Ref
No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BANGALORE

COURSE PLAN

Academic Year 2019-20

Program:	B E – ELECTRONICS AND COMMUNICATION ENGINEERING
Semester :	4
Course Code:	18EC46
Course Title:	8051 MICROCONTROLLER
Credit / L-T-P:	4 / 4-0-0
Total Contact Hours:	50
Course Plan Author:	Mrs.SYEDA N

Academic Evaluation and Monitoring Cell

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Note : Remove "Table of Content" before including in CP Book
     Each Course Plan shall be printed and made into a book with cover page
     Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	EC
Year / Semester :	2/4	Academic Year:	2019-20
Course Title:	Microcontroller	Course Code:	18EC46
Credit / L-T-P:	4-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	50	SEE Marks:	60
CIA Marks:	40	Assignment	10

Course Plan Author:	Mrs.Syeda N		Sign		Dt:	
Checked By:			Sign		Dt:	
CO Targets	CIA Target : ……. %		SEE Target:		……. %	

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051.Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM.8051 AddressingModes .	10	8051 Hardware Architecture Memory Interfacing	L2 L4
2	Introduction to 8051 assembly programming,Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.	10	Assembly Programing Basics 8051 Instruction Set	L2 L2
3	Data types and time delay in 8051C, IO programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C, Accessing code ROM space in 8051C, Data serialization using 8051C. Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C	10	C Programing Basics Timer Programing	L4 L4
4	Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in assembly, serial port programming in 8051 C. 8051 interrupts, Programming timer, external hardware, serial communication interrupt, Interrupt priority in 8051/52, Interrupt programming in C.	10	Serial Communication Programing Interupt Programing	L4 L4
5	LCD interfacing, Keyboard interfacing ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.Relays and opt isolators, stepper motor interfacing, DC motor interfacing and PWM	10	I/O Device and Converter Interface	L4
-	**Total**	**50**	-	-

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1,2,3,4,5	The 8051 Microcontroller and Embedded Systems Using Assembly and C 8051 Muhammad Ali Mazadi Pearson 2 nd Edition, 2008.	In Lib and dept	In Lib / In Dept

B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1,2,3,4,5	The 8051 Microcontroller Kenneth Ayala Cengage Learning 3 rd Edition, 2005	In Lib and dept	In Lib
1,2,3,4	The 8051 Microcontroller and EmbeddedSystems Manish K Patel McGraw Hill 2014	In Lib	In Lib
1,2,3,4,5	Microcontrollers: Architecture,Programming, Interfacing and System Design Raj Kamal Pearson 1 st Edition, 2012	In Lib	In Lib
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
C1	https://www.electronicshub.org/8051-microcontroller-architecture	1	Internet
C2	http://www.zseries.in/embedded%20lab/ 8051%20microcontroller/memory %20mapping.php#.XbaHV-YzbIU	1	Internet
C3	https://www.tutorialspoint.com/addressing-modes-of-8051	2	Internet
C4	https://www.youtube.com/watch?v=9VY6d6oJr7s	2	Internet
C5	https://www.youtube.com/watch?v=t9NrRkdGaME	3	Internet
C6	https://www.electronicwings.com/8051/8051-timers	3	Internet
C7	https://www.gadgetronicx.com/serial-communication-in-8051-microcontroller/	4	Internet
C8	https://www.elprocus.com/types-of-interrupts-in-8051-microcontroller-and-interrupt-programming	4	Internet
C9	https://www.academia.edu/ 6174081/8051_Interfacing_and_Applications_Microcontroller	5	Internet
C10	https://circuitdigest.com/microcontroller-projects/stepper-motor-interfacing-with-8051	5	Internet
D	**Software Tools for Design**		
1	Keil Micro vision tool		
2	Flash Magic tool		
E	**Recent Developments for Research**	**-**	**-**
1	MSP 430		
2	ARM processor		
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**
1	https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers/22	internet	L1-L3
2	https://www.elprocus.com/8051-microcontroller-architecture-and-applications	internet	L1-L4

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	17ELN15/25	Basic Electronics	Microcontroller Architecture and stepper motor Interface	2		

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Mod ules	Topic / Description	Area	Remarks	Blooms Level
1	8051 Hardware Architecture	Computer Hardware	Required for Higher Education, Entrepreneurship	L2, L4
2	Assembly Programing Basics 8051 Instruction Set	IO interfacing	Industry & profession requirements	L2
3	C Programing BasicsTimer Programing	External hardware interfaces	Industry & profession requirements	L2, L4
4	Serial Communication Programing Interrupt Programing	Storage devices	Industry	L2,L3
5	I/O Device and Converter Interface Motor and 8255 Interfacing	Embedded Systems	Industry & profession requirements	L2

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Mod ules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessme nt Method	Blooms' Level
1	18EC46.1	Understand the features and internal architecture of 8051 using block diagram, Analyze the interfacing of RAM and ROM memories with 8051 using connection diagram	10	8051 Architectur e Memory Interfacing	Lecture/ PPT	Test and Assignme nt	L2 Understand
2	18EC46..2	Understand the syntax, rules of and execution procedure of assembly language.	10	Assembly Programin g Basics	Lecture	Test and Assignme nt	L2 Understand
3	18EC46..3	Understand data transfer, arithmetical , logical, loop, jump and call instructions		8051 Instruction Set	Lecture	Test and Assignme nt	L2 Understand
4	18EC46..4	Develop programs for timer/counter -0/1 using assembly and C language Develop program for interrupt handling for timer interrupt, external interrupt and serial communication interrupt using assembly and C language		Timer Programin g Interrupt Programin g	Lecture/ PPT	Test and Assignme nt	L4 Analyse
-	-	**Total**	50	-	-	-	-

2. Course Applications

Write 1 or 2 applications per CO.

