



Walchand Institute of Technology, Solapur
(An Autonomous Institute)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

Choice Based Credit System (CBCS)

Structure and Syllabus
For T.Y.(B.Tech)

Multidisciplinary Minor Program in Electronics Engineering
offered by

Department of Electronics Engineering

W.E.F. 2025-26



Electronics and Computer Engineering

Vision

- To be a distinguished centre for nurturing the holistic development of competent young engineers in the Electronics and Information Technology fields.

Mission

- **M1:** To inculcate and stimulate Electronics & Computer proficiency amongst students through quality education and innovative educational practices.
- **M2:** To create engineering professionals with social consciousness
- **M3:** To foster technical skills of students through creativity and critical thinking
- **M4:** To enhance soft skills et of students which is crucial for career success through effectual training



Electronics and Computer Engineering

Program Educational Objectives (PEOs)

- Graduates will have a successful professional career in Electronics & Information Technology fields.
- Graduates will Leverage his fundamental knowledge to pursue higher education and will continue his professional development in Electronics & Information Technology fields.
- Graduates will Exhibit professional ethics, team spirit and effective communication skills to be successful leader and manager with a holistic approach.
- Graduates will Be sensitive to ethical, societal & environmental issues while conducting his professional work.

Knowledge and Attitude Profile (WK)

WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.



WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.
Program Outcomes (POs)	
PO 1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Engineering Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and The Society(World): Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities, relevant to the professional engineering practice.
PO 7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)



PO 8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning difference
PO 10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO 11	Life-long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)
Program Specific Outcomes (PSOs)	
<ol style="list-style-type: none"> 1. Algorithms : Graduate will able to develop, realize and validate algorithms for different electronic systems and programming applications 2. Systems: Graduate will able to develop, implement and test different electronic systems and computer applications 3. Self Learning: Graduate with his sound fundamentals is prepared to comprehend applications of the Electronics and Computer engineering through self learning mode 	



Minor Program Offered by Department of Electronics Engineering For T.Y.(B.Tech)

Semester	Course Code	Name of Course	Engagement Hours			Credits					Total
			L	T	P		Theory	OE/ POE	ISE	ICA	
V	23ECU5MD6T	Microcontrollers and Peripherals	3	-	-	3	60	-	40	-	100
VI	23ECU6MD6T	Advanced Controllers and Interfacing	2	-	-	2	60	-	40	-	100
Sub-Total			5	0	0	5	120		80	-	200
Laboratory Courses											
VI	23ECU6MD6L	Advanced Controllers and Interfacing	-	-	2	1	-	-	-	25	25
Sub-Total			0	0	2	1	0		0	25	25
Grand-Total			5	0	2	6	0		0	25	225





WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)
Third Year. B.Tech Semester-V

Multidisciplinary Minor III 23ECU5MD6T Microcontrollers and Peripherals

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/week	ESE	60 Marks
Credits	3	ISE	40 Marks

Introduction:

This course introduces microcontrollers, their architecture, programming, and peripheral interfacing. It provides fundamental knowledge essential for embedded systems and real-world applications. The course is designed to be accessible to students by explaining concepts in a structured and simplified manner.

Course Prerequisite:

Students should have a basic understanding of digital electronics, logic gates, and basic C programming. Also Knowledge of Basics of Analog Electronics will help in better understanding of peripherals.

Course Objectives:

1. To introduce the basic concepts of microprocessors and microcontrollers.
2. To understand the internal architecture and working of the 8051 microcontroller.
3. To learn basic programming and interfacing techniques.
4. To explore communication protocols and real-world applications.

Course Outcomes:

After completing this course, student will be able to –

1. Differentiate between a microprocessor and a microcontroller.
2. Read and analyse the architecture and working of the 8051 microcontroller from datasheet
3. Write simple programs in Embedded C for microcontroller applications.
4. Interface LEDs, motors, and displays with a microcontroller.
5. Differentiate between communication protocols like RS232, I2C, and SPI.



