

## Course Information Sheet

<b>Programme:</b> UG	<b>Degree:</b> B.Tech (CSE)	
<b>Course Code:</b>	<b>Course Title: Fundamentals of Microprocessors and Microcontrollers</b>	
<b>Year:</b> III <b>Sem:</b> I <b>A.Y. :</b> 2024-25	<b>Regulation:</b> R20 <b>University:</b> JNTU Kakinada.	
<b>L T/P/D C:</b> 3/0/0/3	<b>Credits:</b> 3	<b>Contact Hrs:</b> 4
<b>Mid Marks:</b> 30	<b>External Marks:</b> 70	<b>Total Marks:</b> 100
<b>Teaching Hrs:</b> 60	<b>Exam Duration:</b> 3 hrs.	

**Course Pre-Requisites:** Switching Theory & Logic Design, Computer Organization.

Course Code	Course Name	Description	Year-Sem
<b>R203204I</b>	Fundamentals of Microprocessors and Microcontrollers	<p>The student will be able to understand the basic microprocessors architecture, its functionality and to interface with I/O devices.</p> <p>2. This course gives the knowledge to understand the advanced processors and its interfacing with various devices.</p> <p>3. It will be the base for embedded system design.</p> <p>4. The course will be useful for understanding computer organization and advanced systems</p>	III CSE Semester -1

**Course outcomes:****Student will able to**

<b>No.</b>	<b>Description</b>	<b>Skill /Bloom's Taxonomy Level</b>
<b>CO1</b>	Ability to define, understand and explain the internal architecture, organization and assembly language programming of 8086 processors , 8051 Microcontrollers and ARM processors	Remember Understand TL1/TL2
<b>CO 2</b>	Ability to apply method to interface memory to 8086 and 8051 based systems	Apply/TL3
<b>CO 3:</b>	Ability to Analyse interfacing external peripherals and I/O devices and program the 8051 microprocessor.	Create /TL4
<b>CO4</b>	Ability to design and program the 8051 using timers and counters	Design/TL 6
<b>CO5</b>	Ability to conduct experiments using modern tools MASM and Keil software for ALP and interfacing	Derived it from lower level Blooms /TL5

### Course Articulation Matrix:

Mapping of Course Outcomes (CO) with Program Outcomes (PO) and Program Specific Outcomes (PSO's):

Course Outcomes (CO)	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	1	-	-	-	-	-	2	2	1
CO2	2	3	3	2	-	1	-	-	-	-	-	2	2	1
CO3	2	3	3	2	2	1	-	-	-	-	-	2	2	--
CO4	2	3	3	2	3	1	-	-	-	-	-	2	2	2
CO5	2	3	3	2	3	1	-	-	-	-	-	2	1	2
Overall	2	2.8	2.8	1.8	1.6	1	-	-	-	-	-	2	1.8	1.2

Level: 1- Low correlation (Low), 2- Medium correlation (Medium), 3-High correlation (High)

## JUSTIFICATIONS OF CO –PO MAPPING

EE 602.1		
PO1	2	Understand the fundamentals of 8085, 8086, 8051 and ARM processor architecture and instruction set. Hence apply the same to solve engineering problems.
PO2	2	Able to Identify functionalities and computing resources of various processors.
PO3	2	Able to design variety of solution to solve problem using 8086/ 8051 assembly language code.
PO4	1	Able to find the solutions of complex engineering problem with knowledge of programming and hardware components for interfacing memory
PO5	-	
PO6	<b>1</b>	Students will be able to apply microprocessor for public safety e.g Theft detection system
PO7	--	
PO8		
PO9	--	
PO10	--	
PO11	--	
PO12	<b>2</b>	Identify the deficiencies and demonstrate the need of updating for the current architecture to overcome the deficiency.