Students should be able to employ / apply the course learnings to . . .

Mod	Application Area	CO	Level

ules	Compiled from Module Applications.		
1	Washing machine, Microwave oven etc..	CO1	L2
2	Design of SOC	CO2	L4
3	Use for typical device drivers, low level embedded systems coding.	CO3	L2
4	Use for writing assembly programs	CO4	L2

3. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes															-
Mod ules	CO.#	At the end of the course student should be able to . . .	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	Level	PSO2	PSO3	Lev el
1	18EC46.1	Understand the features and internal architecture of 8051 using block diagram, Analyze the interfacing of RAM and ROM memories with 8051 using connection diagram	3	2		2	2					1		1	L2	1	3	L2
2	18EC46..2	Understand the syntax, rules of and execution procedure of assembly language.	3	2	2	1	1					1		1	L4		1	L4
3	18EC46..3	Understand data transfer, arithmetical , logical, loop, jump and call instructions	3	3	3	2						1		1	L4	3	2	L4
4	18EC46..4	Develop programs for timer/counter -0/1 using assembly and C language Develop program for interrupt handling for timer interrupt, external interrupt and serial communication interrupt using assembly and C language	3	3	3	3	2	1	1	2	1	2	1	2	L4	1	1	L4
-	CS501PC	Average attainment (1, 2, or 3)																-
-	PO, PSO	1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design																

4. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Mod ules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Mod ules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	8051 Microcontroller Basics	10	2	-	-	1	-	2	CO1	L2
2	Assembly programming and instruction of 8051	10	2	-	-	1	-	2	CO2	L4
3	8051 programming in C 8051 Timer programming in Assembly and C	10	-	2	-	1	1	2	CO3	L4
4	8051 serial port programming in assembly and C 8051 Interrupt programming in assembly and C	10	-	2	-	1	1	2	CO4	L4
5	Interfacing ADC, DAC and sensor interfacing Motor control 8051 interfacing with 8255	10	-	-	4	1	1	2	CO4	L4
-	**Total**	50	4	4	4	5	5	10	-	-

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Mod ules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	30	CO1, CO2	L2
3, 4	CIA Exam – 2	30	CO3,Co4	L4
5	CIA Exam – 3	30	CO4	L4
1, 2	Assignment - 1	10	CO1, CO2	L2
3, 4	Assignment - 2	10	CO3,Co4	L4
5	Assignment - 3	10	CO4	L4
1, 2	Seminar - 1	-	-	-
3, 4	Seminar - 2	-	-	-
5	Seminar - 3	-	-	-
1, 2	Other Activities – define – Slip test	-	-	-
3, 4	**Final CIA Marks**		-	-
5	Quiz - 3		-	-
1 - 5	Other Activities – Mini Project	-	-	-
	Final CIA Marks	40	-	-

D1. TEACHING PLAN - 1

Module - 1

Title:	**8051 Microcontroller Basics**		Appr Time:	10Hrs
a	***Course Outcomes***		-	**Blooms**
-	**8051 Microcontroller Basics**		-	**Level**
1	Understand the features and internal architecture of 8051 using block diagram	CO1	L2
2	Analyze the interfacing of RAM and ROM memories with 8051 using connection diagram	CO1	L2

b	*Course Schedule*	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Inside the Computer	CO1	L2
2	Inside the Computer	CO1	L2
3	Micro-controllers and Embedded Processors	CO1	L2
4	Block Diagram of 8051	CO1	L2
5	PSW and Flag Bits, 8051 Register Banks ,internal Memory Organization of 8051	CO1	L2
6	Stack	CO1	L2
7	IO Port Usage in 8051,	CO1	L2
8	Types of Special Function Registers and their uses in 8051	CO1	L2
9	Types of Special Function Registers and their uses in 8051	CO1	L2
10	Pins Of 8051	CO1	L2
11	Memory Address Decoding	CO1	L2
12	8031/51 Interfacing With External ROM	CO1	L2
13	8031/51 Interfacing With External RAM	CO1	L2
14	8051 Addressing Modes	CO1	L2
15	8051 Addressing Modes	CO1	L2
c	**Application Areas**	**CO**	**Level**
1	Interfacing designs	CO1	L3
d	**Review Questions**	-	-
1	List the tree components of a computer system	CO1	L1
2	Wiht does CPU stands for? Explain its function in a computer	CO1	L2
3	Litst the types of buses and their purpose in computer system	CO1	L1
4	What does ALU stand for ? What is its purpose ?	CO1	L2
5	What is the purpose of program counter and instruction decoder ?	CO1	L2
6	List the features of 8051	CO1	L2
7	What are the major difference among 8051, 8052 and 8031.	CO1	L2
		CO1	L2
8	Which is the flag register in 8051 and what is the size of of it ?	CO1	L2
9	On power up , 8051 uses bank ------ for registers R0 - R7	CO1	L2
10	What is the size of the SP register ?	CO1	L2
11	On power up, 8051 uses RAM location ------ as the first location of stack	CO1	L2
12	Find the organization and chip capacity of following ROM with indicated address and data pins 1) 14 address, 8 data 2) 16 address, 8 data 3) 12 address, 8 data	CO1	L2
13	Find the capacity and number of pins set aside for address and data for memory chips with the following organization 1) 16K x 4 SRAM 2) 32K x 8 EPROM 3) 1M X 1 DRAM	CO1	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

