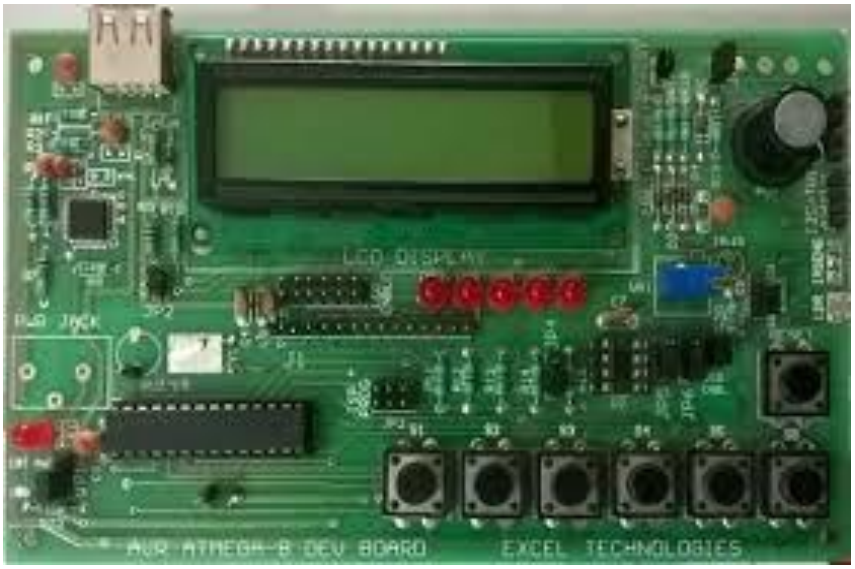
MUZAFFARPUR INSTITUTE OF TECHNOLOGY

MUZAFFARPUR

COURSE FILE

MICROCINTROLLER

(041565)



Faculty Name:

SAKET KUMAR

ASSISTANT PROFESSOR, DEPARTMENT OF ECE

CONTENTS

Department of Electronics and Communication engineering

Vision

Electronics and Communication Engineering Department goals to offer a platform of excellence to yield ingenious technocrats those can face the challenges of a new era and excel at a national level. So as to boost world-wide affluence by nurturing technology international.

Mission

M1. To offer its students with information required for superiority engineering course.

M2. To offer originality, enlargement actions, incorporation, allocation and spread over information about electronics and communication technologies.

M3. To prepare its students with a comprehensive knowledgeable spectrum with the purpose of get ready them for competitive carrier paths.

M4. Offer moral and value based education by encouraging actions addressing the collective requirements.

Electronics and Communication Engineering Program Educational Objectives

PEO-1

To graduate student for a successful profession with team work skills, effective communication skills and graft with ethics that support the diversified needs of research, industry and academia.

PEO-2

To endorse responsiveness among student towards problems of social significance and present them to proficient ethics and practice.

PEO-3

To prepare student graduates with self-learning capability by instructing the attitude to constantly learn, invent and contribute to formation of novel knowledge for the assistance of the humanity.

PEO-4

To make students in understanding, investigating and making new technologies and product that help to find solution of real world difficulties.

PEO-5

To introduce in student the aptitude to get multidisciplinary information through self-make projects and engineering training, so long as a supportable economical edge in research and development and providing industry demands.

PEO-6

To introduce in student, the potentials of management for expertise invention and entrepreneurship

Electronics and Communication Engineering Student Outcomes

Students who complete the B.Tech.degree in Electronics and Communication Engineering will be able to:

PO1 Apply the knowledge of Mathematics, Science & Engineering principles and domain specialization to solve the problems of Electronics and communication engineering in core and allied industries/institutions. (Engineering knowledge)

PO2 Identify, formulate, survey literature and analyze complex Electronics and communication engineering problems and arrive at suitable conclusions. (Problem analysis)

PO3 Design / Develop solutions for complex Electronics and communication engineering problems with due consideration for public health & safety, cultural, societal and environmental concerns.(Design/Development of solutions)

PO4 Conduct investigations on complex Electronics and communication engineering problems using various research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide suitable conclusions. (Conduct investigations of complex problems)

PO5 Use suitable techniques, resources and modern engineering tools in modeling, simulating and analyzing complex Electronics and communication engineering problems with the knowledge of their limitations. (Modern tool usage)

PO6 Apply reasoning with the appropriate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Electronics and communication engineering practices. (The engineer and society)

PO7 Understand the impact of Electronics and communication engineering solutions on society and Eco-friendly environment and the need for sustainable development. (Environment and sustainability)

