Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
Autonomous

Course Structure & Credit Distribution for S. Y. B. Sc. (Computer Science) Electronics (Sem. III) (2022 Pattern)
(w.e.f. June, 2023)

Semester	Paper Code	Title of Paper	No. of Credits
III	UCSEL231	8051 Architecture and Programming	3
	UCSEL232	Instrumentation Systems	3
	UCSEL233	Electronic Practical's	3

SYLLABUS (CBCS) FOR S. Y. B. Sc. (Computer Science)

Electronics

(w.e.f. June, 2023)

Class: S.Y. B. Sc. (Comp. Sci.) (Sem III) (2022 Pattern)

Paper Code : UCSEL231

Title of Paper: 8051 Architecture and Programming

Paper : I

Credit : 3 **No. of lectures: 48**

Course Objectives:

1. To study the basics of 8051 microcontroller.
2. To study the Programming of 8051 microcontroller.
3. To study the interfacing techniques of 8051 microcontroller.
4. To apply knowledge of 8051 to design different application circuits.
5. To introduce the basic concepts of advanced Microcontrollers.
6. To introduce advance microcontrollers.
7. To learn the Embedded C programming language.

Course Outcomes:

CO1. Get familiar with general microcontroller and their working.
CO2. Knowledge about architecture and programming syntaxes of microcontroller.
CO3. Run the programmes on the Compiler "Keil".
CO4. Interfacing of input output peripherals to the 8051 microcontrollers.
CO5. Designing microcontroller based hobby projects.
CO6. Comparing the microcontrollers.
CO7. Comparing Assembly Language and Embedded C language.

Unit 1: Architecture of 8051 Microcontroller **[12]**

Introduction to microcontrollers, difference in controller and processor, architecture of 8051, Internal block diagram, Internal RAM organization, SFRS, pin functions of 8051, I/O port structure & Operation, External Memory Interface- RAM, ROM, EPROM.

UNIT-2: Instruction Set **[12]**

Instruction classification, Instruction set, Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives (org, end), features with example, I/O Bit & Byte programming using assembly language for LED and seven segment display (SSD) interfacing. Introduction to 8051 programming in C

UNIT- 3: Timer/Counter, Interrupts **[12]**

Timer / counter: TMOD, TCON, SCON, SBUF, PCON Registers, Timer modes, programming for time delay using mode 1 and mode 2.

Interrupts: Introduction to interrupt ,Interrupt types and their vector addresses, Interrupt enable register and interrupt priority register(IE,IP)

UNIT- 4: I/O Interfacing & serial communication of 8051 [12]

Interfacing: ADC, DAC, LCD, stepper motor, Synchronous and asynchronous serial communication, Programming serial port without interrupt, Use of timer to select baud rate for serial communication.

Study of advanced microcontrollers (ARM & PIC): Features and applications

Reference Books:

1. The 8051 Microcontroller Architecture, Programming and application [Second Edition] Kenneth J. Ayala, Penram International (1999)
2. 8051 microcontroller and Embedded system using assembly and C : Mazidi, Mazidi and McKinley, Pearson publications
3. The 8051 microcontroller – Architecture, programming and applications: K.Uma Rao and AndhePallavi, Pearson publications.
4. The 8051 Microcontroller and Embedded Systems using Assembly and C, Kenneth J. Ayala, Dhananjay V. Gadre. Cengage Learning

Mapping of Program Outcomes with Course Outcomes

Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	-	1	1
CO2	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	2
CO4	2	2	2	-	-	-	-
CO5	2	2	2	2	-	1	-
CO6	-	-	-	-	1	1	1
CO7	-	-	-	-	-	-	1

Justification for the mapping

PO1: Computer Knowledge

CO3: Students will be running programs on the Keil compiler is a specific skill that supports the broader application of computer fundamentals and programming knowledge.

CO4: Students will be able to interfacing input/output peripherals with microcontrollers requires the application of mathematics, statistics, and computer fundamentals.

CO5: Students will be capable of designing microcontroller-based hobby projects involves applying knowledge of microcontroller architecture and programming syntaxes.

PO2: Design/ Development of Solution

CO3: Students will be able to run programs on the Keil compiler is a specific skill that is not directly linked to designing solutions with the latest technologies.

CO4: Students will interface different peripherals with microcontrollers are a skill that contributes to solution design, but the focus is on microcontroller technology rather than the latest IT application technologies.