Module – 2

Title:	Assembly programming and instruction of 8051	Appr Time:	10 Hrs
a	*Course Outcomes*	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Understand the syntax, rules of and execution procedure of assembly language.	CO2	L4
2	Understand data transfer, arithmetical, logical, loop, jump and call instructions	CO2	L4

b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
16	Introduction to 8051 assembly programming	CO2	L4
17	Assembling and running an 8051 program, Data types	CO2	L4
18	Assembler directives(Basic)	CO2	L4
19	Arithmetic instructions(Derived)	CO2	L4
20	Arithmetic programs	CO2	L4
21	Logic instructions	CO2	L4
22	Logic programs	CO2	L4
23	Jump instructions	CO2	L4
24	loop and call instructions	CO2	L4
25	IO port programming	CO2	L4
c	Application Areas	CO	Level
1	Use for typical device drivers, low level embedded systems coding.	CO2	L4
2	Use for writing assembly programs	CO2	L4
d	Review Questions	-	-
1	What is the purpose of pseudo - instructions	CO2	L4
2	------- are traslated by assembler into machine code, whereas ---- are not.	CO2	L4
3	What is the extension of source file in assembly /	CO2	L4
4	Which is the file produced by an 8051 assembler ?	CO2	L4
5	Which directive is always used for ASCII strings?	CO2	L4
6	What is the the advantage in using the EQU directive to define a constant value ?	CO2	L4
18	How many bytes are used by the following ? DATA_1: DB "INDIA"	CO2	L4
19	Why is the following ADD instruction illegal ? ADD R1, R2	CO2	L4
20	Where lower byte and upper byte of multiplication result will be stored ?	CO2	L4
21	Where quotient and remainder of division result will be stored ?	CO2	L4
22	To mask certain bits of the accumulator we must ANL it with -----	CO2	L4
23	To set certain bits of the accumulator to 1 we must ORL it with ---	CO2	L4
24	XRLing an operand with itself results in ------	CO2	L4
e	Experiences	-	-
1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	18EC46	Sem:4	I	Marks:	50	Time:	75 minutes		
Course:	Design and Analysis of Algorithms								
-	-	Note: Answer any 2 questions, each carry equal marks.					Marks	CO	Level
1	a	Compare microprocessor with Microcontroller.					05	CO1	L2
	b	With neat diagram,explain the internal architecture of 8051					05	CO1	L2
	c	Show the neat schematic interface 8K external data RAM to 8051					05	CO1	L2
		OR						CO1	L2
2	a	Explain flag register of 8051 Microcontroller					05	CO1	L2
	b	Explain the operation of following code with respect to stack. MOV SP, #10h PUSH SP					03	CO1	L2

		POP 0E0h ADD A,#10h			
	c	Interface 8051 to external 8K RAM and 32K ROM and explain how 8051 access them?	07	CO2	L4
3	a	Explain any seven addressing modes of 8051.Give an example for each of them and mention limitations of each.	20	CO2	L4
	b	Differentiate between JUMP and CALL instructions.		CO2	L4
	c	Write a program in 8051 to find the sum of 20 data bytes stored in array of external RAM starting with address 2000H. Store the 16 bit sum at the end of array.		CO2	L4
				CO2	L4
4	a	Explain the following instructions with their function and bytes used. 1) CJNE dest, source, raddr 2) ACALL target 3) SWAP A 4) RRC A 5) DJNZ Rn, reladdr.	20	CO2	L4
	b	Explain syntax of 8051 Microcontroller instruction.		CO2	L4
	c	Write a program to toggle all bits of of P1 continuously.		CO2	L4

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions								
Crs Code:	18EC46	Sem:		4	Marks:		10 / 10	Time:	90 – 120 minutes
Course:	8051 microcontroller							
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.								

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT18EC002	Compare microprocessor with Microcontroller.	10	CO1	L2
2	1KT18EC003	What is microcontroller? List out the difference between CISC and RISC	10	CO1	L2
3	1KT18EC007	With neat diagram,explain the internal architecture of 8051	10	CO1	L2
4	1KT18EC008	Explain the 8051 block diagram and its features	10	CO1	L2
5	1KT18EC009	Explain flag register of 8051 Microcontroller	10	CO1	L2
6	1KT18EC010	Explain memory organization of 8051 microcontroller with neat diagram.	10	CO1	L2
7	1KT18EC011	With the neat diagram, explain the internal structure of port P1.0	10	CO1	L2
8	1KT18EC012	Discuss the need for stack memory in microcontroller. Explain with examples the PUSH and POP instructions.	10	CO1	L2

9	1KT18EC013	Explain the operation of following code with respect to stack.
		MOV SP, #10h
		PUSH SP
		POP 0E0h
		ADD A,#10h
			10	CO1	L3

