

Deccan Education Society's
FERGUSON COLLEGE, PUNE
(AUTONOMOUS)

SYLLABUS UNDER AUTONOMY
FIRST YEAR B.Sc.
ELECTRONIC SCIENCE
(For Computer Science)

SEMESTER - I

Academic Year 2016-2017

F.Y. B.Sc. (Electronic Science) for Computer Science Students

Particulars	Paper code	Title of Paper	No. of Credits
Semester I	ELC1101	Basic Circuit Theory and Networks	2
	ELC1102	Digital Electronics	2
	ELC1103	Basic Circuit Theory, Networks and Digital Electronics Lab	2
Semester II	ELC1201	Semiconductor Devices	2
	ELC1202	Sequential Circuits	2
	ELC1203	Semiconductor Devices and Sequential Circuits Lab	2

F.Y. B.Sc. Semester I

Theory Paper – 1 (ELC1101): Basic Circuit Theory and Networks

[Credits-2: 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 know the AC circuits and related terminologies

Unit-I	Basic Circuit Concepts Concept of Ideal Voltage and Current source, internal resistance, dc sources(voltage/current) Study of basic circuit elements and passive components (working principle, circuit symbols, types, specifications and applications): Resistor, Capacitor, Inductor, Transformer, Relays, Batteries, Switches, Fuses, Cables, Connectors.	12 L
Unit-II	Circuit Analysis and Network theorems Circuit and Network terminology, Ohms law, series and parallel circuits of resistors, capacitors and inductors, voltage and current dividers, Kirchhoff's Laws, (KCL, KVL), Superposition theorem, concept of black box, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, RC Circuits- Charging and discharging with initial charge, DC Response of Series RLC Circuits.	16 L
Unit-III	AC Circuits Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Passive Filters: Low Pass, High Pass, Band Pass and Band Stop. Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth.	8 L

References:

1. Theory and problems of basic circuit analysis, Schaum's outline series, John O'malley (2004)
2. Electric Circuits, Schaum's outline series, S. A. Nasar, Tata Mc Graw Hill (2004)
3. Electric circuits, Schaum's outline series, M. Nahvi and J. Edminister, Tata McGraw Hill (2005)
4. Basic Electronic, B. Grob, Mc Graw Hill (2007)

F.Y. B.Sc. Semester I
Theory Paper – 2 (ELC1102): Digital Electronics
[Credits-2: Lectures-36]

Objectives:

1. To get familiar with various numbers systems and Boolean algebra.
2. To study basic building block of digital electronics like logic gates and arithmetic circuits.
3. To learn about Combinational circuits

Unit-I	<p>Number System and codes Decimal, binary, octal, hexadecimal number systems Conversion of number from one number system to another including decimal points Binary addition, subtraction, multiplication, division, 1's and 2's complement method of subtraction BCD code numbers and their limitations, addition of BCD coded numbers, conversion of BCD to decimal and vice-versa, Excess-3 code, gray code, binary to gray and gray to binary conversion, Concept of parity, single and double parity, error detection and correction using parity</p>	10 L
Unit-II	<p>Logic gates and Boolean Algebra Logic gates, positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operation of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates, NAND and NOR as universal logic gates Rules and laws of Boolean algebra, logic expression, Demorgan's theorems, their proof, Sum of products form (minterm), Product of sum form (maxterms), simplification of Boolean expressions with the help of Rules and laws of Boolean algebra , Karnaugh mapping techniques upto 4 variables and their applications for simplification of Boolean expression</p>	12 L
Unit-III	<p>Arithmetic circuits Half adder, full adder circuits and their operation, subtractor, half and full, Comparator, Parallel binary adder,</p>	4 L
Unit-IV	<p>Combinational Circuits Multiplexer(2:1 and 4:1), Demultiplexer (1:2 and 1:4), Encoder & decoder, Priority encoder, 3 X 4 matrix keyboard Encoder, Code converters(Decimal to binary, Hexadecimal to binary, BCD to decimal),BCD to seven segment decoder.</p>	10 L
<p>References:</p> <ol style="list-style-type: none"> 1. Digital Principals, Schaum's outline series, Tata Mc Graw Hill (2006) 2. Digital Fundamentals, T. L. Floyd, Pearson Education (2013) 3. Digital System Design, Morris Mano, Pearson Education (2014) 		

F.Y. B.Sc. Semester I

Practical Paper – 1 (ELC1103): Basic Circuit Theory, Networks and Digital Electronics Lab

[Credit-2]

1.	Study of Series and Parallel combination of Resistors
2.	Verification of Kirchhoff's Law.
3.	Verification of Thevenin's Theorem.
4.	Verification of Norton's theorem.
5.	Verification of Superposition Theorem.
6.	Verification of the Maximum Power Transfer Theorem
7.	Measurement of Amplitude, Frequency & Phase difference using CRO.
8.	Designing of a Low Pass RC Filter and study of its Frequency Response.
9.	To verify and design AND, OR, NOT and XOR gates using NAND gates.
10.	To convert a Boolean expression into logic gate circuit and assemble it using logic gate IC's.
11.	Design a Half and Full Adder
12.	Design a Half and Full Subtractor.
13.	De Morgan's theorem verification

Students have to perform any 8 experiments from the above list and 2 activities like simple Electronic circuit design (Electronics project), seminar on advanced topic, Information collection on any latest research topic etc. in consultation with respective teacher.

