

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

<b>Programme</b>	:	<b>Diploma in ET/CE/EE//ME/MT/CM/IT/DDGM</b>
<b>Programme Code</b>	:	01/02/03/04/05/06/07/08/16/1721/22/23/24/26
<b>Name of Course</b>	:	<b>Microcontroller and Applications</b>
<b>Course Code</b>	:	<b>ET389</b>

**Teaching Scheme:**

	<b>Hours /Week</b>	<b>Total Hours</b>
<b>Theory</b>	<b>04</b>	<b>64</b>
<b>Practical</b>	<b>04</b>	<b>64</b>

**Evaluation Scheme:**

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

**Course Rationale:**

This subject gives preliminary knowledge of 8051 microcontroller architecture, peripheral interfacing to it and assembly language programming. 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 embedded system. The subject will help the students to study concepts of embedded system. This subject mainly focuses to understand design of simple microcontroller systems.

**Course Objectives:**

After studying this course, the student will be able to

- Preliminary Knowledge of Micro controller 8051
- Develop logic for programs in assembly language.
- Interface peripherals to microcontroller
- Knowledge of working of microcontroller systems in various fields.

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**Course Content:**

Chapter No.	Name of Topic/Sub topic	Hrs	Marks
<b>SECTION-I</b>			
<b>1.</b>	<b>Introduction to Microcomputers and Microcontrollers</b>		
	1.1 Introduction to single board microcomputer <ul style="list-style-type: none"> <li>➤ Block Diagram of Microcomputer.</li> <li>➤ Elements of Microcomputer. (Buses, Microprocessor, memory, I/O devices).</li> <li>➤ Different types of buses: address, Data, and control bus.</li> </ul> 1.2 Introduction to Microcontroller <ul style="list-style-type: none"> <li>➤ General block diagram of microprocessor and microcontroller</li> <li>➤ Comparison of Microprocessors and Microcontrollers.</li> <li>➤ Types of architectures - Harvard and Von-neuman.</li> <li>➤ Selection factors of microcontroller(Architecture type, speed, Word size, instruction set, memory, and I/O capability)</li> </ul>	<b>5</b>	<b>8</b>
<b>2.</b>	<b>8051 Microcontroller</b>		
	2.1 8051 architecture <ul style="list-style-type: none"> <li>➤ Features, Architecture (description of each on chip peripheral, Pin description.</li> </ul> 2.2 Special Features of 8051 <ul style="list-style-type: none"> <li>➤ Boolean Processor, Power saving options- idle and power down mode, Derivatives of 8051.</li> </ul>	<b>10</b>	<b>12</b>
<b>3.</b>	<b>8051 Instruction set and Programming</b>		
	3.1 Addressing modes and instruction set. <ul style="list-style-type: none"> <li>➤ Assembler directive- ORG, DB, EQU, END, CODE, DATA</li> </ul> 3.2 Instruction Set <ul style="list-style-type: none"> <li>➤ Data moving instructions, logical &amp; arithmetic Instructions,. Jump, call instructions, subroutines, Bit related instructions.</li> </ul> 5.3 Assembly language programming 5.4 Software development cycle- Editor, Assembler, cross compiler, linker, locater, compiler	<b>12</b>	<b>14</b>
<b>4.</b>	<b>MCS 51 Parallel Ports</b>		
	4.1 Port structure 4.2 Reading and writing a port 4.3 Port programming 4.4 Interfacing of LED	<b>03</b>	<b>06</b>
<b>SECTION-II</b>			
<b>5.</b>	<b>MCS 51 Timer/counter</b>		
	5.1 Timer / Counter logic and modes 5.2 Simple programs on timer to generate time delay using polling and interrupt method.	<b>06</b>	<b>08</b>

