S.Y.B.Sc. Electronic Science Syllabi as per NEP 2020

S.Y.B.Sc. (Electronic Science) Semester - III

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous),
Shivajinagar, Pune - 5
Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU3101 Major Mandatory Major Paper 1 (Theory)
Course Name: Linear and Digital Integrated Circuits

Teaching Scheme: TH: 4 Hours/Week	**Credit: 04**
Examination Scheme: CIA: 40 Marks	**End-Sem : 60 Marks**

Prerequisite:

1. Basic Knowledge of Electronic Circuit Elements and circuits.

Course Objectives:

1. Develop the ability to identify different types of amplifiers.
2. Know the difference between discrete and integrated circuit amplifiers.
3. Understand the op-amp parameters and applications.
4. Design discrete and op-amp amplifiers.
5. Learn the design of various op-amp and IC 555 applications.
6. Gain the knowledge of Combinational and Sequential circuit design.
7. Understand the interfacing of input and output devices to digital ICs.

Course Outcomes:

At the end of the course the student should be able to:

1. Differentiate the single stage amplifiers, multistage amplifiers, op-amp amplifiers, Combinational circuits and sequential circuits.
2. Explain the types of amplifiers, applications of op-amp, 555 based multivibrators, basics of Combinational and sequential digital circuits.
3. Work on voltage gain, cut off frequency, gain bandwidth product, K-map design equations, state tables, excitation tables
4. Understand K-Map and simplify Boolean expressions

Course Contents:

Section-I: Linear Integrated Circuits

Unit 1: Single stage transistor amplifier (4 Lectures)

Introduction, General classification of amplifiers, ac and dc analysis of small signal amplifier, Single stage common emitter amplifier, Explanation of terms-gain, frequency response, bandwidth and gain bandwidth product.

Unit 2: Multistage transistor amplifiers (6 Lectures)

Introduction, Block diagram, Types of multistage amplifiers: Two stage R-C coupled, transformer coupled, direct coupled transistor amplifiers (Circuit diagram, Working, frequency response, advantages, disadvantages and applications of all types).

Unit 3: Op-Amp and its linear applications (14 Lectures)
Differential Amplifier, Block diagram, Equivalent circuit, Characteristics of an Ideal and Practical Op-Amp, Concept of feedback, negative and positive feedback, advantages of negative feedback, Open and closed loop configuration. Inverting, non-inverting amplifier, Concept of differential amplifier, Summing and Difference Amplifier, Integrator, Differentiator, Comparator, Schmitt trigger, Active low pass and high pass filters.

Unit 4: Non linear applications of op-amp (6 Lectures)
Oscillators: Concept, Barkhausen criterion for sustained oscillations, Phase Shift oscillator, Wien-bridge oscillator – (no derivation for each),
Multivibrators: Introduction to IC-555, Block diagram, Astable and Monostable multivibrator circuits. (Numerical Examples wherever applicable)

Section II: Digital Integrated Circuits

Unit 1: Combinational Circuits (12 lectures)
Revision of K maps, Design of code converters: BCD to Seven segments, Binary to Gray and Gray to binary, Parallel adder, Priority encoder, Parity generator/Checker, Magnitude comparator. (Relevant ICs)

Unit 2: Asynchronous counters (4 lectures)
Asynchronous counter using JK Flip flops, Up / down counter, Modulo counters, Cascading of asynchronous counters, Application of asynchronous counter(Digital clock). (Relevant ICs)

Unit 3: Synchronous counters (8 lectures)
State table, State diagram, Excitation table and Transition table, Types of counters, modulus and up-down counter, Design of synchronous counter using JK Flip Flop , T Flip Flop, Design of counter for given sequence (Relevant ICs).

Unit 3: Interfacing with Digital ICs (6 lectures)
Interfacing of LED's, single and multi-digit 7 segment displays/ drivers, Switches, Keypad, Thumbwheel switches and Relays. (Relevant ICs)

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Operational Amplifiers & Linear Integrated Circuits, James M. Fiore, Jaico Publishing House,
3. Electronic devices and applications, Salivahanan, Tata McGraw-Hill, 1st Edition
4. Linear Integrated Circuits, D. Roy Choudhury, Jain, 4th Edition, New Age
5. Digital Principles and Applications, A.P. Malvino, D. P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill.