CO5: Students will be capable for designing microcontroller-based hobby projects involves skills that can contribute to solution design but may not necessarily involve the latest technologies.

PO3: Modern tool usage

CO3: Students will be able to running programs on the Keil compiler involves the direct use of a modern IT tool, aligning with the objective of modern tool usage in IT applications.

CO4: Students will be interfacing peripherals involves a skill set that contributes to modern tool usage, but the specific use of modern engineering and IT tools is not explicitly emphasized.

CO5: Students will design microcontroller-based hobby projects contributes to technical skills but may not explicitly involve the application of modern engineering and IT tools.

PO4: Environment and Sustainability

CO5: Students will be designing microcontroller-based hobby projects which involves technical skills, but the connection to societal and environmental impacts is not explicitly emphasized.

PO5: Ethics

CO6: Students will compare microcontrollers, which is more focused on technical aspects and less on explicit consideration of professional ethics.

PO6: individual and Team work

CO1: Students will be familiar with general microcontrollers contributes to individual effectiveness but may not explicitly address teamwork and leadership skills.

CO5: Students will be designing microcontroller-based hobby projects involves both individual and potentially team-based efforts, fostering teamwork and leadership skills.

CO6: Students will study as comparing microcontrollers involves technical analysis but may not directly address teamwork or leadership skills.

PO7: Innovation, employability and Entrepreneurial skills

CO1: Students will be in familiarity with general microcontrollers provides a foundation for innovation and entrepreneurial skills but may not explicitly address value creation and wealth generation.

CO2: Students will get knowledge of microcontroller architecture contributes to innovation and entrepreneurial skills but may not directly address wealth creation or employability.

CO3: Students will be running programs on the Keil compiler involves technical skills but may not explicitly contribute to entrepreneurial skills or employment transition.

CO6: Students will study as comparing microcontrollers involves technical analysis but may not directly address innovation, employability, or entrepreneurial skills.

CO7: Students will be comparing Assembly Language and Embedded C language is more focused on technical aspects and may not directly contribute to innovation, employability, or entrepreneurial skills.

SYLLABUS (CBCS) FOR S. Y. B. Sc. (Comp.Sci.)

ELECTRONICS

(w.e.f. June, 2023)

Class : S.Y. B. Sc. (Comp.Sci.) (Semester- I) (2022P)

Paper Code : UCSEL 232

Title of Paper : Instrumentation Systems

Paper : II

Credit : 3 **No. of lectures: 48**

Course Objectives:

1. To know the instrumentation systems.
2. To study basics of sensors and transducers.
3. To study various sensors and their features.
4. To study signal conditioning and its different circuits.
5. To introduce the measuring instruments.
6. To study digital instruments and different display devices.
7. To learn the LABVIEW software.

Course Outcomes:

CO1. Get familiar with instrumentation.
CO2. Knowledge about the transducers, sensors and their working.
CO3. Identify active and passive filters.
CO4. Designing of Signal Conditioning Circuits
CO5. Learn the operational amplifier and its applications.
CO6. Knowledge about smart sensors.
CO7. Calculations of cut-off frequency of filters, ADC and DAC parameters.

UNIT I: Instrumentation [12]

Introduction, Block diagram of Instrumentation system, Definition of sensor, transducer and Actuators, Difference between sensors and transducers, Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Mechanical and Electromechanical sensor: Definition, principle of sensing & transduction, classification.

UNIT II: Sensors and Actuators [12]

Temperature sensors (LM-35), Optical sensor (LDR), displacement sensor (LVDT), Passive Infrared sensor (PIR), Actuators: DC Motor, stepper motor. Concept of Smart Sensors - Definition, Working, Types (Temperature, motion, light, smog), Difference between base sensors and smart sensors, Benefits of smart sensors.

UNIT III: Signal Conditioning and Data Converters [12]

Introduction to Signal Conditioning, Operational Amplifiers : Inverting and Non inverting Op.Amps with expression, Op. Amp. Specifications, Whetstones bridge, Filters (LPF, HPF, BPF, BRF), Designing of active filters, ADC: Flash,SAR, DAC: Binary weighted, R-2R, Instrumentation Amplifier using OP. AMP.

UNIT IV: Digital Instruments and Display Devices [12]

Introduction to digital instruments, Digital Mulitmeter, Digital Frequency Meter, Block Diagram of CRO, Concept of DSO, LCD technique, Concepts of LCD, LED, OLED Displays.(comparative study). Advantages of Digital instruments over Analog instruments, Introduction to virtual instrumentation (LABVIEW).

