

Course Code	Course Title	L	T	P	C
1152EC118	EMBEDDED CONTROL SYSTEM	3	0	0	3

a) Course Category

Program elective

b) Preamble

To enable the student to get a detailed knowledge of all the hardware components and to understand the different interfaces required for connecting these hardware devices

c) Prerequisite

Microprocessor and Microcontroller

d) Related Courses

Embedded system Design, embedded processor, System on chip, Embedded networking

e) Course educational objectives

1. To study about the basics of data lines, address lines, control lines and ports of both hardware and software system.
2. To learn various input and output devices.
3. To study of A / D converters and D / A converters.
4. To study the various types of serial communication.
5. To learn about Telephonic systems – Stepper control – Digital voltmeter - PWM motor speed controller- Robot system -Washing Machine –Automotive System –Auto Focusing Digital Camera – Air Conditioner.

f) Course Outcomes

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

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the basics of embedded control system	K2
CO2	Discuss various input and output devices which will satisfy to develop embedded applications	K2
CO3	Explain A/D and D/A process to build the embedded system	K2
CO4	Discuss different types of asynchronous serial communication for	K2

	embedded system.	
CO5	Develop the embedded control system model for various application such as Telephonic systems – Stepper control – Digital voltmeter - PWM motor speed controller- Robot system etc.	K3

e)	Correlation of COs with POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	-	-	-	L	-	-	-	-	-	-	-	-	-
CO2	M	M	-	-	M	-	-	-	-	-	-	-	-	-
CO3	H	H	-	-	L	-	-	-	-	-	-	-	L	-
CO4	L	-	M	-	-	L	-	-	-	-	-	M	-	-
CO5	M	H	M	-	M	-	L	-	L	-	-	L	-	L

f) Course Content

UNIT I INTRODUCTION 9

Controlling the hardware with software – Data lines, Address lines, Ports – Schematic representation – Bit masking – Programmable peripheral interface – Switch input detection – 74 LS 244

UNIT II INPUT-OUTPUT DEVICES 9

Keyboard basics – Keyboard scanning algorithm – Multiplexed LED displays –Character LCD modules, LCD module display, Configuration – Time-of-day clock – Timer manager - Interrupts - Interrupt service routines, IRQ, ISR, Interrupt vector or dispatch table multiple-point - Interrupt-driven pulse width modulation.

UNIT III D/A AND A/D CONVERSION 9

R to 2R ladder - Resistor network analysis - Port offsets - Triangle waves analog vs. digital values - ADC0809 – Auto port detect - Recording and playing back voice – Capturing analog information in the timer interrupt service routine - Automatic, multiple channel analog to digital data acquisition

UNIT IV ASYNCHRONOUS SERIAL COMMUNICATION 9

Asynchronous serial communication – RS-232, RS-485 – Sending and receiving data – Serial ports on PC – Low-level PC serial I/O module, buffered serial I/O.

UNIT V EMBEDDED CONTROL APPLICATIONS 9

Telephonic systems – Stepper control – Digital voltmeter - PWM motor speed controller- Robot system - Washing Machine –Automotive System –Auto Focusing Digital Camera – Air Conditioner.

g) Learning Resources

Text Books

1. Jean J. Labrosse, "Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C", The publisher, Paul Temme, 2003
2. Ball S.R., 'Embedded microprocessor Systems – Real World Design', Prentice Hall, 2001
3. Chattopadhyay, "Embedded System Design", PHI Learning, 2011.
4. Steven F.Barrett,DanielJ.Pack,"Embedded Systems-Design & Application with the 68HC12 & HCS12", Pearson Education,2008

Reference Books

1. Herma K, "Real Time Systems – Design for distributed Embedded Applications", Kluwer Academic, 2003
2. Daniel W. Lewis, "Fundamentals of Embedded Software where C and Assembly meet", PHI, 2002.