

I/II Semester

BASIC ELECTRONICS & COMMUNICATION ENGINEERING			
Course Code	21ELN14/24	CIE Marks	50
Teaching Hours / Week (L: T:P:S)	2:2:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Preparation: To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering. 2. Core Competence: To equip students with a basic foundation in electronic engineering fundamentals required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems. 3. Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career. 			
<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes. 2. Arrange visits to nearby PSUs such as BHEL, BEL, ISRO, etc., and small-scale hardware industries to give brief information about the electronics manufacturing industry. 3. Show Video/animation films to explain the functioning of various analog and digital circuits. 4. Encourage collaborative (Group) Learning in the class 5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking 6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it. 7. Topics will be introduced in multiple representations. 8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. 			
Module I			
<p>Electronic Circuits:</p> <p>Power Supplies – Block diagram, Rectifiers, Reservoir and smoothing circuits, Full-wave rectifiers, Bi-phase rectifier circuits, Bridge rectifier circuits, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.</p> <p>Amplifiers – Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback, Multi-stage amplifiers.</p>			

Operational amplifiers - Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits. Oscillators – Positive feedback, Conditions for oscillation, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators. <i>(Only Concepts, working, and waveforms. No mathematical derivations)</i> Text 1: Chapters 6, 7, 8 and 9	
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation of input and output waveforms of the op-amp circuits. Practical Topics: Problems on voltage regulators, op-amp parameters, oscillators. Self-study topics: BJT amplifier types, comparison of BJT & FET.
Module II	
Logic Circuits – Logic gates, Bistables, R-S Bistables, D-type Bistables, J-K Bistables. Text 1: Chapter 10 Data representation, Data types, Data storage, A microcontroller system. Text 1: Chapter 11 Realization using basic gates and truth table the Half Adder (Text 4: Fig.11.11) and Full Adder (Text 4: Table 11.5 & Fig. 11.13), Multiplexer (Text 4: 10.5.3) and decoder (Text 4: 10.5.4). Shift registers, Register type – operation and truth table (Text 4: 13.2, 13.3), Counters and asynchronous counters (Text 4: 13.5, 13.6) Text 4: Fig. 11.11, Fig. 11.13, 10.5.3, 10.5.4, 13.2, 13.3, 13.5, 13.6 <i>(No simplification of Boolean algebra, no K-maps. Only logic circuit, working and truth table)</i>	
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation of truth table and timing waveforms of the logic circuits especially flip flops, adders, shift registers, and counters. Practical Topics: Problems on data representation and types. Self-study topics: Waveforms of counters, shift registers.
Module III	
Embedded Systems – Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC, Harvard vs Von-Neumann. Text 2: 1.1, 1.2, 1.4, 1.5, Fig. 2.1, 2.1, 2.1.1.4, 2.1.1.6, 2.1.1.7. Sensors and Interfacing – Instrumentation and control systems, Transducers, Sensors. Text 1: Chapter 15 Actuators , LED, 7-Segment LED Display, Stepper Motor, Relay, Piezo Buzzer, Push Button Switch, Keyboard. Text 2: 2.3.2, 2.3.3.1 to 2.3.3.8 except 2.3.3.3 Communication Interface , UART, Parallel Interface, USB, Wi-Fi, GPRS. Text 2: 2.4, 2.4.1.3, 2.4.1.5, 2.4.2.2, 2.4.2.6, 2.4.2.8.	
Teaching-Learning Process	Chalk and talk method, Power Point Presentation, YouTube videos Pictures of sensors, actuators, microcontrollers (with manufacturer names) Self-study topics: Block diagrams of the architectures of RISC, CISC, Harvard and Von-Neumann, Actuator types, LCD, Touch screen displays

