Ref No:

Sri Krishna Institute of Technology, Bangalore

COURSE PLAN

Academic Year 2019-2020

Program:	BE
Semester :	IV
Course Code:	18CS44
Course Title:	MICROCONTROLLER AND EMBEDDED SYSTEMS
Credit / L-T-P:	
Total Contact Hours:	40
Course Plan Author:	AMINA.N

Academic Evaluation and Monitoring Cell

Sri Krishna Institute of Technology

#29,Chimney hills,Hesaraghata Main road, Chikkabanavara Post

Bangalore – 560090, Karnataka, INDIA
Phone / Fax :08023721477/28392221/23721315
Web: www.skit.org.in , e-mail: skitprinci@gmail.com

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A. COURSE INFORMATION

1. Course Overview

Degree:	ENGINEERING	Program:	BACHELOR
Semester:	IV	Academic Year:	2020
Course Title:	MICROCONTROLLER AND EMBEDDED SYSTEM	Course Code:	18CL44
Credit / L-T-P:	3	SEE Duration:	3hrs
Total Contact Hours:	40	SEE Marks:	60
CIA Marks:	40	Assignment	10
Course Plan Author:	AMINA.N	Sign ..	
Checked By:	Prof.Geetha Meghraj	Sign ..	
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.

Module	Content	Teaching Hours	Blooms Learning Levels
1	Microprocessor versus microcontroller, ARM Embedded systems ,The RISC design philosophy The ARM design philosophy, Embedded system hardware, Embedded system software. ARM processor :-fundamentals, Registers, current program status register, pipeline, Exceptions Interrupts, and the vector table Core extensions.	8	1,2,3
2	Introduction to ARM instruction set: Data processing instruction, program instruction software interrupt instructions, program status register, instructions, coprocessor instructions, loading constants, ARM programming using assembly language:writng assembly code, profiling and cycle counting, instruction scheduling, register allocation,Conditional execution, looping constructs,	8	1,2,3,4
3	Embedded system components: embedded vs. general computing systems , History of embedded systems,classification of embedded systems, major application areas of embedded systems,purpose of embedded systems, Core of an embedded system including all types of processor/controller, memory,sensors,actuators,LED,segment LED,	8	1,2,3
4	Embedded system design concept, characteristics, quality attributes of embedded systems, operational quality attributes, non –operational quality attributes, Embedded systems-application and domain specific, hardware, software co design and program modeling, embedded firmware design and development,	8	1,2,3,4
5	RTOS and IDE for embedded system design: operating system basics,typesof operating system, task, process and threads,(only POSIX thread with an example program),Thread preemption, Multiprocessing and multitasking, task communication, (without any program). Task synchronization issues, racing and deadlock, concept of binary and counting semaphores, how to choose an RTOS,integration and testing of embedded hardware and firmware,), embedded system development environment,-block diagram(excluding Kiel , dissembler/decompiles, simulator, emulator and debugging techniques target hardware debugging, boundary scan,	8	1,2,3,
-	**Total**	40	

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.

Module s	Details	Chapter s in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	-	-
	• Andrew N Sloss,Dominic Symes and Chris Wright, ARM system developers guide,Elsvier,Morgan Kaufman publishers 2008.	1,2,3	
	• Shibu K.V,"Introduction to Embedded systems "Tata McGraw-Hill Education, Private Limited, 2nd Edition	4,5	
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	-	-
	• Raghunandan.G.H, microcontroller (ARM) and Embedded systems,Cenage Learning publications,2019	1,3	
	• The Insider's Guide to the ARM 7 Based Microcontrollers,Hitex Ltd,Ist edition,2005	2,3,4	
	• Steve Furber,ARM System-on-chip Architecture, Second edition ,Pearson 2015	2,3,5	
	• Raj Kamal, Embedded system. Tata McGraw-Hill publishers,2nd edition,2008	4,5	
C	**Concept Videos or Simulation for Understanding**	-	-
C1	https://www.youtube.com/watch?v=R6SstBoXjKc		
C2	https://www.youtube.com/watch?v=UdY5RkkT7bg		
C3	https://www.youtube.com/watch?v=Xyn0Oh5jlTc		
C4	https://www.youtube.com/watch?v=8Umh-E7bi_I		
C5	https://www.youtube.com/watch?v=ECEvUEkSSLg		
D	**Software Tools for Design**	-	-
	KEIL VERSION 2		
E	**Recent Developments for Research**	-	-
1	Developing cutting-edge Machine Learning (ML) techniques on Arm-based technologies.		
2	Design, Implementation of High Speed ARM Processor Based Data Acquisition and Control System Prototype		
F	**Others (Web, Video, Simulation, Notes etc.)**	-	-
1	microcontrollertips.com		
2	microcontrollerslab.com		

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 . . .

