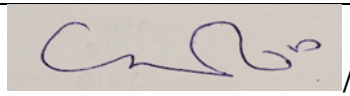
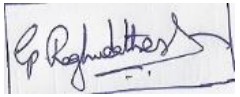
MANIPAL SCHOOL OF INFORMATION SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

Master of Engineering - ME (Embedded Systems)

Course File

Course Name	:	**Microcontrollers and its Applications Lab**
Course Code	:	**ESD 5153**
Academic Year	:	2024 - 25
Semester	:	I
Name of the Course Coordinator	:	Mr. RAGHUDATHESH G P
Name of the Program Coordinator	:	Dr. Dinesh Rao

 **//2025**	 **//2025**
Signature of Program Coordinator with Date	**Signature of Course Coordinator with Date**

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Program Education Objectives (PEOs)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for **ME (Embedded Systems)**, program are as follows.

PEO No.	Education Objective
PEO 1	Enable to draw upon fundamental and advanced knowledge in order to apply analytical and computational approach to solve technological problems in embedded systems.
PEO 2	Introduce state of art technologies in the area of embedded system and inculcate ethical practices to make industry ready professional.
PEO 3	Promote scientific and societal advancement through research and entrepreneurship.

Program Outcomes (POs)

By the end of the postgraduate program in **ME (Embedded Systems)**, graduates will be able to:

PO1	Acquire in-depth knowledge of embedded system domain, with an ability to discriminate, evaluate, analyze, synthesize the existing and new knowledge, and integration of the same for enhancement of knowledge.
PO2	Analyze complex embedded system Eco System critically; apply independent judgement for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.
PO3	Think laterally and originally, conceptualize and solve embedded system Design problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.
PO4	Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.
PO5	Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.

1. Course Plan

1.1 Primary Information

Course Name	**:**	**Microcontrollers and its Applications [ESD 5153]**
L-T-P-C	**:**	0-0-3-1
Contact Hours	**:**	36 Hours
Pre-requisite	**:**	Basic Programming with C
Core/ PE/OE	**:**	Core

1.2 Course Outcomes (COs)

CO	At the end of this course, the student should be able to:	No. of Contact Hours	Program Outcomes (PO's)	BL
CO1	Implement the single tasking applications development using ARM microcontroller.	12	PO1	4
CO2	Implement microcontroller applications using interface device with ARM microcontrollers.	8	PO2	3
CO3	Implement microcontroller applications for Embedded Communication Protocols.	16	PO3	4

1.3 Assessment Plan

Components	**Lab Test**	**Flexible Assessments (2 – 3 in number)**	**End semester/ Makeup examination**
Duration	90 minutes	To be decided by the faculty.	180 minutes
Weightage	0.3	0.2	0.5
Typology of questions	Applying; Analyzing.	Applying; Analyzing.	Applying; Analyzing.
Pattern	Answer all the questions. Maximum marks 30.	**Assignment:** [To be decided by the faculty members. May be Assignments, Problem solving, etc.]	Answer all the questions. Maximum marks 50.
Schedule	As per academic calendar.	**Assignment submission:** November 2024	As per academic calendar.
Topics covered	Basic application building	Single taks applications deices etc	Comprehensive examination covering the full syllabus.

1.4 Lesson Plan

L. No.	TOPICS	Course Outcome Addressed
L0	Course delivery plan, Course assessment plan, Course outcomes, Program outcomes, CO-PO mapping, reference books	---
Lab1	Understanding the tools and installations and specifications	CO1
Lab2	Understanding the hardware layouts and connecting the basic device and running the applications	CO1
Lab3	Applying the knowledge for single task application running.	CO1
Lab4	Analyze the signle tasks	CO1
Lab5	Analyze the performance of single tasks and its performaces	CO2
Lab6	Analyze the performance of interfacing devices	CO2
IT1	Internal lab test	CO1, CO2
Lab7	Analyze the performance of interfacing the devices	CO2
Lab8	Analyze the performance of communication protocols	CO3
Lab9	Analyze the communication prototocols	CO3
Lab10	Evaluate the performance communication protocols	CO3
Lab11	Evaluate the performance embedded applications	CO3
Lab12	Evaluate the performance of embedded applications	CO3