EE 602.2		
PO1	2	Students get basic knowledge for 8051 Microcontroller based system.
PO2	3	Students will be analyse methods for interfacing various memory units
PO3	3	Able to develop solutions for interfacing memory to 8051 microcontroller
PO4	2	Able to connect multiple memory of different specifications
PO5	-	
PO6	<b>1</b>	Able to apply for assembling a microcomputer
PO7		
PO8	-	
PO9	-	
PO10	-	
PO11	-	
PO12	<b>2</b>	Apply the knowledge of 8051 instruction set to design a better solution

**EE 602.3**

PO1	2	Use knowledge of the Microcontroller to interface peripheral devices
PO2	3	Students can identify and formulate some applications and can use various digital gates
PO3	3	Able to analyze the problem and identify the logic and parameter to solve problem related to I/O interfacing.
PO4	2	Design the solutions of complex engineering problem with knowledge of programming and hardware components.
PO5	2	Students will be able to use Keil software for Assembly Language Programming of microcontrollers for interfacing I/O
PO6	1	Students will be able to interface various peripheral devices to microcontrollers .
PO7	--	
PO8	--	
PO9	--	
PO10	--	
PO11		
PO12	2	Apply the knowledge of interfacing to design better embedded systems.

**EE602.4**

PO1	2	Use knowledge of timers and counters to interface to 8051 microcontroller
PO2	3	Students will be able to interface I/O devices to 8051 microcontroller through timers/counters
PO3	3	Students will be able to design and develop microcontroller based small applications
PO4	2	Students will be able to investigate normal applications
PO5	3	Students can develop microcontroller based application using Embedded C or Keil software
PO6	1	
PO7	--	
PO8	--	
PO9	--	
PO10	--	
PO11	--	
PO12	2	Students will be able to develop microcontroller based appliances

**EE 602.5**

PO1	2	Understand the fundamentals of programming
PO2	3	Understand the 8051 instructions and able to apply in writing a program hardware interface
PO3	3	Able to design variety of solution to solve problem using assembly Language Instructions
PO4	2	Able to investigate a complex problem
PO5	3	Students will be able to use latest tools of Microcontrollers for designing
PO6	1	Able to design a commercial application using microcontrollers
PO7	-	
PO8	-	
PO9	--	
PO10	--	
PO11	--	
PO12	2	Apply the knowledge of microcontrollers to design an embedded systems.

**Justification for Avg CO-PO Mapping**

<b>Mapping</b>	<b>Level</b>	<b>Justification</b>
PO1	2.0	Microprocessors and Microcontrollers are used in designing engineering systems for solving engineering problems
PO2	2.4	Microprocessors and Microcontrollers are used in designing engineering systems to analyze complex engineering problems
PO3	2.0	Microprocessors and Microcontrollers are used in designing engineering systems for solving engineering problems related to public health and safety and environmental systems
PO4	1.6	Microprocessors and Microcontrollers are used in designing engineering systems for solving engineering problems
PO5	1	Microcontroller based systems use modern tools viz MASM, Keil software
PO6	1	Microcontroller based systems can be used for gathering information for assessing various issues
PO7	--	
PO8	--	
PO9	--	

PO10	--	
PO11	--	
PO12	1.2	Knowledge in MP & MC programming helps in acquiring skills to design, analyze and develop algorithms

### Justification for CO-PSO Mapping

Mapping	Level	Justification
PSO1	2	Students get a sound knowledge of architecture of processor used in designing
PSO1	2	Students learn the programming skills required for designing
PSO1	2	Knowledge of microcontroller which is used in automation industry
PSO1	2	Students understand few of the interfacing modules required to design a product
PSO1	1	Only overview of the basics of the advanced processors
PSO2	1	Students are taught designing using Assembly Language programming for microprocessors and microcontrollers
PSO2	1	Real time applications using ALP are executed
PSO2	-	Real time applications using ALP are executed
PSO2	2	External devices are interfaced using ALP
PSO2	2	Identify the deficiencies and demonstrate the need of updating for the current architecture to overcome the deficiency.

