



**Progressive Education Society's**  
**Modern College of Arts, Science and Commerce (Autonomous),**  
**Shivajinagar, Pune – 5**  
**First Year of B. Sc. (2019 Course)**

**Course Code : 19ScEleU102**

**Course Name: Fundamentals of Digital Electronics**

**Teaching Scheme: TH: 3 Hours/Week**  
**Examination Scheme: CIA: 50 Marks**

**Credit : 02**  
**End-Sem: 50 Marks**

**Prerequisite Courses: -**

**Course Objectives:**

- To get familiar with number systems and codes
- To understand basic logic gates, Boolean algebra and k-maps

**Course Outcomes:**

On completion of the course, student will be able to–

- Understand number systems and logic gates
- Simplify Boolean expressions

**Course Contents**

Chapter 1	Number Systems	16 lectures
	Introduction to decimal, binary and hexadecimal number systems and their inter conversions, Unsigned and Signed binary number representations, Rules of binary addition and subtraction, Binary addition and subtraction, Subtraction using 1's and 2's complements, BCD code, Excess-3 code, Gray code, Alphanumeric representation in ASCII codes, Code conversion – binary to gray, gray to binary.	
Chapter 2	Logic Gates	7 lectures
	Positive and Negative Logic, OR, AND, NOT gates, NAND, NOR, EX-OR, EX-NOR gates (Symbol and truth table).	
Chapter 3	Boolean Algebra	12 lectures
	Boolean algebra and Boolean laws: Commutative, Associative, Distributive, AND, OR and Inversion laws, DeMorgan's theorem, NAND, NOR as universal gate, K-map Basics, Min terms, Max terms, Boolean expression in SOP and POS form, Simplifications of Logic expressions using Boolean algebra rules and Karnaugh map (up to 4 variables), Implementation of Boolean expressions using basic gates	
Chapter 4	Experiential Learning	1 lecture
	Group Discussion / Field Work / Mini Project.	
<b>Total Lectures</b>		<b>36 lectures</b>

**Text/ Reference Books:**

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

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**First Year of B. Sc. (2019 Course)**

**Course Code :19ScEleU103**

**Course Name:Basic Analog and Digital Electronics Lab**

**Teaching Scheme: PR: 3 Hours/Week**  
**Examination Scheme: CIA: 50 Marks**

**Credit: 02**  
**End-Sem: 50 Marks**

**Prerequisite Courses:**

- Basic information regarding semiconductor physics
- General information of electronic components and basic laws used in electronics
- Characteristics and identification of electronic components

**Course Objectives:**

- To learn identification of electronic circuit components, specifications and characteristics
- To verify various circuit laws used in electronics
- To verify truth tables of digital gates and basic conversions of logical expressions using gates

**Course Outcomes:**

On completion of the course, student will be able to–

- Understand how to identify, use and construct electronic circuits with circuit elements
- Differentiate different logic gates and simplification of logic expressions using them

**Semester I**

**Course Contents:**

*Any nine experiments and one compulsory activity*

1. Identification of electronic components
2. Study of Series and Parallel combination of Resistors
3. Verification of Kirchhoff's voltage and current Laws
4. Verification of Thevenin's Theorem
5. Verification of Norton's theorem
6. Verification of Superposition Theorem
7. Verification of the Maximum Power Transfer Theorem
8. Study of Solar Cell characteristics
9. Study of the I-V Characteristics of P-N junction diode
10. Study of the reverse bias characteristics of Zener junction diode
11. Study of Basic Gates
12. Study of Basic Gates using Universal Gates
13. Realizations of logic expressions using logic gates

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**First Year of B. Sc. (2019 Course)**

**Course Code :19ScEleU201**

**Course Name: Electronic Devices and Circuits**

**Teaching Scheme: TH: 3 Hours/Week**

**Credit : 02**

**Examination Scheme: CIA: 50 Marks**

**End-Sem: 50 Marks**

**Prerequisite:**

- Basic information regarding semiconductor physics
- General information of electronic components, basic laws used in electronics
- Characteristics and identification of electronic components

**Course Objectives:**

- To study basics of semiconductor Transistor devices
- To learn working principle and application of semiconductor devices
- To get familiar with basic electronic circuits

**Course Outcomes:**

On completion of the course, student will be able to–

- Understand various semiconductor transistor devices
- Construct and test basic analog circuits