1.5 References

1. Website Scraping with Python: Using BeautifulSoup and Scrapy, Gábor & Hajba, APRESS Publications, 1st Edition, 2018.
2. Web Scraping with Python: Collecting More Data from the Modern Web, Ryan Mitchell Shroff, O'Reilly, 2nd Edition, 2018.
3. Designing Data Visualizations, Julie Steele and Noah Iliinsky; O'Reilly Media; 1st Edition, 2011.
4. Python for Data Analysis, Wes McKinney; Shroff; O'Reilly; 2nd Edition, 2018.
5. https://learn.microsoft.com/en-us/certifications/exams/pl-300/

1.6 Other Resources (Online, Text, Multimedia, etc.)

1. Web Resources: Blog, Online tools and cloud resources.
2. Journal Articles.

1.7 Course Timetable

2. **1st Semester Embedded** **Room: LG1 LH10** **Lab: ES Lab**

	8- 9	9 - 10	10 - 11	11 – 12	12 – 1	1-2	2 – 3	3 – 4	4 - 5
MON		DS	DS LAB				SEM	ACA	
TUE		RTOS	**MCA**	ELE			ELE LAB*		
WED		DS	RTOS LAB				SEM	ACA	
THU		RTOS	**MCA**	ELE			ACA LAB		
FRI		DS	**MCA LAB**				SEM	ACA	
SAT		RTOS	**MCA**	ELE			Mini Project		

3. Advanced Computer Architecture – Ravikala, Data Structures and Algorithms – Dinesh Rao, Microcontrollers and its Applications – Raghudathesh G P
4. Real Time Operating Systems – Keerthana Prasad, ELE - Internet of Things – Samar, ELE - Database Programming in Java – Sathyendranath Malli

4.1 Assessment Plan

COs		**Marks & weightage**			
CO No.	CO Name	Lab Test (Max. 30)	Assignment (Max. 20)	End Semester (Max. 50)	CO wise Weightage
CO1	Implement the single tasking applications development using ARM microcontroller.	20	-	20	**0.34**
CO2	Implement microcontroller applications using interface device with ARM microcontrollers.	10	-	20	**0.14**
CO3	Implement microcontroller applications for Embedded Communication Protocols.	-	20	10	**0.24**
	Marks (weightage)	0.3	0.2	0.5	**1**

Note:

- In-semester Assessment is considered as the Internal Assessment (IA) in this course for 50 marks, which includes the performances in lab participation, assignment work, lab work, lab tests, quizzes etc.
- End-semester examination (ESE) for this course is conducted for a maximum of 50.
- End-semester marks for a maximum of 50 and IA marks for a maximum of 100 marks to decide upon the grade in this course.

Weightage for CO1 = (Lab Test marks for CO1 + Assignment marks for CO1 + ESE marks for CO1) /100
= (5 + 2 +5)/100 = 0.12

4.2 Assessment Details

The assessment tools to be used for the Current Academic Year (CAY) are as follows:

SI. No.	Tools	Weightage	Frequency	Details of Measurement (Weightage/Rubrics/Duration, etc.)
1	Lab Test	0.3	1	• Performance is measured using lab internal test attainment level. • Reference: question paper and answer scheme. • Lab internal test is assessed for a maximum of 30 marks.
2	Assignments	0.2	1	• Performance is measured using assignments attainment level. • Assignment is evaluated for a maximum of 20 marks.
3	ESE	0.5	1	• Performance is measured using ESE attainment level. • Reference: question paper and answer scheme. • ESE is assessed for a maximum of 50 marks.

4.3 Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5
CO1	Y				
CO2		Y	**Y**		
CO3			**Y**		
Average Articulation Level	*	*	*		