PO8 Follow professional ethics and commit to responsibilities & norms of the engineering practice (Ethics)

PO9 Contribute effectively as an individual or as a member / leader of intra- & inter-disciplinary and multi-cultural teams / working environment. (Individual and team work)

PO10 Communicate effectively both in verbal and written forms with engineers/technocrats in particular and with society at large and give/receive clear instructions. (Communication)

PO11 Apply the principles of engineering and management as a member or leader to manage Projects in multidisciplinary environment. (Project management and finance)

PO12 Recognize the necessity and pursue independent and life-long learning to keep abreast of Latest techniques. (Life-long learning

Course description and Objectives

- Developing of assembly level programs and providing the basics of the processors
- To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems.
- To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier.

Course Outcomes

CO315.1 Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
CO315.2 To study detailed hardware and software architecture of microcontroller
CO315.3: Understand the fundamentals of microcontroller systems and interface, and have the ability to apply them.
CO315.4 Have the ability to use simulation tools to design and program a microcontroller
CO315.5 To understand and the basics of memory and timer circuits.

CO-PO MAPPING

Sr. No.	Course Outcome	PO
1.	CO315.1 Have a thorough understanding of the fundamental concepts of intelligent instruments and its characteristics.	1,2
2.	CO315.2 To design the basic circuits using op-amp and perform operations and their troubleshooting.	1,2,3,4,5,6,12
3.	CO315.3 To Understand the basic building blocks of smart sensor and interfacing devices.	1,2,5,6,12
4.	CO315.4 To understand, analyze and design basic building blocks of different types A/D and D/A converters.	1,2,3,5,6,12
5.	CO315.5 To understand and the basics of memory and timer circuits.	1,2,5,12

Course Outcomes	PO 1	PO 2	PO3	PO 4	PO5	PO 6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO315.1 Have a thorough understanding of the fundamental concepts of intelligent instruments and its characteristics.	√	√										
CO315.2 To design the basic circuits using op-amp and perform operations and their troubleshooting.	√	√	√	√	√	√						√
CO315.3 To Understand the basic building blocks of smart sensor and interfacing devices.	√	√			√	√						√
CO315.4 To understand and analyze basic building blocks of different types A/D and D/A converters.	√	√	√		√	√						√
CO315.5 To understand and the basics of memory and timer circuits	√	√			√							√

B. Tech. V Semester (ECE)

ECE-041565 / **MICROCONTROLLERS**

Max Marks: 100

Final Exam: 70 Marks

Sessional: 20 Marks

Internals: 10 Marks.

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04 1x65 **MICROCONTROLLERS** **L-T-P: 3-1-0** **Credit: 4**

1**. Different types of microcontrollers**: Embedded microcontrollers, external memory microcontrollers, processor architecture, Harvard Vs Princeton. **Lecture: 4**

2. **Microcontrollers**: Overview of 8051 microcontrollers, application areas, compares and contrasts Microprocessor and Microcontrollers. **Lecture: 2**

3. **8051 Microcontrollers Architecture**: 8051 pin description, conception about program counter, data pointer register bank, flags, program status word (PSW), internal memory, RAM memory, ROM memory map, stack and stack pointer, input and output ports, External memory, counters and timers, serial data, input/output interrupts. **Lecture: 8**

4. **8051 Addressing modes**: Immediate and register addressing modes. Accessing memory using various addressing modes, Bit address for I/O and RAM**.** **Lecture: 3**

5. **Basic assembly language programming concepts**: assembling and running an 8051 program. 8051 assembly language programming concepts using arithmetic, logical, data mover, call, jump, loop, time delay instructions and subroutines. **Lecture: 8**

6. **I/O port programming**: 8051 I/O port assembly language programming concepts. **Lecture: 3**

7. Assembly language programs based on rotate, compare and data serialization concepts. **Lecture: 3**

8. **8051 timers programming in assembly**: 8051 timers programming concept, counter programming. Lecture: 5

9. **Interrupts programming in assembly**: Programming timer interrupts**.** **Lecture: 3**

10. Real world interfacing or 8051: Intelligent LCD display, interfacing keyboard to 8051. **Lecture: 5**

11. **PIC Microcontrollers**: Introduction to PIC Microcontrollers, Architecture and pipelining. Program memory considerations. Addressing modes. CPU Registers. instruction set, simple operation.

Text Books: 1. The 8051 Microcontroller and Embedded system by M.A. Mazidi, Pearson/PHI.

