Techno India NJR Institute of Technology

Course File

Microprocessor (5EX4-04)

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Department of ECE

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
III Year - V Semester: B.Tech. (Electrical And Electronics Engineering)

5EX4-04: MICROPROCESSOR

Credit: 3
3L+0T+0P

Max. Marks: 150(IA:30, ETE:150)
End Term Exam: 3 Hours

SN	CONTENTS	HOURS
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Fundamentals of Microprocessors** Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.	07
3	**The 8051 Architecture:** Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.	08
4	**Instruction Set and Programming** Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools..	08
5	**Memory and I/O Interfacing** Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.	06
6	**External Communication Interface** Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.	06
7	**Applications** LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing	05
	TOTAL	41

Course Overview:

General introduction to microprocessor systems; Operation and Control of 8-bit microprocessor; Instruction set; Assembly Language Programming; , I/O Techniques, Interfacing of I/O Devices; Interrupts; Peripheral Devices, Programmable Peripheral Interface (Intel 8255A), Programmable Interval timer (Intel 8253),Programmable Interrupt Controller (Intel 8259A),Programmable Keyboard/Display Interface (Intel 8279).

Course Outcomes:

CO.NO.	Cognitive Level	Course Outcome
1	**Comprehension**	Able to Classify different types of microcontrollers.
2	**Application**	Able to Sketch interfacing circuit for peripherals like, I/O, A/D, D/A, timer etc.
3	**Analysis**	Able to Analyze response time of different microcontrollers.
4	**Synthesis**	Able to Select processors, microcontroller for different application.

Prerequisites:
1. Fundamentals knowledge of digital electronics.
2. Fundamentals knowledge of diode, transistor.

Course Outcome Mapping with Program Outcome:

Course Outcome	Program Outcomes (PO's)											
CO. NO.	Domain Specific					Domain Independent						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	3	0	0	0	0	0	0	0
CO2	2	1	2	1	3	0	0	0	0	0	0	0
CO3	2	2	1	2	2	0	0	0	0	0	0	0
CO4	2	2	2	1	3	0	0	0	0	0	0	0
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

Course Coverage Module Wise:

Lecture No.	Unit	Topic
1	**1**	**INTRODUCTION:** Objective, scope and outcome of the course.
2	**2**	**FUNDAMENTALS OF MICROPROCESSORS**
3	2	Fundamentals of Microprocessor Architecture 8-bitMicroprocessor.
4	2	Architecture. 8-bit Microcontroller
5	2	Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers.
6	2	Definition of embedded system and its characteristics.
7	2	Role of microcontrollers in embedded Systems.
8	2	Overview of the 8051 family.
9	**3**	**THE 8051 ARCHITECTURE**
10	3	Internal Block Diagram
11	3	CPU, ALU, address, data and control bus
12	3	Working registers, SFRs.
13	3	Clock and RESET circuits, Stack and Stack Pointer.
14	3	Program Counter, I/O ports, Memory Structures.
15	3	Data and Program Memory.
16	3	Timing diagrams and Execution Cycles.
17	**4**	**INSTRUCTION SET AND PROGRAMMING**
18	4	Addressing modes: Introduction, Instruction syntax, Data types, Subroutines
19	4	Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing,
20	4	Indexed addressing, Bit inherent addressing, bit direct addressing.
21	4	8051 Instruction set & Instruction timings.
22	4	Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction

23	4	Assembly language programs, C language programs.
24	4	Assemblers and compilers. Programming and debugging tools.
25	**5**	**MEMORY AND I/O INTERFACING**
26	5	Memory and I/O expansion buses Control signals, memory wait states.
27	5	Interfacing of peripheral devices such as General Purpose I/O
28	5	ADC, DAC
29	5	Timers, counters
30	5	Memory devices.
31	**6**	**EXTERNAL COMMUNICATION INTERFACE**
32	6	Synchronous and Asynchronous
33	6	RS232
34	6	SPI & I2C
35	6	Introduction and interfacing to protocols Bluetooth
36	6	Introduction and interfacing to protocols Zigbee
37	**7**	**APPLICATIONS**
38	7	LED, LCD Interfacing
39	7	keyboard interfacing
40	7	Stepper motor interfacing & DC Motor interfacing
41	7	Sensor interfacing

TEXT/REFERENCE BOOKS

1. Microprocessor Architecture: Programming and Applications with the 8085/8080A, R. S. Gaonkar, Penram International Publishing, 1996.
2. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid/Tony Givaris, Jhon, Wiely Student Edition,2006.
3. The 8051 Microcontroller & Embedded System , Muhammad Ali Mazidi,Pearsons.
4. The 8051 Microcontroller, Kenneth J. Ayala, Penram International Publishing, 1996.