Module s	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level

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.

Modules	Topic / Description	Area	Remarks	Blooms Level
1.	software interrupt instructions, program status register	Higher education	GATE topics	2
2.	major application areas of embedded systems	enterpreneurship	Interviews and hardware industries	4
3.	hardware, software co design and program modeling	enterpreneurship	Interviews and hardware industries	4
4.	RTOS and IDE for embedded system design:	Higher education	GATE topics	2

operating system basics,typesof operating system	

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Instr Method	Assessment Method	Blooms' Level
1	18CS44	Describe the Architectural features and instruction set of ARM microcontroller	8	Seminar,lectures,ICT	Question answer,assignment	3
2	18CS44	Develop application for Programming skills using ARM microcontroller	8	lectures,ICT,seminar	Question answer,assignment	3
3	18CS44	Interface external hardware devices such as stepper motor ,dc motor,DAC with ARM microcontroller	8	Seminar,lectures,ICT	Question answer,assignment	3
4	18CS44	Able to explain about embedded systems, characteristics, details and implementation	8	lectures,,ICT,seminar	Question answer,assignment	3
5	18CS44	Illustrate the need of real time operating system for embedded system	8	lectures,ICT,seminar	Question answer,assignment	3
-	-	**Total**	**40**	-	-	**L2-L4**

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Industrial application, research area,higher education	1	4
2	Industrial application, research area,higher education	2	4
3	Industrial application, research area,higher education	3	4
4	Industrial application, research area,higher education	4	4
5	Industrial application, research area,higher education	5	4

3. Articulation Matrix

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

-	-	Course Outcomes	Program Outcomes															-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	1	Describe the Architectural features and instruction set of ARM microcontroller	3	2	3	-	2	2	2		3	2	3	3	5	5	5	2
2	2	Develop application for Programming skills using ARM microcontroller	3	3	3	3	3	3	3		3	3	3	3	5	5	5	3
3	3	Interface external hardware devices such as stepper motor ,dc motor,DAC with ARM microcontroller	3	2	3	3	3	3	3	3	3	3	3	3	5	5	5	4
4	4	Able to explain about embedded systems, characteristics, details and implementation	2		2	-	2	2	-		3	2	2	3	5	5	5	2
5	5	Illustrate the need of real time operating system for embedded system	3		2	2	2	3	3		3	3	3	3	5	5	5	3

-	.	Average	3	2	3	-	2	2	2		3	2	3	3	5	5	5	
-	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.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	MicrocontrollerVS microprocessor	Seminar	14 march	self	2
2	Assmblylanguage programming techniques	Seminar	25 april	Prof. Geetha meghraj	3

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation.

Modules	Title	Teach. Hours	CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE	CO	Levels
1	Difference between microprocessor and microcontroller. Describe the architectural features about ARM processor	8	4	-	-	5	5	4	1	2
2	knowledge about the instruction set of ARM processor, programming of ARM in different applications.	8	4	-	-	5	5	4	2	3
3	detail knowledge about embedded system,Interface external devices and I/O with ARM microcontroller	8	-	4	-	5	5	4	3	4
4	Interpret the basic hardware components and their selection methods based on the characteristics and attributes of embedded system, Develop the hardware/software co-design and firmware design approaches	8	-	4	-	5	5	4	4	2
5	Demonstrate the need of real time operating system for embedded system applications.	8	-	-	4	5	5	4	5	3
-	Total	50	8	8	4	5	5	20	15	14

2. Continuous Internal Assessment (CIA)

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

Modules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	30	1,2	2
3, 4	CIA Exam – 2	30	3,4	2
5	CIA Exam – 3	30	5	2

