MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous institution Affiliated to VTU, Belgaum)

Autonomous Programme

Bachelor of Engineering

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

SYLLABUS

I & II Semester
(2024-25 Admitted Batch)

Academic Year 2024-25

VISION OF THE DEPARTMENT

To produce industry ready, research oriented and socially responsible Electronics & Communication Engineers.

MISSION OF THE DEPARTMENT

- To create an ambience for learning.
- To conduct research, beneficial to the society.
- To promote industry-academic interaction at all-levels.
- To be continuously agile to the needs of the stake holders.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will:
PEO1: Design and test Electronics & Communication systems and be successful professional in the field of ECE and allied areas.
PEO2: Be a good leader, team worker with strong communication skills.
PEO3: Possess capability to pursue higher education and be involved in research in the core and allied areas of E&C engineering and be a lifelong learner.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: An ability to understand the basic concepts in Electronics and Communication Engineering and to apply them to various areas, like Signal and image processing, VLSI, Embedded systems, photonics, networks, MEMS, antennas etc., in the design and implementation of complex systems.

PSO2: Possess the skills to analyze and solve problems, using the latest software tools and hardware available in E & C Engineering along with analytical skills for real-time applications.

PROGRAM OUTCOMES

The program is targeted at developing the following competencies, skills and abilities amongst students of E & C Engineering:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis: Identify, formulate**, reviewer search literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage: Create, select, and** apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics: Apply** ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
THREE CIE's conducted for a total of 30 marks	**30**
Activities as decided by course faculty	**20**
SEE	**50**
Total	**100**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	**50**	**12+8=20** **(CIE + Activity)**
SEE	**50**	**20**

Course Title	BASIC ELECTRONICS		
Course Code	24BEE13/23	**(L-T-P)C**	(3-0-0)3
SEE duration	3hours	**Hours/Week**	03
CIE(Theory)marks	30	**Activity marks**	20
SEE marks	50	**Total contact hours**	40

Sl. No.	Course outcomes	Mapping To POs	PSO's
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	1,2
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9	1,2
3.	Develop competence knowledge to construct basic digital circuit by making use of basic gate and its function.	1, 2, 5, 9	1,2
4.	Analyze the basic concepts of communication System and various Modulation Techniques	1, 2, 5, 9	1,2

Course Objective:
The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.
Course Outcomes(COs): Upon completion of the course, students shall be able to
Course Contents:

MODULE –1	10 Hrs.
Semiconductor Diodes : Introduction, PN Junction diode, Characteristics, Diode Approximations, (Text1:2.1,2.2,2.3,2.4) **Diode Applications:** Introduction, Half Wave Rectifier, Full Wave Center tapped and bridge Rectifier, Full wave Capacitor Filter Circuit, (Text1:3.1,3.2,3.4,3.5) **Zener Diodes:** Junction Breakdown, Characteristics, Zener Diode as Voltage Regulator (Numerical). (Text1:2.9, 3.7)	
MODULE–2	**10 Hrs.**
Bipolar Junction Transistors: Introduction, PNP and NPN Transistor, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, DC Loadline and Biaspoint: Self bias, fixed bias and voltage divider bias (Text1:4.2, 4.3, 4.5,4.6,4.7, 5.1, 5.2, 5.3, 5.4) **Field Effect Transistor:** Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs(Text1: 9.1,9.2,9.5)	
MODULE –3	**10 Hrs.**
Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting &Non-Inverting Amplifier. **Op-Amp Applications:** Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator, Summer and subtractor (Text 2: 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3, 6.12, 6.13).	

MODULE– 4	10hrs.
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions. **Digital Logic Gates** (Text3: 1.2,1.3,1.4,1.5,2.1,2.2,2.3,2.4, 2.5,2.6, 2.7) **Combinational logic**: Introduction, Design procedure, Adders-Half adder, Full adder (Text3:4.1,4.2,4.3) **Communications:** Introduction to Communication System, Modulation- AM and FM(Derivation and numerical)(Textbook5:1.1,1.2, 1.3, 3.1, 5.1)	

List of Activities

Activity Number	Activity Name	Description	Marks
1	**Analog Circuit design and implementation using open Source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation)/any open source simulation tool. • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10**
2	**Digital Circuit design and implementation using open-source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation)/any open source simulation tool. • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10**

Activity1 Details:
Following are the experiments list of analog circuit design and implementation using open-source simulator.