### Topics beyond Syllabus

S.No.	Description	Proposed Actions
1	Stepper motor interface to microcontroller	Assignments
2	No Information On Microcontrollers Other Than 8051	Workshop

### TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/PROJECTS/NPTEL ETC

#### Topic beyond Syllabus: Mapping with PO and PSO:

Topic beyond syllabus	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	3	3	2	3	3	-	-	-	-	-	-	2	3	2

**Justification for Topic beyond the Syllabus (TBS) -PO Mapping.**

Mapping	Level	Justification
TBS-PO1	3	Students could apply the acquired knowledge of Microprocessors and Microcontrollers .
TBS-PO2	3	Able to analyze applications of processors in real time projects .
TBS-PO3	2	Able to design various automation applications .
TBS -PO4	3	Use research-based knowledge for designing microprocessor based projects .
TBS -PO5	3	Use aid of software tools for various applications

**Justification for Topic Beyond the Syllabus (TBS) -PSO Mapping.**

Mapping	Level	Justification
TBS-PSO1	3	Apply the acquired knowledge of design and development of microprocessor or microcontroller based projects .
TBS-PSO2	2	Analyze the Conventional Methods for various applications .

**WEB SOURCE REFERENCES :**

1	<a href="http://www.atmel.com/">www.atmel.com/</a>
2	<a href="https://www.express-technology.com/part-type/microcontrollers/">https://www.express-technology.com/part-type/microcontrollers/</a>

**Syllabus / Lesson Plan:**

S.No.	SYLLABUS	Periods	Methodology	Text book/references /web references and additional text book reference
<b>UNIT – I</b>				
1	<b>8085 PROCESSOR:</b> Hardware Architecture, pinouts — Functional Building Blocks of Processor	<b>2</b>	<b>Chalk &amp; Talk</b>	<b>T2, A1</b>
2	Memory Organization	<b>2</b>	<b>Chalk &amp; Talk,</b>	<b>T1, T2, A1</b>

3	I/O ports and data transfer concepts	2	Chalk & Talk,	T2, A1
4	Interrupts.	2	Chalk & Talk,	T1,T2
5	<b>8086 Architecture:</b> Main features, pin diagram/description	2	Chalk & Talk	T2, A1
6	pin diagram/description, 8086 microprocessor family	2	Chalk & Talk Demo of mechanisms.	T2, A1, A2
7	internal architecture	1	Chalk &Talk Demo of mechanisms.	T2, A1, A2
8	interrupts and interrupt response	2	Chalk & Talk	T1, T2, A2
9	8086 system timing	1	Chalk & Talk	T2,A1
10	minimum mode and maximum mode configuration	2	Chalk & Talk,	T2, A1, A2
	<b>Total</b>	<b>18</b>	Chalk & Talk	T2,A2
<b>Unit 2</b>				
11	<b>8086 Programming:</b> Program development steps	2	Chalk & Talk	T1, A1,A2
12	Instructions	2	Chalk & Talk	T2,A1
13	addressing modes	2	Chalk & Talk,	T2, A1, A2
14	Assembler directives	3	Chalk & Talk	T2,A2
15	writing simple programs with an assembler	2	Chalk & Talk	T2,A2
16	assembly language program development tools	2	Chalk & Talk,	T2, A1, A2
	<b>Total</b>	<b>13</b>		
<b>Unit 3</b>				
17	<b>8086 Interfacing:</b> Semiconductor memories interfacing (RAM, ROM)	3	Chalk & Talk	T2, A1, A2
18	Intel 8255 programmable peripheral interface	2	Chalk & Talk Demo of mechanisms.	T2, A1, A2
19	Interfacing switches and LEDS	1	Chalk & Talk Demo of mechanisms.	T2, A1, A2
20	Interfacing seven segment displays	1	Chalk & Talk	T2, A1, A2
21	software and hardware interrupt applications	3	Chalk & Talk Demo of mechanisms.	T2, A1, A2
22	Intel 8251 USART architecture and interfacing	2	Chalk & Talk	T2, A1, A2
23	Intel 8237a DMA controller	2	Chalk & Talk	T2, A1, A2
24	stepper motor	2	Chalk & Talk	T2, A1, A2
25	A/D and D/A converters	2	Chalk & Talk	T2, A1, A2
26	Need for 8259 programmable interrupt controllers	2	Chalk & Talk	T2, A1, A2
	<b>Total</b>	<b>20</b>		
<b>Unit 4</b>				

