GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI-25

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**EMBEDDED SYSTEM & PIC MICROCONTROLLER PROGRAMMING**
Course Code	**EC/2020/004**
Course Duration	50 Hours
Minimum Eligibility Criteria	10th/+2 /ITI/Diploma/Graduate
Pre-requisites (if any)	Knowledge of Digital Electronics
Course Objectives	Training module has been designed for the participants to • Understand the Architecture of Embedded system • Study the Structure of Assembly language program and Embedded C Program • Discuss the Concept of Interfacing I/O field devices with LPC 2148. • Learn the Architecture and Instruction Set of PIC Microcontroller
Course Outcomes	At the end of training, the trainees will be able to • Explain the Architecture of Embedded system • Develop coding using Embedded C for real time applications • Interface I/O field devices with LPC 2148 • Develop program for arithmetic operation for PIC Microcontroller • Interface Input / Output peripherals with PIC Microcontroller
Expected Job Roles	Microcontroller Programmer

TEACHING AND SCHEME OF EXAMINATION

Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
EC/2020/004	EMBEDDED SYSTEM & PIC MICROCONTROLLER PROGRAMMING	Theory	20	10	20	3 Hours
		Practical	30	40	80	
		Total	50	50	100	

EC/2020/004 - EMBEDDED SYSTEM & PIC MICROCONTROLLER PROGRAMMING
DETAILED SYLLABUS

Unit No	Modules	No.of.Hours	
		Theory	Practical
I	**Introduction to Embedded Systems & Software Requirements**	**10 Hours**	
1.1	Definition – Features of ARM processor – Difference between RISC and CISC processor	07	03
1.2	Architecture of LPC2148 processor		
1.3	Data Flow model		
1.4	Instruction Set		
1.5	Registers		
1.6	GPIO Registers		
1.7	Software Installation & Steps – Keil, Flash Magic (Down loader), USB-UART converter driver		
II	**Simple Arithmetic Program**	**10 Hours**	
2.1	Structure of Assembly language program & Embedded C	04	06
2.2	Simple Arithmetic programs (Addition, Subtraction,Multiplication)		
2.3	**Practical:**LED Interfacing		
2.4	**Practical:**Relay Interfacing		
2.5	**Practical:**Buzzer Interfacing		
III	**Interfacing with Input and Output Devices**	**10 Hours**	
3.1	**Practical:**Seven Segment Interfacing	02	08
3.2	**Practical:**Keyboard Interfacing		
3.3	**Practical:**LCD Interfacing		
3.4	**Practical:**ADC Interfacing & Sensor Interfacing		
3.5	Timer Programming		
IV	**Introduction to PIC microcontroller & software requirements**	**10 Hours**	
4.1	Introduction to PIC controller P16F877A - Definition	05	05
4.2	Instruction Set		
4.3	**Practical:**Software Installation & Steps – mikroC& PICKIT2		
4.4	**Practical:**Simple Arithmetic programs for Addition & Subtraction		

V	PIC Controller Interfacing	10 Hours	
5.1	**Practical:** Buzzer interfacing	02	08
5.2	**Practical:** Seven segment Interfacing		
5.3	**Practical:** LCD Interfacing		
5.4	Timer 0		
5.5	**Practical:** ADC Interfacing		
	Total theory / Practical Hours	**20**	**30**
	Total hours	**50**	

HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	PC / LAPTOP
2	LPC2148 ARM kit
3	P16F877A BASED PIC Microcontroller

SOFTWARE REQUIREMENT

S.NO	LIST OF SOFTWARE
1	Keil µvision 4&Mikro C
2	PIC KIT2

REFERENCE BOOKS

S.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	ARM system Developers Guide Designing and Optimizing	Andrew N. Sloss	Oxford University Press
2	Embedded System	B. Kanta Rao	PHI Learning PVT Limited
3	Embedded systems- Architecture, Programming and Design	Rajkamal	Tata McGraw-Hill Education
4	ARM System – On chip architecture	Steve Furbe	Pearson Education India
5	PIC microcontroller Project book	John IOvine	Tata McGraw-Hill Education

ASSESSMENT AND CERTIFICATION

S.No	Criteria for assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the CIICP Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the CIICP Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training, certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max. Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Objective and Program	20
	b)Procedure and Connections / Execution	20
	c)Result and Viva	20
	d)Record	20
	Total Marks	**100**

EC/2020/004 EMBEDDED SYSTEMS & PIC MICCONTROLLER PROGRAMMING

THEORY MODEL QUESTION PAPER

(Maximum Marks: 20)

(N.B: Answer any Twenty questions) **20x1= 20 Marks**

1. Define embedded systems.
2. Write any two features of embedded systems.
3. Compare RISC and CISC processor.
4. Classify the instruction set of ARM7 processor.
5. Expand CPSR.
6. Draw the CPSR format.
7. What are the fields in CPSR format?
8. What are the flags in ARM7 processor?
9. Write the GPIO registers used in ARM7 processor.
10. How many ports are there in ARM7TDMI–S IC?
11. Write any two barrel shifter instructions in ARM7 processor?
12. What is barrel shifter instruction?
13. What is branch instruction?
14. Write the main difference between comparison & subtraction instruction?
15. Which type of branch instruction is used to move from ARM instruction to Thumb instruction?
16. What is compiler?
17. What is assembler?
18. What is PIC controller?
19. How many ports in P16F877A IC?
20. Write the structure of Assembly language program.
21. Write any three control statements used in PIC controller.
22. What is the condition for command register in LCD?
23. What is the condition for data register in LCD?
24. What is watch dog timer?
25. What is the condition for sense a key in keyboard interfacing?