6. Modern Digital Electronics, R P Jain, McGraw Hill, 5th Edition
7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)

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Modern College of Arts, Science and Commerce (Autonomous),
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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU3102 Major Mandatory (Practical 1)
Course Name: Linear Integrated Circuits Lab

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisite:

1. Fundamentals of small signal amplifiers.
2. Basics of op-amp and timer IC -555.

Course Objectives:

1. Develop the ability to design different types of amplifiers.
2. Design op-amp applications.
3. Learn to design IC 555 applications.

Course Outcomes:

At the end of the course the student should be able to:

1. Design, build and test small signal amplifier.
2. Study frequency response.
3. Design and test op-amp applications.
4. Design and test IC - 555 timer application.

List of Experiments:

Experiments (Any 12 from 1 to 15) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Design of an inverting and non-inverting amplifier using Op-amp (741) for dc voltage for given gain.
2. Study of summing amplifier and difference amplifier.
3. Study of comparator and its application as zero-crossing detector.
4. Study of op-amp as an Integrator.
5. Study of op-amp as a Differentiator.
6. Design of a Wien bridge oscillator for a given frequency using an op-amp.
7. Design and study of a Phase shift oscillator for a given frequency using an op-amp.
8. Design a Butterworth Low Pass active Filter (1^{st} order) & study its frequency Response
9. Design a Butterworth High Pass active Filter (1^{st} order) & study its frequency Response.
10. Design single stage CE amplifier for a given voltage gain.
11. Design of an Astable Multivibrator for given specification using IC 555 Timer.
12. Design of a Monostable Multivibrator for given specification using IC 555 Timer.

13. Study of two stage CE amplifier.
14. Study of AMV using op-amp.
15. Study of data sheet of op-amp IC 741.
16. Comparative study of op-amp ICs LM 358, Op-07 and LM324.

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU3102 Major Mandatory (Practical 2)
Course Name: Digital Integrated Circuits Lab

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:
1. K-map design.
2. Basics of Combinational and Sequential circuits.

Course Objectives:
1. Develop the ability to identify Combinational and Sequential circuits.
2. Know the K-map design of Combinational and Sequential circuits.
3. Understand the interfacing of input and output devices.

Course Outcomes:
At the end of the course the student should be able to:
1. Design, build and test combination circuits.
2. Design, build and test sequential circuits.
3. Interface the input and output devices to digital IC.
4. Design and develop applications of digital circuits.

List of Experiments:

Experiments (Any 12 from 1 to 15) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. To design a Combinational logic circuit for a specified Truth Table.
2. Design of Half Adder and Full Adder circuits.
3. Design of Half Subtractor circuit.
4. Study of 4 bit binary parallel adder using IC 7483/ CD74HCT283.
5. Interfacing of seven segment display with IC 7447 / CD4511.
6. Study of JK Master-slave flip-flop using IC 7476 / 4027.
7. Build and study a 3 bit ripple counter using JK Flip-Flop IC 7476 / 4027.
8. Design a 3 bit synchronous 3 bit up counter using JK Flip-Flop IC 7476 / 4027.
9. Design a 3 bit synchronous 3 bit down counter using JK Flip-Flop IC 7476/ 4027.
10. Study of modulo counter IC 7490 / 4518.
11. Study of two digit decimal counter using IC 7490 / 4518.
12. Interfacing of TWS and SSD
13. Study of relay driver circuit.

14. Interfacing of DIP switches and LED bank.
15. Study of magnitude comparator IC 7485 / 4063.

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU3301 Minor Mandatory (Theory)
Course Name: Introduction to Analog and Digital Electronics

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisite Courses:
1. Basic Knowledge of Electricity

Course Objectives:
1. To get familiar with basic electronic components
2. To understand different network theorems.
3. To get familiar with number systems and codes.
4. To understand basic logic gates, Boolean algebra.

