SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

under the Faculty of Science and technology

S. Y. B. Sc. Electronic Science Syllabus

To be implemented from June 2020

(CBCS Pattern)

SVITRIBAI PHULE PUNE UNIVERSITY,PUNE

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Structure of S. Y. B. Sc. Electronic Science

Sem	Paper Code	Paper	Paper title	credits	Periods/week		Evaluation		
					L*	P*	CIE*	UE*	Total
III	EL-231	I	Communication Electronics	2	3		15	35	50
	EL- 232	II	Digital System Design	2	3		15	35	50
	EL-233	III	Practical Course	2		4	15	35	50
IV	EL-241	I	Analog Circuit Design	2	3		15	35	50
	EL-242	II	Microcontroller and Python programming	2	3		15	35	50
	EL-243	III	Practical Course	2		4	15	35	50

**Abbrevations*

L:Lectures/week

P: Practicals/week

CIE: Continuous Internal Examination

UE: University Examination

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S.Y.B.Sc. (Electronic Science)-Semester-III
EL-231: Paper – I: Communication Electronics

Credits	Number of periods/week	Number of lectures of 50 minutes duration	CIE marks	UE marks	Total marks
02	03	36	15	35	50

Course outcomes:
This course provides basic knowledge of analog(continous wave) and digital 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.
CO5	Solve problems based on AM and FM performance parameters
CO6	Compare pulse modulation techniques such as PAM, PPM, PWM and compare TDM and FDM techniques used in communication
CO7	Understand need of sampling and sampling theorem as well as know about performance parameters of digital communication
CO8	Analyze difference between ASK, FSK , PSK as well as PCM and its applications

Unit	Contents	Lectures allotted
1	**Introduction to Electronic Communication**: Introduction to communication- means and modes, Block diagram of an electronic communication system, Electromagnetic spectrum , Brief idea of frequency allocation for radio communication system in India (TRAI) concept of Noise, signal-to-noise (S/N) ratio, Noise figure and noise temperature Need of modulation and demodulation	6
2	**Continuous-wave modulation techniques:** **Amplitude modulation**: AM waveform, mathematical expression of AM, concept of sideband, Definition and problems: modulation index, power distribution. AM using transistor, AM Receiver**:** demodulator circuit using diode and super-heterodyne receiver, characteristics of receiver: selectivity, sensitivity, Image frequency and dynamic range. Block diagram of AM communication system **Frequency modulation**: FM waveform, mathematical representation, frequency spectrum, bandwidth and modulation index., problems based on modulation index, frequency deviation, average power. FM Modulation using varactor diode. FM Demodulator: Foster-Seeley detector. Block Diagram of FM communication system.	16

	Comparison of AM and FM	
3	**Pulse modulation techniques:** Types of analog pulse modulation: concept and generation of PAM, PWM, PPM, Spectra of pulse modulation, concept of time division multiplexing and frequency division multiplexing	**6**
4	**Introduction to digital communication :** Block diagram of digital communication system, advantages of digital communication system, bit rate, baud rate and bandwidth. Serial and parallel communication, concept of sampling, Sampling theorem, PCM concept of keying techniques: ASK, FSK, PSK Block diagram of MODEM	**8**
	Total lectures	**36**

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.

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S.Y.B.Sc. (Electronic Science)-Semester III
EL-232: Paper- II: Digital Circuit Design

Credits	Number of periods/week	Number of lectures of 50 minutes duration	CIE marks	UE marks	Total marks
02	03	36	15	35	50

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	Distinguish between different logic families based on their performance parameters
CO2	Analyze basic combinational logic circuits for simple applications
CO3	Design combinational logic circuits using K maps for identified applications
CO4	Design Sequential logic circuits using state diagram, excitation table for identified applications
CO5	Understand and compare different types of ADC and their performance parameters using data sheets/manuals
CO6	Understand and compare different types of DAC and their performance parameters using data sheets/manuals