1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2kHz.
4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be2.5 V.
5. A direct-coupled non inverting amplifier with a ± 25 mV input is to produce a ± 5 V output. Design the circuit with suitable resistance values.
6. Design a bridge full wave rectifier circuit to produce 12 Vun regulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
7. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
8. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.
9. The basic concepts of communication System and various Modulation Techniques.

Activity2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

1. Realization of Boolean expressions using basic gates.
2. Realization of half adder circuit.
3. Realization of full adder circuit.
4. Realization of 4-bit parallel adder.
5. Realization of SR and D flip flops.
6. Realization of JK and T flip flop.
7. Conversion of JK flip flop into D flips flop.
8. Realization of 4x2encoder and 2x4decoder.

Web links and Video Lectures(e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072

Course Outcomes	Program Outcomes												Program Specific Outcomes	
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3	2											2	1
CO2	3	2			2				1				2	1
CO3	3	2			2				1				2	1
CO4	3	2			2				1				2	1

Course Title	INTRODUCTION TO ELECTRONICS ENGINEERING		
Course Code	24ESC143/243	**(L-T-P) C**	(3-0-0)3
SEE duration	3 hours	**Hours / Week**	03
CIE (Theory) marks	30	**Activity marks**	20
SEE marks	50	**Total contact hours**	40

Course Objective:

The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping to POs
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9
3.	Develop competence knowledge to construct basic digital circuit by make use of logic gate and its function.	1, 5, 9
4.	Apply the knowledge of Embedded system and basic communication system.	1,2

Course Contents:

MODULE –1	10 Hrs.

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, voltage Multiplier.

Amplifiers – CE amplifier input and output characteristics, multi-stage amplifier; BJT as a switch: Cut-off and saturation modes, BJT Biasing: Introduction, self bias and fixed bias. (Text 1)

MODULE –2	10 Hrs.

Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator. (Text 1)

Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, **RC Phase Shift Oscillator**, Colpitt's and Hartley oscillator, Crystal oscillator, Multivibrators, Single-stage astable multivibrator (using transistor only). (Only Concepts, working, and waveforms. No mathematical derivations).

MODULE –3	10 Hrs.

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)**.**

Combinational logic: Introduction, Design procedure, Adders -Half adder, Full adder. (Text 2).

MODULE – 4	10 hrs.
Embedded Systems–Definition, Embedded systems vs general computing systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller**.** (Text 4). **Analog Communication Schemes** – Modern communication system scheme, Information source,and input transducer, Transmitter, Channel – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM. (Problems on AM only). **Digital Modulation Schemes**: Advantages of digital communication over analog communication, ASK, FSK, PSK.(Only concepts, no mathematical derivations) (Text 3).	

List of Activities

Activity Number	Activity Name	Description	Marks
1	**Analog Circuit design and implementatio non using open source Simulator**	• Use Multisim Live Circuit Simulator (OnlineSimulation) • A group of 3 students should solve assignedexperiment • Demonstration of the circuit with results	**10**
2	**Digital Circuit design and implementation using open-source Simulator**	• Use Multisim Live Circuit Simulator (OnlineSimulation) • A group of 3 students should solve assignedexperiment • Demonstration of the circuit with results	**10**

Activity 1 Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2 kHz.
4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitudeis to be 2.5 V.
5. A direct-coupled noninverting amplifier with a ± 25 mV input is to produce a ± 5 V output.Design the circuit with suitable resistance values.
6. Design a bridge full wave rectifier circuit to produce 12 V unregulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
7. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
8. Design a three-input inverting summing amplifier circuit and show how it can be convertedinto an averaging circuit.

