INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	**MICROCONTROLLERS AND PROGRAMMABLE DIGITAL SIGNAL PROCESSORS LABORATORY**			
Course Code	BESB10			
Programme	M.Tech (ES)			
Semester	I	ECE		
Course Type	Core			
Regulation	IARE - R18			
	Lectures	**Tutorials**	**Practical**	**Credits**
	-	-	3	2
Course Faculty	Mr. K.Chaitanya, Assistant Professor.			

I. COURSE OVERVIEW:

This course provides knowledge of basics of DSP processors and embedded C programming language. This covers the concepts like blinking an LED with software delay, system clock real time alteration using the PLL modules and controlling an LED using switch by polling method. This lab also covers the computing Euclidian distance between any two points and implementation of convolution operation etc. Through laboratory experiments and out of class assignments, students are provided learning experiences that enable them to provide in depth knowledge about embedded and DSP processors.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC108	VI	Microprocessors and Microcontrollers Laboratory	2
UG	AEC107	VI	Digital signal processing Laboratory	2

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Microcontrollers And Programmable Digital Signal Processors Laboratory	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✘	CHALK & TALK	✔	VIVA	✘	ASSIGNMENTS	✘	MOOCs
✔	LCD / PPT	✘	SEMINARS	✔	MINI PROJECT	✘	VIDEOS
✘	OPEN ENDED EXPERIMENTS						

V. EVALUATION METHODOLOGY:

Ccontinuous internal assessment (CIA):

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, with 20 marks for day to day evaluation and 10 marks for Internal Examination (CIE).

Semester End Examination (SEE):

The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the this courses is contains 12 experiments. The question paper pattern is as follows: Two full questions with 'either' 'or' choice will be drawn from each set. Each set contains 4 questions.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 10 marks for Continuous Internal Examination (CIE), 20 marks for Day to Day Evaluation.

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Day to Day Evaluation	
CIA Marks	10	20	30

Continuous Internal Examination (CIE):

Two CIE exam shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration consisting of two sets.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		**Strength**	**Proficiency assessed by**
PO 1	Apply advanced level knowledge, techniques, skills and modern tools in the field of Embedded Systems and sub areas IOT, processor technology, and storage technology	3	Lab related Exercises
PO 2	Function on multidisciplinary environments by working cooperatively, creatively and responsibly as a member of a team.	2	Lab related Exercises / Mini projects
PO 3	Respond to global policy initiatives and meet the emerging challenges with sustainable technological solutions in the field of electronic product designing	1	Lab related Exercises
PO 4	Demonstrate the importance of embedded technologies and design new innovative products for solving society relevant problems	2	Lab related Exercises
PO 5	Independently carry out research / investigation and development work to solve practical problems	2	Lab related Exercises

3= High; 2 = Medium; 1 = Low

VII. COURSE OBJECTIVES:

The course should enable the students to:	
I	Demonstrate Keil IDE tool for development of Embedded system.
II	Program the interfacing of various devices with ARM using Embedded C.
III	Develop program for implementation of interrupts and serial communications.
IV	Implementation of digital signal processing algorithms in MATLAB and C.
V	Understand the real-time operation of digital filters

VIII. COURSE OUTCOMES (COs):

CO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CO 1	Ability to Control intensity of an LED using PWM implemented in software and hardware with P89V51RD2.	PO 1, PO 3	2
CO 2	Ability to write the programs to blink an LED with software delay, delay generated using the SysTick timer with P89V51RD2.	PO 1, PO 2	3
CO 3	Ability to write the programs to Sample sound using a microphone and display sound levels on LEDs.	PO 4	2
CO 4	Ability to develop an assembly code and C code to compute Euclidian distance between any two points.	PO 1, PO 3	2
CO 5	Ability to design and implementation of filters in C to enhance the features of given input sequence/signal.	PO 5	2

3= High; 2 = Medium; 1 = Low

XI. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
BESB10.01	CLO 1	Study the LED toggling.	PO 1, PO2	3
BESB10.02	CLO 2	Design the clock real time alteration using the PLL modules.	PO 1, PO 2	2
BESB10.03	CLO 3	Understand the controlling intensity of an LED using PWM.	PO 1, PO 2	3
BESB10.04	CLO 4	Design the control an LED using switch by polling method	PO 1, PO 2, PO 4	2
BESB10.05	CLO 5	Performing the UART Echo Test.	PO 1, PO 2	2
BESB10.06	CLO 6	Understand the concept of take analog readings on rotation of rotary potentiometer connected to an ADC channel.	PO 1, PO 2, PO 4	2
BESB10.07	CLO 7	Implement the temperature indication on an RGB LED.	PO 1, PO 2, PO 3	3
BESB10.08	CLO 8	Study the working principle of light sensor.	PO 1, PO 3	2
BESB10.09	CLO 9	Analyze the various sleep modes by putting core in sleep and deep sleep modes	PO 1, PO 3	2
BESB10.10	CLO 10	Study the concepts of System reset using watchdog timer	PO 1, PO 2	2
BESB10.11	CLO 11	Analysis of Sample sound using a microphone and display sound levels on LEDs.	PO 1, PO 2, PO 3	3
BESB10.12	CLO 12	Determine and developing an assembly code and C code to compute Euclidian distance between any two points	PO 1, PO 2, PO 3	2
BESB10.13	CLO 13	Developing the assembly code and study the impact of parallel, serial and mixed execution	PO 1, PO 2, PO 3	2
BESB10.14	CLO 14	Understand the assembly and C code for implementation of convolution	PO 1, PO 2, PO3	2

		operation.		
BESB10.15	CLO15	Design and implement filters in C to enhance the features of given input sequence/signal	PO1, PO3, PO4	3