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<b>6.</b>	<b>MCS 51 Serial port</b>		
	6.1 Serial Communication-SCON, SBUF 6.2 Modes of serial communication (Mode 0 to 3). 6.3 Simple programs for serial communication.	<b>06</b>	<b>08</b>
<b>7.</b>	<b>MCS 51 Interrupts.</b>		
	7.1 Interrupts and polling. 7.2 Interrupts structure of 8051SFR - IE, IP 7.3 Simple programs based on interrupts and polling method	<b>06</b>	<b>06</b>
<b>8.</b>	<b>External Memory Interfaces</b>		
	8.1 Semiconductor memory 8.2 Memory address decoding 8.3 Interfacing external ROM 8.4 External data memory space	<b>06</b>	<b>06</b>
<b>9.</b>	<b>External Interfaces</b>		
	Interfacing and programming of external interfaces. 9.1 LCD Display , 9.2 Keyboard , 9.3 DAC & ADC 9.4 sensor interfacing(temperature ,humidity) 9.5 Relays and opto isolators interfacing 9.6 Stepper Motor 9.7 DC.Motor 9.8 RTC Interfacing	<b>10</b>	<b>12</b>
	<b>TOTAL</b>	<b>64</b>	<b>80</b>

**List of Practical/Experiments/Assignments:**

<b>Sr. No.</b>	<b>Name of Experiment/Assignment</b>
<b>1.</b>	Identification & observation of 8051 system board on the kit.
<b>2.</b>	Introduction of Keil software or any other IDE
<b>3.</b>	Assembly language programs which cover Data moving, Arithmetical, Logical, single bit instructions and jumps. Time delays using timers .(Any 15)
<b>4.</b>	Generate square wave and rectangular wave on port pin with a program
<b>5.</b>	External interfacing of leds with 8051
<b>6.</b>	External interfacing of switches/Keyboard with 8051
<b>7.</b>	External interfacing of LCD with 8051
<b>8.</b>	External interfacing of relay with 8051
<b>9.</b>	ADC Interfacing with 8051
<b>10.</b>	External interfacing of stepper motor with 8051
<b>11.</b>	External interfacing of D.C. motor with 8051

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12.	A mini project with any one application on demo board
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**Instructional Strategy:**

Sr. No.	Topic	Instructional Strategy
1.	Introduction to Microcontrollers	Class room teaching & Laboratory work
2.	8051 Microcontroller	Class room teaching & Laboratory work
3.	8051 Instruction set and Programming	Class room teaching & Laboratory work
4.	MCS 51 Parallel Ports	Class room teaching & Laboratory work
6.	MCS 51 Timer/counter	Classroom Teaching & Lab. work
7.	MCS 51 Serial Ports	Classroom Teaching & Lab. Work
8.	MCS 51 Interrupts	Classroom Teaching & Lab. Work
9.	External Memory Interfaces	Classroom Teaching & Lab. Work
10.	External Interaces	Classroom Teaching & Lab. Work

**Text Books:**

Sr. No	Author	Title	Publication
1.	Kenneth J. Ayala	The 8051 Microcontroller	Thomson Publishers
2.	Mohmad-ali-mazidi, Janice-Gelispé-mazidi Roline D. Mckinlay	8051 microcontroller and Embedded Systems	Pearson/PHI

**Reference Books:**

Sr. No	Author	Title	Publication
1.	Ajit pal	Micro controller principal & application	prentice hall of India
2.	Ajay Deshmukh	Microcontroller theory & application.	Tata McGraw- Hill
3.	Rajkamal	Microcontroller Architecture, programming, interfacing, & system design	Pearson
4.	Satish shaha	8051 Microcontroller Mcs-51 family and its variant.	Oxford

**Learning Resources:**

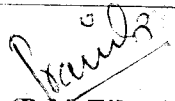


Reference Books, Journals, Data Manuals, and URL's.

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**Specification Table:**

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
<b>Section I</b>					
1.	Introduction to Microcomputers and Microcontrollers	4	4	-	8
2.	8051 Microcontroller	8	4		12
3.	8051 Instruction set and Programming	6	4	2	14
4.	MCS 51 Parallel Ports	2	-	4	6
<b>Section II</b>					
5.	MCS 51 Timer/counter	2	2	4	8
6.	MCS 51 Serial Ports	2	2	4	8
7.	MCS 51 Interrupts	2	2	4	6
8.	External Memory Interfaces	2	-	4	6
9.	External Interaces	2	2	8	12
<b>Total</b>		<b>30</b>	<b>20</b>	<b>30</b>	<b>80</b>

**Prepared By:**

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