Activity 2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

1. Realization of Boolean expressions using basic gates.
2. Realization of half adder circuit.
3. Realization of full adder circuit.
4. Realization of 4-bit parallel adder.
5. Realization of Integrator.
6. Realization of Differentiator.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4 thEdition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980.
2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84.
3. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),PrivateLimited, 2018.
4. Shibu K V, "Introduction to Embedded systems", 4th print, McGraw Hill Education (India),PrivateLimited,2011.

Course Outcomes	Program Outcomes												Program Specific Outcomes	
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3	2											2	1
CO2	3	2			2				1				2	1
CO3	3				2				1				2	1
CO4	3	2											2	1

INTRODUCTION TO INTERNET OF THINGS

Course Code: 24ETC15H	**LTPC: 3-0-0-3**
Exam Hours : 3	Hours / Week : 3
SEE : **50 Marks**	Lecture hours : 40 hours

Course Objective:
Understand about the fundamentals of networking, things in IoT and connecting things with theinternet and IoT usage domains in everyday life.

Course Outcomes (COs){with mapping shown against the Program Outcomes (POs)}Upon completion of the course, students shall be able to:

Course Contents:

COs	**Statement**	**POs**	**PSO's**
1.	Describe the evolution of IoT, IoT networking components, and addressingstrategies in IoT.	PO1	1,2
2.	Classify various sensing devices and actuator types.	PO1	1,2
3.	Explain the processing in IoT and associated IOT technology-cloud computing	PO1	1,2
4.	Illustrate architecture of IOT Applications	PO1,PO5	1,2

Module-1	**Teaching Hours**
Basics of Networking: Introduction, Network Types, Layered network models **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components Textbook 1: Chapter 1- 1.1 to 1.3 Chapter 4 – 4.1 to 4.4	**10 Hours**
Module-2	
IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensor examples,Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. Case study- Sensors and actuators in a smart phone Textbook 1: Chapter 5 – 5.1 to 5.9 Textbook-2 Chapter3- Tables 3.1 and 3.2	**10 Hours**
Module-3	
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. **ASSOCIATED IOT TECHNOLOGIES** Cloud Computing: Introduction, Virtualization, Cloud Models Textbook 1: Chapter 6 – 6.1 to 6.5 Chapter 10– 10.1 to 10.3	**10 Hours**
Module-4	
IOT CASE STUDIES Agricultural IoT – Introduction and Case Studies Vehicular IoT – Introduction Healthcare IoT – Introduction, Case Studies IoT Analytics – Introduction Textbook 1 Chapter 12- 12.1-12.2; Chapter 13– 13.1; Chapter 14- 14.1-14.2; Chapter 17- 17.1	**10 Hours**

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50).A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.Continuous Internal Evaluation(CIE):

Three Unit Tests each of 20 Marks then reduced to 10 Marks (duration 01 hour)

- First test after the completion of 30 % of the syllabus
- Second test after completion of 60% of the syllabus
- Third test after completion of 90% of the syllabus

ACTIVITIES

Activity Number	Activity Name	Description	Marks
1	**Demonstrating the usage of general IoT sensors and actuators**	• Demonstration using online simulation platform wokwi in group of 5-6 students. • Student can select any sensor or actuator for the simulation. For example sensors like DHT11, Ultrasonic sensor, IR sensor, Soil Moisture sensor, gas sensor, Current sensor, barometer etc and actuators like servo motor, LED, buzzer, DC motors etc. • Presentation with two pages report about the characteristics of sensors and actuators used.	**15**
2	**Group Discussion**	• Groups discussion about IoT case studies like Greenhouse automation, Vechicular IoT, IoT in smart cities, IoT in health and lifestyle etc.	**05**

Text Book:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry- IoT Fundamentals- Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press-2017

Reference:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Thingsand Industry 4.0. CRC Press.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1stEdition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach toConnecting Everything", 1st Edition, Apress Publications, 2013.

Course Outcomes	Program Outcomes												Program Specific Outcomes	
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3												2	1
CO2	3												2	1
CO3	3												2	1
CO4	3				2								2	1