10	1KT18EC014	Explain pin configuration of 8051.	10	CO1	L2
11	1KT18EC015	Explain different memory decoding methods.	10	CO2	L2
12	1KT18EC016	Explain the following pins and its function in 8051 microcontrollers 1) ALE 2) PSEN 3)EA 4)RD 5)WR	10	CO1	L2
13	1KT18EC017	Interface 8051 to external 8K RAM and 32K ROM and explain how 8051 access them?	10	CO2	L4
14	1KT18EC018	Show the neat schematic interface 8K external data RAM to 8051	10	CO2	L4
15	1KT18EC019	With the help of neat diagram, explain how to interface	10	CO2	L4

		external 64Kbytes RAM memory with 8051.			
16	1KT18EC020	Explain any seven addressing modes of 8051.Give an example for each of them and mention limitations of each.	10	CO2	L2
17	1KT18EC021	Explain syntax of 8051 Microcontroller instruction.	10	CO2	L4
18	1KT16EC024	Explain assembling and running a 8051 program with flowchart.	10	CO2	L4
19	1KT17EC001	Define assembler directive. Explain ORG, EQU, DB and END directive.	10	CO2	L4
20	1KT19EC400	Explain following instructions mentioning their addressing mode and byte size. i)XCHD A,@R0 ii)MOVC A, @A+DPTR iii) SUBB A,#55h iv) DA A v) ORL C, 100 h	10	CO2	L4
21	1KT19EC401	Explain the following instructions with their function and bytes used. 1) CJNE dest, source, raddr 2) ACALL target 3) SWAP A 4) RRC A 5) DJNZ Rn, reladdr.	10	CO2	L4
22	1KT19EC402	With the relevant figure, write a sequence of events that occur in 8051 microcontroller when the CALL and RET instructions are executed.	10	CO2	L4

D2. TEACHING PLAN - 2

Module – 3

Title:	Data types and Timers	Appr Time:	10 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Develop programs for time delay,input/output operations, input/output bit manipulation , logic and arithmetic operations, data conversion and data serialization using C language	CO3	L4
2	Develop programs for timer/counter -0/1 using assembly and C language	CO3	L4
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Data types	CO3	L4
2	time delay in 8051C	CO3	L4
3	IO programming in 8051C	CO3	L4
4	Logic operations in 8051 C,	CO3	L4
5	Accessing code ROM space in 8051C	CO3	L4
6	Data conversion program in 8051 C	CO3	L4
7	Data serialization using 8051C	CO3	L4
8	Programming 8051 timers	CO3	L4
9	Programming 8051 timers	CO3	L4
10	Programming 8051 timers	CO3	L4
11	Counter programming	CO3	L4
12	Counter programming	CO3	L4
13	Programming timers 0 and 1 in 8051 C	CO3	L4
14	Programming timers 0 and 1 in 8051 C	CO3	L4
c	**Application Areas**	**CO**	**Level**
1	Use for writing computer applications	CO3	L4
2	Use for generating precise time delays in many electronic equipment such as CPU, washing Machine and microwave oven	CO3	L4

d	Review Questions	-	-
1	Give the magnitude of the signed char, unsigned char, signed int and unsigned int data types	CO3	L4
2	Give the three factors that can affect the delay size	CO3	L4
3	Write the address of port0, port1, port2 and port3	CO3	L4
4	Write a short program that toggles all bits of P2.	CO3	L4
5	Write a short program that toggles only bit P1.0	CO3	L4
6	For the following decimal numbers, give the packed BCD and unpacked BCD representation.	CO3	L4
7	Why is the use of packed BCD preferable to ASCII ?	CO3	L4
8	Which one takes memory space: packed BCD or ASCII ?	CO3	L4
9	An ADC provides an input of 0010 0110.What happens if we output that to the screen.	CO3	L4
10	In 8051 C, we should not use more than 100 bytes of the RAM data space for variables. Why ?	CO3	L4
11	How many timers do we have in 8051 ?	CO3	L4
12	Is TMOD register is a bit addressable register ?	CO3	L4
13	Who provides the clock pulses to 8051 timers if C/T = 0 ?	CO3	L4
14	Who provides the clock pulses to 8051 timers if C/T = 1 ?	CO3	L4
15	Indicate the selection made in the statement " TMOD = 0X20"	CO3	L4
16	In the statement "TH1 = -200", find the hex value for the TH register.	CO3	L4
e	Experiences	-	-
1			
2			
3			
4			
5			

Module – 4

Title:	Serial Communication and Interrupts	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Develop programs for serial data communication of 8051 to RS232 using assembly and C language	CO4	L4
2	Develop program for interrupt handling for timer interrupt, external interrupt and serial communication interrupt using assembly and C language	CO4	L4
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Basics of serial communication	CO4	L4
2	8051 connection to RS232	CO4	L4
3	8051 serial port programming in assembly	CO4	L4
4	8051 serial port programming in assembly	CO4	L4
5	8051 serial port programming in 8051 C	CO4	L4
6	8051 interrupts	CO4	L4
7	8051 interrupts	CO4	L4
8	Programming timer interrupts (Basics)	CO4	L4
9	Programming timer interrupts (programs)	CO4	L4
10	Programming external hardware interrupts (Basics)	CO4	L4
11	Programming external hardware interrupts (programs)	CO4	L4
12	Programming serial communication interrupts (Basics)	CO4	L4
13	Programming serial communication interrupts (programs)	CO4	L4
14	Interrupt priority in 8051/52	CO4	L4
15	Interrupt programming in C.	CO4	L4