**Semester II**

**Course Contents**

Chapter 1	<b>Bipolar Junction Transistor</b>	<i>10 lectures</i>
	Bipolar Junction Transistor (BJT)NPN and PNP, working principle, I-V characteristics and Specifications of BJT, Transistor configurations - CB, CC and CE, Current gains ( $\alpha$ and $\beta$ ), Biasing of BJT (potential divider type for CE only), DC load line, Q point.	
Chapter 2	<b>Unijunction Transistor(UJT)</b>	<i>4 lectures</i>
	Unijunction Transistor construction, working principle, I-V characteristics.	
Chapter 3	<b>Field Effect Transistors (FETs)</b>	<i>10 lectures</i>
	JFET: construction, working principle, I-V characteristics and specifications, Applications of JFET (Switch and VVR), Metal Oxide Semiconductor FET (MOSFET), Enhancement type and depletion type.	
Chapter 4	<b>Basic Analog Circuits</b>	<i>11 lectures</i>
	Rectifiers (half wave and full wave), Ripple filters and DC power supply, Diode clipper and clamper circuits, BJT as a switch, BJT amplifier (CE, CB, CC configuration without mathematical treatment).	
Chapter 5	<b>Experiential Learning</b>	<i>1 lecture</i>
	Group Discussion / Field Work / Mini Project	
	<b>Total Lectures</b>	<b>36 lectures</b>

Text/ Reference Books:

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

4. Electronic Devices and Circuits: Bolyestad, Tata McGraw Hill
5. Encyclopedia of electronic components- Volume –II, Charles Platt,O'Reilly Media 2013
6. A Textbook of Applied Electronics (Multicolor Edition), Dr. R S Sedha, 3<sup>rd</sup> Edition, S. Chand Publishing

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**First Year of B. Sc.**  
**(2019 Course)**

**Course Code :19ScEleU202**

**Course Name: Digital Electronic Circuits**

**Teaching Scheme: TH: 3 Hours/Week**  
**Examination Scheme: CIA: 50 Marks**

**Credit : 02**  
**End-Sem: 50 Marks**

**Prerequisite:**

- Basic information logic gates , positive and negative logic concept
- Digital number system and inter conversions between them
- Knowledge of Boolean Algebra

**Course Objectives:**

- To study flip flops
- To study combinational circuits
- To study sequential circuits

**Course Outcomes:**

On completion of the course, student will be able to–

- Understand combination circuits
- Understand types of flip flops and sequential circuit construction using them

**Semester II**

**Course Contents**

Chapter 1	Combinational Circuits	14 lectures
	Multiplexer (2:1, 4:1), Demultiplexers (1:2, 1:4) and their applications, Code converters - Decimal to binary, Hexadecimal to binary, Encoder and decoder, BCD to seven segment decoder, Arithmetic Circuits- Half adder, full adder, Half subtractor, Full subtractor, Four bit parallel adder, subtractor.	
Chapter 2	Flip Flops	8 lectures
	RS flip-flop using NAND/NOR gate, Concept of Latch, clocked (edge and level triggered) RS, JK, Master slave JK, D and T flip-flops, Difference between Latch and Flip-flop, Flip flop operation using truth table and timing diagram.	
Chapter 3	Sequential Circuits	13 lectures
	Counters: Ripple Binary counter, up down counter, cascading of counters, Concept of modulus counters (MOD2, MOD5, MOD10), Shift registers: SISO, SIPO, PISO, PIPO shift registers, Ring counter and Johnson Counter, Universal shift register.	
Chapter 4	Experiential Learning	1 lecture
	Group Discussion / Field Work / Mini Project	
<b>Total Lectures</b>		<b>36 lectures</b>

**Text/ Reference Books:**

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

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**First Year of B. Sc. (2019 Course)**

**Course Code :19ScEleU203**

**CourseName: Analog and DigitalElectronic Circuits Lab.**

**Teaching Scheme: PR: 3 Hours/Week**

**Credit: 02**

**Examination Scheme: CIA: 50 Marks**

**End-Sem: 50 Marks**

**Prerequisite Courses:**

- Basic information regarding semiconductor physics
- General information of electronic components and basic laws used in electronics
- Characteristics and identification of electronic components

**Course Objectives:**

- To learn Semiconductor devices, specifications and characteristics
- To test various basic analog circuits
- To verify truth tables combinational and sequential circuits

**Course Outcomes:**

On completion of the course, student will be able to–

- Understand testing of analog circuits
- Differentiate different combinational and sequential circuits
- Verify truth table of various flip flops

**Semester II**

**Course Contents:**

*Any nine experiments and one compulsory activity*

1. Measurement of Amplitude, Frequency & Phase difference using CRO
2. Study of the I-V Characteristics of JFET
3. Study of the half wave rectifier
4. Study of the full wave (center tap and bridge) rectifier
5. Study of transistor as switch
6. Study of voltage divider bias for transistors
7. Study of RS, JK, T and D flip flops
8. Verification of De Morgan's theorem
9. Verification of Half and Full Adder
10. Verification of Half and Full subtractor
11. Build and Test 2:1 Multiplexer and 1:2 De-multiplexer using gates
12. Study of 4-bit Shift register IC 7495
13. Study of decade counter using IC 7490