MICROPROCESSOR AND MICROCONTROLLERS (EC501PC)

COURSE PLANNER (2021-2022)

* NPTEL COURSE: https:/nptel.ac.in/courses

I. COURSE OVERVIEW:

To teach the Microprocessor& Microcontrollers course on with subject code (EC501PC) as prescribed by the JNTUH to fulfill the requirements for the 3rd year 1ˢᵗ semester ECE students.

To make the students understand Microprocessors and Microcontrollers in order to equip them with the necessary tools for the analysis of Electronic equipment in the field of Microprocessors & Embedded systems to be used in industries, research field and in commercial field applications.

II. PREREQUISITS:

- ☐ Computer Organization basics.
- ☐ Computer Networks basics.
- ☐ Number systems & digital logic design concepts.
- ☐ Basic compilation process.

III. COURSE OBJECTIVES:

1	To familiarize the architecture of microprocessors and micro controllers
2	To provide the knowledge about interfacing techniques of bus & memory.
3	To understand the concepts of ARM architecture
4	To study the basic concepts of Advanced ARM processors

IV. COURSE OUTCOMES:

S.No.	Description	Bloom's Taxonomy Level
1.	Understands the internal architecture, organization and assembly language programming of 8086 processors.	Knowledge, Understand (Level1, Level2)
2.	Understands the internal architecture, organization and assembly language programming of 8051/controllers	Knowledge, Understand (Level1, Level2)
3.	Understands the interfacing techniques to 8086 and 8051 based systems	Knowledge, Understand (Level1, Level2)
4.	Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.	Apply, Create (Level 3, Level 6)

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (PO)		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems related to Electronics & Communication and Engineering.	3	Assignments, Exercises
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complexengineering problems related to Electronics & Communication Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	3	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems related to Electronics & Communication Engineering anddesign system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignments, Exercises
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	3	Assignments
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Assignments, Seminars
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Electronics & Communication Engineering professional engineering practice.	2	Seminars
PO7	**Environment and sustainability**: Understand the impact of the Electronics & Communication Engineering professional engineering solutionsin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	1	Assignments, Seminars
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.	-	-
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.	1	Oral Discussions

Program Outcomes (PO)		Level	Proficiency assessed by
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	2	Document Preparation, Presentation
PO11	**Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	1	Assignments
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.	2	Assignments

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)   - : None

VI. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO 1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	2	Lectures, Assignments
PSO 2	**Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	3	Tutorials
PSO 3	**Successful Career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	2	Seminars, Projects

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)   - : None

VII.   SYLLABUS:

UNIT -I: 8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT -II: Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051. 8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT –III: I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051. Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT –IV: ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT – V: Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:
1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rdEd.
3. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier,2012

REFERENCE BOOKS:
1. Microprocessors and Interfacing, D. V. Hall, MGH, 2ndEdition2006.
2. Introduction to Embedded Systems, Shibu K.V, MHE,2009
3. The 8051Microcontrollers, Architecture and Programming and Applications - K.Uma Rao, AndhePallavi, Pearson,2009.

NPTL URL: https:/nptel.ac.in/courses/108105102/
ONLINE COURSEURL: https:/onlinecourses.nptel.ac.in/noc18_ec03.
GATE SYLLABUS: UNIT- I & II.
IES SYLLABUS: -NA-

VIII. COURSE PLAN (WEEK-WISE):

Lecture No.	Unit No.	Topics to be covered	Link for PDF	Small Projects/ Numerical(if any)	Course learning outcomes	Teaching Methodology	Reference
1		Unit1:Introduction to Microprocessors and Microcontrollers	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing	**https://www.electronicshub.org/water-level-controller-using-8051-microcontroller**	To underrsatnd the microprocessors and controllers	PPT	
2		8086 Architecture-Functional diagram	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To understand the 8086 Architecture	PPT	
3		Register Organization	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To study various registers of 8086	PPT	
4	1	Register Organization	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing	**https://www.electronicshub.org/water-level-controller-using-8051-microcontroller**	To study various registers of 8086	PPT	**Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.**
5		Memory Segmentation	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To understand Memory Organisation	Chalk and Talk	
8		Signal descriptions of 8086	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To evaluate pins of 8086	Chalk and Talk	
9		Interrupts of 8086	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects/**	To understand and analyze the interrupts of 8086	PPT	
10		Instruction formats	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/vi		To understand and analyze	PPT	

