FMTH0303-5.1

Laboratory Plan

Semester: VII Year: 2021-2022

Laboratory Title: Institution Research Project (IRP) **Common to :** Sponsored Research Project (SRP) Institution Sponsored Project (ISP)	Lab. Code: 19EECE493
Total Hours: 75hrs	Duration of exam: **2 hours**
Total Exam Marks: **100**	ISA Marks: **50**
Lab. Plan Author**: Dr. Uma Mudenagudi**	Date:
Checked By:	Date:

Preamble*:*

This is an initiative to promote research and innovation culture in undergraduate students by introducing the 'Institution Research Project (IRP)' course. The research problems are a part of the institution/ industry/government-funded research projects sponsored by the agencies like DST, AICTE, DRDO, Agriculture universities, etc. The course is the first of its kind in India has created a lot of excitement in the students towards choosing research as their career and has lead to a substantial increase in their skillset. The students can work in their interested research areas and have the freedom to choose the interdisciplinary domains. The research problems are a part of the institution/ industry/government-funded research projects. Publication of research outcomes in reputed conferences and journals is part of the course evaluation.

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Carry out a literature survey to identify the research gaps and contemporary issues in the defined area.
2. Apply the competency gained in the curriculum to model, formulate and optimize the solution for the defined research problem.
3. Critically think and come up with creative solutions for research problems and conceive innovative approaches towards designing a product/ prototype.

4. Develop technical writing, presentation, documentation skills and develop team spirit among teammates.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes

Laboratory Title: Institution Research Project (IRP)														Semester:7- Semester
Laboratory code: 19EECE493														Year:2021-2022
Course Outcomes / Program Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PO13**	**PO14**	**PO15**
Carry out a literature survey to identify the research gaps and contemporary issues in the defined area.	H	H	H			M		H		M		L			M
Apply the competency gained in the curriculum to model, formulate and optimize the solution for the defined research problem.	H	H	H			M		M		M					
Critically think and come up with creative solutions for research problems and conceive innovative approaches towards designing a product/ prototype.		H	H	M	H				H	H	L	M	M	M	M
Develop technical writing, presentation, documentation skills and develop team spirit among teammates.						M	M		M		M	M			

Degree of compliance **L**: Low **M**: Medium **H**: High

Competency addressed in the Course and corresponding Performance Indicators

Competency: PO2.4	Demonstrate an ability to execute a solution process and analyze results
PI Code: PO2.4.4	Extracts desired understanding and conclusions consistent with objectives and limitations of the analysis
Competency: PO3.2	Demonstrate an ability to generate a diverse set of alternative design solutions
PI Code: PO3.2.2	Build models, prototypes, etc., to develop a diverse set of design solutions
Competency: PO3.4	Demonstrate an ability to advance an engineering design to defined end state
PI Code: PO3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)
Competency: PO4.3	Demonstrate an ability to critically analyze data to reach a valid conclusion
PI Code: PO4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
Competency: PO5.2	Demonstrate an ability to select and apply discipline-specific tools, techniques, and resources
PI Code: PO5.2.2	Demonstrate proficiency in using EDA tools
Competency: PO6.1	Demonstrate the ability to describe engineering roles in a broader context, e.g. as pertains to the environment, health, safety, and public welfare
PI Code: PO6.1.1	Identify and describe various engineering roles; particularly as pertains to the protection of the public and public interest.
Competency: PO7.1	Demonstrate an understanding of the impact of engineering and industrial practice on social, environmental, and economic contexts
PI Code: PO7.1.2	Demonstrate an understanding of the relationship between the technical, socio-economic and environmental dimensions of sustainability
Competency: PO8.2	Demonstrate an ability to apply the Code of Ethics
PI Code: PO8.2.1	Identify tenets of the IEEE and ACM professional code of ethics
Competency: PO9.3	Demonstrate success in a team-based project
PI Code: PO9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts
Competency: PO10.1	Demonstrate an ability to comprehend technical literature and

