UNIVERSITY OF MYSORE

Course Structure and Syllabus for III & IV Semester B.Sc. Programme from the Academic Year 2025-26

(University of Mysore Letter No. AC2(S)/07/2024-25, dated, 29-04-2025)

Subject: Electronics

Submitted

to

University of Mysore

Mysuru-570 005

Karnataka

UNIVERSITY OF MYSORE

Course Structure and Syllabus for III & IV Semester B.Sc. (Electronics)

From the Academic Year 2025-26

Sl. No.	Semester	Course Code	Course Title	Teaching Hours/Week			Examination				Total Credits
				L	T	P	Examination Hours	CIA Marks	SEE Marks	Total	
1	III	DSC-ELE3	Digital Electronic Circuits and Applications	3	0	0	3	20	80	100	3
2		DSC-ELE3P	Digital Electronic Circuits and Applications Practical	0	0	4	3	10	40	50	2
3		DSE-ELE3-1	PCB Design and Fabrication	3	0	0	3	20	80	100	3
4		DSE-ELE3-2	Sensors and Actuators	3	0	0	3	20	80	100	3
1	IV	DSC-ELE4	Electronic Communication	3	0	0	3	20	80	100	3
2		DSC-ELE4P	Electronic Communication Practical	0	0	4	3	10	40	50	2
3		DSE-ELE4-1P	Digital System Design using Verilog	0	0	4	3	10	40	50	2
4		DSE-ELE4-2	Fundamentals of Robotics	3	0	0	3	20	80	100	3

Preamble

The proposed Programme Structure and Curriculum for III and IV Semester B.Sc. Degree in Electronics is as per the guidelines given by University of Mysore in the letter with No.AC2(S)/07/2024-25, dated, 29-04-2025. There are no changes to Programme Structure and Syllabus for I and II Semesters for the academic year 2025-26 and they remains same as that were present during the academic year 2024-25. In addition, the scheme of continuous assessment, final examination, question paper pattern, etc., which are approved by BoS and implemented during 2024-25 are also remains the same for I to IV semesters for the academic year 2025-26. All these are approved in the BoS meeting held on 26-05-2025.

III Semester

Program Name	**B. Sc. in Electronics**	Semester	**Third Semester**
Course Title	**Digital Electronic Circuits and Applications**		
Course Code	DSC-ELE3	No. of Credits	**3**
Contact Hours	**45 Hours**	Duration of Exam	**3 Hours**
CIA Marks	**20**	SEE Marks	**80**

Course objectives:

- Understand the fundamentals of number systems and logic gates.
- Design and analyze combinational and sequential logic circuits.
- Explore memory devices and programmable logic devices.
- Implement digital-to-analog and analog-to-digital conversions.

Course outcomes:

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

- Work with number systems, binary arithmetic, and digital codes.
- Simplify and implement Boolean expressions using logic gates and K-maps.
- Design and analyze basic combinational and Sequential logic circuits.
- Explain and implement flip-flops, shift registers, and counters.
- Identify and compare types of memory and programmable logic devices.
- Describe the working of ADC and DAC circuits.

Contents	**45 Hrs**
Unit1	**15 Hrs**

Number System: Binary, Octal, Decimal and Hexadecimal Number Systems, Inter conversion - Binary to Hexadecimal and vice-versa, Representation of Signed and Unsigned Binary Numbers, Binary Arithmetic - Addition, Subtraction by 1's and 2's Complement Methods, **Digital Codes:** BCD codes - 8421, 2421, Excess-3, Gray code, Gray to Binary and Binary to Gray Code Conversion. **Logic Gates**: Basic gates - AND, OR, NOT, Derived gates - NAND, NOR, XOR & XNOR, Universal gates – Realization of logic functions using NOR and NAND gates. **Boolean Algebra and Logic Simplification:** Boolean laws and theorems, simplification of Boolean expressions, and realization of Boolean expressions using gates. **Combinational Logic Circuits**: Representation of logic functions - SOP and POS form, Min-term and Max-term, canonical form, conversion form SOP to POS and vice-versa. Boolean expression minimization - K-map simplification technique - SOP simplification for 3 and 4 variables. **Arithmetic Logic Circuits:** Half Adder, Full Adder, Half Subtractor, Full Subtractor, 2–bit magnitude comparator.