					the Instruction formats		
11		Addressing modes	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing	**https://www.mtechprojects.com/microwaves,-antennas-and-propagation.html**	To understand Addressing modes	PPT	
12		Instruction Set	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To evaluate Instruction Set	PPT	
13		Assembler Directives	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To understand Assembler Directives	PPT	
14		Macros	https://drive.google.com/file/d/1t_ry_i6sSTxgXeNRvxmDJ6Ed35dRtI_n/view?usp=sharing		To understand Macros	PPT	
15		**MOCK TEST-1**					
16		**Student Presentations**					
17		**Student Presentations**					
18		Unit2: 8051 Microcontroller Architecture	https://drive.google.com/file/d/1xUuNMQnS1Rf-1LDCc4bdHbIOBzlYrA1L/view?usp=sharing	**https://bestengineeringprojects.com/electronic-tutorial/microwaves/**	To Analyze Architecture o f8051	PPT	
19	2	I/O Ports of 8051 Microcontroller	https://drive.google.com/file/d/1411BBn1gso1vBlkZg-9pqOJdbJ-IULrV/view?usp=sharing		To Analyze I/O Ports of 8051	PPT	**The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed**
20		Addressing Modes of 8051	https://drive.google.com/file/d/1xUuNMQnS1Rf-1LDCc4bdHbIOBzlYrA1L/view?usp=sharing		To Understand the Addressing Modes of 8051	PPT	

21		Instruction set of 8051	https://drive.google.com/file/d/1xUuNMQnS1Rf-1LDCc4bdHbIOBzlYrA1L/view?usp=sharing	https://bestengineeringprojects.com/electronic-tutorial/microwaves/	To Understand the Instruction set of 8051	Chalk and Talk	
22		**Bridge Class-I**					
23		8051 Real Time Control : Programming Timer Interrupts	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To know how to write program on Timer interrupts	PPT	
24		Programming External Hardware Interrupts	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects/**	To know Programming External Hardware	PPT	
25		Serial Communication	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To know how to Programming the Serial Communication Interrupts	Chalk and Talk	
26		UNIT 3 : I/O And Memory Interface:	https://drive.google.com/file/d/1UsOwj-V_NKHTiiKv0bkOzhL7C0S6H9HW/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects/**		PPT	
27		**Bridge Class-II**					
28		**Student Presentations**					
29		External Memory RAM and ROM inetrface	https://drive.google.com/file/d/1UsOwj-V_NKHTiiKv0bkOzhL7C0S6H9HW/view?usp=sharing		Understand Memory Interfacing	PPT	

30		LCD Interface	https://drive.google.com/file/d/1ssHvHdaZuhhTyAD1Qg0dV4zkxGnB8Ri9/view?usp=sharing	**https://www.electronicshub.org/water-level-indicator/**	To know how to Interface LCD	PPT	The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.
31		Keyboard Interface	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To know how to Interface Keyboard		
32		ADC and DAC interface	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/water-level-indicator/**	To understand ADC and DAC interfacing		
33		Serial Communication and Bus Interface: Serial Communication Standards	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/water-level-indicator/**	To understand Serial Communication Standards	PPT Chalk and Talk	The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.
34	3	On-Board Communication Interfaces-I2C Bus	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/water-level-indicator/**	To understand the Interfaces-I2C Bus		
35		SPI Bus ,UART	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To understand the SPI Bus		
36		External Communication Interfaces-RS232,USB	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/water-level-controller-using-8051-microcontroller/**	To understandInterfaces-RS232,USB		
40		Unit4:ARM Processor fundamentals	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To understand ARM Processor fundament	Chalk and Talk	The 8051 Microcontroller, Kenneth. J. Ayala,

				als		Cengage Learning, 3rd Ed.
41		ARM Registers	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To understand the ARM Register	
42		PIPELINE	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects/**	To understand the PIPELINE Concept	
43		Exceptions andinterrupts interrupt vector table	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To understand the exceptions and interrupts interrupt vector table	
44		ARM instruction set			To Analyze the ARM instruction set	Chalk and Talk
45	4	Software interrupt instructions	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To know the Software interrupt instructions	**ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris**
46		loading constants Conditional execution	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects**	Understand conditional execution	
47		Introduction to Thumb instructions	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing		To Understand the Thumb instructions	

