Progressive Education Society's

Modern College of Arts, Science and Commerce,

Shivajinagar, Pune – 5

(Autonomous College)

Second Year of B.Sc. (Computer Science) Minor: Electronics

Under Revised NEP2020 (NEP 2024)

SEMESTER III

Course Code: 24CsEleU3302 **Course Name: Intel 8051 and Raspberry PI**

Teaching Scheme: PR: 4hrs. / Week **Credit : 02**

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

Prerequisites: Basic knowledge of Digital Electronics and C programming.

Course Outcomes:

- Understand the architecture and operation of the 8051 and AVR microcontrollers.
- Learn assembly and embedded C programming for these microcontrollers.
- Develop interfacing skills for peripherals such as LCD, Keypad, ADC, DAC, motors, and sensors.
- Implement embedded system applications using 8051

Course Contents

Chapter 1	**Introduction to Microcontrollers**	08 hrs
	Architecture & Features :- Intel 8051 architecture, Internal memory organization (RAM, ROM), Special function registers (SFRs), I/O ports and pin configuration, Timers and Counters ,Interrupts. **Assembly language programming**:- Addressing modes, Instruction set, assembler directives(ORG,DB, END),Delay generation using loops and timers, Serial communication.	
Chapter 2	C **Programming for 8051 microcontroller**	8hrs
	Peripheral Interfacing:- LED, Seven-Segment Display, LCD and Keypad, Serial Communication (UART),Timer-based delay generation.	
Chapter 3	**Raspberry Pi Fundamentals**	6Hrs
	Introduction: Raspberry Pi, Features of Raspberry Pi, History of Raspberry Pi, Architecture Overview, CPU Overview, CPU Pipeline Stages, Branch Prediction and Folding, Essential Input Output Devices, Setting Up Raspberry Pi, Raspbian OS, Linux commands for Raspberry Pi. GPIO Pins, Configuring GPIO Pins,	

Chapter 4	**Python programming for Raspberry Pi**	8 Hrs
	Python programming on Raspberry Pi platform, modules of Python Raspberry Pi. GPU Overview, Importing Libraries, Python and Hardware Access, **Interfacing**: LED, SSD, Switches, Alphanumeric LCD, ADC, Servo Motor, Stepper Motor with Raspberry Pi. Interfacing different sensors to Raspberry Pi – temperature, pressure, DHT11,PIR sensor, Ultrasonic sensor	

Text/ Reference Books:

1. "The 8051 Microcontroller and Embedded Systems" – Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin McKinlay.
2. 8051 microcontroller hardware,software and application, B udayshankara,MS milikarjuna swami, Tatamcgrahill companies.
3. Programming the Raspberry Pi Getting Started with Python, Simon Monk, The McGrawHill Companies.
4. Python for Everybody, Dr. Charles R. Severance.
5. Learn RPI Programming with Python, Wolfram Donat.
6. Raspberry Pi User Guide by Eben Upton, Greath Halfacree John Wiley Publication
7. Raspberry Pi CookBook: Software & Hardware problems and Solutions by Simon Monk.
8. Python Crash Course: A Hands-On, Project-Based Introduction to Programming.
9. Raspberry Pi Robotic Projects - Third Edition Machine Learning For Absolute Beginner .

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SEMESTER III

Course Code: 24CsEleU3302 Course Name: Lab course on Intel 8051 and Raspbery Pi

Teaching Scheme: PR: 4 hrs / Week **Credit : 02**

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

Prerequisites: Basic knowledge of Digital Electronics and C programming

Course Objectives: This course will enable the students to:

1. Learn basic python programming.
2. Learn interfacing with Raspberry Pi.
3. Learn general input and Output connection.
4. Understand and apply Python syntax and semantics in program development.

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

1. Understand the architecture and operation of the 8051 and Raspberry PI.
2. Learn assembly and embedded C programming for these microcontrollers.
3. Develop interfacing skills for peripherals such as LCD, Keypad, ADC, DAC, motors, and sensors.
4. Implement embedded system applications using 8051 and Raspberry PI.
5. Utilize Python & built-in data structures such as lists, tuples, sets, and dictionaries effectively.
6. Setting up the development environment.

Course Contents:(Any 12)

1. Basics of assembly program: basic arithmetic and logical instruction handling Code conversion, Equal length array addition, Array sorting.
2. Study of LED interfacing to 8051 and programme for LED blinking using 8051
3. Study of SSD interfacing and programming using 8051 as rolling display.
4. Study of Interfacing thumb wheel switch and SSD and programming of 8051
5. Study of LCD interfacing and its programming using 8051

6. Create a simple serial communication program to send characters between the 8051 and PC.
7. Study of waveform generations using DAC 8051.
8. Study for PWM Generation for speed control of DC motor using PIC
9. Study the Configuration of Raspberian OS.
10. Program to find square root of a number using Python programming.
11. Find prime number using Python programming.
12. Find smallest /largest from array of numbers using Python programming.
13. Program the Raspberry Pi to control light emitting diodes (LEDs) and to get feedback from a switch connected to the GPIO pins.
14. Program the Raspberry Pi to get the temperature from a sensor connected to the GPIO pins.
15. Program the Raspberry Pi to detect room light from a photocell sensor connected to the GPIO pins.
16. Program the Raspberry Pi for Motion detection using Raspberry pi.
17. Program the Raspberry Pi for interfacing the DHT11 sensor.
18. Program the Raspberry Pi for interfacing the Ultrasonic sensor.
19. Program the Raspberry Pi for water level monitor.