2. Design with PIC Microcontrollers by John B. Peatman, Pearson.

Reference Books: 1. The 8051 microcontroller by Kenneth Ayala, Thomson Learning.

2. Embedded microcomputer systems by J.W. Valvano Brooks, Thomson Learning.

3. Microcontrollers and Microcomputers by Fredrick M. Cady, Oxford University press

MICROCONTROLLER

GATE SYLLABUS

NONE

Time table: MICROCONTROLLER, 5TH Sem.

Room No. EB – 2

Day/ time	09:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	4:00-5:00
MON					**B**			
TUE			**E1**		**R**			
WED								
THU		E1			**E**			
FRI	**E1**				**A**			
SAT					**K**			

STUDENT LIST

B. TECH. 2016 BATCH

ELECTRONICS & COMMUNICATION BRANCH

Sl. No.	College Roll No.	AKU Reg. No.	Name
1	16EC29	16104107001	SANSKRITI SHREE
2	16EC52	16104107002	ABHIMANYU KUMAR
3	16EC48	16104107003	SRISTI SNEHA
4	16EC13	16104107004	SHREYA ANAND
5	16EC10	16104107005	AGHAZ JUNAID
6	16EC26	16104107006	SUBHAM RAJ
7	16EC46	16104107007	SAKET RANA
8	16EC36	16104107008	NIDHI
9	16EC53	16104107009	BRISHNI KANT PATHAK
10	16EC16	16104107010	NEHA PRAVEEN
11	16EC34	16104107011	OM PRAKASH
12	16EC01	16104107015	ANKIT KUMAR
13	16EC47	16104107016	KISHAN KUMAR
14	16EC50	16104107017	MAMTA KUMARI
15	16EC23	16104107018	RAJU KUMAR
16	16EC49	16104107019	SHIVANI
17	16EC44	16104107020	DEEPAK KUMAR GUPTA
18	16EC35	16104107021	MD SARVAR ALI
19	16EC45	16104107022	RAHUL RANJAN KAPRI
20	16EC14	16104107023	MD ARSHADULLAH
21	16EC43	16104107024	SHIMPI KUMARI
22	16EC38	16104107025	NITISH KUMAR
23	16EC11	16104107026	VIVEK KUMAR SONU
24	16EC17	16104107027	VISHAL KUMAR
25	16EC42	16104107028	AYUSHMAN KUMAR
26	16EC33	16104107029	PRANAY MOHAN
27	16EC51	16104107030	RAJ KUMAR
28	16EC40	16104107031	KUNDAN KUMAR
29	16EC30	16104107032	VIMLA BHARTI
30	16EC09	16104107034	UTSARG RANJAN
31	16EC12	16104107035	SUGANDHA KUMARI
32	16EC32	16104107036	PRASHANT KUMAR
33	16EC37	16104107037	HIMANSHU RAJ
34	16EC24	16104107038	PREM PRAKASH MANGLAM
35	16EC31	16104107039	PUJA KUMARI

36	17(LE)EC04	17104107026	ANIL KUMAR
37	17(LE)EC03	17104107901	AKASH RAJ
38	17(LE)EC07	17104107902	MANOJ KUMAR
39	17(LE)EC05	17104107903	JAY PRAKASH
40	17(LE)EC01	17104107904	SHRUTI RAJNANDANI
41	17(LE)EC02	17104107905	RAGINI KUMARI
42	17(LE)EC06	17104107906	RITUL KUMARI

COURSE HANDOUT

Institute / College Name :	MIT MUZAFFARPUR		
Program Name	MICROCONTROLLERS		
Course Code	041565		
Course Name	MICROCONTROLLERS		
Lecture / Tutorial (per week):	3-0-3	**Course Credits**	3
Course Coordinator Name	SAKET KUMAR		

1. Scope and Objectives of the Course

- Developing of assembly level programs and providing the basics of the processors
- To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems.
- To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional carrier.

Text Books: 1. The 8051 Microcontroller and Embedded system by M.A. Mazidi, Pearson/PHI.

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2. Embedded microcomputer systems by J.W. Valvano Brooks, Thomson Learning.

