Vocational Course

Electronics Technology

Objectives

The overall Objectives of this vocational course:

- The true development of modern society started just after the invention of electron and since then Electronics branch is playing the vital role in development of every sphere of our life. This course will provide learning experiences to students that develop broad knowledge and understanding of key concepts of electronics and equip them with advanced scientific/technological capabilities for analyzing and tackling the issues and problems in the field of electronics.

- Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in electronics

- Develop abilities in students to design and develop innovative solutions for benefits of society.

- Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments or turn as entrepreneurs.

Course Outcome

- Students will enable to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.

- To acquire experimental skills, analyzing the results and interpret data.

- Ability to design / develop/manage/ operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a given specification within ethical and economic constraints.

- Capacity to identify and implementation of the formulate to solve the electronic related issues and analyze the problems in various sub disciplines of electronics.

- Capability to use the Modern Tools/Techniques.

1ST Semester

ELECTRONIC DEVICES AND CIRCUITS

Group A(Theory Part)

Internal Assessment-15, Semester Eam-45 , Credit point 2

Content	Hrs
UNIT – 1	10
Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity Theorems., RLC series and parallel Resonant Circuit	
PN junction diode: Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode, Reverse saturation current, Zener and avalanche breakdown.	
Rectifiers: Half wave and Full wave (centre tap and bridge) rectifiers, expressions for output voltage, ripple factor and efficiency (mention only), Shunt capacitor filter. (Numerical examples wherever applicable).	
UNIT – 2	10
Voltage regulator: Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Clippers (shunt type) and clampers (Qualitative analysis only), Voltage Multipliers.	
Bipolar Junction Transistor: Construction, types, CE,CB and CC configurations (mention only), VI characteristics of a transistor in CE mode, Regions of operation (active, cut off and saturation), leakage currents (mention only), Current gains α , β and γ and their inter-relations, dc load line and Q point. Applications of transistor as amplifier and switch - circuit and working. (Numerical examples wherever applicable).	

UNIT – 3	10
Chapter No. 7- Transistor biasing and Stabilization circuits: Fixed Bias and VoltageDivider Bias. Thermal runaway, stability and stability factor. Transistor as a two-port network, h-parameter equivalent circuit.	
Amplifier: Small signal analysis of single stage CE amplifier using h-parameters. Input and Output impedances, Current and Voltage gains.	
Special semiconductor diodes: Varactor diode, Schottky diode, Tunnel diode - characteristics, working, symbol, and applications for each. LED, LCD and solar cell – construction, operation and applications, 7-segment display.	

Group B – PRACTICAL

Internal assessment -10, Experiment -30

Credit-1, Total Class period: 20 hours

Content	Hrs
1. To draw the characteristic curves of PN-junction diode for both forward and reverse bias and hence to determine AC and DC resistance of the diode. 2. Study of the I-V Characteristics of Zener diode. 3. Study of the I-V Characteristics of LEDs of two different colours and 7-segment display. 4. Study of Half wave rectifier without and with shunt capacitor filter– ripple factor for differentvalues of filter capacitors. 5. Study of full wave bridge rectifier without and with shunt capacitor filter – ripple factor fordifferent values of filter capacitors. 6. Study of Zener diode as a Voltage Regulator using bridge rectifier with shunt capacitor filter[Load and line regulation]. 7. Study of Clipping, Clamping and Voltage Multiplier circuits. 8. Study of Transistor characteristics in CE configuration – determination of h-parameters 9. Study of Series Resonance circuits – determination of its • Resonant frequency • Bandwidth • Quality Factor	30

2ND Semester

ANALOG AND DIGITAL ELECTRONICS

Group A(Theory Part) Credit 2

Internal Assessment-15, Semester Eam-45

Content	Hrs
UNIT – 1	10
Op-Amp: Differential Amplifier, Block diagram of Op-Amp,Characteristics of an Ideal and Practical Op-Amp, Open and closed loop configuration, CMRR, Slew Rate and concept of Virtual Ground.	
Applications of op-amps: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative Study). Inverting and non- inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Comparator.	
Filters: First and Second order active Low pass, High pass and Band passButterworth filters.	
UNIT – 2	10
. **Number System:** Decimal, Binary, Octal and Hexadecimal number systems, base conversions, Binary arithmetic; addition, subtraction by 1's and 2's complement method	
Boolean Algebra: Constants, variables, operators, basic logic gates- AND, OR, NOT, Positive and negative logic, Boolean laws, Duality Theorem, De Morgan"s Theorem, simplification of Boolean expressions-SOP and POS. Derived logic gates (NAND, NOR, XOR & XNOR). Universal property of NOR and NAND gates. (Numerical examples wherever applicable).	
Digital to Analog Converter: DAC with binary weighted resistor and R-2R resistor ladder network. Analog to Digital converter:	

Design of Arithmetic Logic Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor. 4-bit parallel binary adder, Encoder,. Decoder, 2:4 decoder using AND gates, 3:8 decoder using NAND gates, Multiplexer - 4:1 and 8:1 multiplexer, Demultiplexer - 1:4 and 1:8 demultiplexer (logic diagram and truth table of each)	
UNIT – 4	10
Sequential Logic Circuits: Flip-Flops - SR Latch, RS, D and JK Flip- Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master- Slave JK and T Flip-Flops. Applications of Flip-Flops in semiconductor memories, RAM, ROM and types.	

Group B – PRACTICAL

Internal assessment -10, Experiment -30

Credit-1, Total Class period: 20 hours

Content	Hrs
1. Design of inverting and non-inverting amplifier using Op-amp 2. Op-amp inverting and non-inverting adder, subtractor 3. Design and study of differentiator and integrator using op-amp for different inputwaveforms. 4. Design and study of first order high-pass and low-pass filters using op-amp. **5. Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates usingrespective ICs. Realization of XOR and XNOR using basic gates.** **6. Universal property of NAND and NOR gates** **7. Half Adder and Full Adder using (a) logic gates (b) using only NAND gates.** 8. **Half Subtractor and Full Subtractor(a) logic gates (b) using only NAND gates** 9. Study of Clocked RS, D and JK Flip-Flops using NAND gates.	30