Course Outcomes:
On completion of the course, student will be able to–
1. Know working and types of basic electronic components.
2. Understand working and types of Semiconductor Diode and BJT.
3. Understand number systems and logic gates.

Course Contents
Unit 1: Elements of Basic Electronics (10 Lectures)
Study of basic circuit elements:
Resistor- specification, types- fixed, variable, color coding of resistor, applications
Capacitor- working principle, specification, types, applications
Inductor - working principle, types, applications
Transformer - working principle, specifications, types, applications
Relays, Batteries, Switches, (Working principle, circuit symbols, types, specifications and applications).

Unit 2: Semiconductor devices (10 Lectures)
Semiconductors, Types of Semiconductors, PN junction diode: construction, working principle, IV characteristics and applications, BJT: construction, working principle, IV characteristics and applications.

Unit 3: Number Systems (5 Lectures)
Introduction to decimal, binary and hexadecimal number systems, Introduction to analog signal and digital signals, Positive and Negative Logic.

Unit 4: **Logic Gates (5 Lectures)**
Logic gates: definition, symbols, truth tables, Boolean expressions of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates, applications of logic gates.

Text/ Reference Books:

1. Principles of Electronics: V.K. Mehta, S. Chand and Co.
2. A Textbook of Applied Electronics (Multicolour Edition), Dr. R S Sedha, 3rd Edition, S. Chand Publishing
3. Digital Electronics: Jain R.P., Tata McGraw Hill
4. Digital Principles and Applications, A.P. Malvino, D. P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU3301 Minor Mandatory (Practical)
Course Name: Analog and Digital Electronics lab

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisite Courses:
1. Basic information regarding semiconductor physics.
2. General information of electronic components.
3. Characteristics and identification of electronic components.

Course Objectives:
1. To learn identification of electronic circuit components, specifications and Characteristics.
2. To study IV characteristics of active devices.
3. To learn the applications of diodes and BJT
4. To verify truth tables of digital gates and basic conversions of logical expressions.

Course Outcomes:
On completion of the course, student will be able to–
1. Understand how to identify, use and construct electronic circuits with circuit elements.
2. Build and test diode half / full wave rectifier.

3. Differentiate different logic gates and simplification of logic expressions using them.

List of Experiments

Experiments (Any 12) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Study of Signal generator and CRO.
2. Testing of electronic components using multimeter : Diode, LED, Seven Segment Display, Transistor, LDR
3. Study of charging and discharging of capacitor
4. Study of the I-V Characteristics of P-N junction diode
5. Frequency response study of R-C low pass filter
6. Frequency response study of R-C high pass filter
7. Study of half wave rectifier
8. Study of full wave rectifier
9. Study of Basic Gates
10. Study of basic gates using Universal Gates
11. Transistor as a switch
12. Study of relay driver circuit
13. Study of half adder
14. Study of half Subtractor

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Second Year of B.Sc.

(2023 Course under NEP 2020)

Course Code: 23ScEleU3401 OE (Theory)

Course Name: Consumer Electronics

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**

Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. General information of different home appliance
2. Basic knowledge of use of Air conditioner.
3. Basic knowledge of use and functions of mobile, TV.
4. Basic information about concept of home automation and smart homes.

Course Objectives:

1. To understand working principles of home appliance
2. To understand specifications of home appliance
3. To study front panel controls of home appliance.
4. Understand the symptoms and simple faults.

Course outcomes:

1. Identification of proper location for the appliances.
2. Installation and checking of accessories.
3. Checking appliance functioning.
4. Understand the basic communication system of mobile.

Unit 1:- Domestic Kitchen appliances [6]

Refrigerator: working principle, types, specifications and features, Induction cooker: Working principle of Induction cooker, Microwave oven: Functioning, types, specifications, features, front panel control.

Unit 2:- Air Conditioner, Washing machines and Vacuum cleaner [8]

Air Conditioner: types, working principle, specifications, features, Washing machines: Functioning, types, specifications, features, front panel control, Vacuum cleaner: Functioning, types, specifications, features, robotics vacuum cleaner.

