Syllabus for Core Subjects

Course Title: ELE-CT1: ANALOG AND DIGITAL ELECTRONICS-I	Course Credits: 3
Total Contact Hours: 56 Hrs.	Duration of ESA: 4 Hrs.
Formative Assessment Marks: 20 marks	Summative Assessment Marks :80 marks

Course Outcomes (COs):

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

1. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.
2. Acquire experimental skills, analyzing the results and interpret data.
3. 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.
4. Capacity to identify and implementation of the formulae to solve the electronic related issues and analyses the problems in various sub disciplines of electronics.
5. Capability to understand the working principles of the electronic devices and their applications.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**
Aptitude to apply Logic thinking and Basic Science knowledge forproblem solving in various fields of electronics both in industries and research	**x**					
To acquire experimental skills, analyzing the results and interpret data.						
Ability to design / develop / manage / operation and maintenance ofsophisticated electronic gadgets / systems / processes that conforms to a given specification within ethical and economic constraints.						
Capacity to identify and implementation of the formulae to solve the electronic related issues and analyses the problems in various sub disciplines of electronics.						

ELE - CT1: **Analog and Digital Electronics - I** 56 Hours.

UNIT – 1 14 Hrs.

Network Theorems: KCL & KVL, Superposition, Thevenin's, Norton's, Maximum Power Transfer and Reciprocity Theorems. DC analysis of RC circuits, AC analysis of RLC series and parallel Resonant Circuits.

PN junction diode, Zener diode: Working, characteristics and applications.

Rectifiers: Half wave and Full wave rectifiers, expressions for output voltage, ripple factor and efficiency (bridge rectifier), Shunt capacitor filter.

Voltage regulator: Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317), Clippers and Clampers, Voltage Multipliers. SMPS block diagram.

UNIT – 2 14 Hrs.

Bipolar Junction Transistor: Types, Construction, working and configurations, characteristics in CE mode, leakage currents, Current gains α, ß and ɣ and their inter-relations, dc load line and Q point. Transistor as a switch.

Transistor biasing: Thermal runaway, stability and stability factor. Types of biasing, Voltage Divider Bias.

Amplifier: classification, parameters, derivation for voltage and current gain of CE amplifier using r_e- model. Advantages of CC amplifier. Two stage RC Coupled Amplifier – circuit, working and its Frequency Response. Concept of feedback- positive and negative- advantages and disadvantages.

UNIT – 3 14 Hrs.

Number System: Decimal, Binary and Hexadecimal number systems, base conversions, representation of signed and unsigned numbers. Addition, subtraction, BCD code (8421), Gray code, error checking and correction codes, ASCII codes.

Positive and negative logic, Boolean laws, Duality Theorem, De Morgan's Theorems, logic gates- AND, OR, NOT,NAND, NOR, XOR & XNOR. Universal property of NOR and NAND gates. SOP and POS, Minterm, Maxterm, SSOP, SPOS, Simplification of Boolean expressions, K-Map for 3 and 4 variables.

UNIT – 4 14 Hrs.

Half Adder, Full Adder, Half Subtractor, Full Subtractor. 4-bit parallel binary adder, 2-bit magnitude comparator. Encoder: 4:2 encoder, decimal to BCD priority encoder (74147). Decoder: 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder(7445), BCD to 7- Segment decoder(7446), Multiplexer: 4:1 multiplexer, 1:4-De-multiplexer (logic diagram and truth table of each).

REFERENCES:

1. Robert L Boylestad, "Introductory circuit analysis", 5th edition, Universal Book 2003.
2. R S Sedha, "A Text book of Applied Electronics", 7th edition, S. Chand and Company Ltd. 2011.
3. A.P. Malvino, "Principles of Electronics", 7th edition, TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky, 11th Edn, Pearson, 2013.
5. David A. Bell "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2015.
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia, (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Edn, TMH, 2011.
8. Fundamentals of Digital Circuits, Anand Kumar, 2ndEdn, PHI Learning Pvt. Ltd. 2009.
9. Digital Circuits and Systems, K R Venugopal and K Shyla, Tata McGraw Hill, 2011
10. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, PHI Learning, 2001.
6. M. Nahvi & J. Edminister, "Electrical Circuits", Schaum's Outline Series, TMH, 2005
7. S. A. Nasar," Electrical Circuits", Schaum's outline series, Tata McGraw Hill, 2004
8. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill, 2001
9. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6th Edn., Oxford University Press, 2014
10. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum's outline Series, TMG, 1991.

Course Title: ELE-CP1: ANALOG AND DIGITAL ELECTRONICS-I Lab	Course Credits: 2
Total Contact Hours: 56 Hrs.	Duration of ESA: 4 Hrs.
Formative Assessment Marks: 10 marks	Summative Assessment Marks: 40 marks

Course Outcomes (COs):

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

1. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.
2. To acquire experimental skills, analyzing the results and interpret data.
3. 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.
4. Capacity to identify and implementation of the formulae to solve the electronic related issues and analyses the problems in various sub disciplines of electronics.
5. Capability to use the Modern Tools / Techniques.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with ProgramOutcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**
Aptitude to apply Logic thinking and Basic Science knowledge forproblem solving in various fields of electronics both in industries and research						
To acquire experimental skills, analyzing the results and interpret data.	**x**					
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 subdisciplines of electronics.						
Capability to use the Modern Tools / Techniques.						

ELE-CP1: **ANALOG AND DIGITAL ELECTRONICS-I Lab**

(Hardware implementation and Analysis of Circuit using Simulation Software)

(Minimum **Eight** Experiments)

1. Demonstration Experiments: Hands on Experimental Skills and Familiarization with
   a) Electronic components
   b) Resistance in series, parallel and series-parallel
   c) Capacitors and inductors in series and parallel
   d) Multimeter and LCR meter – checking of components / measurements.
   e) Voltage sources in series, parallel and series-parallel
   f) Voltage and current dividers
   g) Measurement of Amplitude, Frequency & Phase difference using oscilloscope
2. Verification of Thevenin's Theorem.
3. Verification of Maximum Power Transfer.
4. Verification of Superposition Theorem.
5. Study of the I-V Characteristics of a P-n junction diode.
6. Study of the I-V Characteristics of a Zener diode
7. Study of half wave rectifier without and with shunt capacitor filter.
8. Study of full wave bridge rectifier without and with shunt capacitor filter.
9. Study of Zener diode as a Voltage Regulator.
10. Study of Clipping, Clamping and Voltage Multiplier circuits.
11. Designing and testing of fixed positive and negative voltage regulators using 78xx and 79xx series ICs.
12. Designing and testing of variable voltage regulator using IC LM317.
13. Study of Transistor characteristics in CE configuration.
14. Study of Voltage divider bias circuit.
15. Study of single stage CE amplifier.
16. Study of two-stage RC-coupled CE amplifier.
17. Study of Series and Parallel Resonance circuits.
18. Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates using respective ICs.
19. Universal property of NAND and NOR gates.
20. Binary to Gray and Gray to Binary code conversion and parity checker using XOR gates IC 7486.
21. 2-bit Comparator using logic gates.
22. Multiplexer & DE multiplexer Circuits.
23. Encoder & Decoder circuits.

Using analog simulator (LT spice, Circuit Logix, NI Multisim, Circuitmake, EasyEDA, Every Circuit, PSpice, Docircuits, etc.,) at least Five experiments are to be performed.