Unit	Contents	Lectures
1	**Logic families**: Revision of logic gates using diodes, transistors and MOSFETS Introduction to logic families and its performance parameters, Comparative study of TTL, CMOS, ECL with reference to performance parameters	4
2	**Combinational logic circuit design:** OR gate for Event detection, AND gate for Frequency measurement, EX-OR gate for Parity generation and checker, NOT gate for square wave generator, NAND gate for key debouncer circuit Design of code converters using K maps: BCD to Seven segment , Concept of adder using Look ahead carry generator , Keyboard encoder circuits : Priority encoder , Error detection technique : hamming code	12
3	**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.	10
4	**Data converters:** Revision of Data converters.: R-2R, binary weighted, counter type, successive approximation ADC: flash, Dual slope Comparative performance analysis of ADC :0808, 0804 and ICL7106 and DACs: 0808, 0804	10
	Total	36

Reference books:

1. Morris Mano, Digital Design, 3rd 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

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S.Y.B.Sc. Electronic Science -Semester IV
EL-241: Paper - I: Analog Circuit Design

Credits	Number of periods/week	Number of lectures of 50 minutes duration	CIE marks	UE marks	Total marks
02	03	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	Design single/multistage amplifier using transistor and analyze their frequency response base on gain-bandwidth product due to coupling /bypass capacitors
CO2	Classify and compare different power amplifiers
CO3	Understand and design push pull amplifier and need of heat sinks
CO4	Distinguish between Opamp Feedback circuits based on their configurations
CO5	Analyze the effect of negative and positive feedback on characteristics of Opamp
CO6	Understand and analyze the need of positive feedback in oscillator circuits
CO7	Design , develop and build circuits for identified applications

Unit	Contents	Lectures
1	**Amplifiers:** 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	6
2	**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. Class B amplifier: Push-pull amplifier concept, complimentary symmetry class-B push pull amplifier, crossover distortion, class AB push pull amplifier, Types of heat sinks.	12
3	**Opamp based Systems :** 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, Circuits: Adder, differential amplifier, integrator, differentiator, First order butterworth active filter Concept of Positive Feedback: Barkhousan criterion, Oscillator circuits -Wien bridge , Phase Shift ,astable multivibrator	14
4	**Application Systems:** Design of Audio Amplifier, Design of Public Address System Design of function generator	04
	Total	36

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

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S. Y. B. Sc. Electronic Science – Semester IV
EL-242: Paper II: Microcontroller and Python Programming

Credits	Number of periods/week	Number of lectures of 50 minutes duration	CIE marks	UE marks	Total marks
02	03	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(arduiono)
CO2	Write code/program using open source programming language(ardiuno) 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, tupules
CO5	Design , build and implement applications using ardiuno and python

Unit	Contents	Lectures
1	**Introduction to Microcontroller** Introduction to Arduino ,: Microcontrollers used in Arduino, Pin configuration and architecture, Concept of digital and analog ports.	4
2	**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 Serial Port Communication Function blocks: Analogread(), digitalread() functions Intensity control of LED with Pulse Width Modulation using analogWrite()	10
3	**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	12
4	**Python Functions , Modules And Packages** Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules, Programming using functions, modules and external packages Building blocks of python programs, Understanding string in built methods, List manipulation using in build methods, Dictionary manipulation, Programming using string, list and dictionary in built functions , tupules	10

	LED blinking using Arduino with python programming	
	Total	**36**

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

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S. Y. B. Sc. Practical Course

Credits/semester	Duration of one practical	CIE marks/semester	UE marks/semester	Total marks/semester
02	4 hours 20 mins	15	35	50

Laboratory requirements: Instruments

1. Power Supply(single and dual)
2. Signal Generator and function generators
3. CRO
4. Digital multimeters
5. Communication training kits/breadboards/tag boards

Software requirements

1. Arduino 10.0 programming enviornment and add on hardware modules
2. Python 3.0 and above

Guidelines for conducting practical:

As the practical in each semester is of 2 credits i.e.duration of 4 hours and 20 minutes. General guidelines for teachers to engage the students are as follows

1. **Utilization of allotted time for hardware practicals**
   a. Understanding the purpose of performing particular expt
   b. Understanding the knowhow of the expt such as circuit diagram, connections, performing the expt, analyzing and verifying the results, plotting the graphs, interpretation of results
   c. Expt can be performed on breadboard/circuit boards/tag boards
   d. Getting familier with datasheets for ICs or components
   e. extension of expt (if possible)
   f. Continuous assessment activity(Viva etc.)
   g. Simulation of experiment using softwares like proteus,pSpice etc
   h. Project like /skill development activity
   i. Poster presentation/project documentation

