

**Course Name** : Electronics Engineering Group  
**Course Code** : ET/EN/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI  
**Semester** : Fifth for ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU and Sixth for IU/ED/EI  
**Subject Title** : Microcontroller  
**Subject Code** : 17534

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

This subject comes under technology area. The subject is an extension of concepts covered in digital technique. 8051 microcontroller architecture, peripheral interfacing to it, assembly language programming is covered in this subject.

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.

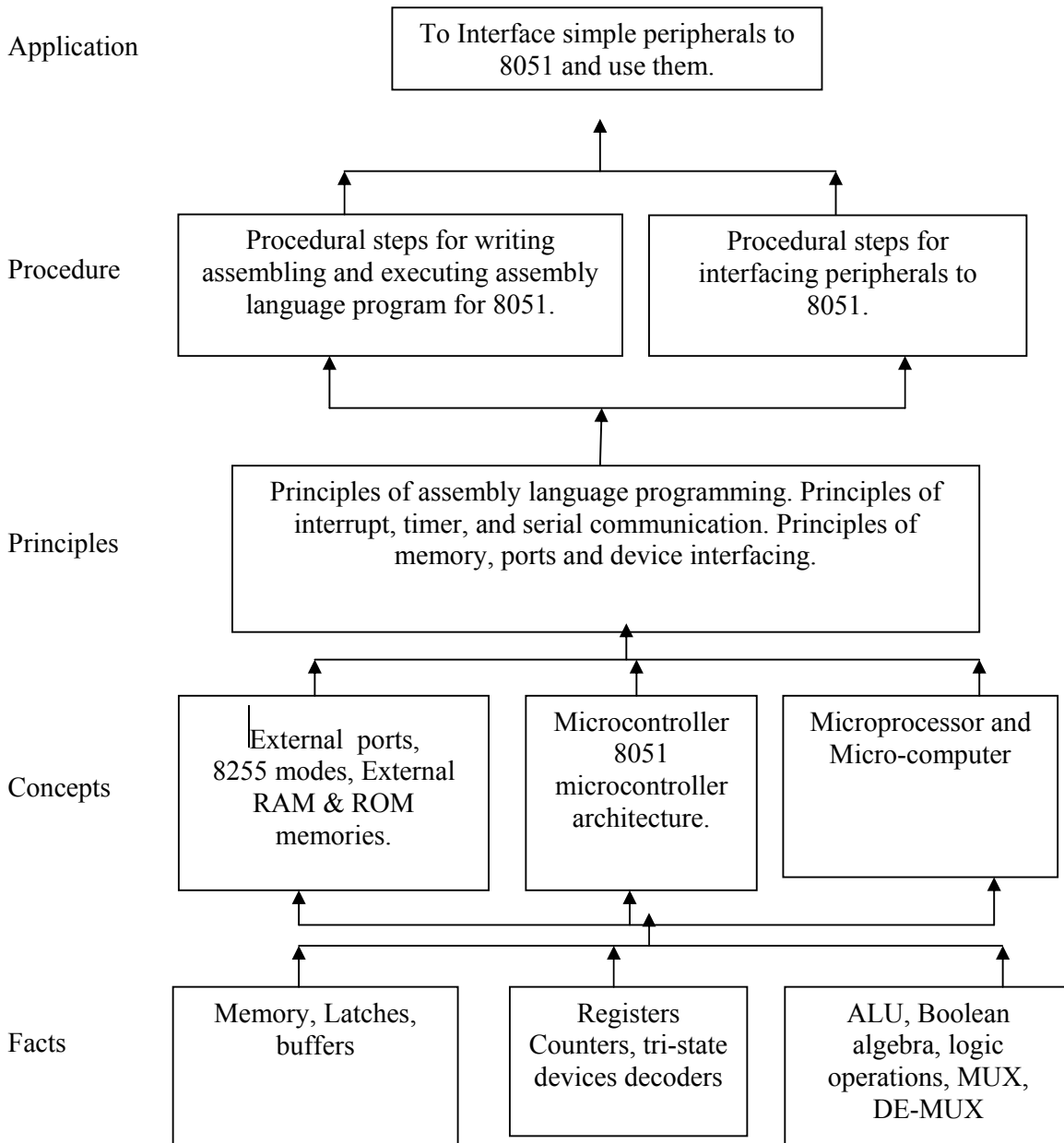
The student will gain the knowledge of peripheral interfacing and programming them. Microcontroller is in built element of embedded system. The subject will help the students to study concepts of embedded system. It will also help to understand design of simple microcontroller systems.

**General Objectives.**

Students will able to:

- Understand concepts of microcomputer, microprocessor and microcontroller.
- Interface peripherals to microcontroller.
- Develop logic for assembly language programming.
- Understand the principles of working of present day microcontroller systems in various fields.