51		UNIT 5 : Introduction to CORTEX Processor	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects**	To Understand the CORTEX Processor		
52	5	CORTEX Processor architecture	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects**	To Understand the architecture	Chalk and Talk	**ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris**
53		CORTEX Processor architecture		**https://www.electronicshub.org/arm-based-projects**	To Understand the architecture		
54		OMAP Processor	https://drive.google.com/file/d/1hGZlBdvBtUwJaPjHsc005PvNOl6DrVPo/view?usp=sharing	**https://www.electronicshub.org/arm-based-projects**	To Understand the OMAP Processor		
55		**Student Presentations**					

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	-	-	-	3	3	2	2	3	2
CO2	3	3	2	3	2	3	-	-	-	2	2	2	2	3	2
CO3	1	1	2	2	1	-	2	-	2	3	1	3	1	1	1
CO4	3	3	2	3	3	1	1	-	-	2	1	-	2	3	2
CO5	3	3	2	3	-	2	1	-	2	-	-	3	2	3	1
Average	2.6	2.6	2	2.8	1.6	1.6	0.8	0	0.8	1.6	1.4	2	1.8	2.6	1.6
Average (Rounded)	3	3	2	3	2	2	1	0	1	2	1	2	2	3	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)   - : None

X.   QUESTION BANK (JNTUH) :

UNIT - I
Long Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Explain the architecture of 8086 with block diagram.	Remember	1
2	Explain the register organization of 8086.	Remember	1
3	Draw the pin diagram of 8086 and explain the function of each pin. (Common function signals, minimum mode and maximum mode signal.)	Understand	1
4	Differentiate minimum and maximum modes of operation of 8086.	Remember	1
5	Draw the timing diagram of memory write in minimum and maximum modes of 8086.	Understand	1
6	Explain the different general purpose registers of 8086	Understand	1
7	Explain briefly the addressing modes of 8086 with an example each	Understand	1
8	Explain the different Data copy / Transfer instructions of 8086 with an example	Understand	1
9	Explain different assembler directives and operators of 8086 in brief	Understand	1
10	Explain the different string manipulation operations of 8086 with a example each	Understand	1

Short Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Explain various groups of instructions of 8086 with examples.	Understand	1
2	What is an addressing mode? Explain various addressing modes of 8086 with examples.	Understand	1
3	What is an assembler directive? State the functions of assembler directives. Explain various assembler directives of 8086.	Understand	1
4	Write 8086 ALP for the following: (i) 8-bit, 16-bit addition, subtraction, multiplication, division. (ii) Searching Largest & Smallest number in an array.	Apply	1

5	Write 8086 ALP for the following: (i) Sorting in Ascending & Descending Order. (ii) Block Transfer of Data	Apply	1
6	Write a program to move a string of data words from offset 2000H to offset 3000H the length of the string is 0FH	Understand	1
7	Write an ALP to Add the contents of memory location 2000H:5000H to contents of 3000H:0600H and store the result in 5000H:0700H	Understand	1
8	Write an ALP to arrange a given series of hexadecimal bytes in ascending order	Understand	1
9	Explain with a neat diagram the Maximum mode 8086 system and timings	Understand	1
10	**Interface two 4K X 8 EPROMs and two 4K X 8 RAM chips with 8086. Select suitable maps.**	Understand	1

UNIT - II
Long Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Draw the block diagram of 8051 microcontroller and explain the architecture.	Remember	2
2	Explain about I/O ports of 8051. (Ports – 0, 1, 2, 3)	Remember	2
3	Explain various addressing modes of 8051 with examples.	Understand	2
4	Explain various groups of instructions/ instruction set of 8051 with examples	Remember	2
5	Draw the pin diagram of 8051 and explain the function of each pin	Understand	2
6	With a neat diagrams explain the interfacing of an DAC7523 with 8086	Understand	2
7	Explain the interrupt cycle of 8086	Remember	2
8	Explain (i) NMI (ii) INTR	Remember	2
9	Explain with a neat diagram the architecture of 8251	Understand	2
10	Write an ALP to transmit 100 bytes of data string starting at location 2000:5000H	Understand	2