	document project work.
PI Code: PO10.1.1	Read, understand and interpret technical and non-technical information
Competency: PO10.2	Demonstrate competence in listening, speaking, and presentation
PI Code: PO10.2.2	Deliver effective oral presentations to technical and non-technical audiences
Competency: PO10.3	Demonstrate the ability to integrate different modes of communication.
PI Code: PO10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
Competency: PO11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints
PI Code: PO11.3.2	Use project management tools to schedule an engineering project so it is completed on time and on budget.
Competency: PO12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps.
PI Code: PO12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
Competency: PO13.2	Demonstrate an ability to Identify and apply appropriate design principles for the development of hardware systems
PI Code: PO13.2.1	Ability to identify design principles for the development of hardware systems
PI Code: PO13.2.2	Ability to use design principles for the development of software systems
Competency: PO13.3	Demonstrate an ability to Identify and apply appropriate design principles for the development of software systems
PI Code: PO13.3.2	Ability to use design principles for the development of software systems
Competency:PO14.2	Demonstrate the ability to analyze, design and develop.
PI Code: PO14.2.2	Ability to design and develop considering the constraints
Competency:PO15.2	Demonstrate an ability to identify the modern techniques for design, and develop.
PI Code: PO15.2.2	Ability to identify modern techniques for design and development.

Guidelines for selection of a project:

- Researchers from the University apply for the research funding individually or in collaboration with national importance institutions to the agencies like DST, AICTE, VGST, DRDO, Agriculture Universities, industries. Faculty also apply for institutional funding to carry out research to provide an engineering solution for a societal problem.
- Once funding is confirmed, the Research and Development cell release Call For Participation (CFP) across the campus mentioning the details of all IRP/SRP/ISP.
- Applications are scrutinized by the IRP/SRP/ISP team and an eligible team of students is allocated with the sub-module of the project.
- Time plan: Research work worth of 60-70Hrs per team is assigned, including capacity building of individual members (80-100 Hrs) and teamwork (60-75hrs).

Criteria for group formation:

- 3-4 students in a team.
- Role of teammates: Team lead and members.

Allocation of Guides/ Mentors for the projects:

IRP/SRP/ISP faculty team will mentor the students' team

Role of a Guide/ Mentor

The primary responsibility of the mentor is to help students to understand the meaning and need of various stages in the implementation of the project. At every stage of the project development, a mentor should help towards its successful completion as per the predefined standards.

How student should carry out a project:

- Define the problem.
- Specify the requirements.
- Specify the design in an understandable form (Block Diagram, Flowchart,Algorithm, etc).
- Analyze the design and identify hardware and software components separately.
- Select appropriate simulation tool and development board for the design.
- Implement the design.
- Optimize the design and generate the results.
- Result representation and analysis.
- Prepare a document and presentation.

Report Writing

- The format for report writing should be downloaded from ftp://10.3.0.3/projects

- The report needs to be shown to guide and committee for each review.
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Evaluation Scheme

- Internal semester assessment (ISA)
- Evaluation is done based on the evaluation parameters and rubrics given in Table 1, and Table 2 respectively.
- The progress of the project is reviewed and evaluated by the concerned team.

Table 1: Evaluation parameters for ISA

Reviews	Stages of projects	Parameters	Outcome Elements	Max Marks	Marks obtained
Review 1 (20M)	Initiation	Need analysis and Identification of problem	5.1.1	3	
		Problem relating socio economic context	7.1.2	3	
		Problem definition and application	6.1.1	3	
		Identifying multiple solutions, selecting the best suited solution and justifications with support of technical literature	10.1.1	5	
		Identify the standards and like IEEE& ACM Professional code of conduct	6.2.2 8.2.1	3	
		Identify limitations in the objectives and sources of error	2.4.3	3	
Review 2 (20M)	Planning	Project Planning (Gantt chart) and WBS(Work Breakdown Structure)	9.3.1	3	
		Identify the individual task	11.3.1	3	
		Mathematical and physical model of a system	2.3.2	3	
		Collection of appropriate test data	4.3.1	3	
		Functional block diagram relating input & output	5.2.2	3	
		Simulation of the design using suitable open source	5.2.1	3	
		Verify the credibility of results w.r.to accuracy and limitations	5.3.2	2	
Review 3	Execution	Detailed block diagram with all hardware specifications	13.2.1	5	

(40M)		Detailed block diagram with all software specifications	13.2.2	5	
		Integrating the functional blocks, debugging details and partial demonstration of results	3.4.1	5	
		design and develop considering modern techniques under the constraints	14.2.2/15.2.2	5	
		Demonstrate the results	13.5.1	10	
		Plan for optimization	10.1.1	5	
		Draft copy of technical report	12.3.1	5	
Review 4 (20M)	Closure	Implementation, analysis and conclusion of the results (Pre optimization and post optimization discussion)	13.5.2	10	
		Report submission in Latex (as given in the format)	10.3.2	10	
		Budget for the project	11.3.2	7	
		Future improvement of the project	12.1.1	3	
		Deliver effective oral presentation	10.2.2	10	