Unit 2	**15 Hrs**

Encoder and Decoder: Decimal to BCD priority encoder, 3:8 decoder using NAND gates, BCD to decimal decoder, BCD to 7-Segment decoder. **Multiplexer and** De-multiplexer: 4:1 multiplexer,

1:4 demultiplexer. **Sequential Logic Circuits**: Introduction to flip-flops, Basic NAND latch, RS, D and JK flip-flops. Clocked flip-flops (level and edge triggered), Pre-set and Clear operations. Race-around conditions in JK flip-flop, Master-Slave JK (block diagram) and T Flip-Flops. **Shift Registers:** Introduction, Types of Shift Registers: Serial-in-Serial-out (SISO), Serial-in-Parallel-out (SIPO), Parallel-in-Serial-out (PISO) and Parallel-in-Parallel-out (PIPO) Shift Registers (4-bits only). **Counters:** Synchronous versus asynchronous counters, Ring and Johnson counters, 4-bit ripple counter, 4-bit Up-Down counter, 4-bit Synchronous counter, modulo-n counters - Mod 3, Mod 5 and decade counters design using K-maps.

Unit 3	**15 Hrs**

Memory Devices: Internal and External memory, Types of memories: Primary memory - ROM: ROM, EPROM, EEPROM and RAM -SRAM, DRAM, SDRAM, RDRAM, Secondary Memory - Magnetic Disk, Flash memory, SSD. **Programmable Logic Devices**: Evolution and types - Programmable Logic Array (PLA) and Generic Array Logic (GAL), Complex programmable Logic Devices (CPLDs) - Internal structure: macro cells and I/O blocks, Field Programmable Gate Arrays (FPGAs) - Architecture: Configurable Logic Blocks (CLBs), Look-Up Tables (LUTs), interconnects, I/O Blocks (IOBs), Comparison between CPLD and FPGA, Applications and industry relevance. **DAC and ADC:** Digital to analog converters (DAC) - R-2R ladder and Binary Weighted resistor DAC, analog to digital converters (ADC) - Digital ramp ADC and Successive approximation circuitry, specifications and applications.

Reference Books	
1	Thomas L. Floyd, "Digital Fundamentals," 11th Edition, Pearson Education, 2015.
2	S. Salivahanan, "Digital Circuits and Design",5th Edition, Oxford University Press India, 2018.
3	K. R. Venugopal, K. Shaila, "Digital Circuits and Systems," 1st Edition, TMH, 2011.
4	A.P. Malvino, D. P. Leach, and Saha, "Digital Principles and Applications," 8th Edition, TMH, 2014.
5	Anil K. Maini, "Digital Electronics: Principles and Integrated Circuits", Wiley India, 2007.
6	G.K. Kharate "Digital Electronics" Oxford University Press India, 2010

III Semester

Program Name	**B. Sc. in Electronics**	Semester	Third Semester
Course Title	Digital Electronic Circuits and Applications Practical		
Course Code	**DSC-ELE3P**	No. of Credits	**2**
CIA Marks	**10**	SEE Marks	**40**

Note: Minimum of 10 experiments to be completed.

Course Objectives:

- Understand and verify the operation of basic and derived logic gates using ICs.
- Design and implement combinational and sequential logic circuits using logic gates and ICs.
- Analyze the working of encoders, decoders, multiplexers, demultiplexers and flip-flops.
- Construct and test counters, shift registers and digital-to-analog converters.
- Gain hands-on experience in building and troubleshooting digital electronic circuits.

Course Outcomes:

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

- Verify truth tables of basic and universal logic gates using ICs.
- Implement arithmetic circuits such as adders and subtractors using logic gates.
- Demonstrate understanding of code converters, multiplexers, decoders and encoders.
- Construct and analyze flip-flops, counters and shift registers using digital ICs.
- Build and evaluate the performance of digital-to-analog converters using resistor networks.

List of Experiments to be executed: **(Minimum of 10 experiments to be completed.)**

1. Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates using respective ICs.
2. Realization of basic gates using universal gates.
3. Binary to Gray and Gray to Binary code conversion using XOR gates IC 7486.
4. Half Adder and Full Adder using basic and derived gates.
5. Half Adder and Full Adder using NAND gates.
6. Half Subtractor and Full Subtractor using basic and derived gates.
7. Half Subtractor and Full Subtractor using NAND gates.
8. Clocked RS, D and JK Flip-Flops using NAND gates.
9. BCD to decimal decoder using IC.
10. Encoders using IC.
11. 4:1 multiplexer and 1:4 De-multiplexer using ICs.
12. 3-bit asynchronous counter using JK Flip-Flop.
13. 3-bit Shift Register – SISO using IC.
14. Digital to Analog Converter using binary weighted resistor method
15. Digital to Analog Converter using R-2R ladder method.