Unit 3:- Television [6]

Television: Working principle, types, specifications, features, LED TV- comparison with earlier TVs, Resolution- VHD, 4K, UHD, OLED, QLED, Smart TV- types and features.

Unit 4:- Mobile [6]

Mobile communication: Connection Establishment, Frequency Allocation, Routing, Overview of Generations of Mobile Communication Technologies- 2G,3G,4G,5G

SMART phones – inbuilt features, Bluetooth, Wi-fi, different sensors, apps, Operating system- definition, functions of OS, types of OS, Role of mobile in day today life.

Unit 5:- Home Automation [4]

Automation – definition, components, Internet of Things (IoT), Smart home: concept of smart home, features, overview of smart homes in India and other developed countries.

Reference books –

1. P. Bali, Consumer Electronics, Pearson Education (2008)
2. R.G. Gupta, Audio and Video systems, Tata McGraw Hill (2004)
3. Principles of Electronic Communication Systems, Frenzel, 4th Edition, McGraw Hill.

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU5101 VSC (Practical)
Course Name: Simulation of Analog and Digital circuits – II

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. General information of simulation software.
2. Basic knowledge of electronic components and circuits.

Course Objectives:

1. To learn simulation software.
2. To design basic circuits.
3. To verify the output of the circuits in simulation software.

Course Outcomes:

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

1. Understand use of simulation software.
2. Select different components in simulation software.
3. Design and simulate the circuit in simulation software.
4. Compare the output with ideal/expected values.

List of Experiments

Experiments (Any 12) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Design and Simulate the inverting and non-inverting amplifiers for given gain.
2. Design and Simulate op-amp integrator and differentiator circuit.
3. Design and Simulate the active low pass and high pass filters of given cut-off frequency.
4. Design and Simulate a Wien Bridge oscillator for given oscillation frequency.
5. Design and Simulate phase shift oscillator for given oscillation frequency.
6. Design and Simulate an Astable Multivibrator for given specification using IC 555 Timer.
7. Design and Simulate a Monostable Multivibrator for given specification using IC 555 Timer.
8. Design and Simulate single stage CE amplifier.
9. Design and Simulate Astable Multivibrator using op-amp
10. Simulate 4-bit synchronous counter using Flip-Flop IC 7476 / 4027.
11. Simulate decimal to BCD priority encoder 74147/ CD 40147.
12. Simulate seven segment display decoder for common cathode and common anode.
13. Simulate of 4 bit binary parallel adder using IC 7483/ CD74HCT283.
14. Simulate of two digit decimal counter using IC 7490/ 4518.

15. Simulate the interfacing of TWS and SSD.
16. Simulate magnitude comparator using IC 7485/ 4063.

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Second Year of B.Sc.
(2023 Course under NEP 2020)

Course Code: 23ScEleU3002 Mini Project (Practical)
Course Name: Mini Electronics Project

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:
1. Basic information of Electronic components.
2. General information of electronic circuits.
3. Electronic circuit design.

Course objectives:
1. To select Mini Project
2. To design, build and test Mini Project.

Course Outcomes:
On completion of the course, student will be able to–
1. Understand how to select a Mini Project theme.
2. Purchase components as per the circuit diagram.
3. Design and develop PCB.
4. Test the Mini Project.
5. Prepare project report.

Guideline:

For the project course, student can select a project related to any domain relevant to Electronic Science. The student should report about the progress of a project to the guide at least once in the week. Logbook of the continuous progress of the work should be maintained by the candidate. One copy of the project report should be submitted to the department and another copy can be kept by the student. The assessment of the project work is a continuous process.