Recommended Books:

1. Electronic Instrumentation -Kalsi TMH
2. Transducers & Instrumentation -Murthy PHI (Unit 1)
3. Instrumentation Measurements &Analysis-Nakra&Chaudhry TMH
4. Instrumentation Devices & Systems -Rangan, Sarma, Mani TMH
5. Sensor & transducers, D. Patranabis, 2nd edition, PHI

Mapping of Program Outcomes with Course Outcomes
Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	-	1	1
CO2	-	-	-	1	-	1	-
CO3	-	-	-	1	-	1	1
CO4	-	-	-	-	-	1	1
CO5	-	-	1	1	-	1	1
CO6	-	-	-	-	-	-	-
CO7	-	1	-	-	-	-	-

Justification for the mapping

PO2: Design / Development of solution

CO7: Students will do calculations of cut-off frequency for filters, ADC, and DAC parameters involve technical skills that contribute to designing solutions but may not explicitly address the latest technologies or languages.

PO3: Modern tool usage

CO5: students will be learning about operational amplifiers and their applications contributes to understanding electronic components, but may not explicitly focus on modern engineering and IT tools for complex IT applications.

PO4: Environment and sustainability

CO2: Students will get the knowledge about transducers, sensors, and their working is more focused on technical aspects and may not directly consider the societal and environmental contexts.

CO3: Students will be able to identifying active and passive filters involves technical skills that contribute to designing solutions but may not explicitly address the societal and environmental impact of IT solutions.

CO5:Students will be as learning about operational amplifiers and their applications is a technical aspect and may not inherently involve consideration of the societal and environmental impact of IT solutions.

PO6: Individual and Team work

CO1: Students will be getting familiar with instrumentation involves acquiring individual skills but may not explicitly address the aspects of functioning effectively in a team or leadership capacity.

CO2: Students will get knowledge about transducers, sensors, and their working contributes to individual skills but may not directly emphasize teamwork or leadership aspects.

CO3: Students will identify active and passive filters involving technical skills that may contribute to individual effectiveness but may not explicitly address teamwork or leadership.

CO4: Students will be designing signal conditioning circuits is more focused on technical aspects and may not inherently involve teamwork or leadership.

CO5: Students will learn about operational amplifiers and their applications are a technical skill that contributes to individual effectiveness but may not explicitly address teamwork or leadership.

PO7: Innovation, employability and Entrepreneurial skills

CO1: Students will be getting familiar with instrumentation involves acquiring technical skills but may not explicitly address identifying opportunities, creating value, or developing entrepreneurial skills.

CO3: Students will identify active and passive filters involves technical skills that may contribute to innovation but may not explicitly address entrepreneurial aspects.

CO4: Students will get knowledge of designing signal conditioning circuits is more focused on technical aspects and may not inherently involve identifying opportunities or entrepreneurial skills.

CO5: Students will be learning about operational amplifiers and their applications is a technical skill that contributes to individual effectiveness but may not explicitly address entrepreneurial skills.

SYLLABUS (CBCS) FOR S. Y. B. Sc. (Comp.Sci.)

ELECTRONICS

(w.e.f. June, 2023)

Class : S.Y. B. Sc. (Comp.Sci.) (Semester- I) (2022P)

Paper Code : UCSEL 233

Title of Paper : Electronics Practical

Paper : III

Objectives:

1. To use basic concepts to build any circuit.
2. To understand design procedures of different electronic circuits as per requirement.
3. To develop skills of programming
4. Verify different signal conditioning circuits doing them practically at laboratory.
5. To observe the outputs of interfacing circuits of 8051.
6. Building various applications in electronics using instrumentation and microcontroller.
7. To learn new software.

Outcomes:

CO1. Design any operational amp. Based application circuit and test it.
CO2. Knowledge about the 8051 microcontroller architecture.
CO3. Calculations of the different signal conditioners and verify the formulae.
CO4. Write an 8051 program for various applications.
CO5. Learn the Pinnacle Assembler.
CO6. Simulate the 8051 program on Keil compiler.
CO7. Interface peripherals to 8051 microcontroller and observe the outputs.

