

GOVERNMENT POLYTECHNIC, PUNE
(An Autonomous Institute of Govt. of Maharashtra)

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|-----------------------|---|--|
| Programme | : | Diploma in ET/CE/EE//ME/MT/CM/IT/DDGM |
| Programme Code | : | 01/02/03/04/05/06/07/08//16/17/21/22/23/24/26 |
| Name of Course | : | Peripheral Interface Controller |
| Course Code | : | ET 488 |

Teaching Scheme:

| | Hours /Week | Total Hours |
|------------------|--------------------|--------------------|
| Theory | 04 | 64 |
| Practical | 02 | 32 |

Evaluation Scheme:

| | Progressive Assessment | Semester End Examination | | | |
|-----------------|--|---------------------------------|------------------|--|------------------|
| | | Theory | Practical | Oral | Term work |
| Duration | Two class tests, each of 60 minutes | 3 Hrs. | 3 Hrs. | 3 Hrs. For batch of 20 students | -- |
| Marks | 20 | 80 | 50 | -- | -- |

Course Rationale:

Microcontroller is heart of all domestic, industrial, consumer goods and other high end products. Automation in every field of life is being used and microcontroller is inbuilt element of these systems and devices. Microcontroller is in built element of an embedded system. This subject mainly focuses to understand design of RISC microcontroller systems. PIC is the most popular controller in industries. Students will be able to develop PIC microcontroller based systems for different applications using different I/O devices and also will study different communication protocols .

Course Objectives:

After studying this course, the student will be able to

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| • | Have basic knowledge of PIC 18 microcontroller. |
| • | Develop logic for programs in assembly language for PIC 18. |
| • | Interface peripherals to microcontroller to PIC 18 |
| • | Knowledge of developing microcontroller based systems. |
| • | Knowledge of communication protocols |

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Course Content:

| Chapter No. | Name of Topic/Sub topic | Hrs | Marks |
|-------------------|---|-----------|-----------|
| SECTION-I | | | |
| 1. | Introduction PIC 18 Microcontroller | | |
| | 1.1 Introduction to Microcontroller <ul style="list-style-type: none"> ➤ Types of architectures - Harvard and Von-neuman - RISC and CISC ➤ Concept of pipelining. 1.2 PIC 18 Microcontroller <ul style="list-style-type: none"> ➤ Features, Architecture (description of each on chip peripheral) Pin description (PIC18F452) ➤ RISC features of PIC 18 ➤ Oscillator configuration ➤ RESET options. ➤ Memory organisation- Program Memory,Flash Program Memory , Data Memory organisation, Data EEPROM | 12 | 12 |
| 2. | PIC 18 Instruction set and Programming | | |
| | 2.1 Addressing modes and instruction set <ul style="list-style-type: none"> ➤ Assembler directive- ORG, DB, EQU, END, LIST,SET 2.2 Instruction Set <ul style="list-style-type: none"> ➤ Data moving instructions, logical & arithmetic Instructions, branching, call , Time delay, bank switching, table processing instructions, subroutines, Bit related instructions. 2.3 Assembly language programming | 10 | 12 |
| 3. | PIC 18 on-Chip Peripheral | | |
| | Understanding on chip peripherals with their internal blocks ,special function registers and programming techniques <ul style="list-style-type: none"> 3.1 Input- Output ports 3.2 Timer module. 3.3 Serial Port(UART) module.(RS232 PORT) 3.4 Interrupts module. 3.5 ADC module. 3.6 CCP module. | 12 | 16 |
| SECTION-II | | | |
| 4. | External Interfaces | | |
| | Interfacing and programming of external interfaces. <ul style="list-style-type: none"> 4.1 Interfacing of LED and switches 4.2 LCD Display , 4.3 Keyboard , 4.4 DAC 4.5 sensor interfacing(temperature ,humidity) | 12 | 16 |