c		Application Areas	CO	Level
1		Serial communication	CO4	L4
2		Use for multitasking	CO4	L4
d		Review Questions	-	-
1		Which communication is fastest and expensive among serial and parallel communication ?	CO4	L4
2		Find overhead due to framing ?	CO4	L4
3		Is RS232 is TTL compatible ?	CO4	L4
4		Is sending data to printer is duplex ?	CO4	L4
5		Which pins are set aside for serial communication and what are their functions ?	CO4	L4
6		Which timer of 8051 is used to set the baud rate ?	CO4	L4
7		Which mode of the timer is used to set the baud rate ?	CO4	L4
8		To transfer a byte of data serialy, it must be placed in register ------	CO4	L4
9		SCON stand for ---- and it is a ----- bit register	CO4	L4
10		When TI raised ?	CO4	L4
11		Of the interrupt and polling methods, which one avoids tying down the micro controller ?	CO4	L4
12		Beside reset, how many interrupts do we have in the 8051 ?	CO4	L4
e		Experiences	-	-
1				
2				
3				
4				
5				

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	18EC46	Sem:		4	Marks:		30	Time:		80 minutes		
Course:	8051 MICROCONTROLLER											
-	-	Note: Answer any 2 questions, each carry equal marks.								Marks	CO	Level
1	a	Give the bit size and data range details for widely used seven C data types of 8051 C.								8	CO3	L1
	b	Write a 8051 C program to toggle all the bits of P0,P1 and P2 continuously with 250ms delay. Use sfr keyword to declare the port addresses.								9	CO4	L4
	c	Explain the different modes of operation of Timer/Counter of 8051 with relevant block diagram and steps to program the modes.								9	CO3	L2
		OR										
2	a	Explain the difference between counter mode and timer mode of operation. With necessary format, explain the various bits of TMOD –SFR.								5	CO3	L2
	b	Write an 8051 C program to find the checksum byte of data stream 30H,4AH,65H and 10H.Convert the binary value of checksum into decimal and display the value of the BCD digits om ports P0, P1 and P2								5	CO4	L4
	c	Assume that a 1-HZ external clock is being fed into pin T1(P3.5).Write a C program for counter 1 in mode 2 to count up and disllay the state of TL1 count on P1.start the count at 00H.								5	CO3	L4
3	a	List the advantages of serial communication over parallel communication.								5	CO3	L2
	b	Explain the format of SCON register in details								5	CO4	L2
	c	Write a program for 8051 to transfer the message "GOOD LUCK" serially at baud rate of 9600, 8bit data with 1 stop bit. Do this continuously								5	CO3	L4
		OR										
4	a	Define interrupt, and mention the difference between interrupt and polling method.								5	CO3	L2

	b	Explain IE register formats	5	CO4	L2
	c	Write 8051 interupt program to do the following: 1) Recieve data serialy P2 and sent it to P1 continuously. 2) Make timer 0 to generate a square wave of 5KHZ frequency at port Po.1.Assume crystal frequency as 11.0592HZ at baude rate of 9600.	5	CO3	L4

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18EC46	Sem:	4	Marks:	10	Time:	80 minutes
Course:	8051 MICROCONTROLLER						

Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT18EC002	Give the bit size and data range details for widely used seven C data types of 8051 C.	10	CO3	L2
2	1KT18EC003	Write a 8051 C program to toggle all the bits of P0,P1 and P2 continuously with 250ms delay. Use sfr keyword to declare the port addresses.	10	CO4	L3
3	1KT18EC007	Write a 8051 C program to toggle all the bits of P0,P1 and P2 continuously with 250ms delay. Use the EX-OR operator.	10	CO3	L4
4	1KT18EC008	Explain with an example , bit wise logical operators for 8051 C.	10	CO4	L3
5	1KT18EC009	Write an 8051 C program to find the checksum byte of data stream 30H,4AH,65H and 10H.Convert the binary value of checksum into decimal and display the value of the BCD digits om ports P0, P1 and P2.	10	CO3	L4
6	1KT18EC010	Write a 8051 C program to convert packed BCD number 0x29 to ASCII and display the result on port1 and port2.	10	CO4	L4
7	1KT18EC011	Write a C program to convert a given hex data 0FF into its equivalent decimal data and display the result digits on Po, P1 and P2.	10	CO3	L4
8	1KT18EC012	What is data serialization ? Explain different types with examples	10	CO4	L2
9	1KT18EC013	Explain the difference between counter mode and timer mode of operation. With necessary format, explain the various bits of TMOD.	10	CO3	L2
10	1KT18EC014	Explain the different modes of operation of Timer/Counter of 8051 with relevant block diagram and steps to program the modes.	10	CO4	L2
11	1KT18EC015	Explain the various bits of TCON register.	10	CO3	L2
12	1KT18EC016	Assuming that XTAL = 11.0592MHZ, find the TH1, TL1 value to generate a time delay of 2ms.Timer 1 is programmed in mode 1.	10	CO4	L4
13	1KT18EC017	Assuming that XTAL = 11.0592MHZ, find the TH1, TL1 value to generate a time delay of 5ms.Timer 1 is programmed in mode 1.	10	CO3	L4
14	1KT18EC018	Write an ALP in 8051 which generates a square wave of frequency 10 kHz on pin P1.2, using timer-1, mode 1. Assume XTAL frequency as 11.0592 MHz. What is the minimum frequency that can be generated?	10	CO4	L4
15	1KT18EC019	Write a program to generate a symmetric square wave of frequency 2Khz in Temer 1 Mode 1, if crystal of frequency 11.0592MHz is used	10	CO3	L4
16	1KT18EC020	write an ALP to generate square wave of 3KHZ frequency with 50% duty cycle on Pin P2.1 using timer 1 mode 1 operation, Assume XTAL=12MHZ in Temer 1 Mode 1,and show the delay calculation.	10	CO4	L4
17	1KT18EC021	Write an ALP to generate a frequency of 100 KHZ on pin P2.3.Use Timer 1 in Mode 1. Assume crystal frequency of 11.0592MHZ.	10	CO3	L4

