

**Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and
Commerce, Baramati**

Autonomous

Course Structure For F. Y. B. Sc. Electronic Science

| Semester | Paper Code | Title of Paper | No. of Credits |
|-----------------|-------------------|-------------------------------------|-----------------------|
| I | ELE1101 | Basic Circuit Elements and Theorems | 2 |
| | ELE1102 | Logic Gates and Arithmetic Circuits | 2 |
| II | ELE1201 | Semiconductor Devices | 2 |
| | ELE1202 | Digital Circuits And IC Technology | 2 |
| Annual | ELE1203 | Practical | 4 |

SYLLABUS (CBCS) FOR F. Y. B. Sc. STATISTICS (w.e. from June, 2019)

Academic Year 2019-2020

Class : F.Y. B. Sc. (Semester- I)

Paper Code: ELE1101

Paper : I Title of Paper: **Basic Circuit Elements and Theorems**

Credit : 2 No. of lectures: 36

Objectives:

1. To get familiar with basic circuit elements and passive components
2. To understand DC circuit theorems and their use in circuit analysis
3. To study characteristic features of semiconductor components
4. To study elementary electronic circuits and applications

Unit 1: Passive Components (12L)

Study of basic circuit elements and passive components (with special reference to working principle, circuit symbols, types, specifications and applications): Resistor, Capacitor, Inductor, Transformer, Cables, Switches, Fuses, Batteries.

Unit 2: Semiconductor Diodes and Circuits (12L)

Study of semiconductor active components (with reference to symbol, working principle, I-V characteristics, parameters, specifications, applications): p-n junction diode, zener diode, varactor diode, light emitting diode, photo diode.

Clipper and clamper circuits, Rectifiers (half and full wave), Zener regulator, Block diagram of power supply,

Unit 3: Basic Electrical Circuits and Circuit Theorems (12L)

Concept of Ideal Voltage and Current source, internal resistance, dc sources(voltage/current) and sinusoidal ac source(amplitude, frequency, phase angle), Network terminology, series and parallel circuits of resistors, capacitors and inductors, Ohms law, Kirchhoff's Laws (KCL, KVL), Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (problems), Charging-discharging of capacitor, RC low pass and high pass filter

Text/ Reference Books:

1. Electronic Principles : Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
2. Principles of Electronics: V.K. Mehta, S.Chand and Co.
3. A text book of electrical technology: B.L.Theraja, S.Chand and Co.
4. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.

ELE1102: Logic Gates and Arithmetic Circuits (Paper II)

Credits: 2

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn number systems and their representation
3. To understand basic logic gates, boolean algebra and k-maps
4. To study arithmetic circuits.

Unit 1: Number Systems and Logic Gates (12L)

Introduction to decimal, Binary and hexadecimal number systems and their inter conversions, BCD, Excess-3 and Gray codes

Positive and Negative Logic, Study Of Basic Logic gates (NOT, AND, OR) & derived gates (NAND, NOR, EX-OR) using Symbol, Boolean Equations and truth table

Unit 2: Boolean Algebra and Karnaugh maps (12L)

Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive, AND, OR and Inversion laws, De Morgan's theorem, Universal gates. Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).

Unit 3: Arithmetic Circuits (12L)

Rules of binary addition and subtraction, subtraction using 1's and 2's complements, half adder, full adder, Half subtractor, Four bit parallel adder, Basic Block diagram of Computer, Introduction to CPU

Text/ Reference Books:

1. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
 2. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education
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Semester II

ELE 1201 : Semiconductor Devices (Paper I)

Credits: 2

Objectives:

1. To study characteristic features of BJT, FET, UJT.
2. To learn applications of BJT, FET and UJT
3. To understand basics and applications of operational amplifiers.

Unit 1: Bipolar Junction Transistor and Circuits (12L)

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V characteristics, parameters, specifications.

Concept of amplification, Transistor amplifier configurations - CB, CC and CE, Biasing circuits - voltage divider, collector feedback bias and emitter feedback bias, DC load line (CE), Q point

Transistor as a switch, Concept of class A, B and class C amplifiers, Single stage RC coupled CE amplifier, concept of frequency response and bandwidth

Unit-2: FET, UJT and Applications (12L)

Symbol, types, construction, working principle, I-V characteristics, Specifications and parameters of : Junction Field Effect Transistor (JFET),

Metal Oxide Semiconductor FET (MOSFET), Symbol, types, construction, working principle, I-V characteristics, Specifications and parameters of : Uni-Junction Transistor (UJT), UJT as a relaxation oscillator.