The guidelines of the assessment of the project for in-semester examination (Concurrent examination) as well as end-semester examination are as follows:

For CIE:
1. Project Selection, Reference work, first presentation (10)
2. System development, designing, testing (15)
3. Report writing, Demonstration and presentation (15)

For ESE:

1. Self-Expression, and Communication Skill (10)
2. Demonstration and Presentation (30)
3. Viva voce. (10)
4. Overall Performance (10)

S.Y.B.Sc. (Electronic Science) Semester – IV

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Modern College of Arts, Science and Commerce (Autonomous),
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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU4101 Major Mandatory Major Paper 4 (Theory)
Course Name: Microcontroller and its interfacing

Teaching Scheme: TH: 4 Hours/Week	**Credit: 04**
Examination Scheme: CIA: 40 Marks	**End-Sem : 60 Marks**

Prerequisites:

1. Basic knowledge of digital electronics.
2. General information of logic gates, flip flops.
3. Basic knowledge of registers, counters.

Course Objectives:

1. Understand basic concept of microprocessor.
2. Study of architecture of microcontroller.
3. Understand basic difference between microprocessor and microcontroller.
4. Write an assembly language program.

Course Outcomes:

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

1. Program code for a given application.
2. Develop the microcontroller based system.
3. Make use of timers for delay generation.
4. Understand the applications of microcontroller based systems.

Section I: Fundamentals of Microcontroller

Unit 1: Overview of Microprocessors: (4 Lectures)

Introduction to microprocessors, Microprocessor based systems: Block diagram, Input/Output Devices, Data storage (RAM and ROM), Memory organization & addressing, Memory Map and Memory Interfacing.

Unit 2: Fundamentals of Microcontrollers: (12 Lectures)

Introduction to Microcontrollers, 8051 microcontroller: features, overview of 8051 family, block diagram , architecture, programming model, RAM and ROM memory map, I/O ports, Timers, Stack pointer and stack memory, Interrupts and serial communication.

Unit 3: Instruction set of 8051 (10 Lectures**)**

Addressing Modes: immediate addressing, register addressing, direct addressing, register indirect addressing and indexed addressing, Different Groups of Instructions, Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Boolean Instructions, Program branching instructions.

Unit 4: Assembly Language Programming: (14 Lectures**)**

Algorithms, Flow Charts, Assembly Language instruction Format, Assembler Directives (ORG, EQU, DB, DW, DS, END) Arithmetic Programs: 8-bit addition, subtraction, multiplication and division, One's and two's complement of 16-bit numbers, Code Conversion Programs**:** Hex to ASCII and BCD to binary conversion, Delay generation, I/O port program: LED blinking, one digit counter.

Section II: Interfacing to 8051

Unit 1: 8051 Timer programming: (6 Lectures**)**

Basic structure, Control registers, Modes of timers, Delay calculation steps, programming of timers in different modes, use of timer delay for the port programming.

Unit 2: Serial Communication: (6 Lectures**)**

Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly. Use of serial port to transmit and to receive a message.

Unit 3: 8051 Microcontroller interfacing I: (8 Lectures)

Interfacing of Switch, Thumb wheel switch, Transistor, LED, Seven Segment Display, IR sensor and PIR sensor. Switch on/off LED with respect to switch / IR / PIR status.

Unit4: 8051 Microcontroller interfacing II:(10 Lectures)

Interfacing of 16x2 LCD display, Stepper motor, DC motor, DAC and ADC. DC motor speed control using PWM.

Reference Books:

1. Microprocessor Architecture Programming & applications with 8085, 2002, R.S. Goankar, Prentice Hall.
2. The 8051 Microcontroller and Embedded Systems using Assembly and C, M.A.Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd edition, 2007, Pearson Education India.
3. 8051 Microcontroller: Architecture, Programming and Applications, Kenneth J. Ayala, 2nd edition, Delmar Cengage Learning.
4. 8051 Microcontroller Architecture, Programming and Application, M. Mahalakshmi, 1st Edition, University Science Press.
5. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing, Subrata Ghoshal, 2nd Edition, Pearson.

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Modern College of Arts, Science and Commerce (Autonomous),
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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU4102 Major Mandatory (Practical 1)
Course Name: Assembly Language Programming Lab

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. Knowledge of assembly language instructions.
2. Information of architecture of microcontroller.