III Semester

Program Name	**B. Sc. in Electronics**	Semester	**Third Semester**
Course Title	**PCB Design and Fabrication**		
Course Code	DSE-ELE3-1	No. of Credits	**3**
Contact Hours	**45 Hours**	Duration of Exam	**3 Hours**
CIA Marks	**20**	SEE Marks	**80**

Course objectives:

- Understand the evolution, types, and applications of PCBs.
- Identify and describe key electronic components, their packages, and integration for PCB assembly.
- Learn PCB fabrication techniques such as laminate processing, etching, plating, and soldering.
- Knowledge of fabrication methods in PCB manufacturing.

Course outcomes:

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

- Describe the evolution, classification, structure, and applications of PCBs.
- Identify and classify electronic components with their symbols,
- Perform PCB assembly operations such as soldering, drilling, and inspection.
- Debug multilayer PCB boards and understand solder methods.

Contents	**45 Hrs.**
Unit 1	**15 Hrs.**

Basics of Printed Circuit Boards: Advantages of PCBS, Evolution of PCBs, Components of a PCB, Classification of PCBs-Single-sided PCBs, Double-sided PCBs, Multi-layer Boards, Rigid and Flexible PCBs, Manufacturing of Basic PCBs- Single-sided Boards, Double-sided Plated Through-holes, Multi-layer Boards, Flexible Boards. Challenges in Modern PCB Design and Manufacture and PCBs with Embedded Components. **Electronic Components**: Basics of Electronic components, Active versus Passive components, Discrete versus Integrated Circuits, Component Leads, Polarity in Components, Component Symbols. Passive Components – Resistors, Capacitors and Inductors, Active Components –Diodes and Transistors. **Surface Mount Devices** – Surface Mount Technology versus through-hole devices, SMDs, Surface Mounting Semiconductor Packages and Packaging of Passive Components as SMDs, Heat Sinks, Transformer and Connectors. **Semiconductor devices and ICs**: Linear ICs - Op-amp and Voltage Regulator, Digital ICs – Logic Gates. Memory Devices – RAM and ROM.

Unit 2	**15 Hrs.**

PCB Design and Layout: Reading Drawings and Diagrams-Block Diagram, Schematic Diagram. Design Considerations-Mechanical Design Considerations - Types of Boards, Mechanical stress and Board thickness, Electrical Design Considerations-Resistance, Capacitance Considerations, Inductance of PCB Conductors, High electrical stresses, Component Placement Rules - Conductor Width and Thickness, Conductor Spacing, Conductor Shapes, Conductor Routing and Locations, Supply and Ground Conductors. **Artwork**

Generation and CAD tools: Manual versus CAD based artwork, Basic CAD Operation – Layout procedure, Library manager, Component placement, Conductor routing. **Image Transfer Techniques**: Image Transfer, Screen Printing – Screen frame, screen cloth, screen preparation and Squeegees, Photo Printing – Liquid Photo Resist and Dry Film Photo Resist, Laser Direct Imaging (LDI) - Benefits of LDI.	
Unit 3	**15 Hrs.**
Fabrication of PCBs: Copper Clad Laminates – Anatomy of laminates, Manufacture of Laminates - Materials - Fibre-glass cloth, Epoxy resins, Copper foils, Etching Techniques -Wet and Dry methods, Plating Process - Electroplating and through-hole platting. Solder Mask - Solder Resist Classification, Liquid Film Solder Mask, Dry Film Solder Masking, Resolution, Encapsulation, Surface Topography Resist Thickness, Placement Assistance, Reliability of Solder Mask. Soldering and Cleaning, Tenting of Vias. Solder Mask over Bare Copper [SMOBC]. **Conformal Coatings** - Materials for Conformal Coatings, Methods of Applying Conformal Coatings, Standards for Coatings. **Multilayer boards:** Design features of multi-layer boards - Mechanical Design Considerations and Electrical Design Considerations, Multi-layer drilling – Schematic key for Multi-layer built-ups. **Soldering:** Soldering, Soldering Material-Solder, Flux. Soldering Tools- Soldering Iron. Other Hand Soldering Tools- Cutters, Pliers, Strippers, Bending Tools, Heat Sinks, General Cleaning Tools, Hand Soldering. Introduction to Environmental Concerns in PCB Industry.	