1, 2	Assignment - 1	10	1,2	2
3, 4	Assignment - 2	10	3,4	2
5	Assignment - 3	10	5	2
1, 2	Seminar - 1	5	-	-
3, 4	Seminar - 2	5	-	-
5	Seminar - 3	5	-	-
1, 2	Quiz - 1	5	-	-
3, 4	Quiz - 2	5	-	-
5	Quiz - 3	5	-	-
1 - 5	Other Activities – Mini Project	-		
	Final CIA Marks	50	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	ARM processor fundamentals	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
	Difference between microprocessor and microcontroller. Describe the architectural features about ARM processor.	1	2
b	***Course Schedule***	-	
Class No	**Portion covered per hour**	**-**	
1	Microprocessor versus microcontroller, ARM Embedded systems	1	2
2	The RISC design philosophy	1	2
3	The ARM design philosophy	1	2
4	Embedded system hardware, Embedded system software.	1	2
5	ARM processor :-fundamentals, Registers, current program status register	1	2
6	pipeline, Exceptions Interrupts, and the vector table	1	2
7	Core extensions	1	2
8	Review and discussion	1	2
c	**Application Areas**		
-	Students should be able employ / apply the Module learning's to . . .		
1	Research area ,industrial application		
d	**Review Questions**		
1	Give comparison between microprocessor and microcontroller	1	2
2	List the features of RISC processor	1	2
3	List the application of microcontroller	1	2
4	Write note on ARM bus technology	1	2
5	Write note on memory hierarchy	1	2
6	Differentiate between SDRAM and DRAM	1	2
7	Explain the architecture of a typical embedded device based on ARM core with neat diagram	1	2
8	Write note on commonly used controllers in embedded system	1	2
9	Draw and explain the functional block diagram of a microcontroller	1	2
10	Give comparison between RISC and CISC	1	2
E14	**Experiences**	-	-
1			
2			

Module – 2

	Title:	Introduction to ARM instruction set	Appr Time:	10 Hrs
a		*Course Outcomes*	CO	**Blooms Level**
1		knowledge about the instruction set of ARM processor, programming of ARM in different applications	-	
b		*Course Schedule*	-	-
Class No		**Portion covered per hour**	**-**	**-**
1		Introduction to ARM instruction set: Data processing instruction, program instruction	2	2
2		software interrupt instructions, program status register	2	3
3		instructions, coprocessor instructions, loading constants	2	3
4		ARM programming using assembly language:writng assembly code	2	3
5		profiling and cycle counting	2	2
6		instruction scheduling, register allocation	2	2
7		Conditional execution, looping constructs.	2	2
8		Class assessment And discussion	1	2
c		**Application Areas**	**-**	**-**
-		Students should be able employ / apply the Module learnings to . . .	-	-
1		Research area		
2		industrial application		
d		**Review Questions**	**-**	**-**
1		List the features of ARM instructions	2	2
2		Write notes on register allocation	2	2
3		Write notes on profiling and cycle counting	2	2
4		Explain coprocessor instructions of ARM processor	2	3
5		Explain multiply instruction of ARM	2	3
6		Explain arithmetic instructions with example	2	3
7		Explain barrel shifter with a neat sketch	2	2
8		Explain LDR instructions	2	3
e		**Experiences**	**-**	**-**
1			CO3	L2
2				

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	18CS44		Sem:IV	I	Marks:50		Time:2		
Course:		MICROCONTROLLER AND EMBEDDED SYSTEMS							
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 1, 2**					**Marks**	**CO**	**Level**
	1	write features of RISC processor					5	2	2
	2	Comparison between microprocessor and microcontroller					5	2	2
	3	Differentiate between RISC and CISC					5	2	2
	4	Explain embedded software					5	2	2
	5	Draw and explain the architecture of a microcontroller					5	2	2
	6	Explain the applications of a microcontroller					5	2	2
	7	Draw and explain the dataflow model of an ARM processor					5	2	2

	8	Explain data processing instructions	5	2	2
	9	Draw and explain barrel shifter in an ARM instruction set	5	2	2
	10	Explain coprocessor instructions	5	2	2
	11	Discuss about load store architecture	5	2	2
	12	Write notes on register allocation	5	2	2

b. Assignment -1

<table>
<tr><td colspan="8" align="center">Model Assignment Questions</td></tr>
<tr><td>Crs Code:</td><td>18CS44</td><td>Sem:</td><td colspan="2">IV</td><td>Marks:</td><td>10</td><td>Time:</td><td>1hr</td></tr>
<tr><td>Course:</td><td colspan="5">MICROCONTROLLERANDEMBEDDED SYSTEMS</td><td></td><td></td></tr>
</table>

SNo	Assignment Description	Marks	CO	Level
1	Differentiate between DRAM and SDRAM	5	2	2
2	Write notes on ARM bus technology	5	2	2
3	Write notes on core extension	5	2	2
4	Explain tightly coupled memory extensions to processor core with help of neat diagram	5	2	2
5	Explain cache memory extensions to processor core with help of neat diagram	5	2	2
6	Write short notes on swap instructions with the help of examples	5	2	2
7	Write notes on branch instructions with an example each	5	3	2
8	Describe briefly about assembler directives	5	3	2