3. Microcontrollers and Microcomputers by Fredrick M. Cady, Oxford University press

Other readings and relevant websites

S.No.	**Link of Journals, Magazines, websites and Research Papers**
1.	https://www.tutorialspoint.com/embedded_systems/es_microcontroller.htm
2.	http://irist.iust.ac.ir/files/ee/pages/az/mazidi.pdf
3.	https://www.engineersgarage.com/8051-microcontroller
4.	https://www.intorobotics.com/8051-microcontroller-programming-tutorials-simulators-compilers-and-programmers/

5. Course Plan

Sl. No.	Topic Name	Periods
	1.INTRODUCTION	
1.1	Different types of microcontrollers	1
1.2	Embedded microcontrollers, external memory microcontrollers	2
1.3	processor architecture, Harvard Vs Princeton	1
	2.Microcontrollers	
2.1	Overview of 8051 microcontroller, application areas, compares and contrasts	1
2.2	Microprocessor and Microcontrollers.	1
	3. 8051 Microcontrollers Architecture	
3.1	8051 pin description	1
3.2	conception about program counter, data pointer register bank, flags , program status word (PSW)	2
3.3	internal memory, RAM memory, ROM memory map, stack and stack pointer, input and output ports, External memory	2
3.4	counters and timers , serial data, input/output interrupts.	3
	4. 8051 Addressing modes	
4.1	Immediate and register addressing modes. Accessing memory using various addressing modes,	2
4.2	Bit address for I/O and RAM	1
	5. Basic assembly language programming concepts	
5.1	assembling and running an 8051 program	2
5.2	8051 assembly language programming concepts using arithmetic	2
5.3	Logical , data mover, call, jump	2
5.4	Loop, time delay instructions and subroutines	2
	6. I/O port programming	

6.1	8051 I/O port assembly language programming concepts.	1
6.1	Programming based on 8051 I/O port assembly language programming concepts.	2
	7. Assembly language programs	
7.1	based on rotate, compare and data serialization concepts.	3
	8. 8051 timers programming in assembly	
8.1	8051 timers programming concept, counter programming	5
	9. Interrupts programming in assembly	
9.1	Programming timer interrupts	3
	10. Real world interfacing or 8051	
10.1	Intelligent LCD display	2
10.2	interfacing keyboard to 8051.	3
	11. PIC Microcontrollers	
11.1	Introduction to PIC Microcontrollers	1
11.2	Architecture and pipelining. Program memory considerations	2
11.3	Addressing modes. CPU Registers. instruction set , simple operation	3
	TOTAL	**50**

Evaluation Scheme:

Component 1	Mid Semester Exam	20
Component 2	Assignment Evaluation and class test	10
Component 3**	End Term Examination**	70
	Total	**100**

****** The End Term Comprehensive examination will be held at the end of semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

SYLLABUS

Topics	No of lectures	Weightage
Different types of microcontrollers : Embedded microcontrollers, external memory microcontrollers, processor architecture, Harvard Vs Princeton.	4	8%
Microcontrollers : Overview of 8051 microcontroller, application areas, compares and contrasts Microprocessor and Microcontrollers	2	4%
8051 Microcontrollers Architecture : 8051 pin description , conception about program counter, data pointer register bank, flags , program status word (PSW) , internal memory, RAM memory, ROM memory map, stack and stack pointer, input and output ports, External memory , counters and timers , serial data, input/output interrupts	8	16%
8051 Addressing modes : Immediate and register addressing modes. Accessing memory using various addressing modes, Bit address for I/O and RAM.	3	6%
Basic assembly language programming concepts: assembling and running an 8051 program. 8051 assembly language programming concepts using arithmetic , logical , data mover, call, jump, loop, time delay instructions and subroutines	8	16%
I/O port programming : 8051 I/O port assembly language programming concepts.	3	6%
Assembly language programs based on rotate, compare and data serialization concepts. Lecture : 3 8. 8051 timers programming in assembly : 8051 timers programming concept, counter progra	5	10%
Interrupts programming in assembly : Programming timer interrupts	3	6%
Real world interfacing or 8051 : Intelligent LCD display, interfacing keyboard to 8051.	5	10%
PIC Microcontrollers : Introduction to PIC Microcontrollers , Architecture and pipelining. Program memory considerations. Addressing modes. CPU Registers . instruction set , simple operation.	6	12%

This Document is approved by:

Designation	Name	Signature
Course Coordinator	SAKET KUMAR	
H.O.D	Dr. RAM SAGAR SINGH	
Principal	Dr. J N JHA	
Date	20/05/07	