Short Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Write 8051ALP for the following: 8-bit addition, subtraction, multiplication, division.	Apply	2
2	Explain the following SFRs: (i) TMOD (ii) TCON (iii) SCON (iv) PCON	Apply	2
3	Write 8051ALP for the following: Shift Right, Shift Left, Rotate Right, Rotate Left	Apply	2
4	Explain about serial communication Interrupts	Understand	2
5	Explain about 8051 Timing Diagram	Understand	2
6	Explain with neat diagram the operation of 8051 in each of the timer modes	Understand	2
7	What is an interrupt? What is the role of interrupts in 8051?	Understand	2
8	Explain with a neat diagram the structure of interrupt operation in 8051	Understand	2
9	Explain with a neat diagram the memory addressing of 8051	Understand	2
10	What is the necessity to have different registers for serial communications and Timer / Counter operations?	Understand	2

UNIT - III
Long Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Draw the block diagram for the following chips and explain: (i) 8255 PPI (ii) 8259 PIC (iii) 8251 USART.	Remember	3
2	Explain various operating modes of 8255 PPI.	Remember	3
3	Draw the control word format of 8255 PPI and explain	Understand	3
4	Explain the interfacing of the following with 8086 with neat sketches: (i) D/A Converter (ii) A/D Converter (iii) Keyboard.	Remember	3
5	Write short notes on Vector interrupt table and Interrupt Service Routines.	Remember	3
6	Explain in detail with a neat diagram the internal architecture of 8255 PIO	Understand	3

7	Explain in detail the different modes of operation of 8279 and also explain the different command words of 8279.	Understand	3
8	Explain with block, pin and timing diagrams the functionality of ADC 0808	Understand	3
9	Explain the different pins of a dual slop 12-bit ADC 7109 and draw the individual block diagrams of analog and digital sections for the same.	Understand	3
10	Explain the different modes of operation in 8255	Understand	3

Short Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Explain about UART.	Understand	3
2	Explain about RS232 Cable	Apply	3
3	Explain about Memories.	Understand	3
4	Explain about I2C Bus.	Apply	3
5	Explain about interface of 8051.	Understand	3
6	State the features of 8051	Understand	3
7	List the alternate functions of various pins of port 3 of 8051.	Understand	3
8	Explain with a neat diagram the external I/O interfacing for 8051	Understand	3
9	Explain the different registers of 8051	Understand	3
10	Explain the transfer of control during execution of an ISR	Understand	3

UNIT - IV
Long Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Explain about ARM Processor Architecture	Understand	4
2	Explain about ARM instructions set.	Understand	4
3	Explain about different Registers in ARM based architecture.	Understand	4
4	Explain about different types of Interrupts	Understand	4
5	Write a simple program using Thumb Instructions.	Understand	4
6	Write a simple program using Branch & Load Instructions.	Understand	4
7	How Pipeline is used in ARM processor	Understand	4

8	What is PSR, explain in detail.	Understand	4
9	Differentiate between ARM processor & other real time processor	Understand	4
10	Explain Pin diagram of ARM.	Understand	4

Short Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Design interrupt Vector table of ARM.	Understand	4
2	What are software interrupts?	Understand	4
3	How data p[processing is done in ARM processor	Understand	4
4	What are conditional interrupts	Understand	4
5	State minimum 5 features of ARM Processor	Understand	4
6	What is CPSR	Understand	4
7	What are different types of instructions used in ARM processor	Understand	4
8	Write simple program for Memory allocation in ARM processor	Understand	4
9	How memory allocation is used for data processing	Understand	4
10	Write a simple program using Thumb instruction.	Understand	4

UNIT - V
Long Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Differentiate between different ARM processors	Understand	5
2	Explain about CORTEX processor.	Understand	5
3	Design Architecture of CORTEX processor	Understand	5
4	Design block diagram for CORTEX processor	Understand	5
5	Explain about OMAP processor.	Understand	5
6	Design Architecture of OMAP processor	Understand	5
7	Design block diagram for OMAP processor	Understand	5
8	Brief about interrupts in CORTEX processor	Understand	5
9	Brief about interrupts in OMAP processor	Understand	5
10	Write Simple Program using Instructions of CORTEX processor	Understand	5

Short Answer Questions:

S.No.	Question	Blooms Taxonomy Level	Course Outcome
1	Explain instructions of Cortex processor	Understand	5
2	Explain pin diagram of Cortex processor	Understand	5
3	Explain registers used in Cortex Processor	Understand	5
4	Explain register formats used for data processing in Cortex processor	Understand	5
5	Explain instructions of OMAP processor	Understand	5
6	Explain pin diagram of OMAP processor	Understand	5
7	Explain registers used in OMAP Processor	Understand	5
8	Explain register formats used for data processing in OMAP processor	Understand	5
9	Explain Memory processing and commands used in OMAP processor	Understand	5
10	Explain Memory processing and commands used in Cortex processor	Understand	5