D2. TEACHING PLAN - 2

Module – 3

Title:	Embedded system components	Appr Time:	10 Hrs
a	**Course Outcomes**	CO	Blooms
-	At the end of the topic the student should be able to . . .	-	Level
	detail knowledge about embedded system, Interface external devices and I/O with ARM microcontroller		
b	**Course Schedule**		
Class No	**Portion covered per hour**	-	-
1	Embedded system components: embedded vs. general computing systems ,	3	2
2	History of embedded systems	3	2
3	classification of embedded systems,	3	2
4	major application areas of embedded systems	3	2
5	purpose of embedded systems	3	2
6	Core of an embedded system including all types of processor/controller	3	2
7	memory,sensors,actuators,LED,segment LED	3	3
8	Review discussion	3	2
c	**Application Areas**	-	-
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Research area		
2	Industrial application		
3	Higher education		
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Give he charecteristics of embedded systems		
2	Explain briefly the charecteristics of embedded computing application		
3	Explain the design of a requirement form for the begining of project		
4	Describe the hardware unit of embedded systems		

5	What are the specifications of a sensor			
6	What are the types of sensors			
7	Difference between actuators and sensors			
8	Draw and explain the block diagram of PPI			
e	**Experiences**		-	-
1			CO6	L2
2				

Module – 4

Title:	Embedded system design concept	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
	Interpret the basic hardware components and their selection methods based on the characteristics and attributes of embedded system, Develop the hardware/software co-design and firmware design approaches		
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
1	Embedded system design concept, characteristics.		
2	quality attributes of embedded systems		
3	operational quality attributes		
4	non –operational quality attributes		
5	Embedded systems-application and domain specific.		
6	hardware, software co design and program modeling,		
7	embedded firmware design and development		
8	Review		
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Research area		
2	Industrial area		
3	Higher education		
d	**Review Questions**	**-**	**-**
1	The attainment of the module learning assessed through following questions	-	-
2	Difference between operational attributes and non operational attributes		
3	Difference between domain specific and application specific embedded systems		
4	Write short notes on Program modeling of an embedded system		
5	What do you mean by concurrent /communication process model		
e	**Experiences**	**-**	**-**
1		CO7	L2
2			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:		Sem:		Marks:		Time		
Course:	MICROCONTROLLERANDEMBEDDED SYSTEMS							
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 3, 4**				**Marks**	**CO**	**Level**
	1	What is sensor? List sensor specification. Explain different types of sensors				5	2	2
	2	What is embedded system? Differentiate between a general purpose computer and an embedded system.				5	2	2
	3	Explain the purpose of embedded system.				5	2	2
	4	Compare the following. A) RAM and ROM B) FPGA and ASIC				5	2	2
	5	Explain the classificaion of embedded based on generation and based on				5	2	2

		compexity and performance.			
	6	Explain the following: a) SPI b) optocoupler	5	2	2
	7	Describe various quality attributes of embedded systems	5	2	2
	8	Explain embedded firmware design and development	5	2	2
	9	Write short notes on automotive communication buses	5	2	2
	10	Explain application specific embedded system:washing machine	5	3	3
	11	Explain the following a)DFD b) sequential program model	5	2	2
	12	What is embedded firmware development language? explain embedded C and C language	5	2	2

b. Assignment – 2

Model Assignment Questions					
Crs Code:		Sem:	Marks:	Time:	
Course:	MICROCONTROLLERANDEMBEDDED SYSTEMS				

SNo	Assignment Description	Marks	CO
1	Difference between actuators and sensors		
2	Explain in detail about sensors		
3	What do you mean by memory shadowing		
4	Write a note on UART		
5	Explain parallel interface		
6	Explain in detail embedded firmware		
7	Comparison between operational and non operational attributes		
8	Explain the fuctional block diagram of a washing machine		

D3. TEACHING PLAN - 3

Module – 5

Title:	RTOS AND IDE for embedded system design	Appr Time:	10 Hrs
a	**Course Outcomes**	CO	Blooms
-	At the end of the topic the student should be able to . . .	-	Level
	Demonstrate the need of real time operating system for embedded system applications		
b	**Course Schedule**	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	RTOS and IDE for embedded system design: operating system basics, types of operating system,		
2	task, process and threads,(only POSIX thread with an example program),Thread preemption,		
3	Multiprocessing and multitasking, task communication, (without any program).		
4	Task synchronization issues, racing and deadlock, concept of binary and counting semaphores		
5	how to choose an RTOS,integration and testing of embedded hardware and firmware,),		
6	embedded system development environment,-block diagram(excluding Kiel , dissembler/decompiles		
7	simulator, emulator and debugging techniques target hardware debugging, boundary scan		
8	Review		
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learning's to . . .	-	-
1	Research area		
2	Industrial area		
3	Higher education		
d	**Review Questions**	-	-
1	The attainment of the module learning assessed through following questions	-	-
2	How to choose a real operating system?		

