, ERC-721), comparison of Ethereum blockchain, TRON blockchain, Creating wallet accounts (MetaMask/Trustwallet).

Security challenges in blockchain, 51% attack, Double spending problem; Blockchain applications/ Use cases in finance, supply chain, healthcare, IoT, Digital identity.

Reference Books

1. Swan, M. (2015). Blockchain: Blueprint for a new economy. O'Reilly Media, Inc
2. Antonopoulos, A. M., & Harding, D. A. (2023). Mastering bitcoin: Programming the open blockchain (3rd ed.). O'Reilly Media, Inc.
3. Bashir, I. (2023). Mastering blockchain: Inner workings of blockchain, from cryptography and decentralized identities, to DeFi, NFTs and Web3 (4th ed.). Packt Publishing.
4. Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). Bitcoin and cryptocurrency technologies: A comprehensive introduction. Princeton University Press.

III B.Sc. SEMESTER - VI

ELEDSC-07: Paper - 7 : Power Electronics and E-Vehicles

(Credits: Theory – 03)
Total Teaching: 48 Hrs Hours of Teaching: 3 Hrs / Week

Unit - 1 12 Hrs

Fundamentals of Power Electronics: Introduction to Power Electronics & Devices Overview: Role of power electronics in modern systems, specifically EVs. Power Semiconductor Devices: Diodes, MOSFETs & IGBTs V-I characteristics, switching behavior, key advantages in power applications, Brief mention of Wide Band gap Devices (SiC, GaN) for EVs. Device Protection: Introduction to snubber circuits. **DC-DC Converters Principles:** Basic operation, role in voltage conversion. Step-Down (Buck) Converter: Circuit, operation (continuous mode), voltage conversion ratio. Step-Up (Boost) Converter: Circuit, operation (continuous mode), voltage conversion ratio. Control Basics: Introduction to Pulse Width Modulation (PWM).

Unit - 2 12 Hrs

Converters and EV Fundamentals: AC-DC Converters (Rectifiers), Uncontrolled Rectifiers: Single-phase full-wave rectifier (bridge), concepts of average DC voltage, ripple. Controlled Rectifiers (Brief): Introduction to phase control using Thyristors (SCRs), basic concept. Power Factor Correction (PFC): Need for PFC, brief overview of active PFC. DC-AC Converters (Inverters) – Introduction, Role in converting DC battery power to AC for motors. Single-Phase Inverters: Half-bridge and full-bridge topologies, square wave output. Three-Phase Inverters: Basic operation, 6-step waveform generation. Pulse Width Modulation (PWM) for Inverters: Sinusoidal PWM (SPWM) for harmonic reduction.

Unit - 3 12 Hrs

Electric Vehicles: Introduction, Need for EVs, environmental impact, limitations of IC engine vehicles, e-mobility concept, advantages and disadvantages of EVs. Classification of electric vehicles – Battery Electric Vehicles (BEV), Hybrid Electric Vehicles (Series, Parallel, Series-Parallel, Plug-in Hybrid) and Fuel Cell Electric Vehicles. Electric vehicle architecture – block diagram, major components and working principle, solar assisted EV concept.

Energy Storage Technology: Battery fundamentals, battery parameters, State of Charge (SOC), Depth of Discharge (DOD), charging and discharging characteristics and battery pack design. Types of batteries – Lead acid, NiCd, NiMH, Lithium-ion, Lithium polymer, solid-state batteries and super capacitors. Battery charging methods – Constant Current (CC), Constant Voltage (CV) and CC-CV charging. Battery Management System (BMS) – monitoring, protection, cell balancing and safety considerations. Battery Swapping.

EV Charging Systems: AC and DC charging technologies, dedicated and non- dedicated charging systems, fast and flash charging, inductive charging, Vehicle-to-Grid (V2G), Vehicle-to-Home (V2H), grid-connected residential and public charging systems, EV charging safety and EMI considerations

Unit - 4 12 Hrs

Inverters and Motor Drives: Voltage Source Inverters (VSI), Current Source Inverters (CSI), PWM control techniques, harmonic effects and multilevel inverters. Electric motors for EV applications – DC motor, Induction motor, PMSM, BLDC and SRM drives, torque-

speed characteristics, regenerative braking and EV drivetrain integration.
Advanced EV Technologies: Hybrid energy storage systems, super capacitor applications, solar integrated EV systems, smart grid interaction, energy management techniques and future EV technologies. Laboratory work includes modelling and simulation of converters, inverters, PWM control and EV charging circuits.

Reference Books

1. Ned Mohan, Tore M. Undeland and William P. Robbins, Power Electronics: Converters, Applications, and Design, "Power Electronics: Converters, Applications, and Design", **3rd Edition**, John Wiley & Sons, 2003.
2. Muhammad H. Rashid, Power Electronics Handbook, "Power Electronics Handbook", **4th Edition**, Butterworth-Heinemann, 2018.
3. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, "Electric and Hybrid Vehicles: Design Fundamentals", **2nd Edition**, CRC Press, 2011.
4. Mehrdad Ehsani, Yimin Gao, Sebastian E. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design", **2nd Edition**, CRC Press, 2009.
5. James Larminie and John Lowry, Electric Vehicle Technology Explained, "Electric Vehicle Technology Explained", **2nd Edition**, Wiley, 2012
6. Ali Emadi, Advanced Electric Drive Vehicles, "Advanced Electric Drive Vehicles", **1st Edition**, CRC Press, 2014