27	<b>8051 MICRO CONTROLLER</b> Hardware Architecture, pinouts	2	Chalk & Talk	T2, A1, A2
28	Functional Building Blocks of Processor	2	Chalk & Talk	T2, A1, A2
29	Memory organization	2	Chalk & Talk	T2, A1, A2
30	I/O ports and data transfer concepts	2	Chalk & Talk	T2, A1, A2
31	Timing Diagram, Interrupts- Data Transfer	2	Chalk & Talk	T2, A1, A2
32	Manipulation, Control Algorithms& I/O instructions	2	Chalk & Talk	T2, A1, A2
33	Comparison to Programming concepts with 8085	2	Chalk & Talk	T2, A1, A2
	<b>TOTAL</b>	<b>14</b>		
<b>UNIT - V</b>				
34	<b>MICRO CONTROLLER PROGRAMMING &amp; APPLICATIONS</b> : Simple programming exercises	2	Chalk & Talk	T2, A1, A2
35	key board and display interface	2	Chalk & Talk	T2, A1, A2
36	Control of servo motor stepper motor control	2	Chalk & Talk	T2, A1, A2
37	Application to automation systems	2	Chalk & Talk	T2, A1, A2
	<b>TOTAL</b>	<b>8</b>		
	<b>GRAND TOTAL</b>	<b>60</b>		

#### Topic Beyond Syllabus:

S.No.	Topic Beyond Syllabus Planning	PERIODS	Methodology	Text book/references/web references and additional text book reference
1	Stepper Motor interface using microcontrollers	2	Seminar	T1, T2,A1
2	PIC / ATMEL Processors	2	Industrial Visit	

#### Note: Bloom's Taxonomy Levels

<b>BTL1-Remember</b>	<b>BTL2 – Understand</b>	<b>BTL3 –Apply</b>
<b>BTL4-Analyze</b>	<b>BT56 –Evaluate</b>	<b>BTL6–Create</b>

Text books (T) / Reference books (R)/Additional text books (A):

T/R/A	Book Title/Author/Publication
T1	Advanced Microprocessors and Peripherals –A.K.Ray and K.M Bhurchandani, TMH , 2 <sup>nd</sup> Edition , 2006
T2	ARM System Development Guide,Andrew N SLOSS,Domino SYMES Chris Wright ,Elseveier,2012
R1	The 8051 Microcontroller, Mazidi and Mazidi ,Cangage Learning, 3 <sup>rd</sup> Edition,2004
R2	Microprocessors and Interfacing, D.V.Hall,TMGGH , 2 <sup>nd</sup> Edition, 2008
A1	The 8051 Microcontrollers Architecture and Programming and Applications-K.Uma Rao,Andhe Pallavi ,Pearson,2009
A2	Digital Signal Processing and Applications with the OMAP –L138 Experimenter,Donald Raey ,WILEY 2012

### Web References:

W	Web References
W1	<a href="https://mrcet.com/downloads/digital_notes/ECE/III%20Year/mpmc%20digital%20notes.pdf">https://mrcet.com/downloads/digital_notes/ECE/III%20Year/mpmc%20digital%20notes.pdf</a>
W2	<a href="https://nptel.ac.in/courses/108108076/">https://nptel.ac.in/courses/108108076/</a>
W3	<a href="https://nptel.ac.in/courses/108105053/">https://nptel.ac.in/courses/108105053/</a>
W4	<a href="https://nptel.ac.in/courses/108105017/">https://nptel.ac.in/courses/108105017/</a>
W5	<a href="https://nptel.ac.in/courses/117106108/">https://nptel.ac.in/courses/117106108/</a>
W6	<a href="https://nptel.ac.in/courses/122/106/122106025/">https://nptel.ac.in/courses/122/106/122106025/</a>

### ASSESSMENT METHODOLOGIES-DIRECT

<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input checked="" type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS		

### ASSESSMENT METHODOLOGIES-INDIRECT

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> OTHERS

**Prepared by**

**Approved by**