18	1KT16EC024	Write an ALP to generate a square with an ON time of 3ms and OFF time of 10ms on all pins of port 0.Assume crystal frequency of 11.0592MHZ.	10	CO4	L4
19	1KT17EC001	Write an ALP to generate a pulse train of 2 seconds period on pin P2.4. Use Timer 1 in Mode 1.	10	CO3	L4
20	1KT19EC400	Write a program to generate the following waveform as shown in fig ..Assume crystal frequency of 11.0592MHZ. Show the delay calculations. This waveform should be generated continuously.	10	CO4	L4
21	1KT19EC401	A switch is connected to pin P1.2. Write a C program to monitor the switch and create the following frequencies on pin P1.7 1) When SW = 0; 500HZ 2) When SW = 1; 750HZ Use timer-0 mode 1 for both of them.	10	CO3	L4

22	1KT19EC402	Find the delay for XTAL = 11.0592MHZ, if the program segment for timing is
		MOV TMOD, #01
		MOV TH0, #0FFH
		MOV TL0, #00
		SETB TR0
			10	CO4	L3

D3. TEACHING PLAN - 3

Module – 5

Title:	INTERFACING	Appr Time:	10 Hrs
a	*Course Outcomes*	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Develop program for LCD, Keyboard, ADC , DAC chip and sensor interface with 8051 using assembly and C language	CO4	L4
2	Develop program for motor and 8255 chip interface with 8051 using assembly and C language	CO4	L4
b	*Course Schedule*		
Class No	**Module Content Covered**	**CO**	**Level**
1	LCD interfacing	CO4	L4
2	Keyboard interfacing	CO4	L4
3	DC 0808 interfacing to 8051,	CO4	L4
4	A Serial ADC Max1112 ADC interfacing to 8051	CO4	L4
5	DAC interfacing	CO4	L4
6	Sensor interfacing and signal conditioning.	CO4	L4
7	Relays and opt isolators interfacing with 8051	CO4	L4
8	stepper motor interfacing with 8051	CO4	L4
9	DC motor interfacing PWM interfacing with 8051	CO4	L4
10	Programming the 8255	CO4	L4
11	8255 interfacing, C programming for 8255	CO4	L4
c	**Application Areas**	**CO**	**Level**
1	Use for cell phone, computer	CO4	L4
2	Use for door opening and closing, cd driver , arm position of robots and	CO4	L4

		automatic guided vehicles		
d		**Review Questions**	-	-
	1	The RS pin is an ------(input, output) pin for the LCD.	CO4	L4
	2	The E pin is an ------(input, output) pin for the LCD.	CO4	L4
	3	Indicate the steps to detect the key press.	CO4	L4
	4	In readins columns of a keyboard matrix, if no key is pressed we should get all -------(1s, 0s)	CO4	L4
	5	In the ADC0804, the INTR signal is an -------(input, output)	CO4	L4
	6	Is transducer must be connected to the signal conditioning circuitry before it is sent to the ADC ?	CO4	L4
	7	Why do we place a driver between the microcontroller and the relay ?	CO4	L4
	8	Give the 4 – step sequence of a stepper motor if we start with 0110.	CO4	L4
	9	Why do we use the MOVX instruction to access the ports of 8255 ?	CO4	L4
	10	What is the function of data pins D0 – D7 in the 8255	CO4	L4
	11	What special features does the bit set/reset feature of 8255 ?	CO4	L4
e		**Experiences**	-	-
	1			
	2			
	3			
	4			
	5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:		18EC46	Sem:		4	Marks:		30	Time:		75 minutes		
Course:		8051 MICROCONTROLLER											
-	**-**	**Note: Answer any 2 questions, each carry equal marks.**									**Marks**	**CO**	**Level**
1	a	Show the interfacing circuit and functional pins of LCD									8	CO4	L4
	b	Explain the registers and pins of LCD and write an ALP to display " HELLO" at LCD displays.									9	CO4	L4
	c	How does the LCD distinguish between data and command?									9	CO4	L4
2	a	Interface a 4 X 4 matrix keyboard to 8051.Write the required block schematic and assembly program.									13	CO4	L4
	b	How does the busy flag aid in making the LCD program more efficient ?									12	CO4	L4
3	a	Draw the block schematic of DAC 0808 interfaced to 8051 at port P1 and write an 8051 program to generate sine wave.									8	CO4	L4
	b	Interface stepper motor to 8051 and write a program to rotate it continously.									9	CO4	L4
	c	With a block diagram explain the features of 8255 PPI chip and its mode of operation.									9	CO4	L4
4	a	Explain DAC interface with diagram and also write a C program to generate stair case waveform.									8	CO4	L4
	b	Interface an ADC to 8051 and write an ALP to convert analog input to digital.									9	CO4	L4
	c	Howl to interface the DC motor to 8051 microcontroller using opto isolator ? Write a c Program to move DC motor with 25% dutu cycle pulse.									9	CO4	L4