ELEDSC-07P: Paper - 7 : Power Electronics and E-Vehicles Lab

(Credits: Practical – 02) Hours of Practical: 4 Hrs / Week

1. Study of Device Characteristics, linear and switching operations: SCR, Triac, BJT, MOSFET and IGBT.
2. Study of Protection circuits.
3. Study of any one Embedded platform (Atmel, STM32, Microchip, TI) for Basic Embedded operations (I/O processing, interrupt processing)
4. Study of Embedded platform (Atmel, STM32, Microchip, TI) for ADC processing, UART communications.
5. Study of any one Embedded platform (Atmel, STM32, Microchip, TI) for Timer and PWM Generations.
6. MOSFET based Step up and step down converter for low voltage EV loops
7. Half and full bridge converter and role of control signals for DC motor
8. Demonstrating both Current/Voltage loop control of DC motor
9. Study of drive schemes and role of control signals for induction motor
10. Demonstrating Control of Induction motor
11. Study of drive schemes and role of control signals for BLDC/PMSM/SRM motor
12. Demonstrating Control of BLDC /PMSM /SRM motor

ELEDSC-08: Paper - 8 : Artificial Intelligence and Machine Learning

(Credits: Theory – 03)
Total Teaching: 48 Hrs Hours of Teaching: 3 Hrs / Week

Unit - 1 10 Hrs

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents, Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)
AI vs Machine Learning vs Deep Learning (Basic Difference)

Unit - 2 10 Hrs

Advanced Search: Constructing Search Trees, Stochastic Search, AO* Search Implementation, Minimax Search, Alpha-Beta Pruning, Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

Unit - 3 10 Hrs

Machine-Learning: Introduction. Machine Learning Systems, Forms of Learning: Supervised and Unsupervised Learning, reinforcement – theory of learning – feasibility of learning – Data Preparation– training versus testing and split.

Unit - 4 18 Hrs

Supervised Learning:
Regression: Linear Regression, multi linear regression, Polynomial Regression, logistic regression, Non-linear Regression, Model evaluation methods. **Classification:** – support vector machines (SVM) , Naïve Bayes classification
Unsupervised learning
Nearest neighbour models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees ,Clustering trees – learning ordered rule lists – learning unordered rule .
Reinforcement learning- Example: Getting Lost -State and Action Spaces

Reference Books

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.
2. MACHINE LEARNING An Algorithmic Perspective 2nd Edition, Stephen Marsland,2015, by Taylor & Francis Group, LLC
3. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009. 2. George F. Luger,
4. Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
5. Introduction to Machine Learning, Second Edition, Ethem Alpaydın, the MIT Press, Cambridge, Massachusetts, London, England.
6. Machine Learning , Tom M. Mitchell, McGraw-Hill Science, ISBN: 0070428077
7. Understanding Machine Learning:From Theory to Algorithms, c 2014 by ShaiShalev-Shwartz and Shai Ben-David, Published 2014 by Cambridge University Press.

ELESEC-3 : Robotics and IoT Applications

(Credits: 02)
Total Teaching: 48 Hrs Hours of Teaching: (1 + 2P) Hrs / Week

Unit - 1 14 Hrs

Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism-Interpolation-Interlock commands- Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effectors and sensors commands.

Unit - 2 14 Hrs

Raspberry Pi using Python and Sensing Data using Python: Introduction, Python vs. Other Languages, Applications of Python. Understanding Python Interpreted Languages: Variables, Keywords, Operators and Operands, Data Types in Python, Importing Libraries, Flow Control, Conditional Statement, Loops. Sensors Interfacing, Communicating using Raspberry Pi- GSM interfacing, Accessing on-board Wi-Fi, Mini project using Raspberry Pi

Unit - 3 14 Hrs

Advanced Interfacing Techniques: Multi-sensor interfacing (using ESP32 or STM 32), Analog vs digital sensor integration, Interrupt-based control

Wireless Communication for Robotics: Bluetooth communication, Wi-Fi based control, Serial communication between controllers

Motor Control for Robotics: PWM speed control, Motor driver interfacing, Differential drive concept

IoT Data Monitoring: Sending sensor data to cloud, Basic IoT dashboard, Remote monitoring

Hands-on: IoT-based sensor monitoring, IoT Physical Devices and Endpoints -
Semi-Autonomous Robotics: Obstacle avoidance with multiple sensors, Line follower with speed control, Basic navigation logic

Mini Project
Students will develop one project such as: IoT based smart robotic vehicle, Wi-Fi controlled robot, Smart surveillance robot, IoT based delivery robot, Smart agriculture robot

List of Experiments

1. Multi-sensor interfacing using microcontroller
2. Bluetooth communication with robot
3. PWM based motor speed control
4. Differential drive robot control
5. Wi-Fi based LED/robot control
6. IoT sensor data upload to cloud
7. Remote monitoring dashboard
8. Multi-sensor obstacle avoidance robot
9. Line follower with speed control

ELESEC-4 : Prolog Programming

(Credits: 02)
Total Teaching: 48 Hrs Hours of Teaching: (1 + 2P) Hrs / Week

Introduction to Prolog: An example program: defining family relations, Extending the example program by rules, A recursive rule definition, How Prolog answers questions, Declarative and procedural meaning of programs.
Syntax and Meaning of Prolog Programs: Data objects, Matching, Declarative meaning of Prolog programs, Procedural meaning, Example: monkey and banana
Lists, Operators, Arithmetic: Representation of lists, Some operations on lists, Operator notation, Arithmetic.
Using Structures: Example Programs: Retrieving structured information from a database, Doing data abstraction, Simulating a non-deterministic automaton, Travel planning, The eight queens problem.
Programming Style and Technique: General principles of good programming How to think about Prolog programs Programming style Debugging Efficiency.
Basic Problem-Solving Strategies: Introductory concepts and examples Depth-first search strategy Breadth-first search strategy

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