2**. Utilization of allotted time for software experiment**
   a. Understand the software (Arduino and python) : its features and facilities
   b. Self learning through small programs *for through understanding
   c. Understand step by step procedure to execute the program
   d. Understand interfacing of various modules to Arduino
   e. Exploring different features of Python programming
   f. Learning algorithms and flowcharts
   g. Building different application programs using arudino and python
   h. Project like/skill development activity

Note: One can extend the activities as per need of the particular experiment

Number of students per batch: 12

Evaluation Process:

- University Examination : 35 marks
- Continuous Internal Examination : 15 marks

Following are different methods of assessing the studies for internal practical examination

1. Oral
2. Journal
3. Mock tests
4. Attendance
5. Performance
6. Project/PLE/Industrial visit

Reference books:

- TTL manuals:National Semiconductor, Signetics
- CMOS manual
- EXAR manual
- Smart Power manual
- National semiconductor manual

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S.Y.B.Sc. (Electronic Science)
EL-233: Paper- III: Practical Course: SEMESTER III

Course outcomes:
This course provides hands on experience in communication and digital circuits, which can be conducted by standard circuits. Investigate the operation of several communication circuits and digital circuits (Combinational and sequential). Upon completion of this course student will be able to

CO1	Describe and explain the techniques of generation of AM/ FM and demodulation
CO2	Design FSK generation using standard IC XR 2206 refering data manuals
CO3	Describe and explain the TDM/ FDM generation technique
CO4	Demonstrate PPM/PWM/PAM and PCM techniques using standard circuits in data manuals
CO5	Design and build minimum complexity digital circuits using logic gates
CO6	Design and analyze different combinational and sequential logic circuits using standard ICs in data manuals
CO7	Design ADC/ DAC using data manuals and study its performance parameters

Total experiments: 10

Group B: List of Practicals (Communication Electronics): Any Five

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 Frequency Shift Keying(FSK) using XR 2206
4. Design ,build and test Time division multiplexing/Frequency division multiplexing
5. Design ,build and test Balance modulator and demodulator using IC 1408
6. Design ,build and test PPM/PWM /PAM
7. Demonstration of PCM/delta modulation
8. Design build and test FM Receiver

Group B:List of Practicals (Digital Circuit Design): Any Five

1. Design ,build and test BCD to 7 segment decoder
2. Design ,build and test Event counter/Frequeny counter/square wave generator using logic gates
3. Study of 4- Bit Arithmetic Unit using IC 74181
4. Design ,build and test DAC using R-2R ladder network
5. Design ,build and test ADC using IC 0808/IC 7109/IC 741/IC 324
6. Design ,build and test Sequence generator for stepper motor
7. Design ,build and test Priority keyboard encoder using IC 74148
8. Design ,build and test hamming code error detection circuit

SAVITRIBAI PHULE PUNE UNIVERSITY,PUNE
CBCS(2020 PATTERN)
S.Y.B.Sc. (Electronic Science)
EL-243: Paper- III: Practical Course: SEMESTER IV

Course outcomes:
This course provides hands on experience in communication and digital circuits, which can be conducted by standard circuits. Investigate the operation of several communication circuits and digital circuits (Combinational and sequential). Upon completion of this course student will be able to

CO1	Describe and explain the design procedure of different types of active filters and analyze its frequency response
CO2	Demonstrate positive feedback for oscillator circuits using standard ICs
CO3	Describe and explain design procedure for two stage amplifiers and application circuits
CO4	Design practical circuits for identified applications
CO5	Develop working setup and write programs using programming techniques of arduino
CO6	Demonstrate and explain interfacing hardware to arduino microcontroller
CO7	Solve problems using programming techniques of python

Total Expts: 10

Group A: List of Practicals (Analog Circuit Design): Any Five

1. Design,build and test butterworth first order Low Pass Filter and High Pass Filter using OPAMP IC-741
2. Design ,build and test Wein bridge oscillator/Phase shift oscillator
3. Design ,build and test Push pull amplifier
4. Design ,build and test Astable multivibrator using opamp
5. Design ,build and test of two stage amplifier using transistor
6. Design, build and test audio amplifier
7. Liquid level detector
8. Mini project/industrial visit/PLE

Group B: List of Practicals (Arudino and python programming): Any Five

arduino programming practicals:

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:

5. Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
6. Write a program to generate the Fibonacci series.
7. Write a function that reverses the user defined value
8. Write a recursive function to print the factorial for a given number