Maharashtra Education Society's

Abasaheb Garware College

Karve Road, Pune – 411 004.

(Autonomous)

(Savitribai Phule Pune University, Pune)

Three Year B.Sc. Degree Program in Electronic Science

(Faculty of Science and Technology)

Syllabi under Autonomy

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

Choice Based Credit System Syllabus

To be implemented from Academic Year 2023-2024

S. Y. B. Sc. (Electronic Science)
Course Structure

Year	Semester	Course type	Course code	Course Title	Remark	Credits	No. of Lectures /Practical to be conducted
II	III	Core Courses	USEL-231	Paper I: Basic Electronic Circuits	-	2	36
			USEL-232	Paper II: Digital System Design and VHDL	-	2	36
			USELP-233	Paper III: Practical Course	-	2	08 Expts
		Language (Science)	USLG A/B/C -231	English / Hindi /Marathi	-	2	36
		Environmental Science	USEVS-231	Environmental Science	-	2	36
	IV	Core Courses	USEL-241	Paper I: Analog Communication	-	2	36
			USEL-242	Paper II: Microcontroller and Python programming	-	2	36
			USELP-243	Paper III: Practical Course	-	2	08 Expts
		Language (Science)	USLG A/B/C -241	English / Hindi /Marathi	-	2	36
		Environmental Science	USEVS-241	Environmental Science	-	2	36

MES ABASAHEB GARWARE COLLEGE (Autonomous)
KARVE ROAD, PUNE 411 004.
Department of Electronic Science
USEL -231: Paper I: Basic Electronic Circuit

Semester	Credits	Lectures	Internal Assessment marks	External Assessment marks	Total marks
III	2	36	15	35	50

Course Outcomes:

This course provides basic knowledge about systematic methodology of designing analog systems. After study through lectures and assignment, student will be able to

CO1 Understand working principle of different diode circuits

CO2 Understand different types of BJT circuits

CO3 Able to design small signal amplifiers, power amplifier and their types

CO4: Able to understand basics of operational amplifier, circuits and applications.

UNIT 1: Basic Circuits (20 lectures)

Diode circuits: Diode as Rectifier, Positive and Negative Clipper circuits, Positive and negative Clamper circuits, Zener diode regulator, Passive filters: Low Pass filter and High Pass filter

BJT circuits: Review of CE, CB Characteristics and regions of operation, Transistor biasing, DC load line, operating point, Fixed bias without and with RE, collector to base bias, voltage divider bias and emitter bias (+VCC and –VEE bias), circuit diagrams and their working, Transistor as a switch, circuit and working, Darlington pair and its applications.

Small signal amplifiers: A.C and D.C. analysis, frequency response, gain Bandwidth product. Design of single stage amplifier, effect of coupling capacitor and bypass capacitor on frequency response (qualitative approach), Design of two stage amplifier

Power Amplifier: Definition of Power Amplifier, Classification of power amplifiers on the basis of conduction: class-A, class-B, class-AB, class-C. Class-A amplifier: resistive load/transformer coupled load, efficiency calculation. Concept of harmonic distortion.

UNIT 2: Operational Amplifier (16 lectures)

Basics of Opamp: Concept of negative feedback, Types of feedback circuits: current shunt, current series, voltage shunt and voltage series, Effect of Negative feedback: on gain Bandwidth, input and output impedance,

Opamp Circuits: Adder, differential amplifier, integrator, differentiator, First order butterworth active filter, instrumentation amplifier

Oscillators: Concept of Positive Feedback, Barkhousan criterion, Wien bridge oscillator, Phase Shift oscillator, Astable multivibrator, function generator

Reference Books:

1. Ramakant Gaikwad, Operational amplifiers and linear Integrated Circuits, 3rd edition, PHP
2. G. B. Clayton, Operational amplifier, ELBS
3. Boylested , Electronic devices and circuits, PHP
4. B.L.Thereja, Principles of Electronics , S.Chand and Company

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USEL -232: Paper II: Analog Communication

Semester	Credits	Lectures	Internal Assessment marks	External Assessment marks	Total marks
III	2	36	15	35	50

Course Outcomes:

Course outcomes: This course provides basic knowledge about systematic methodology of designing digital systems. After study through lectures and assignment, student will be able to

CO1: Analyze basic combinational logic circuits for simple applications

CO2: Design combinational logic circuits using K maps for identified applications

CO3: Design Sequential logic circuits using state diagram, excitation table for identified applications

CO4: Get familiar with concept of HDL and different keywords related to VHDL

UNIT 1: Digital system design (18 lectures)

Design of combinational circuits:

Design of code converters using K maps: BCD to Seven segments, Concept of adder using Look ahead carry generator, Keyboard encoder circuits: Priority encoder, Error detection technique: hamming code

Design of sequential circuits:

Sequential logic circuit design: State table, State diagram, excitation table and transition table, Design of counters using state machines: asynchronous, modulus and up-down counter, Design of sequence generator.

