Academic Course Description

BHARATH UNIVERSITY

Faculty of Engineering and Technology

Department of Electronics and Communication Engineering

BEC502 – MICROPROCESSOR AND MICROCONTROLLER

Fifth Semester, 2016-17 (Odd Semester)

Course (catalog) description

Microprocessor is a required course for under-graduate students in the ECE program. The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation. Topics include Semiconductor memory devices and systems, microcomputer architecture, assembly language programming, I/O programming, I/O interface design, I/O peripheral devices, data communications, and data acquisition systems. Several laboratory exercises will be based on microprocessor (Intel 8086), microcontroller (Intel 8051) and ARM 7.

Compulsory/Elective course **:** Compulsory for ECE students

Credit hours **:** 3 credits.

Course Coordinator **: Ms.S.Philomina**, Asst. Professor, Department of ECE

Instructor(s) :

Name of the instructor	Class handling	Office location	Office Phone	Email (domain: @bharathuniv.ac.in)	Consultation
S.Philomina	III YEAR	SA 006		philomina.ece	12.30 - 1.30 PM
S.Beulah Hemalatha	III YEAR	SA 006		beulahhemalatha.ece	12.30 - 1.30 PM
V.Srinivasan	III YEAR	SA 006		srinivasan.ece	12.30 - 1.30 PM

Relationship to other courses

Pre-requisites : BEE101Basic Electrical & Electronics Engineering, BEC302 Principles of Digital Electronics

Assumed knowledge : Basic knowledge in Digital Electronics

Following Courses : Nil

UNIT 1 MICROPROCESSOR 8086 **12 HOURS**

Register Organization -Architecture-Signals-Memory Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts - Service Routines – I/O and Memory Interfacing concepts.

UNIT 2 PROGRAMMING OF 8086 **12 HOURS**

Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086. RISC architecture – introduction to ARM Programming register configuration and instruction set - introduction to PIC Programming register configuration and instruction set – sample program.

UNIT 3 INTERFACING DEVICES **12 HOURS**

Programmable Peripheral Interface (8255) - Programmable Interval Timer (8254) - Programmable Interrupt Controller (8259A) - Programmable DMA Controller (8257) - Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

UNIT 4 MICROCONTROLLER-8051 **12 HOURS**

Register Set-Architecture of 8051 microcontroller- I/O and memory addressing-Interrupts-Instruction set- Addressing modes. Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

UNIT 5 SYSTEM DESIGN USING MICROPROCESSOR & MICROCONTROLLER **12 HOURS**

Case studies – Traffic light control, washing machine control, RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor.

TOTAL 60 HOURS

Text book(s) and/or required materials

TEXT BOOKS

T1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 -Microcontroller and Embedded systems", 7th Edition, Pearson Education, 2004.

T2. Doughlas.V.Hall, “Microprocessor and Interfacing : Programming and Hardware”, Revised 2nd edition, McGraw Hill, 1992

T3. Steve Furber, “ARM System On Chip Architecture”, Second Edition,Pearson Education, 2000.

T4. K. Ray and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals – Architectures, Programming and Interfacing", Tata McGraw Hill, 2002 Reprint

T5. Design with PIC microcontroller by John B Peatman.

REFERENCES

R1. Kenneth.J.Ayala, “8051 Microcontroller Architecture, Programming and Applications”, 3rd edition, Thomson, 2007.

R2. nuvoTon Cortex M0 (Nu-LB-NUC100/140) Driver and Processor Reference Manual;

R3. www.nuvoton.com

Computer usage:

Students are expected to use the computer to write and assemble assembly language programs and also run them by downloading them to the target microprocessor. Students will also use a microprocessor software simulator that runs on the personal computer. Students will also prepare lab reports and conduct out-ofclass assignments using the computer

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Communication | Signal Processing | Electronics | VLSI | **Embedded**

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 20	2 Periods
2	Cycle Test-2	September 2nd week	Session 21 to 40	2 Periods
3	Model Test	October 3rd week	Session 1 to 60	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

The scope of this course is to provide the complete analysis of Microprocessor and Microcontroller. This knowledge helps them to acquire better application of these in Embedded system. The overall objective is to introduce the student to the basics of Microprocessor and Microcontroller . This course emphasizes:	Correlates to program outcome		
	H	M	L
1. 8086 microprocessor and its applications, introduction to ARM and PIC	a, c, d	e,f	g
2. Programming of 8086	a, c, d	e,f	g
3. Understanding the details of interfacing ICs	a, c, d	e,f	g
4. 8051 architecture and its interfacing	a, c, d	e,f	g
5. Application of Processor and controllers	a, c, d	e,f	g
6. The program prepares students to successfully compete for employment in Electronics, Manufacturing and Embedded fields.	a, c, d	ef	g