XI: OBJECTIVE QUESTIONS:

UNIT-I

1. A microprocessor is a _____ chip integrating all the functions of a CPU of a computer.
A. Multiple B. single C. double   D. triple

2. Microprocessor is a/an _____ circuit that functions as the CPU of the compute
A. electronic B. mechanic C. integrating   D. processing

3. Microprocessor is the _____ of the computer and it perform all the computational tasks
A. main   B. heart   C. important   D. simple

4. The purpose of the microprocessor is to control _____
A. memory   B. switches   C. processing   D. tasks

5. The first digital electronic computer was built in the year_____
A. 1950   B. 1960   C. 1940   D. 1930

6. In 1960's texas institute invented _____
A. integrated circuits   B. microprocessor   C. vacuum tubes   D. transistors

7. The intel 8086 microprocessor is a _____ processor
A. 8 bit   B. 16 bit   C. 32 bit   D. 4 bit

8. The microprocessor can read/write 16 bit data from or to _____
A. memory   B. I /O device   C. processor   D. register

9. In 8086 microprocessor , the address bus is _____ bit wide
A. 12 bit   B. 10 bit   C. 16 bit   D. 20 bit

10. The work of EU is _____
A. encoding   B. decoding   C. processing   D. calculations

UNIT-II

1. _____ destination inverts each bit of destination
A.   B. NOR   C. AND   D. OR

2. The JS is called as _____
A. jump the signed bit   B. jump single bit   C. jump simple bit   D. jump signal it

3. Instruction providing both segment base and offset address are called _____
A. below type   .B. far type   C. low type   D. high type
4. The conditional branch instruction specify _____ for branching
A. conditions   B. instruction   C. address   D. memory
5. The microprocessor determines whether the specified condition exists or not by testing the

_____
A. carry flag   B. conditional flag   C. common flag   D. sign flag
6. The LES copies to words from memory to register and _____
A. DS   B. CS   C. ES   D. DS
7. The _____ translates a byte from one code to another code
A. XLAT   B. XCHNG   C. POP   D. PUSH
8. The _____ contains an offset instead of actual address
A. SP   B. IP   C. ES   D. SS
9. The 8086 fetches instruction one after another from _____ of memory
A. code segment   B. IP   C. ES   D. SS
10. The BIU contains FIFO register of size 6 bytes called _____.
A. queue   B. stack   C. segment   D. register
UNIT-III
1. The ___ bus controller device decodes the signals to produce the control bus signal
A. internal   B. data   C. external   D. address
2. A _____ Instruction at the end of interrupt service program takes the execution back to the interrupted program
A. forward   B. return   C. data   D. line
3. The main concerns of the _____ are to define a flexible set of commands
A. memory interface   B. peripheral interface   C. both (A) and (B)   D. control interface
4. Primary function of memory interfacing is that the _____ should be able to read from and write into register
A. multiprocessor   B. microprocessor   C. dual Processor   D. coprocessor
5. To perform any operations, the Mp should identify the _____
A. register   B. memory   C. interface   D. system
6. The Microprocessor places _____ address on the address bus
A. 4 bit   B. 8 bit   C. 16 bit   D. 32 bit
7. The Microprocessor places 16 bit address on the add lines from that address by _____ register should be selected
A. address   B. one   C. two   D. three
8. The _____of the memory chip will identify and select the register for the EPROM
A. internal decoder   B. external decoder   C. address decoder   D. data decoder
9. Microprocessor provides signal like ____ to indicate the read operatio
A. LOW   B. MCMW   C. MCMR   D. MCMWR
10. To interface memory with the microprocessor, connect register the lines of the address bus must be added to address lines of the _____ chip.
A. single   B. memory   C. multiple   D. triple
UNIT-IV
1.The 8051 microcontroller is of ___pin package as a _____ processor.
a) 30, 1byte   b) 20, 1 byte   c) 40, 8 bit   d) 40, 8 byte

