Academic Course Description

BHARATH UNIVERSITY Faculty of Engineering and Technology Department of Electrical and Electronics Engineering

BEE049 DESIGN OF EMBEDDED SYSTEMS Sixth Semester (Even Semester)

Course (catalog) description

To introduce students to the design issues of embedded systems.

Compulsory/Elective course:		Elective for EEE students		
Credit hours	:	3 credits & 45 Hrs		
Course Coordinator	:	K.S.S.PRASAD		
Instructors	:	K.S.S.PRASAD		

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
K.S.S.PRASAD	Final year	KS 304		Hod.eee@bharathuniv.ac.in	9.00-9.50 AM
	EEE		04422290125		

Relationship to other courses:

Pre – requisites : BEE306 Digital Electronics

Following courses : Microprocessor and Microcontroller

Syllabus Contents

UNIT I OVERVIEW OF EMBEDDED SYSTEMS

Basics of Developing for Embedded Systems – Embedded System Initialization- I/O Devices – Types and Examples – Synchronous, Iso-synchronous and Asynchronous Communication – Serial Communication Devices – Parallel Device Ports- Reset Circuitry – Serial Communication Protocols : I2C, CAN,USB – Parallel Bus device Protocols: ISA, PCI, ARM bus

UNIT II CPU ARCHITECTURE OF PIC MICROCONTROLLER

PIC Microcontroller – Architecture of PIC 16F8xx – FSR – Reset action – Oscillatory Circuit – Program Memory Consideration- Register File Structure and Addressing Modes – Instruction Set- Simple Assembly Language Programming

UNIT III PIC PROGRAMMING

Interrupts – Constraints – Interrupt Servicing – Interrupt Programming – External Interrupts – Timers – Programming - I/O ports – LCD Interfacing– ADC – MPLAB IDE – Hex file format – Programming Tools

UNIT IV CASE STUDIES OF PIC MICROCONTROLLER

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Driving a Multiplexed LED and LCD Display –Washing Machine control: actuators and sensor interfacing-Closed loop control of servo motor.

UNIT V REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphore – Mutex – Mailbox – Message Queue – Other Kernel Objects – Memory Management – Priority Inversion Problem

Text book(s) and/or required materials

T1. Raj Kamal, "Embedded Systems Architecture Programming and Design", 2 nd Edition, Tata

McGraw Hill, 2008, New Delhi.

T2. Dr. K.V.K Prasad, "Embedded /Real-Time Systems: Concepts, Design and Programming", 1stEdition, Dream tech Press, 2009.

Reference Books:

R1. Ajay V Deshmukh, "Microcontroller Theory and Applications", 1st Edition, Tata

McGraw Hill, 2007, New Delhi.

R2. Daniel .W Lewis, "Fundamentals of Embedded Software", 1st Ed., Pearson Education, 2005.

Professional component

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

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2 nd week	Session 1 to 18	2 Periods
2	Cycle Test-2	March 2 nd week	Session 19 to 38	2 Periods
3	Model Test	April 3 rd week	Session 1 to 45	3 Hrs
4	University	ТВА	All sessions / Units	3 Hrs.
4	Examination			

Mapping of Instructional Objectives with Program Outcome

To introduce students to the design issues of embedded	Correlates to program outcome		
systems.			
	Н	Μ	L
1. To understand the Design and communication Protocols of of	C,D,E,I,J	K	A,B,F,G,H
embedded systems			
2. To study the architecture of PIC controller.	B,D,E,F,G,H,K	C,J,L	A,I
3. To study the interfacing of PIC Programming	A,B,D,F,I,J,K,L	C,E,G,H	
4. Analyzing different case studies of PIC microcontroller.	A,F,	В	
5. To be familiar about different real time operating system concepts.	C,D,E,F,H,I	G,L	A,B

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

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	OVERVIEW OF EMBEDDED SYSTEMS		
1.	Basics of Developing for Embedded Systems	NO	T1 T 2
2.	Embedded System Initialization	NO	- 11, 12
3.	I/O Devices	NO	_
4.	Types and Examples	NO	-
5.	Synchronous, Iso-synchronous and Asynchronous	NO	-
	Communication		
6.	Serial Communication Devices	NO	
7.	Parallel Device Ports- Reset Circuitry	NO	-
8.	Serial Communication Protocols : I2C, CAN,USB	NO	_
9.	Parallel Bus device Protocols: ISA, PCI, ARM bus	NO	-
UNIT II	CPU ARCHITECTURE OF PIC MICROCONTRO	OLLER	<u> </u>
10.	PIC Microcontroller	NO	T1, R1
11.	Architecture of PIC 16F8xx	NO	-
12.	FSR – Reset action	NO	-
13.	Oscillatory Circuit	NO	-
14.	Program Memory Consideration	NO	-
15.	Register File Structure	NO	_
16.	Addressing Modes	NO	-
17.	Instruction Set	NO	-
18.	Simple Assembly Language Programming	NO	-
UNIT III	PIC PROGRAMMING		
19.	Interrupts	NO	T1, R1
20.	Constraints	NO	
21.	Interrupt Servicing	NO	
22.	Interrupt Programming	NO	_
23.	External Interrupts	NO	_
24.	Timers	NO	_
25.	Programming	NO	_
26.	I/O ports – LCD Interfacing– ADC	NO	
27.	MPLAB IDE	NO	
28.	Hex file format – Programming Tools	NO	
UNIT IV	CASE STUDIES OF PIC MICROCONTROLLI	ER	I
29.	Driving a Multiplexed LED	NO	T1, R1
30.	LCD DisplayPage 4 of 7	NO	

31.	Washing Machine control	NO	
32.	actuators	NO	
33.	sensors	NO	
34.	Closed loop control of servo motor.	NO	
35.	interfacing	NO	
36.	PIC microcontroller Basics	NO	
37.	Programming of pic microcontroller	NO	
38.	Revision	NO	
UNIT V	REAL-TIME OPERATING SYSTEM CONCEPTS		
39.	Architecture of the Kernel	NO	T1, T2
40.	Task and Task Scheduler	NO	
41.	Interrupt Service Routines	NO	
42.	Semaphore	NO	
43.	Mutex-Mailbox - Message Queue - Other Kernel	NO	
	Objects		
44.	Memory Management	NO	
45.	Priority Inversion Problem	NO	1

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		50%
Cycle Test – I	-	J 70
Cycle Test – II	-	5%
Model Test	-	10%
Attendance	-	5%
Assignment		5%
Final exam	-	70%

Prepared by: K.S.S.PRASAD

Dated :

Addendum

ABET Outcomes expected of graduates of B.Tech / EEE / 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 the 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 the 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 to understand 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.
- 1) An ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION

Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE

Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM

Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS

Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through lifelong learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

BEE049 - DESIGN OF EMBEDDED SYSTEMS

Course Teacher	Signature
K.S.S.PRASAD	

Course Coordinator (K.S.S.PRASAD) HOD/EEE

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