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem Solving (Yes/No)	Text / Chapter
UNIT I - MICROPROCESSOR 8086			
1	Register Organization	No	T4/C1
2	Architecture of 8086	No	T4/C1
3	Signals	No	T4/C1
4	Memory Organization	No	T4/C1
5	Bus Operation	No	T4/C1
6	I/O Addressing	No	T4/C1
7	Minimum Mode	No	T4/C1
8	Maximum Mode	No	T4/C1
9	Timing Diagram	No	T4/C1
10	Interrupts	No	T4/C4
11	Service Routines, I/O interfacing	No	T4/C4
12	Memory Interfacing concepts.	No	T4/C5
UNIT II - PROGRAMMING OF 8086			
13	Addressing Modes	No	T4/C2
14	Instruction format of 8086	No	T4/C2
15	Instruction set of 8086	No	T4/C2
16	Assembly language programs in 8086	No	T4/C3
17	Introduction to ARM	No	T3/C1
18	ARM Programming register configuration	No	T3/C2
19	ARM instruction set	No	T3/C3
20	RISC architecture	No	T4/C13
21	Introduction to PIC	No	T5/C2
22	PIC Programming register configuration	No	T5/C2
23	PIC instruction set	No	T5/C2
24	PIC program	No	T5/C2
UNIT III - INTERFACING DEVICES			
25	Introduction to Programmable Peripheral Interface (8255)	No	T4/C5
26	Block diagram and Interfacing of 8255	No	T4/C5
27	Introduction to Programmable Interval Timer (8254)	No	T4/C6
28	Block diagram and Interfacing of 8254	No	T4/C6
29	Introduction to Programmable Interrupt Controller (8259A)	No	T2/C8
30	Block diagram and Interfacing of 8259A	No	T2/C8

31	Introduction to Programmable DMA Controller (8257)	No	T4/C7
32	Block diagram and Interfacing of 8257	No	T4/C7
33	Introduction to Programmable Communication Interface (8251A)	No	T4/C6
34	Block diagram and Interfacing of 8251A	No	T4/C6
35	Introduction to Programmable Keyboard and Display Controller (8279).	No	T2/C9
36	Block diagram and Interfacing of 8279	No	T2/C9
UNIT IV - MICROCONTROLLER-8051			
37	Register Set	No	T1/C1
38	Architecture of 8051 microcontroller	No	
39	I/O and memory addressing	No	T1/C2
40	Interrupts, Instruction set	No	T1/C11
41	Addressing modes, Timer	No	T1/C5,C9
42	Serial Communication,	No	T1/C10
43	Interrupts Programming	No	T1/C11
44	Interfacing to External Memory, ADC	No	T1/C12
45	Interfacing to LCD	No	T1/C12
46	Interfacing to DAC	No	T1/C13
47	Interfacing to Keyboard	No	T1/C13
48	Interfacing to stepper motor	No	T1/C13
UNIT-V - SYSTEM DESIGN USING MICROPROCESSOR & MICROCONTROLLER			
49	Introduction to Traffic light control	No	T2/C10
50	Design of Traffic light control	No	T2/C10
51	Introduction to washing machine control	No	T2/C10
52	Design of washing machine control		T2/C10
53	RTC Interfacing using I2C Standard	No	T2/C10
54	Introduction to Motor Control	No	T2/C10
55	Design of Motor Control		T2/C10
56	Relay	No	T2/C10
57	PWM	No	T2/C10
58	DC motor	No	T2/C10
59	Stepper Motor	No	T1/C13
60	Design of stepper motor control	No	T1/C13

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	10%
Cycle Test – II	-	10%
Model Test	-	25%
Attendance	-	5%
Final exam	-	50%

Prepared by: S.Philomina, Assistant Professor, Department of ECE **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / program by the time that they graduate:

(a) an ability to apply knowledge of mathematics, science, and engineering fundamentals.
(b) an ability to identify, formulate, and solve engineering problems
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to design and conduct experiments, as well as to analyze and interpret data
(e) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(f) an ability to apply reasoning informed by a knowledge of contemporary issues
(g) an ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(h) an ability in understanding of professional and ethical responsibility and apply them in engineering practices
(i) an ability to function on multidisciplinary teams
(j) an ability to communicate effectively with the engineering community and with society at large
(k) an ability in understanding of the engineering and management principles and apply them in Project and finance management as a leader and a member in a team.

Program Educational Objectives

PEO1: PREPARATION: To provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Electronics And Communication Engineering.

PEO2: CORE COMPETENCE: To enhance the skills and experience in defining problems in Electronics And Communication Engineering design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM: To enhance their skills and embrace new Electronics And Communication Engineering Technologies through self-directed professional development and post-graduate training or education

PEO4: SKILL: To provide training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS: Apply the ethical and social aspects of modern communication technologies to the design, development, and usage of electronics engineering.

Course Teacher	Signature
S.PHILOMINA	
S.BEULAH HEMALATHA	
V.SRINIVASAN	

Course Coordinator	Academic Coordinator	Professor In-Charge	HOD/ECE