Reference Books	
1	R.S Khandpur, "Printed Circuit Boards - Design, Fabrication, Assembly and Testing," 1st Edition, TMH, 2017.
2	Walter C. Bosshart, "Printed Circuit Boards- Design and Technology," McGraw Hill Education, 1983.
3	Clyde F. Coombs, "Printed Circuits Handbook," 6th Edition, McGraw Hill Education, 2007.
4	Kraig Mitzner, "Complete PCB Design Using OrCAD Capture and PCB Editor," 2nd Edition, Academic Press, 2019.
5	Rao R. Tummala, "Introduction to System-on-Package (SOP): Miniaturization of the Entire System," McGraw Hill, 2008.
6	Mark I. Montrose, "EMC and the Printed Circuit Board-Design, Theory and Layout Made simple," 1st Edition, Wiley-IEEE Press, 1998.

III Semester

Program Name	**B. Sc. in Electronics**	Semester	**Third Semester**
Course Title	**Sensors and Actuators**		
Course Code	DSE-ELE3-2	No. of Credits	**3**
Contact Hours	**45 Hours**	Duration of Exam	**3 Hours**
CIA Marks	**20**	SEE Marks	**80**

Course objectives:

- Define and differentiate sensors, transducers, and transmitters.
- Understand the characteristics and selection criteria of primary measuring elements.
- Learn various signal types, transmission methods, and signal conditioning techniques.
- Understand the operation and classification of actuators used in control systems.

Course outcomes:

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

- Distinguish between sensors, transducers, and transmitters.
- Select appropriate primary measuring elements.
- Illustrate the working principles of resistive, inductive and photo-resistive transducers.
- Analyze the principles of micro sensors and micro actuators in smart systems.
- Identify sensor materials and outline MEMS fabrication techniques.

Contents	**45 Hrs**
Unit1	**15 Hrs**

Sensors: Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band, Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, Strain Gauges, Resistance thermometer, Thermistor, Hot-wire anemometer, Resistance Hygrometer, Photo-resistive sensor. **Inductive transducers:** Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer, synchros, microsyn.

Unit 2	**15 Hrs**

Capacitive transducers: Principle of operation, construction details, characteristics of Capacitive transducers– different types and signal conditioning- Applications:- capacitor microphone, capacitive pressure sensor, proximity sensor. **Actuators:** Types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its

application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.
Unit 3 **15 Hrs**
Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. **Micro Actuators:** Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators-Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles. **Materials for sensors:** Silicon, Plastics, metals, ceramics, glasses, nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, Bulk silicon micro machining, Surface silicon micro machining, LIGA process.

Reference Books	
1	Patranabis D, "Sensors and Transducers", Wheeler publisher, 1994.
2	Sergej Fatikow and Ulrich Rembold, " Microsystem Technology and Microbotics", First edition, Springer –Verlag Newyork, Inc., 1997.
3	Jacob Fraden, "Hand Book of Modern Sensors: Physics, Designs and Application" Fourth edition, Springer, 2010.
4	Robert H Bishop, "The Mechatronics Hand Book", CRC Press, 2002.
5	Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.
6	MassoodTabib and Azar, "Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures", First edition, Kluwer academic publishers, Springer, 1997.
7	Manfred Kohl, "Shape Memory Actuators", first edition, Springer.

IV Semester

Program Name	**B. Sc. in Electronics**	Semester	**Fourth Semester**
Course Title	**Electronic Communication**		
Course Code	DSC-ELE4	No. of Credits	**3**
Contact hours	**45 Hours**	Duration of Exam	**3 Hours**
CIA Marks	**20**	SEE Marks	**80**

Course Objectives:

- Understand the principles of electromagnetic spectrum allocation.
- Analyze different modes of electromagnetic wave propagation and their applications.
- Comprehend the functioning and design of transmission lines.
- Identify various sources of noise in communication systems.
- Grasp the necessity and types of modulation techniques.
- Learn the fundamentals of antennas, waveguides and satellite communication systems.

Course outcomes:

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

- Explain the allocation and usage of different EM bands in communication systems.
- Evaluate the impact of internal and external noise sources on communication systems.
- Describe the design and operation of AM and FM receivers.
- Explain the functioning and applications of different types of antennas and waveguides.
- Describe the components and principles of satellite communication.