UNIT 2: Introduction to VHDL (18 lectures)

A Brief History of HDL, Structure of HDL Module, Comparison of VHDL and Verilog, Introduction to Simulation and Synthesis Tools, Test Benches, Verilog Modules, Delays, data flow style, behavioral style, structural style, mixed design style, simulating design Introduction to Language Elements: Keywords, Identifiers, White Space Characters, Comments, Format, Integers, Reals and Strings, Logic Values, Data Types-net types, Undeclared nets, scalars and vector nets, Register type, Parameters, Expressions, Operands, Operators, types of Expressions **Examples**: Half adder, full adder, Flip Flop

Reference books:

1. Morris Mano, Digital Design, 3 rd Edition, Prentice Hall of India.
2. R. P.Jain, Modern Digital Electronics, 4th edition, Tata MacGraw Hill Education India,
3. K. R. Botkar, Integrated Circuits, 3rd Edition, Khanna Publications
4. Thomas Floyd and Jain, Digital Fundamentals, 4th Edition, Pearson Education International
5. Manuals: National semiconductor, EXAR, Intersil, Signetics, Analog Devices

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USELP -233: Paper III: Practical Course

Semester	Credits	Number of Practicals	Internal Assessment marks	External Assessment marks	Total marks
III	**2**	**08**	**15**	**35**	**50**

At the end of this course, students will be able to
CO1: Understand and design simple analog/digital systems.
CO2: Prepare the technical report on the experiments carried

1. To design ,build and test positive/negative clipper /clamper using diode
2. To design ,build and test Zener regulator
3. To design ,build and test single stage amplifier
4. To design ,build and test Class AB push pull amplifier/audio amplifier
5. To design ,build and test Astable multivibrator using opamp/IC 555
6. To design, build and test sequence generator for stepper motor
7. To design, build and test Priority keyboard encoder.
8. To design, simulate and test logic gates using Xilinx
9. To design , simulate and test code converters(gray to binary, binary to gray) using Xilinx
10. Activity: (any one)

a. To design, build and test smoke detector circuit
b. To design, build and test humidity detector circuit
c. To design ,build and test three op-amp Instrumentation amplifier

MES ABASAHEB GARWARE COLLEGE (Autonomous)
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Department of Electronic Science
USEL -241: Paper I: Analog Communication

Semester	Credits	Lectures	Internal Assessment marks	External Assessment marks	Total marks
IV	2	36	15	35	50

Course outcomes: This course provides basic knowledge of analog (continuous wave) communication systems. After study through lectures and assignment, student will be able to
CO1: Understand different blocks in communication systems, types of noise in communication systems and its different parameters
CO2: Understand need of modulation, modulation process and amplitude modulation and demodulation methods
CO3 Analyse generation of FM Modulation and demodulation methods and comparison between amplitude and frequency modulation
CO4: Identify different radio receivers and their performance parameters.

UNIT- 1: Basics of communication system (16 lectures)
Electromagnetic spectrum. Block diagram of communication system, Types of communication: Half duplex, Full duplex, Applications
Concept of noise: External noise, internal noise, signals to noise ratio, noise factor, noise temperature, Friss formula.
Some Practical Antennas: Half-wave Dipole Antenna, Quarter-wave Monopole Antenna, small Loop Antenna, Aperture Antenna, Antenna Arrays.

UNIT -2: Analog modulation techniques (20 lectures)
Need of modulation, Definition of modulation and demodulation, Types of modulation
Amplitude modulation: Equation, Modulation index, frequency spectrum, generation of AM (collector modulator), Amplitude Demodulation (diode detector), And other forms of AM: DSBSC, SSB, VSB

Angle modulation: Frequency and phase modulation, Equation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (Direct and indirect methods), FM detector (Slope detector, balanced slope detector). Comparison between AM, FM. FM Generation using varactor diode, FM demodulation using Foster Seely Demodulator
Receiver parameters: Sensitivity, selectivity and fidelity,
Types of multiplexing: Time division multiplexing and Frequency division multiplexing.