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|-----------|---|-----------|-----------|
| | 4.6 Relays and opto isolators interfacing 4.7 Stepper Motor 4.8 DC.Motor 4.9 RTC Interfacing | | |
| 5. | Communication Protocols | | |
| | Study of communication of protocols with their features , OSI layer diagram and working : 5.1 I2C 5.2 USB 5.3 SPI 5.4 BLUETOOTH 5.5 ZIGBEE 5.6 CAN | 10 | 12 |
| 6. | Integrated Development Environment (IDE) for Microcontrollers. | | |
| | 6.1 Software development cycle- Editor, Assembler, cross compiler, linker, locater, compiler. 6.2 MPLAB IDE for PIC micro controllers . 6.3 Study of programming using assembly language and “C” Cross compiler, 6.4 Programming tools such as simulator, assembler,”C”cross compiler, emulator and debugger. 6.5 Illustrative applications and programming techniques 6.6 Tutorial programs either in C OR assembly language should include programming using: Arithmetic instructions, Jump, Loop and Call instructions, I/O programming, Logic instructions, Single bit instructions, Timer/Counter Programming,UART programming, Interrupt Programming 6.7 Analysis of reference design : ➤ Application examples: Fully Automatic Washing Machine, Elevator , Microwave Oven ➤ Reference circuit schematic with specification application and firmware analysis can be done. | 10 | 12 |
| | TOTAL | 64 | 80 |

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List of Practical/Experiments/Assignments:

| Sr. No. | Name of Experiment/Assignment |
|---------|---|
| 1. | Identification & observation of PIC 18 system board on the kit. |
| 2. | Introduction of MPLAB IDE software . |
| 3. | Assembly language or C programs which cover data moving instruction ,block transfer by indirect addressing Arithmetic instructions, Jump, Loop and Call instructions, I/O programming, Logic instructions, Single bit instructions, Timer/Counter Programming, UART programming, Interrupt Programming (Any 15) can be performed using simulator. |
| 4. | Generate square wave and rectangular wave on port pin with a program |
| 5. | External interfacing of leds with PIC 18 |
| 6. | External interfacing of switches with PIC 18 |
| 7. | External interfacing of LCD with PIC 18 |
| 8. | External interfacing of relay with PIC 18 |
| 9. | Sensor Interfacing with on chip ADC of PIC 18 |
| 10. | External interfacing of stepper motor with 8051 |
| 11. | External interfacing of D.C. motor with 8051 |

Instructional Strategy:

| Sr. No. | Topic | Instructional Strategy |
|---------|--|---------------------------------------|
| 1. | Introduction to PIC 18 Microcontrollers | Class room teaching & Laboratory work |
| 2. | PIC 18 Instruction set and Programming | Class room teaching & Laboratory work |
| 3. | PIC 18 on-Chip Peripheral | Class room teaching & Laboratory work |
| 4. | External Interfaces | Class room teaching & Laboratory work |
| 5. | Communication Protocols | Classroom Teaching |
| 6. | Integrated Development Environment (IDE) for Microcontrollers. | Classroom Teaching & Lab. Work |

Text Books:

| Sr. No | Author | Title | Publication |
|--------|--|--|-------------------|
| 1. | Mohmad-ali-mazidi, Roline D. Mckinlay | PIC microcontroller and Embedded Systems | Pearson |
| 2. | MICROCHIP PIC 18 DATASHHET | --- | www.microchip.com |

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Reference Books:

| Sr. No | Author | Title | Publication |
|--------|----------------|--|------------------------|
| 1. | Han-Way Huang | PIC microcontroller: an introduction to software and hardware interfacing | Cengage Learning, 2005 |
| 2. | Micheal Predko | Programming and Customizing the PIC Microcontroller | McGraw-Hill |
| 3. | Tim Wilmshurst | Designing Embedded systems with PIC microcontroller: Principles and Applications | Newnes |

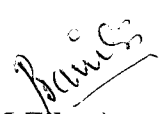


Learning Resources:

Reference Books, Journals, Data Manuals, and URL's.

Specification Table:

| Sr. No. | Topic | Cognitive Levels | | | Total |
|-------------------|--|------------------|---------------|-------------|-----------|
| | | Knowledge | Comprehension | Application | |
| Section I | | | | | |
| 1. | Introduction to PIC 18 Microcontrollers | 8 | 4 | -- | 12 |
| 2. | PIC 18 Instruction set and Programming | 4 | 4 | 4 | 12 |
| 3. | PIC 18 on-Chip Peripheral | 4 | 4 | 8 | 16 |
| Section II | | | | | |
| 4. | External Interfaces | 4 | 4 | 8 | 16 |
| 5. | Communication Protocols | 8 | 4 | -- | 12 |
| 6. | Integrated Development Environment (IDE) for Microcontrollers. | 2 | - | 10 | 12 |
| Total | | 30 | 20 | 30 | 80 |

Prepared By :

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