3 = High; 2 = Medium; 1 = Low

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3		1				
CO 2	3	2					
CO 3				2			
CO 4	3		1				
CO 5						2	

3= High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CLO 1	3						
CLO 2	3	3					
CLO 3	3	3					
CLO 4			3				
CLO 5	3	2					
CLO 6		2			2		
CLO 7		2			2		
CLO 8	2				2		
CLO 9		3			3		
CLO 10		2			2		
CLO 11	2	2					
CLO 12		2	2				
CLO 13	2	2					
CLO 14	3	2					
CLO15	3			2			

3 = High; 2 = Medium; 1 = Low

X. ASSESSMENT METHODOLOGIES – DIRECT:

CIE Exams	PO 1, PO 3, PO 4	SEE Exams	PO 1, PO 3, PO 4	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2, PO 3, PO 4, PO 5	Student Viva	PO 3, PO 5	Mini Project	PO 2	Certification	-
Term Paper	-						

XI. ASSESSMENT METHODOLOGIES – INDIRECT:

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XII. SYLLABUS:

LIST OF EXPERIMENTS	
Week-1	**Blink an LED with software delay, delay generated using the SysTick timer**
Write an Embedded C program to blinky led with software delay, delay generated using SysTick timer	
Week-2	**System clock real time alteration using the PLL modules**
Generation of System clock real time alteration using the PLL modules	
Week-3	**Control intensity of an LED using PWM implemented in software and hardware**
Write an embedded C program to control intensity of a led using pwm implemented in software.	
Week-4	**Control an LED using switch by polling method, by interrupt method and flash the LED once**
Design an LED using switch by polling method, by interrupt method and flash the LED once	
Week-5	**Take analog readings on rotation of rotary potentiometer connected to an ADC channel**
Write an embedded C program to take analog readings on rotation of rotary potentiometer	
Week-6	**Temperature indication on an RGB LED**
To write an embedded C program for Temperature indication on an RGB LED and to Verify the output in the Cortex-M3 kit	
Week-7	**Evaluate the various sleep modes by putting core in sleep and deep sleep modes**
Design an embedded C program for evaluate the various sleep modes by putting core in sleep and deep sleep modes	
Week-8	**System reset using watchdog timer in case something goes wrong**
Generation of system reset function by using watchdog timer and verifies it.	
WeeK-9	**Sample sound using a microphone and display sound levels on LEDs**
To generate a real time Sample sound using a microphone and display sound levels on LEDs	
Week-10	**To develop an assembly code and C code to compute Euclidian distance between any two points**
Calculate the Euclidian distance between any two points Using DSK Code composer studio	
Week 11	**To develop assembly and C code for implementation of convolution operation.**
Verify the convolution operation Using DSK Code composer studio	
Week 12	**To design and implement filters in C to enhance the features of given input sequence/signal.**
To performance of the fitters and implement filters in C to enhance the features of given input sequence/signal	

XIII. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

S.NO.	Topics to be covered	CLOs	Reference
1	Study the LED toggling.	CLO 1	T1:1.4 R1:1.2
2	Design the clock real time alteration using the PLL modules.	CLO 2	T1:1.5 R1:2.4
3	Understand the controlling intensity of an LED using PWM.	CLO 3	T1:2.5 R1:2.5
4	Design the control an LED using switch by polling method	CLO 4	T1:2.5 R1:2.6
5	Performing the UART Echo Test.	CLO 5	T1:22.7
6	Understand the concept of take analog readings on rotation of rotary potentiometer connected to an ADC channel.	CLO 6	T1:6.3 R1:5.3
7	Implement the temperature indication on an RGB LED.	CLO 7	T1:7.5 R1:6.3
8	Study the working principle of light sensor.	CLO 8	T1:8.5 R1:6.8
9	Analyze the various sleep modes by putting core in sleep and deep sleep modes	CLO 9	T1:8.5 R1:6.8
10	Study the concepts of System reset using watchdog timer	CLO 10	T1:8.5 R1:6.8
11	Analysis of Sample sound using a microphone and display sound levels on LEDs.	CLO 11	T1:12.2 R1:13.1
12	Determine and developing an assembly code and C code to compute Euclidian distance between any two points	CLO 12	T1:12.3 R1:13.2
13	Developing the assembly code and study the impact of parallel, serial and mixed execution	CLO 13	T1:12.10 R1:13.7
14	Understand the assembly and C code for implementation of convolution operation.	CLO 14	T1:11.2 R1:10.2
15	Design and implement filters in C to enhance the features of given input sequence/signal	CLO15	T1:12.2 R1:13.2

XIV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION EQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Lab Practices	PO 1, PO 2	PSO 1
2	Design and develop interfacing programs with advanced devices	Lab Practices / NPTEL	PO 3, PO4	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations	NPTEL	PO 3, PO 4	PSO 1

Prepared by: **HOD, ECE**

Mr. K.Chaitanya