Lecture Plan

Sl. No.	Topic Name	Periods
	1.INTRODUCTION	
1.1	Different types of microcontrollers	1
1.2	Embedded microcontrollers, external memory microcontrollers	2
1.3	processor architecture, Harvard Vs Princeton	1
	2.Microcontrollers	
2.1	Overview of 8051 microcontroller, application areas, compares and contrasts	1
2.2	Microprocessor and Microcontrollers.	1
	3. 8051 Microcontrollers Architecture	
3.1	8051 pin description	1
3.2	conception about program counter, data pointer register bank, flags , program status word (PSW)	2
3.3	internal memory, RAM memory, ROM memory map, stack and stack pointer, input and output ports, External memory	2
3.4	counters and timers , serial data, input/output interrupts.	3
	4. 8051 Addressing modes	
4.1	Immediate and register addressing modes. Accessing memory using various addressing modes,	2
4.2	Bit address for I/O and RAM	1
	5. Basic assembly language programming concepts	
5.1	assembling and running an 8051 program	2

5.2	8051 assembly language programming concepts using arithmetic	2
5.3	Logical , data mover, call, jump	2
5.4	Loop, time delay instructions and subroutines	2
	6. I/O port programming	
6.1	8051 I/O port assembly language programming concepts.	1
6.1	Programming based on 8051 I/O port assembly language programming concepts.	2
	7. Assembly language programs	
7.1	based on rotate, compare and data serialization concepts.	3
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	9. Interrupts programming in assembly	
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10.1	Intelligent LCD display	2
10.2	interfacing keyboard to 8051.	3
	11. PIC Microcontrollers	
11.1	Introduction to PIC Microcontrollers	1
11.2	Architecture and pipelining. Program memory considerations	2
11.3	Addressing modes. CPU Registers. instruction set , simple operation	3
	TOTAL	**50**

Question bank

MICROCONTROLLER QUESTION BANK UNIT-I

PART-A

1. What is microcontroller?
2. How many I/O ports are placed in microcontroller 8051?
3. Define DPTR.
4. What is the purpose of PSW register?
5. What is use of EA pin?
6. How many bit addressable location are placed in internal RAM?
7. What is interrupts signal?
8. Name the types of 8051 interrupts signals.
9. Define clock cycle.
10. Define machine cycle.

PART-B

1. Explain the Architecture of 8051.What are the blocks in Microcontroller.
2. Explain the Pin Diagram of 8051.
3. Explain the Instruction set with examples.
4. Explain the block diagram of 8051 Microcontroller.

UNIT-II

PART-A

1. What is assembler?
2. Mention the different fields in assembly language instructions?
3. What is operand field?
4. What are fields used in assembly language instructions as optional?
5. Mention two assembler directives?
6. Mention any four addressing modes of 8051?
7. Mention any two examples of direct addressing instructions?
8. What are the instructions used to access external RAM?

9. How can you perform multiplication using 8051 microcontrollers?

10. What is the operation carried out when 8051 executes the instruction

MOVC A, @A+DPTR?

PART-B

1. Write an ALP for multibyte addition.

2. Explain the different modes of addressing used in 8051.

3. Write an ALP for finding maximum value in an array.

4. Explain assembly and running of an 8051 program.

5. Explain the structure of assembly language.

6. Write an ALP to arrange the given set of 'n' numbers in ascending order.

UNIT-III

PART-A

1. Mention the timers of 8051?

2. Mention the bit addresses of ports p0 and p1?

3. How many bit addressable locations are placed in internal RAM of 8051?

4. Mention the SFR registers used in timer operation?

5. Mention the operating modes of 8051?

6. What is the function of C/T bit in TMOD register?

7. Find the timers clock frequency for the crystal frequency of 11.0592MHz?

8. State the function of M1 and M0 bits in TMOD register?

9. What is the function of TF0 bit in TCON register?

10. State the use of T0 pin of 8051?

PART-B

1. Explain the bit addresses for I/O of 8051.
2. Explain TMOD and TCON registers.
3. Explain bit addresses for RAM.
4. Explain the steps to program the timer 1 in mode 2.
5. Explain in detail about the programming of 8051 timer.
6. Explain the various modes of timer operation with diagram.

UNIT-IV

PART-A

1. How will you double the baud rate in 8051?
2. What is the function of SMOD in PCON register?
3. What is RS 232C?
4. How many timers are in 8051? Specify their names.
5. Mention the four modes of timer operation.
6. Mention are the registers used for timer/counter operation.
7. Define timer operation.
8. Define counter operation.
9. What are registers used for serial communication in 8051?
10. Why are drivers bused in between RS232 and microcontroller?

PART-B

1. Explain the baud rates of serial communication in 8051.
2. Explain the interrupts of 8051.
3. Explain about the serial port programming.
4. Draw the interfacing diagram of RS232 with 8051 and explain its operation.
5. Explain the functions of each bit of SCON and PCON registers.