Fergusson College (Autonomous), Pune

Learning Outcomes-Based Curriculum

for 3⁄4 years B. Sc. / B. Sc. (Honours) Programme

as per guidelines of

NEP 2.0

for

F. Y. B. Sc. (Electronic Science)

With effect from Academic Year

2024-2025

Program Outcomes (POs) for B. Sc.	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate programme. Execute strong theoretical and practical understanding generated from the specific graduate programme in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	**Research-related skills and Scientific temper:** Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and also collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO9	**Self-directed and Life-long learning:** Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

PSO No.	Program Specific Outcomes (PSOs) Upon completion of this programme the student will be able to
PSO1	**Academic competence:** (i) Apply the knowledge, facts, and rules of basic and applied sciences (Physics, Chemistry, Mathematics and Statistics) for understanding elements of Electronic Science. (ii) Identify basic elements and systems of the real analog world and modern digital world.
PSO2	**Personal and Professional Competence:** (i) Demonstrates the ability to build and test basic blocks of modern digital systems and computers. (ii) Operate basic and advanced tools, equipment and Instruments. (iii) Discuss performance parameters for selection of sensors, actuators, linear and digital ICs.
PSO3	**Research Competence:** (i) Design and build Electronics systems in various domains like Computers, consumer products, medical, transportation, agriculture, and defense. (ii) Formulate and provide creative, innovative, and effective solutions to real world problems using hardware –software co-design tools for microcontroller / embedded systems and IoTs. (ii) Develop and utilizes modern tools (like PSPICE, MATLAB, Simulink) for mathematical modelling and simulation for future ready systems.
PSO4	**Entrepreneurial and Social competence:** Employ the process of thinking independently, taking initiative, working in a team effectively, preparing project reports and developing capability to lead the team through real life projects.

Fergusson College (Autonomous), Pune

NEP 2.0 Subject Credit Distribution Structure 2024-25

Department 0f Electronic Science (Science)

FYBSc Sem - I	**Theory/ Practical**	**Paper Code**	**Paper Title**	**Credits**	**Exam Type**
Discipline Specific Core, **DSC-1**	Theory	ELS-1001	**Electronics Circuits and Networks**	**2**	CE +ESE
Discipline Specific Core, **DSC-1**	Practical	ELS-1011	**Electronics Practical 1**	**2**	CE +ESE
Open Elective-1 **OE-1** (For other faculty)	Theory	ELS -1021	**Electronics for Everyone**	2	Only CE

FYBSc Sem - II	**Theory/ Practical**	**Paper Code**	**Paper Title**	**Credits**	**Exam Type**
Discipline Specific Core, **DSC-1**	Theory	ELS-1002	**Semiconductor Devices**	**2**	CE +ESE
Discipline Specific Core, **DSC-1**	Practical	ELS -1012	**Electronics Practical 2**	**2**	CE +ESE
Open Elective-2 **OE-2** (For other faculty)	Theory	ELS -1022	**Understanding Electronic Products**	**2**	Only CE
Skill Enhancement Course, **SEC**	Theory/ Practical	ELS-1032	**PCB Design Techniques**	**2**	Only CE

Head

Department of Electronic Science

Fergusson College (Autonomous), Pune

NEP 2.0 Paper Weightage Distribution 2024-25

Department 0f Electronic Science

Class: F. Y. B. Sc. Sem. I

Paper Code: **ELS-1001 Electronics Circuits and Networks**

Number of Credits: 2 Credits **Number of Hours**: **30**

Sr. No.	Course Outcomes	Blooms Taxonomy level	Weightage in % (For Example)
1	CO-1: Identify elements of electrical circuit analysis like DC and AC signals, voltage, current, power, resistors, series-parallel connections. Quote fundamental laws and theorems for electrical circuits	Remember	**40%**
2	CO-2: Discuss node-voltage analysis and mesh current analysis for network evaluation Explain fundamental laws and theorems w.r.t. various electrical circuits	Understand	40% .
3	CO-3: Apply the fundamental theorems, laws to translate complicated networks and/ circuits into simpler / equivalent forms and evaluate various voltages, currents, resistances in them	Apply	20% .

Electronics Circuits and Networks [2 Credits, 30 Hours]

Unit	Title and Contents	CO	Weightage (Hours)
1	**Basic Circuit Concepts**: Voltage and Current Sources, **Resistors:** Fixed and Variable resistors, Characteristics, Colour coding of resistors, resistors in series and parallel. **Inductors:** Fixed and Variable inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction, Energy stored in an inductor, Inductance in series and parallel, **Capacitors:** Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of Dielectric Constant, Dielectric strength, Energy stored in a capacitor, capacitors in series and parallel. **Transformer:** Types, Principles of operation	**1,2,3**	**20%(5Hrs)**
2	**Circuit Analysis:** Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis. **Network Theorems**: Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem,	**1,2,3**	**50% (15Hrs)**

	DC Transient Analysis: RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with Sources, Filter circuit LPF and HPF		
3	**AC Circuit Analysis:** Sinusoidal Circuit Analysis for RL, RC and RLC Circuits. Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth. Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.	**1,2,3**	**30%(10Hrs)**

Resources:

1. Grob's Basic Electronics by Mitchel E. Schultz, McGraw-Hill Publication 2011, 11th Edition.

2. Electronic Principles by Albert Malvino and David Bates, McGraw-Hill Publication 2021 , 9th Edition.

3. Electronic Devices by T. L. Floyd, Pearson Education Asia 2012, 9th Edition.

Paper Code: **ELS-1011** **Electronics Practical 1**

Number of Credits: 2 Credits **Number of Hours**: 60

Sr. No.	Course Outcome	Blooms Taxonomy level	Weightage in % (For Example)	
1	CO-1: List the components required for carrying out the experiment. Identify the required test and measuring instruments	Remember	**30%**	
2	CO-2: Describe procedure for performing the experiment. Report the observations recorded for experiment	Understand	40	
3	CO-3: Interpret the results and compare them with expected values	Apply	**30%**	

Any 10 Experiments

Expt. No.	Title of the Experiment
1.	Study of Series and Parallel combination of Resistors
2.	Verification of Kirchhoff's Voltage Law (KVL) and/ Kirchhoff's Current Law (KCL)
3.	Verification of Thevenin's Theorem and/ Norton's Theorem
4.	Verification of Superposition Theorem and/ the Maximum Power Transfer Theorem
5.	Measurement of Amplitude, Frequency & Phase difference using DSO and Signal generator
6.	Designing of Low Pass RC Filter and/ High Pass RC Filter and study its Frequency Response
7.	RC Circuits: Time Constant of Differentiator and Integrator
8.	Study of frequency Response of a series **or** parallel LCR circuit and determination of -(a) Resonant Frequency (b) Impedance at Resonance (c) Band Width (d) Quality Factor Q
9.	Charging and Discharging of capacitor to Plot graph of voltage across Capacitor when it is charging and discharging

10.	Study of Thermistor as a special purpose resistor
11.	Identification of Components Resistor, Inductor, Capacitor and Transformer
12.	Study of Light Dependent Resistor (LDR)
13.	Study of Resistor (R) as Current Limiter for LED's **or** DC Motor
14.	Design Battery Eliminator using resistor
15.	Study of Transformer

Or Any Other Equivalent Experiment

Class: F. Y. B. Sc. Sem. II

Paper Code: **ELS-1002** **Semiconductor Devices**

Number of Credits: 2 Credits **Number of Hours**: **30**

Sr. No.	Course Outcome	Blooms Taxonomy level	Weightage in % (For Example)
1	CO-1: Identify various electronic materials and diodes and BJTs and discuss their properties	Remember	40%
2	CO-2: Explain biasing techniques for diode and BJT. Discuss various types of filters, wave shapers, rectifiers, BJT configurations	Understand	40**%**
3	CO-3: Illustrate the designing of filters, wave shapers and various biasing circuits Apply the concept of reactance to design coupling of specific frequency signals	Apply	20**%**

ELS-1002 Semiconductor Devices [2 Credits, 30 Hours]

Unit	Title and Contents	CO	No. of hours
1	**Semiconductor Diode** Introduction to Semiconductor Materials, Intrinsic Semiconductors and Extrinsic semiconductors, n type and p type semiconductors with reference of energy levels, Donors, Acceptors, concept of Fermi Level, majority and minority carriers. PN junction diodes - Symbol, pins, unbiased diode, depletion layer, barrier potential, working in forward bias and reverse bias, concept of break down, diode equation, I-V characteristics, knee voltage, break down voltage, bulk resistance, zener diode, light emitting diode, photo diode, solar cell, metal varactor diode, applications of various diodes.	1,2,3	50% (15Hrs)
2	**Bipolar Junction Transistor (BJT)** Symbol, pins, basic types- PNP and NPN, unbiased transistor, Biased Transistor, transistor currents, concept of current gain, α, β of BJT, configurations CE, CB and CC, with respect to CE configuration I-V characteristics-base curve and collector curves, load line, operating point, Biasing techniques - voltage divider bias, emitter bias, collector feedback bias and base bias applications.	1,2,3	50% (15Hrs)

Resources:

1. Grob's Basic Electronics by Mitchel E. Schultz, McGraw-Hill Publication 2011, 11th Edition

2. Electronic Principles by Albert Malvino and David Bates, McGraw-Hill Publication 2021 , 9th Edition

3. Electronic Devices by T. L. Floyd, Pearson Education Asia 2012, 9th Edition

Paper Code: **ELS-1012 Electronics Practical 2**

Number of Credits: 2 Credits **Number of Hours**: **60**

Sr. No.	Course Outcome	Blooms Taxonomy level	Weightage in % (For Example)
1	CO-1: List the components required for carrying out the experiment. Identify the required test and measuring instruments	Remember	30%
2	CO-2: Describe procedure for performing the experiment. Report the observations recorded for experiment	Understand	40
3	CO-3: Interpret the results and compare them with expected values	Apply	30%

Any 10 Experiments

Sr.No	Title of the Experiment
1.	Semiconductor Components Testing
2.	I-V Characteristics of PN junction Diode and its application
3.	I-V Characteristics of Zener Diode and its application
4.	I-V Characteristics of LED and Reverse characteristics of photodiode for different light intensities
5.	I-V Characteristics of Solar Cells
6.	Output Characteristics of the CE configurations of BJT and its application
7.	Study of Q point with reference to Class A, Class B and Class C BJT amplifier, using potential divider bias (variable R2)
8.	Transistor as an amplifier
9.	Study of Emitter Follower
10.	Study of half wave rectifier and full wave rectifier circuit
11.	Study of voltage doubler circuit
12.	Study of Clipper and Clamper circuit
13.	Energy bandgap measurement of Ge diode
14.	Study of Photo relay
15.	Study of Clap switch

Or Any Other Equivalent Experiment