Course Objectives:

1. Develop the ability to write the assembly language codes.
2. Know the importance of some of the CPU registers.
3. Understand the use of specific instructions for a particular task.

Course Outcomes:

At the end of the course the student should be able to:

1. Make use of data transfer, Arithmetic, Logical, Bit and branching instructions.
2. Write the simple codes for basic operations.
3. Read any one ports data and write it to another one.
4. Write the delay subroutines using timers.

List of Experiments:

Experiments (Any 12 from 1 to 15) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Addition and subtraction of two 8 bit unsigned numbers.
2. Addition of 8-bit unsigned numbers stored in RAM.
3. Addition of two 16 bit unsigned numbers.
4. Multiplication and division of two 8 bit unsigned numbers.
5. Packed BCD to unpacked BCD and vice versa.
6. Decimal to Hex conversion.
7. Single digit hex to ASCII and ASCII to hex code conversion.
8. Block data transfer.
9. Use of CALL and RET Instructions to access subroutines.
10. Binary counter.
11. Comparison of string.
12. Bit toggling.
13. Program to read a port data, complement the data and write to the other port.
14. Ring counter.
15. Program to find the largest/smallest number.

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Second Year of B.Sc.

(2023 Course under NEP 2020)

Course Code: 23ScEleU4102 Major Mandatory (Practical 2)

Course Name: 8051 Interfacing Lab

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**

Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. Knowledge of assembly language instructions.
2. Information of architecture of microcontroller.

Course Objectives:

After the successful completion of the course, the students will be able to:

1. Develop the ability to interface different I/O devices.
2. Know the importance of time delays while using the sensors and actuators.
3. Understand the simulation and real time testing of interfaced devices.

Course Outcomes:

At the end of the course the student should be able to:

1. Interface LED banks and generate different patterns on them.
2. Write a program to read TWS and display its value on SSD.
3. Interface ADC and DAC.
4. Make use of motors.

List of Experiments:

Experiments (Any 12 from 1 to 15) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Program to implement 8- bit binary counter on LED's connected to a port.
2. Program to flash LEDs connected to a port. Generate delay using timer.
3. Program to rotate the contents of the accumulator first right and then left on LED bank connected to any one I/O port.
4. Program to read data from TWS connected to anyone I/O port and display it on the seven segment LED display.
5. Program to implement a single digit decimal counter on the seven segment LED display.
6. To interface seven segment LED display with 8051 microcontroller and display 'HELP' on the seven segment LED display.
7. To toggle '1234' as '1324' in the seven segment LED display.
8. Interface stepper motor with 8051 and write a program to rotate in clockwise or counter clockwise direction.
9. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clockwise or counter clockwise direction.
10. Program to rotate the DC motor, change the speed of the DC motor.

11. ADC 0804 interfacing.
12. DAC 0808 interfacing.
13. 16x2 LCD interfacing.
14. Interfacing of DIP switches and LED bank.
15. Line following robot.

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU4301 Minor Mandatory (Theory)
Course Name: Sensors, Actuators and Data converters

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. Basic performance parameters of sensors.
2. Understanding of operating principles, constructions and specifications of sensors.
3. Classification of different types of sensors and actuators.
4. Selection of sensors and actuators for a specific application.
5. To study different types of data converters.

Course Outcomes:

On completion of the course, the students will be able to:

1. Define basic performance parameters of sensors and identify their applications.
2. Explain operating principles, construction and specifications of various sensors and actuators.
3. Classify various types of sensors and actuators.
4. Select the data converters for a particular application.

Course Contents:

Unit 1: Fundamentals of Sensors: (6 Lectures)

Need of sensors, Definition, Types of sensors, Operating Principle, Specification and performance parameters: Accuracy, Resolution, Threshold, impedance, Sensitivity, Hysteresis, Linearity, Range, Reliability, Selectivity.

Unit 2: Commonly used Sensors (8 Lectures)

Principle, Construction, Working, specifications of sensors and applications: temperature, displacement, Force, Pressure, position/ Motion, level, flow, Humidity, pH sensors, load cells, smoke sensor, sound, and light.