References Books:
1. Communication Electronics: Principles and applications by Louis E Frenzel 3rd edition TMH Publications
2. Electronics Communication Systems by Denis Roddy, John Coolen, PHI publication.
3. Kennedy, George & Davis, Bernard / “Electronic Communication Systems” / Tata McGraw-Hill / 4th Ed.
4. Singh, R.P. & Sapre, S.D. / “Communication Systems: Analog & Digital” / Tata McGraw-Hill.

MES ABASAHEB GARWARE COLLEGE (Autonomous)
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Department of Electronic Science
USEL -242: Paper II: Microcontroller and Python programming

Semester	Credits	Lectures	Internal Assessment marks	External Assessment marks	Total marks
IV	2	36	15	35	50

Course outcomes: This course introduces students with microcontroller using Arduino as well as develops programming ability using python language. After study through lectures and assignment, student will be able to

CO1 Identify the features and architectural details of microcontroller (arduino)

CO2 Write code/program using open source programming language (arduino) for basic identified applications

CO3 Understand programming basics of python programming language

CO4 Understand special features of python programming language such as importing modules, directory, and tupules

UNIT 1: Introduction to Microcontroller (Arduino) (16 lectures)

Concept of microcontroller, General Architecture of microcontroller, Microcontrollers used in Arduino, Pin configuration and architecture, Concept of digital and analog ports.

Building blocks of Arduino programming: variables and data types, Comparison Operators (arithmetic, logical and relational, modulo and assignment)

Statements: If-Else Statement, Switch statement Control structures: While and For Loop Writing arduino programs: LED blinking and Push button, Function blocks: Analogread(), digitalread() functions,

UNIT 2: Introduction to Python (20 lectures)

Introduction to python: Understanding Python variables, Python basic Operators, Understanding python blocks, Declaring and using

Numeric data types: int, float, complex, Using string data type and string operations, Defining list and list slicing, Use of Tuple data type,

Conditional blocks using if, else and elif,

Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else

Programming using Python conditional and loops, block Python Functions,

Modules and Packages, List manipulation using in build methods, Dictionary manipulation, Programming using string, list and dictionary in built functions, tupules

Reference books:

1. Think Python, Allen Downey, O'Reilly, 2012
2. Introduction to Problem Solving with Python, E. Balagurusamy
3. Arduino-Based Embedded Systems: By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.
4. Arduino Made Simple by Ashwin Pajankar

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USELP -243: Paper III: Practical Course

Semester	Credits	Number of Practicals	Internal Assessment marks	External Assessment marks	Total marks
IV	1.5	08	15	35	50

At the end of this course, students will be able to
CO1: Understand and design simple digital systems.
CO2: Prepare the technical report on the experiments carried

List of Experiments (any 8)

Communication Practicals (any 4)

1. Design ,build and test Amplitude Modulator using transistor
2. Design ,build and test FM generation using VCO/IC 8038/varactor diode
3. Design ,build and test Time division multiplexing/Frequency division multiplexing
4. Design ,build and test Balance modulator and demodulator using IC 1408
5. Design ,build and test PPM/PWM /PAM

Arduino programming practicals (any 2)

1. To study and understand Interfacing LED array to arduino
2. To study and understand Interfacing keyboard to arduino
3. To study and understand Interfacing sensor to arduino
4. To study and understand interfacing bluetooth to arduino

Python programming practicals :(any 2)

1. Write a python program to enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
2. Write a python program to to generate the Fibonacci series.
3. Write a python program to that reverses the user defined value
4. Write a recursive function to print the factorial for a given number

Activity: Students can perform Project/Industrial visit. This will be equivalent to two experiments.

Suggested Practical Time Distribution

Slot number	Time Duration	Details
1	20 min	Introduction of practical
2	60 mins	Theory and design procedure of given practical circuit
3	30 mins	Circuit connections and how to perform the practical
4	60 mins	Students perform the practical Take readings Plot graphs(if any)
5	30 mins	Student complete the practical sheet of given experiment
6	30 mins	Refer the manuals/do extension practicals
7	30 min	Submission of practical sheet along with corrections if required
8	60 min	Activity