3	What do you mean by task synchronization,explain?			
4	Define simulator,emulator, and debugging techniques			
5	Explain the charecteristics of RTOS			
6	Write notes on semaphore			
7	Comparison between monolihic and microkemel			
8	Explain with neat diagram task communication			
9	How to choose a real time operating system?			
10	What is process? Explain process control block?			
e	**Experiences**		-	-
1			CO10	L2
2			CO9	

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code		Sem:		Marks:		Time:	
Course:		MICROCONTROLLERANDEMBEDDED SYSTEMS					

-	-	**Note: Answer all questions, each carry equal marks. Module : 5**	**Marks**	**CO**	
	1	What is task? Explain task state model?	5	1,2	
	2	What is boundary scan? Explain.	5	1,2	
	3	Write notes on: multiprocessing and multitasking.	5	1,2	
	4	What is process? Explain process control block?	5	1,2	
	5	How to choose a real operating system?	5	1,2	
	6	What is real operating system?explain qualities og a good RTOS	5	1,2	
	7	Explain embedded system development environment	5	1,2	
	8	Write notes on semaphore	5	1,2	
	9	What do you mean by task synchronization,explain?	5	1,2	
	10	Explain with neat diagram task communication	5	1,2	

Model Assignment Questions

Crs Code:		18CS44	Sem:	IV	Marks:	50	Time:	2hr
Course:		MICROCONTROLLERANDEMBEDDED SYSTEMS						

SNo	Assignment Description	Marks	CO
1	Draw and explain the functional block diagram of a washing machine	5	5
2	Explain the internal working of an automotive embedded system	5	5
3	Explain in detail program modelling	5	5
4	Comparison between monolihic and microkemel	5	5
5	Explain the charecteristics of RTOS	5	5
6	Difference between hard and soft real time	5	5
7	Write notes on thread premption	5	5
8	Explain socket fnction and RPC function with respect to RTOS	5	5
9	Define simulator,emulator, and debugging techniques	5	5
10	How to choose a real time operating system?	5	5

b. Assignment – 3

F. EXAM PREPARATION

1. University Model Question Paper

Course:		MICROCONTROLLERANDEMBEDDED SYSTEMS				Month / Year	May /2018	
Crs Code:		18CS44	Sem:	IV	Marks:	60	Time:3hr	180 minutes
Module		Answer all FIVE full questions. All questions carry equal marks.				**Marks**	**CO**	**Level**
1		Draw and explain the dataflow model of an ARM processor				6	2	2
1		Write note on commonly used controllers in embedded system				6	2	2
2		Explain coprocessor instructions of ARM processor				6	3	2
2		Explain arithmetic instructions with example				6	3	2
3		Explain briefly the charecteristics of embedded computing application				6	2	2
3		Draw and explain the block diagram of PPI				6	2	2
4		Explain embedded firmware design and development				6	2	2
4		Write short notes on Program modeling of an embedded system				6	2	2
5		What is process? Explain process control block?				6	2	2
5		Explain socket function and RPC function with respect to RTOS				6	2	2

2. SEE Important Questions

Course:			MICROCONTROLLERANDEMBEDDED SYSTEMS			Month / Year		
Crs Code:			18CS44	Sem:IV		Marks:		Time:	
		Note	Answer all FIVE full questions. All questions carry equal marks.			-	-	
Module	Qno.		Important Question			**Marks**	**CO**	**Year**
1			Draw and explain the functional block diagram of a microcontroller			5	2	
1			Give comparison between RISC and CISC			5	2	
2			Explain coprocessor instructions of ARM processor			5	3	
2			Explain arithmetic instructions with example			5	3	
3			Explain briefly the characteristics of embedded computing application			5	2	
3			Explain the design of a requirement form for the begining of project			5	2	
4			Define simulator, emulator, and debugging techniques			5	2	
4			Explain the characteristics of RTOS			5	2	
5			Explain the internal working of an automotive embedded system			5	3	
5			Explain in detail program modeling			5	2	