Unit – I	Introduction to Microprocessors and Microcontrollers	08Hours
Basics of microprocessors: working principles, Address, data, and control buses and their role in data processing, Memory organization: RAM, ROM, Flash, EEPROM – types and classification, Differences between microprocessors and microcontrollers, Applications of microcontrollers in automation, robotics, and consumer electronics.		
Unit – II	The 8051 Microcontroller Architecture	09 Hours
Overview of 8051 microcontroller: features and applications, Internal architecture: ALU, Boolean processor, oscillator, Registers: General-purpose and special function registers, Stack, stack pointer, and program counter, Clock and reset circuits and their importance, Memory organization: program memory vs. data memory, Pin configuration and I/O port operations, Addressing modes and instruction set overview.		
Unit – III	Microcontroller Programming	09 Hours
Basics of Embedded C programming and its advantages over assembly, GPIO (General-Purpose Input / Output) and port programming, Timers and counters: operation and applications, Interrupts and their role in multitasking, Serial communication basics and UART operation.		
Unit – IV	Peripherals	08Hours
Interfacing LEDs and Seven-segment displays, LCD interfacing: character and graphical displays, Keypad and switch interfacing techniques, Basics of motor control: DC motor and Stepper motor interfacing, Practical applications of peripheral interfacing in embedded systems.		
Unit – V	Communication Protocols	08Hours
Serial communication: RS232, I2C and SPI communication, Interfacing external memory with microcontrollers.		
Textbooks:		
<ol style="list-style-type: none"> 1. Muhammad Ali Mazidi, “The 8051 Microcontroller and Embedded Systems,” Pearson. 2. Kenneth J. Ayala, “The 8051 Microcontroller,” Thomson. 		
Reference books:		
<ol style="list-style-type: none"> 1. Raj Kamal, “Embedded Systems: Architecture, Programming and Design,” McGraw Hill. 2. Frank Vahid, Tony Givargis, “Embedded System Design,” Wiley. 		





WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

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Third Year. B.Tech Semester-VI

Multidisciplinary Minor IV 23ECU6MD6T Advanced Controllers and Interfacing

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/week	ESE	60 Marks
Practical	2 Hours/Week	ISE	40 Marks
Credits	3	ICA	25 Marks

Introduction:

This course introduces advanced microcontrollers like Arduino and ESP32, focusing on their architecture, programming, and real-world interfacing applications. It emphasizes hands-on learning, enabling students to develop embedded solutions using sensors, actuators, and communication protocol.

Course Prerequisite:

Students should have completed Microcontrollers and Peripherals and have basic knowledge of embedded programming.

Course Objectives:

1. To introduce the architecture and programming of Arduino and ESP32 microcontrollers.
2. To interface various sensors, actuators, and displays with microcontrollers.
3. To explore different communication protocols in systems.
4. To implement application based on sensor-actuator based applications using ESP32.

Course Outcomes:

After completing this course, student will be able to –

1. Differentiate between architectures and list features of Arduino and ESP32.
2. Write and debug embedded programs using IDE.
3. Interface sensors with microcontrollers.
4. Interface Actuators with microcontrollers.
5. Simulate Communication Protocols like RS232, I2C, SPI

Unit – I	Introduction to Advanced Microcontrollers	04 Hours
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Overview of Arduino and ESP32 microcontrollers, Comparison between Arduino (AVR) and ESP32 (Xtensa) architectures, Development environments: Arduino IDE, PlatformIO, Power management and low-power modes in ESP32.



Unit – II	Digital and Analog Interfacing	05Hours
GPIO programming: Digital input and output, Pulse Width Modulation (PWM) and servo motor control, Analog input with ADC: Interfacing potentiometers and sensors.		
Unit – III	Sensor Interfacing	05 Hours
Interfacing temperature, humidity, and motion sensors, Ultrasonic sensor-based distance measurement. LDR Interfacing.		
Unit – IV	Actuator Interfacing	05Hours
Stepper and DC motor control using motor drivers, Relay module interfacing for automation, LCD Display Interfacing.		
Unit – V	Communication Protocols	06Hours
Serial communication: UART, Software Serial, I2C protocol: Interfacing multiple devices (OLED, EEPROM), SPI communication: Interfacing SD cards and displays, Bluetooth and BLE in ESP32.		
Internal Continuous Assessment (ICA):		
<ul style="list-style-type: none"> • ICA shall consist of minimum 8 experiments based upon- <ol style="list-style-type: none"> 1. Blinking LED and controlling GPIO using Arduino and ESP32 2. Interface DHT Sensor to Read Temperature and Humidity. 3. Reading analog sensors like LDR and displaying data. 4. PWM control of LED brightness and servo motor positioning 5. Interfacing Ultrasonic Sensor to Measure Distance of Object. 6. Interfacing LCD/OLED display for sensor visualization 7. UART-based serial communication between Arduino/ESP32 and PC 8. I2C communication with peripherals (OLED, RTC module, etc) 9. Relay Module Interfacing to Control HV Appliances 10. DC Motor Interfacing with ESP32 using Driver Circuit 		
Textbooks:		
<ol style="list-style-type: none"> 1. Simon Monk, “Programming Arduino: Getting Started with Sketches,” McGraw Hill. 2. Pradeeka Seneviratne, “Internet of Things with Arduino and ESP32,” Packt. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Michael Margolis, “Arduino Cookbook,” O'Reilly Media. 2. Charles Bell, “Beginning Sensor Networks with Arduino and Raspberry Pi,” Apress. 		