Group A : Activities (Any one)

A. To study CRO and DSO.

B. To learn Pinnacle Software

C. To learn LABVIEW Software

D. Internet Survey on Recent technologies in Electronics.

Group B : The 8051 Architecture & Programming (Any four)

1. Arithmetic, logical & code conversion problems using assembly/C programming
2. Interfacing the thumbwheel & seven segment display.
3. Traffic light controller using microcontroller.
4. Interfacing LCD to Microcontroller.
5. Waveform generation using DAC Interface.
6. Event counters using opto- coupler using seven segment display / LCD.
7. Speed Controller of stepper motor using microcontroller
8. Interfacing ADC to Microcontroller.

Group C : Instrumentation Systems (Any four)

1. LM-35 based temperature sensing system.
2. IC-741 Op Amp. As Inverting and Non-inverting amplifier
3. Build and test DAC using R-2R Ladder network.
4. Flash ADC using discrete components.
5. Build and test LDR based light control system.
6. Study of Linear Variable Differential Transformer.
7. Build and test Instrumentation Amplifier.
8. Build and test LPF and HPF.

8 experiments are compulsory and 1 activity is compulsory for each semester.

Mapping of Program Outcomes with Course Outcomes

Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	-	1	1
CO2	-	-	-	-	-	2	1
CO3	-	1	1	1	-	1	-
CO4	1	1	1	-	-	-	1
CO5	1	1	-	-	-	-	1
CO6	2	2	2	-	-	-	-
CO7	1	1	1	-	-	2	-

Justification for the mapping

PO1: Computer Knowledge

CO4: Students will be able for writing programs for the 8051 microcontroller involves applying knowledge of computer fundamentals and architecture in the context of embedded systems.

CO5: Students will be able for learning the Pinnacle Assembler contributes to the understanding of assembly language programming, which is part of computer knowledge but is more specific to programming languages.

CO6: Students can simulate 8051 programs on the Keil compiler directly involves the application of computer fundamentals and knowledge in a practical setting.

CO7: Students will learn to interface peripherals to the 8051 microcontroller involves applying computer knowledge to connect external devices to the microcontroller and observe their outputs.

PO2: Design / Development of solution

CO3: Students will do calculations of signal conditioners involve designing solutions for electronic circuits, contributing to the broader objective of designing solutions for IT applications.

CO4: Students will be able to write programs for the 8051 microcontroller involves designing solutions and implementing them using the latest technologies in the field of embedded systems.

CO5: Students will learn the Pinnacle Assembler contributes to the understanding of assembly language programming, which is part of designing solutions but is more specific to programming languages.

CO6: Students will be simulating 8051 programs on the Keil compiler involves designing and testing solutions for IT applications in a simulated environment.

PO3: Modern tool usage

CO3: Students will be familiar with calculations of signal conditioners involve applying techniques and resources for electronic design, contributing to the broader objective of using modern tools in engineering applications.

CO4: Students will write programs for the 8051 microcontroller involves using modern engineering and IT tools for software development in the context of embedded systems.

CO6: Students will simulate 8051 programs on the Keil compiler involves using modern tools for software simulation in the development process.

CO7: Students will do the interfacing peripherals to the 8051 microcontroller and observing outputs require the use of modern tools and techniques for hardware integration and testing in the context of IT applications.

PO4: Environment and sustainability

CO3: Students will do calculations of signal conditioners are focused on technical aspects and do not explicitly address the societal and environmental contexts or the need for sustainable development.

PO6: Individual and Team work

CO1: Students will be familiar with designing and testing an operational amplifier-based application circuit may involve individual work, but the direct emphasis on functioning effectively as an individual is not explicit.

CO2: Students will get knowledge about the 8051 microcontroller architecture may contribute to individual effectiveness, but the direct mention of teamwork is not evident in this outcome.

CO3: Students will get knowledge of calculations of signal conditioners involve technical skills and may not inherently emphasize teamwork aspects.

CO7: Students will do interfacing peripherals to the 8051 microcontroller often requires collaboration in a team or multidisciplinary setting to integrate hardware components effectively.

PO7: Innovation, employability and Entrepreneurial skills

CO1: Students will be designing and testing an operational amplifier-based application circuit may contribute to identifying opportunities.

CO2: Students will get knowledge about the 8051 microcontroller architecture directly aligns with the goal of developing skills for employment in hardware/software companies, especially in the context of embedded systems.

CO4: Students will get familiar for writing programs for the 8051 microcontroller involves developing skills relevant to employment in hardware/software companies and aligns with the goal of pursuing opportunities for innovation.

CO5: Students will be learning the Pinnacle Assembler involves acquiring skills in a specific programming language, which contributes to employability but may not directly address entrepreneurial skills.