Contents	**45 Hrs**
Unit 1	**15 Hrs**

Introduction: Brief idea of frequency allocation for radio communication system. Electromagnetic communication spectrum, EM band designation and usage. Block diagram of an electronic communication system. **Propagation of EM waves:** Introduction, Ground Wave, Sky-wave and Space-wave propagation. **Transmission lines:** Basic principles, characteristic impedance, losses in transmission lines, standing waves. **Noise:** Introduction, Internal noises – Thermal agitation Noise, Shot Noise, Transit-time Noise, External noises - Atmospheric noise, Extra-terrestrial noise, Industrial noise, signal to noise ratio (S/N), noise figure. **Modulation:** Introduction need and types of modulation. **AM:** Representation of AM, Theory of AM, frequency spectrum of AM wave, power and current calculation, modulation by several sine waves. AM generation using Modulated transistor amplifiers.

Unit2	**15Hrs**

SSB: Introduction, suppression of carrier - Balanced modulator, suppression of unwanted sideband -Filter system, phase shift method, vestigial sideband transmission. **AM Receiver:** Block diagram and working of tuned radio frequency receiver and Super-heterodyne receiver and Simple diode detector. **FM and PM:** Theory of FM and PM, frequency spectrum of FM, bandwidth, phase modulation, comparison of AM, FM and PM. FM generation using Direct method. **FM Receiver**: Block diagram and working of Super-heterodyne receiver, Single slope FM Detector.

Unit 3	15 Hrs
Antennas: Introduction, EM radiation, resonant and non-resonant antennas, antenna gain and effective radiated power, field intensity, antenna resistance, bandwidth, beam width, polarization, antenna with parabolic reflector. Geometry and properties of parabolic reflector. **Waveguides:** Introduction, working principle of rectangular waveguide and circular waveguide. **Satellite Communication:** Introduction, Kepler's Laws, Satellite Orbits, Geostationary Satellites, Attitude control, Station keeping, Antenna Look angles, Satellite classifications, Transponders(c-band) and Earth station.	

Reference Books	
1	George Kennedy, "Electronic Communication Systems," TMH, 4th Edition, 1999.
2	D. Roddy and J. Coolen, "Electronic Communications," Pearson Education India, 4th Edition.
3	Tomasi, "Advanced Electronics Communication Systems," 6th Edition, Prentice Hall.
4	William Schweber, "Electronic communication systems, PHI, 4th Edition, 2002.
5	Dennis Roddy and Coolen, "Satellite Communication," 4th edition, McGraw Hill, 2006.

IV Semester

Program Name	**B. Sc. in Electronics**	Semester	**Fourth Semester**
Course Title	**Electronic Communication Practical**		
Course Code	DSC-ELE4P	No. of Credits	**2**
CIA Marks	**10**	SEE Marks	**40**

Note: Minimum of 8 Experiments to be completed.

Course Objectives:

- Provide hands-on experience with analog communication components and systems.
- Enable to analyze and evaluate amplitude and frequency modulation techniques.
- Develop an understanding of receiver and transmitter functionalities in AM and FM systems.
- Reinforce theoretical concepts through practical implementation of communication subsystems.

Course Outcomes:

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

- Demonstrate the ability to modulate and demodulate amplitude-modulated signals
- Analyze RF amplifier performance and extract mid-band gain and bandwidth.
- Perform frequency modulation and demodulation.
- Evaluate the frequency response of tuned and IF amplifiers.
- Analyze the radiation characteristics of LEDs.

List of Experiments to be executed: **(Minimum of 8 experiments to be completed.)**

1. Amplitude modulator and determine the modulation index.
2. Amplitude demodulator and determine the signal frequency.
3. Radio frequency amplifier and determine its mid-band gain and bandwidth.
4. Frequency modulator and determine the modulation index.
5. Study the AGC circuit used in AM detection.
6. Frequency mixer circuit and determine the output frequency for different sets of input frequencies.
7. Frequency response of a tuned amplifier.
8. Radiation pattern of a Light Emitting Diode
9. IF amplifier.
10. FM transmitter.
11. FM receiver.
12. Pre-emphasis and De-emphasis in FM communication systems.

IV Semester

Program Name	**B. Sc. in Electronics**	Semester	**Fourth Semester**
Course Title	**Digital System Design using Verilog**		
Course Code	DSE-ELE4-1P	No. of Credits	**2**
CIA Marks	**10**	SEE Marks	**40**

Note: Minimum of 12 Experiments to be completed.