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions

Crs Code:	18EC46	Sem:	4	Marks:	30	Time:	75 minutes
Course:	8051 MICROCONTROLLER						

Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT18EC002	Show the interfacing circuit and functional pins of LCD	5	CO9	L2
2	1KT18EC003	Which are the control pins of the LCD? What are their functions?	3	CO9	L2
3	1KT18EC007	How does the LCD distinguish between data and command?	2	CO9	L3
4	1KT18EC008	How does the busy flag aid in making the LCD program more efficient ?	2	CO9	L3
5	1KT18EC009	Indicate the steps to detect the key press.	3	CO9	L2
6	1KT18EC010	Interface a 4 X 4 matrix keyboard to 8051.Write the required block schematic and assembly program.	5	CO9	L4
7	1KT18EC011	Explain the registers and pins of LCD and write an ALP to display " HELLO" at LCD displays.	7	CO9	L4
8	1KT18EC012	With necessary interface diagram, write a program to display "VTU2018" on a LCD interface.	7	CO9	L4
9	1KT18EC013	Interface LCD display to 8051 and write an ALP to display the message "VERY GOOD".	7	CO9	L4
10	1KT18EC014	Indicate the steps to identify the key press.	4	CO9	L2
11	1KT18EC015	Interface an ADC to 8051 and write an ALP to convert analog input to digital.	7	CO9	L4
12	1KT18EC016	Set up a circuit to generate a sine wave using 8051 and DAC 808.Explain how a sine wave can be generated using a suitable example.	7	CO9	L4
13	1KT18EC017	Draw the block schematic of DAC 0808 interfaced to 8051 at port P1 and write an 8051 program to generate sine wave.	7	CO9	L4
14	1KT18EC018	Explain with diagram, how the DAC 0808 can be interfaced to 8051 microcontroller. Write an 8051 C program to generate the triangular waveform.	7	CO9	L4
15	1KT18EC019	Explain DAC interface with diagram and also write a C program to generate stair case waveform.	7	CO9	L4
16	1KT18EC020	Interface 8051 to stepper motor and write an ALP to rotate the motor first +4 steps and then -6 steps.	7	CO10	L4
17	1KT18EC021	Explain stepper motor with diagram and also write a C program if a motor takes 90 steps to make one complete revoiution and show the calculation.(Both clockwise and anticlockwise).	7	CO10	L4
18	1KT16EC024	Interface stepper motor to 8051 and write a program to rotate it continously.	7	CO10	L4
19	1KT17EC001	Howl to interface the DC motor to 8051 microcontroller using opto isolator ? Write a c Program to move DC motor with 25% dutu cycle pulse.	7	CO10	L4
20	1KT19EC400	Describe 8051 connection to stepper motor and write an ALP to rotate the motor clockwise for 180 degree. Assume motor specifications 1.8 degree/step.	7	CO10	L4
21	1KT19EC401	Explain the various modes of 8255 and find the control word for the following configurations : I) All ports of A,B and C are output ports (mode 0). ii)PA = IN , PB = OUT, PCL = OUT and PCH = OUT.	7	CO10	L3
22	1KT19EC402	Explain 4 modes of operation 8255 along with control word format.	8	CO10	L3

F. EXAM PREPARATION

1. University Model Question Paper

Course:	8051 MICROCONTROLLER					Month / Year	May /2018
Crs Code:	18EC46	Sem:	4	Marks:	100	Time:	180 minutes