Unit 3: Actuators (8 Lectures)

Actuators: principle, construction and specifications, Pressure controller, flow control actuators (Valves), Solid State Relay, Electromagnetic devices: Relay, Solenoid, Electromechanical: Servo motor, DC motor, AC motor and Stepper motor.

Unit 4: Data Converters (8 Lectures)

Basic concepts of digital to analog conversion (DAC) and Analog to digital conversion (ADC), specifications of ADC and DAC, Binary weighted and R - 2 R ladder networks, Analog to digital conversion: Comparative (Flash), Successive approximation, dual slope ADC techniques, Study of DAC (IC 0808) & ADC (IC 0804) (Features & functional description)

Reference books:

1. Modern Digital Electronics, R P Jain, McGraw Hill, 5th Edition
2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
3. Electronic Instrumentation, H. S. Kalsi., McGraw Hill, 2nd Edition
4. Instrumentation Devices and systems, Rangan, Mani and Sharma, McGraw Hill, 2nd Edition.

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU4301 Minor Mandatory (Practical)
Course Name: Sensors, Actuators and Data converters Lab

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. Basic knowledge of Sensors, Actuators and Data converters.

Course Outcomes

On completion of the course, the students will be able to:

1. Know the performance parameters of practical sensors.
2. Explain the operating principles and construction of various sensors and actuators.
3. Build and test sensor, actuator systems.
4. Select the data converters for a particular application.

Experiments: Sensors, Actuators and Data Converter:

Experiments (Any 12 from 1 to 15) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Study of thermistor characteristics.
2. Study of IR Sensors
3. Study of an application of LDR
4. Study of Load cell sensor

5. Study of Proximity sensor
6. Displacement Measurement using LVDT.
7. Study of DC motor speed control
8. Study of stepper motor driver circuit
9. Study of solenoid flow control circuit
10. Study of temperature sensor LM 35
11. Study of R-2R ladder DAC.
12. Study of Binary weighted DAC.
13. Study of Parallel/Flash ADC.
14. Study of ADC IC 0804.
15. Study of DAC IC 0808.

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Second Year of B.Sc.

(2023 Course under NEP 2020)

Course Code: 23ScEleU4401 **OE (Theory)**

Course Name: Security and surveillance system

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**

Examination Scheme: CIA: 20 Marks **End-Sem : 40 Marks**

Prerequisites:

1. General information of need of security system
2. Basic knowledge of different types of security systems.
3. General information of CCTV cameras.
4. Basic information about scope of security systems in different fields.

Course Objectives:

1. Explain the use of security systems in different context.
2. Understand different type and functions of cameras used in security surveillance.
3. Understand roll of recording devices in surveillance systems.
4. Explain the range of camera accessories used in security surveillance.

Course Outcomes:

At the end of the course the student should be able to:

1. Identify different types of CCTV equipment.
2. Understand local and international regulations and standards.
3. To check operational status of CCTV recording devices.
4. Understand Operation of different types of CCTV equipment to capture relevant, scenes.

Unit 1:- Introduction to Security Systems: 04 Lecture

Definition of Security Systems, need of security system, application areas of security system, advantages of security system, Overview of use of security system in India, local regulations for installation of CCTV camera.

Unit 2:- Closed Circuit Television 06 Lecture

Introduction to CCTV: - Definition, applications, CCTV Uses, Indoor and Out door CCTV Systems, CCTV Manufacturing Companies, CCTV Spare parts and Accessories: Camera, DC adapter, multiplexer, splitter, switcher, DVR box, cables, Firmware software.

Unit 3: - CCTV Cameras 10 Lecture

CCTV Camera types: Dome Security Camera, Outdoor Security Camera, Pan Tilt Zoom Camera (PTZ), Network IP Camera, Wireless Security Camera, Hidden Security Camera, Day and Night Camera, IR Camera, Spy Camera, Under Water Camera, Remote Joysticks, Digital, Mini USB Camera, Wireless Camera.