Unit 3: Operational Amplifier (12L)

Symbol, block diagram, Opamp characteristics, basic parameters (ideal and practical) such as input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, Concept of virtual ground, concept of feedback, Study of general purpose IC-741

Applications- Opamp as inverting and non-inverting amplifier, Adder, Subtractor,

Text/ Reference Books:

1. Electronic Principles : Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
2. Principles of Electronics: V.K. Mehta, S.Chand and Co.
3. A text book of electrical technology: B.L. Theraja, S.Chand and Co.
4. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C.,

ELE1202 : Digital Circuits And IC Technology (Paper II)

Credit: 2

Objectives:

1. To get familiar with concepts of digital circuits.
2. To learn combinational and sequential circuits.
3. To study logic families and IC technology,

Unit 1: Combinational Circuits

(12L)

Multiplexer (2:1, 4:1, 8:1), Design of higher MUX using lower MUX, Applications. Demultiplexer (1:2, 1:4, 1:8) and their applications, Code converters – Types of Encoders- Decimal to binary, Hexadecimal to binary, Priority encoder, Keyboard encoder Types of Decoders- Binary to decimal decoder, BCD to seven segment decoder.

Unit 2: Sequential Circuits

(12L)

Flip flops :RS using NAND/NOR , clocked RS, JK, D and T.

Counters: Ripple Binary counter, up down counter, concept of modulus counters, Decade counter, Counters for high-speed applications (Synchronous counters) with timing diagrams.

Shift registers: SISO, SIPO, PISO, PIPO shift registers, universal 4-bit shift register and Applications.

Unit 3: Logic Families

(12L)

Classification of logic families, Introduction to Integrated circuit technologies- TTL, ECL, CMOS

IC parameters- Logic levels, propagation delay, power dissipation, noise margins and fan-in ,fan-out of TTL, ECL and CMOS.

TTL NAND & NOT gate, Comparison of TTL and CMOS gates.

Text/ Reference Books:

1. Digital Principles and Applications: Malvino, Leach, Tata McGraw-Hill.
 2. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education
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Preparatory experiments (**2 Compulsory**)

1. Study of Components.
2. Study of Basic Electronic Devices (Multimeters, Signal Generators, CRO)
3. Study of AC and DC sources

All the students are required to complete **16** experiments from the following list :

Group A (Any Four)

1. Study of forward and Reverse biased characteristics of PN Junction Diode
2. Study of breakdown characteristics and voltage regulation action of Zener diode
3. Study of output characteristics of Bipolar Junction Transistor in CE mode
4. Study of output and transfer characteristics JFET/MOSFET
5. Study of I-V characteristics of UJT and UJT based relaxation oscillator.
6. Study of solar cell.

Group B (Any Four)

1. Verification of network theorems: KCL and KVL,
2. Verification of network theorems: Thevenin/ Norton/ Maximum Power Transfer.
3. Design, build and test Low pass / High pass RC filters.
4. Study of low voltage Half-wave, Full-wave and Bridge rectifier circuits.
5. Build and test Inverting / non inverting amplifier using OPAMP.
6. Build and test adder and subtractor circuits using OPAMP.

Group C (Any Four)

* Minimum Two experiments may be carried out with CMOS ICs

1. Basic Logic gates using Diodes and transistors
2. Inter conversions and realizations of logic expressions using ICs
3. Study of RS, JK and D flip flops using NAND gates
4. Study of Up/Down Counter
5. Study of decade counter IC circuit configurations
6. Study of 4-bit Shift register IC

Group D (Any Four)

1. Build and Test 4 bit parity checker/ generator using X-OR gate IC
 2. Build and Test Half Adder, Full Adder and Subtractor using basic gates
 3. Build and Test 2:1 Multiplexer / 1:2 Demultiplexer using gates
 4. Build and Test 3X4 matrix Keyboard Encoder
 5. Build and Test Diode matrix ROM
 6. Study of Four bit Universal Adder/Subtractor / ALU
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