-	Note	Answer all FIVE full questions. All questions carry equal marks.	Marks	CO	Level
1	a	What is microcontroller? List out the difference between CISC and RISC	5	CO1	L2
	b	Explain the 8051 block diagram and its features	10	CO1	L2
	c	Explain the PSW Register.	5	CO1	L2
		OR			
-	a	With the help of neat diagram, explain how to interface external 64Kbytes RAM memory with 8051	5	CO1	L2
	b	Explain the following addressing modes with an examples. i) Indirect Addressing Mode ii) Indexed Addressing Mode iii) Direct Addressing Mode.	5	CO1	L2
	c	Explain PUSH and POP instruction with an example.	5	CO1	L2
2	a	List out and explain different assembler directives used in an ALP.	10	C02	L2
	b	Explain the following instructions with an example i) SWAP A ii) RRC A iii) DIV AB iv) XCHD A,@Ri v) DA A	10	C02	L2
		OR			
	a	Write an ALP to convert unpacked BCD to Packed BCD Number	5	C02	L4
	b	Explain Checksum byte in ROM, with an example	5	C02	L2
	c	Name the addressing modes of the following instructions i) MOV F0H, #29H ii) ADD A, 30H iii) MOV 35H,@R0 iv) SUBB A, R1 v) XRL A,@R1	5	C02	L2
3	a	Give the bit size and Data range details for the widely used C Data types of 8051.	5	CO3	L2
	b	Write an 8051 C program to toggle all the bits of P1 continuously.	5	CO3	L2
	c	Write an 8051 C program to convert packed BCD 0x29 to ASCII and display the bytes on P1 and P2.	5	CO3	L4
		OR			
-	a	What is the difference between timer and counter? Explain the function of each bit in TMOD Register.	5	CO3	L2
	b	write an ALP to generate square wave of 3KHZ frequency with 50% duty cycle on Pin P2.1 using timer 1 mode 1 operation, Assume XTAL=12MHZ and show the delay calculation.	5	CO3	L4
	c	what is the advantage and disadvantages of MODE 2 operation of 8051 when compared to Mode 1 Operation.	5	CO3	L2
4	a	write the steps required for programming 8051 to transfer and receive data serially.	10	CO4	L2
	b	write an ALP to transfer letter "Y" serially at 9600 baud rate, continuously	10	CO4	L4
		OR		CO4	
-	a	Explain the importance of TI and RI flag.	10	CO4	L2
	b	Define interrupt, and mention the difference between interrupt and polling method and also write the steps in executing interrupt	10	CO4	L2
5	a	Explain DAC interface with diagram and also write a C program to generate staircase waveform.	10	CO4	L4
	b	Show the interfacing circuit and functional pins of LCD	10	CO4	L2
		OR		CO4	
	a	Draw the pin diagram of 8255 and briefly explain the signals	10	CO4	L2
	b	Explain about stepper motor interface with diagram, and also write a c program if motor takes 90 steps to complete one revolution and show the calculation (Clockwise Direction)	10	CO4	

2. SEE Important Questions

Course:	8051 MICROCONTROLLER					Month / Year	May /2018		
Crs Code:	15EE52	Sem:	5	Marks:	100	Time:	180 minutes		
	Note	Answer all FIVE full questions. All questions carry equal marks.					-	-	
Module	Qno.	Important Question					Marks	CO	Year
1	1	Compare microprocessor with Microcontroller.					5	CO1	2004
	2	With neat diagram,explain the internal architecture of 8051					7	CO1	2004
	3	Interface 8051 to external 8K RAM and 32K ROM and explain how 8051 access them?					8	CO2	2004
	4	Explain flag register of 8051 Microcontroller					5	CO1	2007
	5	Explain the operation of following code with respect to stack. MOV SP, #10h PUSH SP POP 0E0h ADD A,#10h					3	CO1	2007
2	1	Explain any seven addressing modes of 8051.Give an example for each of them and mention limitations of each.					7	CO1	2005
	2	Differentiate between JUMP and CALL instructions.					4	CO1	2005
	3	Write a program in 8051 to find the sum of 20 data bytes stored in array of external RAM starting with address 2000H. Store the 16 bit sum at the end of array.					5	CO1	2009
	4	Explain the following instructions with their function and bytes used. 1) CJNE dest, source, raddr 2) ACALL target 3) SWAP A 4) RRC A 5) DJNZ Rn, reladdr.					5	CO1	2006
	5	Write a program to toggle all bits of of P1 continuously.					5	CO1	2004
3	1	Give the bit size and data range details for widely used seven C data types of 8051 C.					5	CO2	2006
	2	Write a 8051 C program to toggle all the bits of P0,P1 and P2 continuously with 250ms delay. Use sfr keyword to declare the port addresses.					5	CO2	2006
	3	Explain the difference between counter mode and timer mode of operation. With necessary format, explain the various bits of TMOD –SFR.					5	CO2	2007
	4	Write an 8051 C program to find the checksum byte of data stream 30H,4AH,65H and 10H.Convert the binary value of checksum into decimal and display the value of the BCD digits om ports P0, P1 and P2					5	CO2	2004
	5	Assume that a 1-HZ external clock is being fed into pin T1(P3.5).Write a C program for counter 1 in mode 2 to count up and dis[lay the state of TL1 count on P1.start the count at 00H.					5	CO2	2004
4	1	List the advantages of serial communication over parallel communication.					4	CO3	2004
	2	Write a program for 8051 to transfer the message "GOOD LUCK" serially at baud rate of 9600, 8bit data with 1 stop bit. Do this continuously					5	CO3	2004
	3	Define interrupt, and mention the difference between interrupt and polling method.					5	CO3	2006
	4	Explain IE register formats					5	CO3	2004
	5	Write 8051 interupt program to do the following: 1) Recieve data serialy P2 and sent it to P1 continuously. 2) Make timer 0 to generate a square wave of 5KHZ frequency at port Po.1.Assume crystal frequency as 11.0592HZ at baude rate of 9600.					5	CO3	2007
5	1	Show the interfacing circuit and functional pins of LCD					6	C04	2009
	2	Draw the block schematic of DAC 0808 interfaced to 8051 at port P1 and					7	C04	2007

		write an 8051 program to generate sine wave.			
	3	Interface stepper motor to 8051 and write a program to rotate it continously.	7	C04	2007
	4	With a block diagram explain the features of 8255 PPI chip and its mode of operation.	7	C04	2004
	5	Howl to interface the DC motor to 8051 microcontroller using opto isolator ? Write a c Program to move DC motor with 25% duty cycle pulse.	7	C04	2005