Table 2: Evaluation Rubrics

Review	Sl. No	Description	Marks	Inadequate Up to 25%	Average Up to 50%	Admirable Up to 75%	Outstanding Up to 100%
R1	1.	Need Analysis and identifying the problem.	5	Not done	Not well defined	Framed but not clear	Need analysis done.
	2.	Understanding of professional ethics Copyright, plagiarism.	5	Does not understands	Understands and not considered	Understands and considered	Understands thoroughly and planned to address
	3.	Problem definition and Application in the societal context.	5	The problem definition is not stated correctly.	Aware of the problem but objectives and scope not well defined.	Overall sound understanding of the problem and constraints.	Problem and scope are well defined to the proposed work.
	4.	Identifying multiple solutions and	5	Not developed alternate	Developed few (min 3) alternate	Developed alternate solutions	Developed alternate solutions

		selecting the best-suited solution and justifications with support of technical literature.		solution.	solutions.	but no evaluation.	and selection of optimal solutions.
R2	1	Project Planning (Gantt chart) and WBS(Work Breakdown Structure).	5	Work distribution is not done.	The leader identified, but work is not started	The leader identified, but work is not distributed properly.	The leader identified, and work has been distributed properly.
	2	Specification and identification of input & output.	5	Input and output are not identified.	Input and output are identified.	Input and output are identified but not according to specs.	Inputs, outputs are identified and are according to specs
	3	Functional block diagram relating. input & output	5	Incomplete functional block diagram	The functional block diagram is done but inputs outputs are not stated.	The functional block diagram is done but inputs and outputs are not clearly mentioned.	The functional block diagram is done with proper inputs and outputs are not clearly mentioned.
	4	Simulation of the design using any open source.	5	No results and no analysis	Partial results but no analysis.	Inadequate analysis	Desired results are obtained and analyzed.
R3	1	Detailed block diagram with all specifications/ algorithms	5	Incomplete block diagram	The functional block diagram is done but improper interconnections of the block.	The functional block diagram is done with proper interconnections of the block but not according to specs.	The functional block diagram is done with proper interconnections of blocks according to specs.
	2	Integrating the functional blocks, debugging details and Partial demonstration of results	5	Functional blocks are not identified. No results	Functional blocks are implemented but improper integrated Code/Simulation results are not proper.	Functional blocks are implemented with proper integration. Code/Simulation results are proper but unable to demonstrate.	Proper integration of functional blocks and debugging details are provided. Able to demonstrate the required result.

	3	Plan and need for optimization	5	Not done	Partial	Incomplete	Done
	4	Draft a copy of the project report	5	Not done	Partial	Incomplete	Done
R4	1	Implementation, demonstration, and analysis of results.(Pre optimization and post-optimization discussion)	10	Design is incomplete in terms of specifications and sub-blocks. No results and no analysis	The design of sub-blocks is satisfactory, with partial results but no analysis.	Design is completed in line with the specifications required. Inadequate analysis.	Design is complete, with all functional blocks in working condition. Desired results are obtained and analyzed.
	2	Report submission in Latex (as given in the format)	10	Not followed the recommended format	Followed the format but the contents are not properly organized	Format and contents are satisfactory	The report is properly organized as per the recommended format.
	3	Budget for the project	10	Not done	Partial	Incomplete	Done
	4	Deliver an effective oral presentation	10	Not followed the recommended format	Followed the format but the contents are not properly organized	Format and contents are satisfactory	The report is properly organized as per the recommended format.

End Semester Evaluation (ESA)

A semester-end examination is done based on the rubrics given in Table 3. The semester-end examination includes submission of the project report, demonstration of the projects, and viva-voce conducted by the external and internal examiner. ESAcarries 50% weightage of total marks of projects. The following assessment rubrics are followed to evaluate the student.

Table 2: ESA Rubrics

1	2			3	4		5
Write UP:(W) 10 Marks	Design methodology 20 Marks			Demonstration of results & analysis 10 Marks	Report, presentation & Viva 10 Marks		Total Marks (50)
Objectives, block diagram, operation, results and individual contribution	Design specifications 1) Mathematical /algorithmic 2) Physical	Concepts applied, Optimization techniques	Applications and limitations, Meeting societal/industrial/commercial needs	Representation and analysis of Results	Presentation skills, clarity& language usage	Clear &well organized report	
1.3.1	3.1.6	3.2.2	7.1.2	4.1.3	10.2.2	10.1.3	

Date: **Dean R and D**