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Dr. Pankaj Kumar Porwal
(Principal)

NPTEL COUSES LINK

1. https://nptel.ac.in/courses/106/103/106103182/

QUIZ Link

1. https://www.javatpoint.com/embedded-systems-mcq
2. https://www.sanfoundry.com/embedded-systems-questions-answers-mcqs/
3. https://www.eguardian.co.in/embedded-systems-multiple-choice-questions-with-answers/

Faculty Notes Link

1. https://drive.google.com/drive/folders/1iQxrGEcg2U9Z9Sg5YJAmT2KR5KQDfQkh?usp=sharing

Assessment Methodology:

1. Practical exam using MATALB software.
2. Two Midterm exams where student have to showcase subjective learning.
3. Final Exam (subjective paper) at the end of the semester.

5E1364

B.Tech. V- Semester (Main) Examination, Nov. - 2019
PCC/PEC Electrical Engg.
5EE4-04 Microprocessor
(Common For EE,EX)

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks : 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of Seven from Part B and Four questions out of Five from Part C. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory   (10×2=20)

1. Differentiate between timers and counters. Draw the diagram of TCON in 8051.   (2)

2. Which register is used for serial programming in 8051? Illustrate it.   (2)

3. List the 8051 interrupts with its priority.   (2)

4. How is A/D converter interfaced with 8051? Explain.   (2)

5. What are the benefits of subroutine?   (2)

6. What does the term embedded system mean?   (2)

7. Explain the function of each bit in TMOD register.   (2)

8. Draw the pin diagram of 8051.   (2)

9. State how band rate is calculated for serial data transfer in mode 1. (2)

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions (5×8=40)

1. Compare 8-bit, 16-bit and 32-bit microcontrollers. (8)
2. Show the interfacing circuit and functional pins of LCD. (8)
3. Explain the block diagram of 8051. Also discuss its features. (8)
4. Write short note on overview of 8051 family. (8)
5. Give PSW of 8051 and describe the use of each bit in PSW. (8)
6. Write short note on synchronous and Asynchronous communication. (8)
7. How are D/A and A/D interfaces used? Explain. (8)

PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any **Four** questions (4×15=60)

1. a) How microprocessors and microcontrollers are different from computer based controllers? Explain. (7)

   b) What is sensor interfacing and external memory interfacing? Explain in detail. (8)

2. a) A switch is connected to pin P 2.7 and a stepper motor to port 1. Write a program to monitor the status as of switching and if SW = 0, stepper motor should rotate clockwise continuously. if SW = 1, stepper motor should rotate anticlockwise, continuously. (8)

   b) For an 8051 system of 11.0592 MHz. find the time delay for the following subroutine.

   Delay : MOV R3, #250

   Back : Nop

   Nop

   DJNZ R3, BACK

   RET (7)

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(Principal)

3. a) Draw and explain the architecture of 8051. (10)

    b) Write an ALP to read switch as shown in figure 1. If switch is closed turn on the LED else turn OFF the LED. (5)
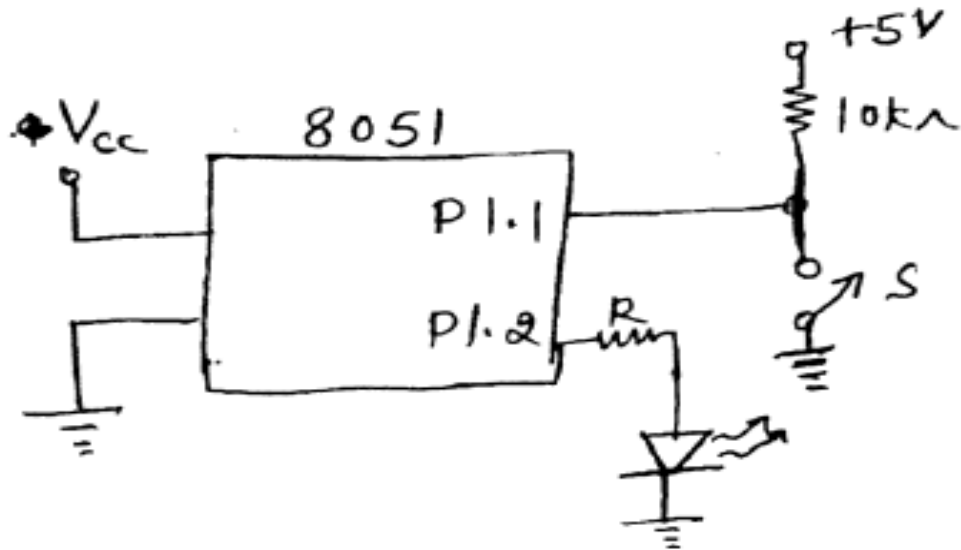

Figure 1.

4. a) Interface ADC 0804 to 8051 and write an ALP to connect the analog input to digital value. (10)

    b) What are SFR's? Explain. (5)

5. a) Draw the schematic for interfacing a stepper motor with 8051 microcontroller and write 8051 ALP for changing speed and direction of motor. (12)

    b) Explain any two data addressing modes of 8051 with example (3)