Unit 4:- Recording and Monitoring 10 Lecture

Difference between CCTV Monitor and TV Monitor, Wireless Transmitter and Receiver, Digital Video Recording card/ hard disk, CCTV networking (definition only), CCTV Monitoring System: Local and Remote viewing CCTV systems.

Reference books:

1. CCTV Surveillance: Video practices and technology, Hemant Kruegle, 2nd Edition, Elsevier Science.
2. What is CCTV?: Electronic Surveillance, Satish Ubhalkar, Kindle Edition, 2020.
3. Digital CCTV: A Security Professional's Guide, Emily M. Harwood and Alan Matchett, ebook.

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Second Year of B.Sc.

(2023 Course under NEP 2020)

Course Code: 23ScEleU4601 SEC (Practical)

Course Name: Design, built and test Electronic systems

Teaching Scheme: TH: 4 Hours/Week Credit: 02

Examination Scheme: CIA: 20 Marks End-Sem: 30 Marks

Prerequisites:

1. Basic knowledge of analog and digital circuits.
2. Information of circuit design.
3. PCB design and development.
4. Circuit testing.

Course Objectives:

After the successful completion of the course, the students will be able to:

1. Develop the ability to identify need of particular circuit.
2. Know the system design.
3. Application of basic knowledge for the system design and development.

Course Outcomes:

At the end of the course the student should be able to:

1. Differentiate the requirements of analog and digital systems.
2. Explain the system design steps.
3. Assemble, test and fine tune the system for the required results.
4. Write a source code for given systems.

List of Experiments:

Experiments (Any 12 from 1 to 15) + Activity / Study tour report / Assignments / Demonstration / Virtual lab

1. Automatic LED emergency light
2. Infrared motion detection
3. Four digit object counter
4. Public Address system
5. DC motor speed variation using PWM
6. Water level indicator using ultrasonic transceiver
7. ON- OFF temperature controller
8. Digital thermometer
9. Electronic weighing machine
10. Waveform generator
11. Fire alarm
12. Bank token generator
13. Line following robot
14. Street light control
15. Traffic Signal control
16. Motion sensor application

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Second Year of B.Sc.
(2023 Course under NEP 2020)
Course Code: 23ScEleU4003 CEP (Theory)
Course Name: E- waste management

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisites:

1. Basic information of Electronic products.

Course Objectives:

After the successful completion of the course, the students will be able to:

1. Develop the ability to identify different types of E-wastes.
2. Know the various techniques of E-waste disposal.
3. Understand the Environmentally Sound E-Waste Management.

Course Outcomes:

At the end of the course the student should be able to:

1. Differentiate the E-waste disposal methods.
2. Explain the Environmentally Sound E-Waste Management.
3. Explain the unique initiatives taken by the world for the E-waste management and disposal.
4. Tell the Government policies on E-waste management.

Unit-1 Introduction [6]

What is E-Waste, Indian and global scenario of e-Waste, Growth of Electrical and Electronics industry in India, E-waste generation in India, Composition of e-waste, Possible hazardous substances present in e-waste, Environmental and Health implications.

Unit 2: Methods of E-waste disposal [12]

Historic methods of waste disposal – dumping, burning, landfill, Demerits of historic methods, Recycling and recovery technologies –sorting, crushing, separation; Life cycle assessment of a product – introduction.

Unit 3: E-Waste Management [12]

Emerging recycling and recovery technologies, Guidelines for management of e-waste, Treatment technology for e-waste, Guidelines for establishment of integrated e-waste recycling and treatment facility, Standards for E-Waste Management. Case studies for single E-waste.

Reference Books:

1. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi.
2. Electronic Waste: Recycling and Reprocessing for a Sustainable Future, Maria Holuszko, Amit Kumar and Denise Espinosa, Wiley-VCH, 2022.
3. Electronic Waste and Printed Circuit Board Recycling Technologies, Muammer Kaya, Springer, 2019.
4. Management of Electronic Waste: Resource Recovery, Technology and Regulation, Anshu Priya, Wiley, 2023.