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SEMESTER - II

Academic Year 2016-2017

F.Y. B.Sc. Semester II

Theory Paper – 1 (ELC1201): Semiconductor Devices

[Credits-2: Lectures-36]

Objectives:

1. To get familiar with semiconductor basics
2. To study the construction and characteristics of semiconductor devices

Unit-I	Semiconductor Basics Classification of materials, Introduction to Semiconductor Materials, Intrinsic Semiconductors and Extrinsic semiconductors, Energy Band in Solids, Fermi Level for Intrinsic & Extrinsic Semiconductors, Donors, Acceptors, Dependence of Fermi Level on Temperature and Doping Concentration,	4 L
Unit-II	PN junction diode Study of semiconductor devices with reference to symbol, working principle, I-V characteristics, parameters, specifications: diode (Formation of Depletion Layer, Space Charge at a Junction, barrier potential) zener diode, light emitting diode, photo diode, solar cell	10 L
Unit-III	Bipolar junction transistor PNP and NPN Transistors, Basic Transistor Action, Emitter Efficiency, Base Transport Factor, Current Gain, Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V characteristics, parameters, specifications. Biasing circuits voltage divider, collector feedback bias and emitter feedback bias, DC load line, Q point and factors affecting the stability, Transistor configurations - CB, CC and CE	14 L
Unit-IV	UJT, JFET and MOSFET Symbol, types, construction, working principle, I-V characteristics, Specifications parameters of: Uni-Junction Transistor (UJT), Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET), comparison of JFET, MOSFET and BJT	8 L

References:

1. Solid state Electronic Devices, B. G. Streetman and S. Banerjee, Pearson Education (2006)
2. Basic Electronics and Linear circuits, N. N. Bhargava, D. C. Kulshreshtha, S. C. Gupta, Tata Mc Graw Hill (2008)
3. Semiconductor Device Physics and Design, Umesh k. Mishra and Jasprit Singh, Springer (2008)

F.Y. B.Sc. Semester II

Theory Paper – 2 (ELC1202): Sequential Circuits

[Credits-2: Lectures-36]

Objectives:

1. To get familiar with various sequential circuits.
2. To study basic applications of sequential circuits.

Unit-I	Flip flops Latch, SR-latch, D-latch, Flip-flop, difference between latch and flip-flop, S-R, D flip-flop their operation using waveform and truth tables, race around condition, JK flip-flop, master slave, T flip flop and their operation using waveform and truth tables	12 L
Unit-II	Sequential Circuits Counters: Ripple, Decade counter, up counter, down counter, Up-Down counter, Concept of modulus counters, Shift registers: SISO, SIPO, PISO, PIPO, Ring counter, universal 4-bit shift register,	14 L
Unit-III	Digital Circuits Seven segment display and its types, Shift register as rolling display, Interfacing of Thumbwheel switch to Seven Segment Display, Counter as digital clock Diode Matrix ROM.	10 L

References:

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., Jain R.P., Pearson Education

F.Y. B.Sc. Semester II

Practical Paper – 2 (ELC1203): Semiconductor Devices and Sequential Circuits Lab [Credit-2]

1.	Study of the half wave rectifier and Full wave rectifier.
2.	Study of the I-V Characteristics of Diode – Ordinary and Zener Diode.
3.	Study of the I-V Characteristics of the CE configuration of BJT and obtain r_i , r_o , β
4.	Study of the I-V Characteristics of the Common Base Configuration of BJT and obtain r_i , r_o , α .
5.	Study of transistor as switch / inverter
6.	Designing of a Single Stage CE amplifier
7.	Study of the frequency response of Common Source FET amplifier
8.	Study of RS, JK and D flip flops using NAND gates
9.	Study of Flip flop ICs
10.	Build and Test 4:1 Multiplexer and 1:4 Demultiplexer using gates
11.	Study of decade counter IC circuit configurations

Students have to perform any 8 experiments from the above list and 2 activities like simple Electronic circuit design(Electronics project), Seminar on advanced topic, Information collection on any latest research topic etc. in consultation with respective teacher.