Course Objectives:

- Introduce the fundamentals of Verilog HDL.
- Develop competency in writing Verilog code using different modelling styles
- Provide practical knowledge for designing and verifying combinational and sequential digital circuits.
- Familiarize students with basic language constructs, operators, and simulation.
- Apply Verilog for real-world digital system design and verification.

Course Outcomes:

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

- Explain the syntax and semantics of Verilog HDL.
- Demonstrate the ability to model digital systems using structural, behavioral, and dataflow approaches.
- Design and simulate combinational and sequential logic circuits using Verilog.
- Verify the correctness of digital circuits through simulation and test benches.

Section – A

Overview of Verilog HDL –Introduction to HDL**,** Importance of HDLs, Typical HDL flow, Trends in HDLs. **Verilog Basics:** Modules and Ports – Module definition and Syntax, Port declaration and types – Input, Output and Inout, Wire versus register data types, Connecting ports – Instantiation of modules and Port mapping techniques. Verilog Primitive Operators: Logic operators, Bitwise and Reduction operators, Relational and Equality operators, Arithmetic operators, Concatenation and Replication, Delay and Event control. **Modelling of Combinational and sequential Circuits:** Gate level modelling - Syntax, usage and design examples, Dataflow modelling- use of **assign** statements and operators, design examples, **Behavioural Modelling** - use of **always** and **initial** blocks and design examples.

Section – B

Simulation of Digital Circuits using Verilog HDL

Simulate following experiments using Verilog (**Minimum of 12 Experiments to be completed)**

1) Basic and derived gates.

2) Simplified of Boolean expressions and its realization.
3) Half Adder and Full Adder circuits.
4) Half Subtractor and Full Subtractor circuits.
5) Binary to Gray and Gray to Binary code converters.
6) 4-bit and 8-bit ALU.
7) 4:1 multiplexer and 1:4 Demultiplexer.
8) Encoder and decoder.
9) SR- flipflop and D-flipflop.
10) JK - flipflop and T-flipflop.
11) Magnitude comparators.
12) Up-counter.
13) Down-counter.
14) Shift registers.
15) Ripple Counter.

Note:

- Digital Design using Verilog is a hands-on-training Course. The theory part given in section-A has to be taught in the laboratory so that students get acquainted with Verilog tool so that he/she can conduct simulation experiments given in section-B.
- The scheme of examination is as that of Practical Examination with the list of experiments given in Section –B
- Section-A syllabus content shall be used for internal-assessment and viva-voce examination at the time of Practical examination.

Reference Books	
1.	Thomas L. Floyd, "Digital Fundamentals," 11th Edition, Pearson Education, 2015.
2.	K. R. Venugopal, K. Shaila, "Digital Circuits and Systems," 1st Edition, TMH, 2011.
3.	A.P. Malvino, D. P. Leach, and Saha, "Digital Principles and Applications," 8th Edition, TMH, 2014.
4.	Samir Palnitkar, "Verilog HDL: A guide to digital design and synthesis", Pearson education, Second Edition.
5.	Nazeish M Botros, "HDL Programming Fundamental: VHDL and Verilog," 2009 reprint, Dreamtech Press.
6.	Donald E. Thomas, Philip R. Moor by, "The Verilog Hardware description language", Stringer Science + Business media, LLC, Fifth edition.
7.	Michael D Ciletti, "Advanced Digital Design with the Verilog HDL", Person (PHI), Second Edition.
8.	Padmanabhan, Tripura Sundari, "Design through Verilog HDL." Wieley, 2016 or earlier.
9.	Cyril P.R., "Fundamentals of HDL", pearson/sanguine 2010.

IV Semester

Program Name	**B. Sc. in Electronics**	Semester	**Third Semester**
Course Title	**Fundamentals of Robotics**		
Course Code	DSE-ELE4-2	No. of Credits	**3**
Contact Hours	**45 Hours**	Duration of Exam	**3 Hours**
CIA Marks	**20**	SEE Marks	**80**

Course objectives:

- Understand the basic anatomy, types, and movements of robotic systems.
- Learn the principles of robot control systems and drive mechanisms.
- Develop mathematical models and analyze control responses in robotic systems.
- Explore various sensors, actuators, and power transmission elements used in robotics.