2.The SP is of ___ wide register. And this may be defined anywhere in the _____.
a) 8 byte, on-chip 128 byte RAM.   b) 8 bit, on chip 256 byte RAM.
c) 16 bit, on-chip 128 byte ROM   d) 8 bit, on chip 128 byte RAM.
3.After reset, SP register is initialized to address_____.
a) 8H   b) 9H   c) 7H   d) 6H
4.What is the address range of SFR Register bank?
a) 00H-77H   b) 40H-80H   c) 80H-7FH   d) 80H-FFH
5.Which pin of port 3 is has an alternative function as write control signal for external data memory?
a) P3.8   b) P3.3   c) P3.6   d) P3.1
6.What is the Address (SFR) for TCON, SCON, SBUF, PCON and PSW respectively ?
a) 88H, 98H, 99H, 87H, 0D0H.   b) 98H, 99H, 87H, 88H, 0D0H
c) 0D0H, 87H, 88H, 99H, 98H   d) 87H, 88H, 0D0H, 98H, 99H
7.Serial port interrupt is generated, if ____ bits are set
a) IE   b) RI, IE   c) IP, TI   d) RI, TI
8. In 8051 which interrupt has highest priority?
a)IE1 b)TF0 c)IE0 d)TF1
9. Intel 8096 is of ___ bit microcontroller family called as _____.
a) 8, MCS51 b) 16, MCS51 c) 8, MCS96 d) 16, MCS96
10. What is the function of watchdog timer?
a)The watchdog Timer is an external timer that resets the system if the software fails to operate properly.
b)The watchdog Timer is an internal timer that sets the system if the software fails to operate properly.
c) The watchdog Timer is an internal timer that resets the system if the software fails to operate properly.
d) None of them
UNIT-V
1.In 8051, the stack pointer is a
a.4 bit register b.8 bit register c. 16 bit register   d.32-bit register
2.In 8051 microcontroller _____ is not addressable
a.program counter   b. data pointer   c. stack pointer   D. PSW
3. _____ of 8051 microcontroller has only one function
a.Port 0   b.Port 1   C.Port 2   d. Port 3
4.The instruction MOV A, 55H is an example of ____ mode in 8051.
a.Immediate addressing   b.direct addressing   C. register direct   d.register indirect
5.During serial transmission using 8051 microcontroller the baud rate can be altered by changing the value in
a.TLO   B.TLI   c.THO   d.THI
6. The Clock frequency of the 8051 microcontroller is_____
(A) 3 KHz (B) up to 16 MHz (C)) up to 15 MHz (D) none
7. Which 8051 ports needs pull-up resister to function as I/O ports……………..
(A) Port-0 (B) Port-1 (C)) Port-2 (D) Port-3
8.The 8051 has _____ I/O ports
(A) 1   (B) 2   (C)) 3   (D) 4
9.The RI+TI is a _____ interrupt.

(A) Serial   (B) Timer   (C)Hardware   (D) Software

10.The Timer-1 is a _____ bit timer.

(A) 8   (B) 16   (C)32   (D) 64

XII. WEBSITES:

1. https://www.mpmcguide.com
2. https://www.oreilly.com/library/view/microprocessor.
3. https://electronicengineering/controller/wikepedia.

XIII. EXPERT DETAILS:
1. Mr. S. Srinivasan, Professor, Indian Institute of Technology, Madras
2. Dr. L. Behera,IIT,karagpur
3. Dr. S. P. Das, IIT,karagpur
4. Dr.K.ChandraBhushana Rao (JNTUK)
5. Dr. V. Sumalatha (JNTUA)
6. Dr. M.N Giriprasad (JNTUA)

XIV. JOURNALS:
INTERNATIONAL:

1. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering
2. International Journal of Embedded Systems
3. IEEE Transactions.

NATIONAL:
1. ICTACT Journal On Communication Technology
2. IETE Journal of Research
3. Journal of Electrical Engineering and Electronic Technology

XV. LIST OF TOPICS FOR STUDENT SEMINARS:
1) Explain Pin and Block diagram of 8086.
2) Explain Timing diagram of 8051.
3) Explain about ARM Processor and its advantages.
4) Explain about new Advanced ARM processor and its features with Applications.

XVII. CASE STUDIES / SMALL PROJECTS:
1) Implement a simple 8-bit ALU using 8086.
2) Implement a 4kx8 memory using 8086.
3) Using ARM processor implement 4-bit HUB controller
4) Using ARM processor implement serial communications with less instructions.