**Learning Structure:**



**Theory:**

Topic and Contents	Hours	Marks
<p><b>Topic 1: Introduction to Microcomputers and Microcontrollers</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Distinguish microcomputer, microprocessor, and microcontroller</li> </ul> <p><b>Contents:</b></p> <p>1.1 Introduction to single board microcomputer. (Marks 04)</p> <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> <p>1.2 Introduction to Microcontroller (Marks 06)</p> <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>	04	10
<p><b>Topic 2: 8051 Microcontroller</b></p> <ul style="list-style-type: none"> <li>➤ Identify Hardware features and internal registers with their functions</li> <li>➤ Identify physical difference between external and internal memory and between different ports</li> <li>➤ Compare different members of 8051 family.</li> </ul> <p><b>Contents :</b></p> <p>2.1 8051 Architecture (Marks 10)</p> <ul style="list-style-type: none"> <li>• Features, Architecture, Pin description.</li> <li>• Memory Organisation of 8051</li> </ul> <p>2.2 Special Features of 8051 (Marks 06)</p> <ul style="list-style-type: none"> <li>• Boolean Processor, Power saving options- idle and power down mode, Derivatives of 8051:- 8031, 8751,8952, 89V51RD2</li> </ul>	08	16
<p><b>Topic 3: 8051 Instruction set and programming</b></p> <ul style="list-style-type: none"> <li>➤ Comprehend addressing modes and instruction set.</li> <li>➤ Develop and realize assembly language programs.</li> </ul> <p>3.1 Addressing modes and instruction set. (Marks 10)</p> <ul style="list-style-type: none"> <li>• Assembler directive- ORG, DB, EQU, END, CODE, DATA</li> </ul> <p>3.3 Assembly language programming (Marks 10)</p> <p>3.4 Software development cycle- Editor, Assembler, cross compiler, linker, locater, compiler (Marks 04)</p>	12	24

<p><b>Topic 4: Parallel Ports and Serial Communication:</b></p> <ul style="list-style-type: none"> <li>➤ Comprehend Serial and parallel communication</li> </ul> <p><b>Contents:</b></p> <p>4.1 Parallel Port of 8051 (Marks 08)</p> <ul style="list-style-type: none"> <li>• I/O port structure &amp; its Programming.</li> </ul> <p>4.2 Serial Port of 8051 (Marks 08)</p> <ul style="list-style-type: none"> <li>• Serial Communication-SCON, SBUF</li> <li>• Modes of serial communication</li> <li>• Simple programs for serial communication.</li> </ul>	08	16
<p><b>Topic 5: MCS 51 Interrupt and timers</b></p> <ul style="list-style-type: none"> <li>➤ Realize Concept of Interrupts, timer, and related SFRs</li> <li>➤ Use timers and Interrupts through programs</li> <li>➤ Compare interrupts and polling method.</li> </ul> <p><b>Contents:</b></p> <p>5.1 8051 Timer/counter (Marks 08)</p> <ul style="list-style-type: none"> <li>• Timer / Counter logic and modes</li> <li>• Simple programs on timer to generate time delay using polling and interrupt method.</li> </ul> <p>5.2 8051 Interrupts (Marks 08)</p> <ul style="list-style-type: none"> <li>• Interrupts and polling.</li> <li>• SFR - IE, IP</li> <li>• Simple programs based on interrupts and polling method</li> </ul>	08	16
<p><b>Topic 6: Memory and I/O interfacing</b></p> <ul style="list-style-type: none"> <li>➤ Interface I/O devices and memory devices</li> <li>➤ Expand memory and I/O</li> </ul> <p><b>Contents:</b></p> <p>6.1 Memory Interfacing : (Marks 06)</p> <ul style="list-style-type: none"> <li>• Interfacing of External Program and Data Memory</li> <li>• Address map table</li> <li>• Linear and absolute decoding techniques</li> </ul> <p>6.2 I/O Interfacing: (Marks 12)</p> <ul style="list-style-type: none"> <li>• 8255-Block diagram, operating modes</li> <li>• Port expansion with 8255</li> <li>• Interfacing of LED, keys, Relays, Seven segment display, Stepper motor using 8255.</li> </ul>	08	18
<b>Total</b>	<b>48</b>	<b>100</b>

**Practical's:**

Skills to be developed:

**Intellectual skill**

1. Understand hardware and instruction set.
2. Develop assembly programs.

**Motors skills**

1. Handle trainer kits, computer.
2. Interface peripherals.

**List of Practicals:**

1. Understand 8051 development board and tools of keil simulation software.

2. Develop and simulate assembly language program for arithmetic operations as addition, subtraction, multiplication, division.
3. Develop and simulate assembly language program for Block transfer and Block Exchange with external memory.
4. Develop and simulate Assembly Language program for finding smallest/largest numbers and arranging the numbers in ascending/descending order.

**Practice Experiment and Cross word**

5. Develop, simulate and download an assembly language program to generate square and rectangular wave on port pin of 8051 using timer.
6. Develop, simulate and download an assembly language program to ON/OFF LED using a key connected at ports of 8051.
7. Interface seven segment display to 8051 and develop, simulate an assembly language program to design UP/DOWN counter (using Timer Interrupts).
8. Interface stepper motor to 8051 and develop program to rotate motor in clockwise direction.
9. Interface 8 bit DAC and ADC to 8051. Develop and download an assembly language program to generate at least two different waveforms using DAC and convert analog data into digital using ADC.
10. Develop and simulate an assembly language program for Level controller/Traffic controller

**Optional**

11. Develop, simulate and download an assembly language program for serial communication with HyperTerminal of windows operating system.

**Learning resources:****1. Books**

Sr. No.	Title	Author	Publisher
01	8051 Microcontroller architecture programming & application.	K. J. Ayala	EEE/ Prentice Hall of India
02	The 8051 microcontroller & embedded system.	Mohmad-ali-mazidi, Janice-Gelispé-mazidi, Roline D. Mckinlay	Pearson / Prentice hall
03	Microcontroller principal & application	Ajit Pal	Prentice Hall of India
04	Microcontroller theory & application.	Ajay Deshmukh	Tata McGraw- Hill
05	Microcontroller Architecture, programming, interfacing, & system design	Rajkamal	Pearson
06	8051 Microcontroller Mcs-51 family and its variant.	Satish shaha	Oxford