Course out comes:

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

- Explain the fundamental concepts of robotics.
- Describe and analyze control systems and various control strategies used in robotic systems.
- Identify and evaluate the role of sensors, actuators, and power transmission components in robotic systems.
- Understand the basics of robot programming methods and recognize real-world applications in engineering and biomedical fields.

Contents	**45 Hrs**
Unit1	**15 Hrs**

Introduction to Robotics: Introduction to Robotics and Automation technologies, Robotics in science fiction, Brief history of robotics, Robot Anatomy- Four common configurations of Robot, Robot motions-Linear, Rotational, Revolving, twisting, Cylindrical, Spherical. **Degrees of Freedom of Robot-** Introduction to degrees of freedom, three degrees of freedom associated with arm and body of a polar coordinate robot. Three degrees of freedom associated with robot wrist roll, wrist pitch and wrists yaw. Joint notation scheme and Work Volume. **Robot drive systems-** Types of drive system, Hydraulic, Electric, Pneumatic, and advanced actuators. **Robot Control Systems-** Four types of Robot controls: Limited sequence robots, Playback robots with point to point control, Playback robots with continuous path control, Intelligent robot. **Precision of movement**-Spatial resolution, Accuracy, Repeatability and Compliance. End effectors, Robotic Sensors and Robot applications.

Unit 2	**15 Hrs**

Basic control systems concepts and models: Mathematical models, Transfer functions, block diagrams, characteristics equations. **Robot controllers**-On-off, proportional, integral, proportional-plus-integral, proportional-plus-derivative, proportional-plus integral plus derivative. **Control system analysis**-Transient response of second order systems and steady state response. **Robot Sensors and Actuators:** Internal state sensors, external state sensors. Position

sensors- potentiometers, Resolvers, Encoders. Velocity sensors. Actuators- Pneumatic and Hydraulic actuators, Electric motors, stepper motors and AC servo motors and other types. Power transmission systems-Gears, power screws and other transmission systems.

Robot ARM Kinematics: Introduction to manipulator kinematics, Robot position representation, Forward transformation of a 2-degree of freedom Arm, Reverse Transformation of the 2-Degree of freedom Arm. **Robot ARM Dynamics:** Introduction to robot arm dynamics, understanding of Dynamics using Euler-Lagrangian-formation method. Only Introduction to Denavit-Hartenberg parameters.

Unit 3	**15 Hrs**

Sensors in Robotics: Transducers and Sensors, tactile sensors- touch sensors. Force sensors- Joint sensing and Tactile array sensors. Proximity and range sensors. Uses of sensors in robotics. Introduction to functions of Machine vision systems only. **Introduction to Robot Programming:** Methods of Robot Programming-Lead through methods, Textural robot languages, Powered lead through, manual lead through. Introduction to generations of Robot Programming Languages-First Generation Languages-Second generation languages, and future generation languages. Robot language structure block diagram, operating systems. Definitions of Robot Language Elements and its functions. Robot Applications in Engineering and Specific applications in healthcare/Biomedical.

Reference Books	
1	Mikell P Groover, Industrial Robotics-Technology, Programming and Applications 2nd edition, Tata McGraw Hill.
2	Robert J Schilling, Fundamentals of Robotics, 2003.
3	Richard D.Klafter, Robotics Engg. PHI, 2003.
4	R.K.Mittal and J.Nagarath, Robotics and Control,Tata McGraw Hill, Year 1995.
5	K.S.Fu, R.C.Gonzales and Lee. Robotics, McGraw Hill International, 2008.
6	Ganesh S Hegde, Industrial Robotics –Second Edition.

UNIVERSITY OF MYSORE

Dr. M. Mahadeva Prasad
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No. PGCH/201/25-26

Date: 26-05-2025

To

The Deputy Registrar
Academic Section
Vishwavidyalaya Karya Soudha
Crawford Hall
University of Mysore
MYSURU – 570 005

Sir,

Sub: Proceedings of Board of Studies Meeting 2025-26 in Electronics (UG)-reg.
Ref: Letter from the Officer of the Registrar, University of Mysore, with No. UA2/379/2013-14, dated, 05-05-2025.

As per the directions received from the office of the Registrar, University of Mysore, Mysuru, UG Board of Studies meeting in Electronics is conducted on 26-05-2025 at Department of Studies in Electronics, Hemagangotri, Hassan.