Module IV	
<p>Analog and Digital Communication – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Softwired, Noise, Receiver, Multiplexing, Types of communication systems.</p> <p>Text 3: 1.2, 1.2.1, 1.3, 1.4 – 1.4.1, 1.4.2, 1.5, 1.5.2, 1.6, 1.14, 1.15</p> <p>From Summary portion of Chapter 1 of Text 3: Types of modulation (only concepts) – AM (only 2.2, no 2.2.1 and rest), FM, Phase Modulation, Pulse Modulation, PAM (Fig. 6.5b), PWM (Fig. 6.8), PPM, PCM. Concept of Radio wave propagation (Ground, space, sky with Fig. 1.28)</p> <p>From Summary portion of Chapter 6 – Digital Communication of Text 3: Concepts of Sampling theorem, Nyquist rate, Digital Modulation Schemes (also see 6.12) – ASK, FSK, PSK Radio signal transmission – Text 3: 6A.1.1, Fig. 6A.1, Fig. 6A.3 Multiple access techniques – Text 3: 6A.1.4, 6A.1.5 Multipath and fading – Text 3: 6A.2.1 Error Management – Text 3: 6A.3.1, 6A.3.2 Antenna, Types of antennas – Text 3: 13.1, 13.3 (only definition and antenna model, exclude radiation patterns).</p>	
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos Self-study topics: Multiplexing techniques – TDM, FDM, CDM, WDM, OFDM
Module V	
<p>Cellular Wireless Networks - Introduction, cellular telephone system, cellular concept and frequency reuse. Text 3: 8.1, 8.2, 8.3</p> <p>Wireless Network Topologies - First Generation (1G) Technology, Second Generation (2G) Technology, GSM Communications, GSM System architecture, Third Generation (3G) Technology, CDMA Technology, High-level architecture of LTE, Fourth Generation (4G) Technology, Wireless LAN, Bluetooth, Bluetooth Architecture. Text 3: 8.4, 8.5, 8.6, 8.7, 8.7.2, 8.9, 8.10, 8.12, 8.15, 8.16, 8.17, 8.17.1</p> <p>Satellite Communication – Elements of Satellite Communication, Types of satellites – GEO, LEO, MEO. Text 3: 9.1, 9.4, 9.12 - 9.12.1, 9.12.2, 9.12.3</p> <p>Optical Fiber Communication - A fiber optic Communication system. Text 3: 10.15 – 10.15.1 to 10.15.9</p> <p>Microwave Communication – Introduction, Frequency modulated microwave communication system. Text 3: 11.1, 11.7.1</p>	
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos Self-study topics: 5G

Course outcomes (Course Skill Set):

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

1. Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators.
2. Present the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.
3. Discuss the characteristics and technological advances of embedded systems.
4. Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.
5. Explain the different modes of communications from wired to wireless and the computing involved.

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). 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):

Proposed Activities to be carried out for 10 marks of CIE:

Students should construct and make the demo of the following circuits in a group of 3/4 students:

1. +5V power supply unit using Bridge rectifier, capacitor filter, and IC 7805.
2. To switch on/off an LED using a diode in forwarding / reverse bias using a battery cell.
3. Transistor switch circuit to operate a relay that switched off/on an LED.
4. IC 741 Integrator circuit / comparator circuit.
5. To operate a small loudspeaker by generating oscillations using IC 555.

Note: Following experiments to be executed using Multisim/Pspice/EDA/Proteus or any suitable Software

Using suitable simulation software, demonstrate the operation of the following circuits:

1. Half / full-wave rectifier using diodes
2. Voltage multipliers
3. Op-amp circuits – inverting, non-inverting amplifiers, summers, differentiators, oscillators.
4. Flip-flops – all types
5. Shift registers and counters
6. AM and FM modulation and demodulation

The CIE marks awarded in the case of Laboratory shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and one/ two practical test(s).

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:**Text Books:**

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015. DOI <https://doi.org/10.4324/9781315737980>. eBook ISBN9781315737980
2. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.
3. S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017. <https://elib4u.ipublishcentral.com/pdfreader/communication-systems>
4. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India), Private Limited, 2018.

Note: E-book versions are available at 'https://www.knimbus.com/' of the VTU consortium. Remote login available through respective college IDs.

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

Developing electronic applications using Raspberry Pi – **Text 1: Chapter 18**

Google Drive Link

<https://drive.google.com/drive/folders/1aTCPv2Bf5M-k40IAYfE0cgZwBjcpAZcR?usp=sharing>