AMPUSH

AMPUSHWORKS ENTERPRISES PRIVATE LIMITED

Technical Training Programmes 2026–27

SYLLABUS

Embedded Systems and Microcontrollers

Course information	
Programme	2. Embedded Systems and Microcontrollers
Duration	One month
Total hours	102 hours (theory 32, practical 64, examinations 6)
Course fee	₹3,000 per candidate
Batch size	Minimum 10 candidates; batches scheduled after sufficient registrations
Eligibility	B.Tech, Diploma, ITI, B.Sc and BCA students, engineering graduates, working professionals and college faculty
Prerequisites	Basic electronics. Basic programming knowledge is helpful but not essential.

1. Course Introduction

Embedded systems are the dedicated computers inside everyday products. This course teaches how microcontrollers are programmed in C and how they interact with switches, displays, sensors and communication modules, leading to the development of a small embedded product.

2. Course Objectives

On completing this course, candidates will be able to:

- Describe the architecture of a microcontroller
- Write and debug embedded C programs
- Use GPIO, timers, interrupts, ADC and PWM
- Communicate with modules using UART, I2C and SPI
- Combine these skills in a small embedded product

3. Hours Distribution

Component	Hours
Theory classes (8 units × 4 hours)	32
Practical sessions (14 labs × 4 hours)	56
Mini project (practical)	8
Theory examination	2
Practical examination	4
Total programme hours	**102**

Practical sessions including the mini project total 64 hours (56 + 8). The examinations (6 hours) are held after completion of the training.

4. Theory Syllabus (32 hours)

Unit	Topics covered	Hours
Unit 1	INTRODUCTION TO EMBEDDED SYSTEMS • Embedded systems vs general-purpose computers • Applications in products and industry • Development workflow: write, compile, upload, test	4
Unit 2	MICROCONTROLLER ARCHITECTURE • CPU, memory, registers and peripherals • Clock, reset and power • Pin configuration and datasheets	4
Unit 3	EMBEDDED C PROGRAMMING • Data types, operators and control structures • Functions, arrays and bit manipulation • Writing readable and reusable code	4
Unit 4	GPIO, TIMERS AND INTERRUPTS • Digital input and output • Timers and delays • External and timer interrupts	4
Unit 5	ANALOGUE INTERFACING • ADC: reading analogue sensors • PWM: controlling brightness and speed • Signal scaling and calibration	4
Unit 6	SERIAL COMMUNICATION • UART and serial monitor • I2C bus and devices • SPI bus and devices	4
Unit 7	DISPLAYS AND MODULES • Character LCD (16×2) with I2C • Keypads and switches • Real-time clock and EEPROM	4
Unit 8	EMBEDDED PRODUCT DEVELOPMENT • From requirement to design • Testing, debugging and reliability • Documentation of an embedded product	4

5. Practical Sessions (64 hours)

Lab	Practical assignment	Hours
1	LED patterns using GPIO	4
2	Push buttons with debouncing	4
3	Timer-based blinking without delay	4
4	External interrupt counter	4
5	Read a potentiometer with ADC	4
6	LED brightness control with PWM	4
7	DC motor speed control with PWM	4
8	UART communication with a computer	4

Lab	Practical assignment	Hours
9	Interface a 16×2 LCD using I2C	4
10	Read a sensor over I2C	4
11	Interface an SPI device	4
12	Keypad entry with LCD display	4
13	Real-time clock and timed event	4
14	Debugging a faulty embedded program	4
MP	Mini project: Embedded digital controller: keypad set-point, sensor reading, LCD display and relay output.	8
	Total practical hours	**64**

6. Mini Project

Project: Embedded digital controller: keypad set-point, sensor reading, LCD display and relay output.

Each candidate (or small group) plans, builds, tests and documents the project during the final practical sessions, and presents it during the practical examination.

7. Hardware, Tools and Software

- Microcontroller development boards
- 16×2 LCD with I2C adapter, keypads, potentiometers
- Sensors, motors and relay modules
- Real-time clock and EEPROM modules
- Laptop with programming and debugging software

8. Learning Outcomes

By the end of the course, candidates will be able to:

- Program microcontrollers in embedded C
- Interface displays, sensors and communication modules
- Use timers, interrupts, ADC and PWM correctly
- Develop and document a small embedded product

9. Assessment and Certification

Examination	What is assessed	Duration
Theory examination	Understanding of concepts, components and principles covered in the 8 units	2 hours
Practical examination	Ability to build, wire, program, test and fault-find; presentation of the mini project	4 hours

Practical assignments completed during the course are also reviewed as part of the practical assessment.

A **training completion certificate** will be issued subject to successful completion of the programme and assessment requirements.

10. Enrolment and Contact

To enrol, send your name, mobile number, college or organisation, course and year, and the name of this programme to Ampushworks. You will be informed when your batch is scheduled.

Contact	Details
Address	Priyadarshi Nagar, Bhagwat Nagar, Patna, Bihar – 800026
Website	https://ampushworks.com
Registration form	https://www.ampushworks.com/training.html#register
Email	support@ampushworks.com
Phone	+91 94702 13936
WhatsApp	+91 94702 13937

Note: This syllabus may be updated by Ampushworks to reflect new technology and equipment. The syllabus issued at the start of a batch applies to that batch.