With this letter, hard copy of the proceedings of UG BoS meeting and Programme structure and Syllabus for III and IV Semester B.Sc. (Electronics) are enclosed. The soft copies are mailed to academicsection123@gmail.com.

Since there is no Post Graduate Programme (MSc-Electronics) at University of Mysore, BoS meeting in connection to Syllabus Revision, and Panel of Examination (PG) Approval are not conducted.

Thanking you,

Yours sincerely,

26/5/25

(M. MAHADEVA PRASAD)
Dr. M. Mahadeva Prasad
Chairman, BoS in Electronics
University of Mysore
P.G. Centre, Hemagangotri
HASSAN-573 226

Copy to: Prof. G. R. Janardhana, Professor and Dean of Faculty of Science & Technology, Dept. of Studies in Botany, Manasagangotri, University of Mysore, Mysuru.

UNIVERSITY OF MYSORE

Department of Studies in Electronics, Hemagangotri, Hassan – 573 226

Proceedings of the BoS Meeting of Electronics (UG)

As per the directions of the Registrar, University of Mysore, Mysuru (Letter No.UA2/379/2013-2014, dated, 05-05-2025), Board of Studies Meeting of Electronics (UG) of University of Mysore is conducted on 26-05-2025 at Dept. of Studies in Electronics, Hemagangotri, Hassan. The information about the discussion carried out in the meeting is enclosed with this letter. The details of the BoS members who participated in the meeting are given below.

Sl. No.	Name of the BoS Member	Designation	Signature
1.	Prof. M. Mahadeva Prasad	Chairman	26/5/25
2.	Mr. Nagesh A	Member	Superannuated
3.	Mrs. T V Latha	Member	Superannuated
4.	Mrs. Divyamani M P	Member	Divyamani
5.	Mr. Vijayakumar A Patil	Member	Vijaykumar
6.	Dr. Umashankara M	Member	M. Umashankara

26/5/25

Dr. M. Mahadeva Prasad
Chairman, BoS in Electronics
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UNIVERSITY OF MYSORE

Department of Studies in Electronics, Hemagangotri, Hassan – 573 226

Details of the Discussion & Decisions Taken at BoS Meeting of Electronics (UG)

1. The Chairman, BoS in Electronics welcomed the BoS members and placed the BoS Meeting Agenda before the members of BoS.
2. Based on the Programme Structure suggested by University of Mysore in the Letter with No. AC2(S)/07/2024-25, dated, 29-04-2025, the prgoramme structure and syllabus for 2nd year (3rd and 4th Semesters) of Electronics (UG) is approved.
3. There are no modifications to 1st year (I and II Semester) Syllabus for the academic year 2025-26.
4. There are no modifications to continuous assessment scheme, question paper pattern, theory and practical examination schemes. The schemes approved during 2024-25 BoS meeting is applicable to 2nd year (III and IV Semester) and 1st year (I and II Semester) Programmes of Electronics for the academic year 2025-26.
5. The Panel of Examiners for Electronics (UG) Examinations for the academic year 2025-26 is approved.
6. **Opening of Department of Electronics at Manasagangotri, Mysuru**

   The Dept. of Electronics under the University of Mysore jurisdiction is started functioning at Post Graduate Centre, Hemagangotri, University of Mysore, Hassan from the academic year 1993-94 to cater the needs of students who wish to pursue their higher studies like M.Sc. and Ph.D. in Electronics. Students from Mysore, Hassan, and Chamarajangar Districts which comes under the Mysore University jurisdiction and other Universities across Karnataka and neighboring States like Andhra, Kerla, Tamilnadu are getting benefit from this.

   During 2023, Govt. of Karnataka has initiated the official procedure to separate Hassan P. G. Centre form University of Mysore to form an independent University. Because of this, students who are interested to purse their Masters and Research Programmes in Electronics under the University of Mysore may lose their opportunity.

   After discussing this in the meeting, all BoS members understood the importance of commencing the Electronics Programme at Manasagangotri, Mysuru and concluded that the Administrative Authorities of University of Mysore has to take necessary steps to commence the Electronics Programme at Manasagangotri Campus, Mysuru and help the student community of University of Mysore for pursuing their higher studies in Electronics.

7. The BoS meeting is concluded with the vote of thanks by the Chairman.

26/5/25

Dr. M. Mahadeva Prasad
Chairman, BoS in Electronics
University of Mysore
P.G. Centre, Hemagangotri
HASSAN-573 226