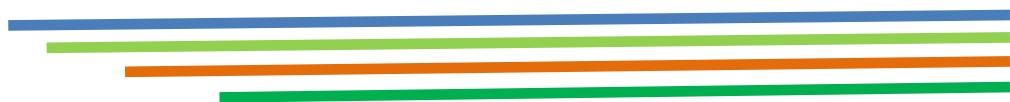


Heaven's Light is Our Guide



Rajshahi University of Engineering & Technology  
Department of Electrical & Electronic Engineering

# Capstone Project Design Manual



January 2025

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## **1. Introduction**

Capstone Project is a design project work that takes place during the third year and final year of 4 years engineering curriculum of B.Sc. in Electrical and Electronic Engineering. It extends across the final three semesters with the following course structure:

- (i) EEE 3202, Capstone Project Design I, 0.75 Credit

Students will attend this course throughout the 3rd year even semester and submit the project at the end of 3rd year even semester. The theme of project should reflect the knowledge gained from 1<sup>st</sup> year odd semester to 3rd year odd semester.

- (ii) EEE 4002, Capstone Project Design II, 0.75 Credit

Students will attend this course throughout the 4th year odd and even semester and submit the project at the end of 4th year even semester. The theme of project should reflect the knowledge gained from 1st year odd semester to 4th year even semester.

Capstone Project must reflect culminating activities of the student where s/he would showcase knowledge, skills and attitudes learned in the earlier courses.

## **2. Structure of the Capstone Project**

The capstone project will be carried out through the following steps:

- Assigning a project supervisor
- Submission of the project proposal to the supervisor
- Review and feedback on the project proposal by the supervisor
- Commencement of the project
- End-semester presentation to showcase project completion
- Project showcasing involving industry and academia experts
- Grade evaluation based on the assigned rubrics.

## **3. Assignment of Project Supervisor**

Supervisor for both Capstone Projects and Thesis/Project are assigned at the beginning of the 3<sup>rd</sup> year even semester following the same rules. Therefore, the supervisor of both Capstone Projects and Thesis/Project is the same person.

## **4. Maximum Number of Students in a Project Group**

(Recommended) maximum number of students per project group: 2

## **5. Program Outcome Mapping**

The capstone project works must address the corresponding program outcomes (POs) of B.Sc. in EEE Engineering Program. The name of the POs along with the descriptions are listed in Table 1.

**Table 1:** POs for Capstone Projects (EEE 3202 and EEE 4002)

PO	Name	PO Statements
PO(e)	Modern tool usage	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.
PO(i)	Individual work and teamwork	Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO(j)	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO(k)	Project management and finance	Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

## 6. Complex Engineering Problems

The capstone projects include the Complex Engineering Problems mentioned in Table 2. The attributes of complex engineering problems are given below:

**Table 2:** Complex Engineering Problem Solving through the Capstone Projects (EEE 3202 and EEE 4002).

Attribute	Complex Engineering Problems
Depth of knowledge required	Requires research-based knowledge, much of which is at, or informed by, the forefront of the professional discipline and that allows a fundamental- based, first-principles analytical approach
Familiarity of issues	Involve infrequently encountered issues
Interdependence	Are high-level problems that include many component parts or subproblems

## 7. Complex Engineering Activities

The capstone projects include the Complex Engineering Activities mentioned in Table 3. The attributes of complex engineering activities are given below:

**Table 3:** Complex Engineering Activities involved in the Capstone Projects (EEE 3202 and EEE 4002).

Attribute	Complex Engineering Activities
Range of resources	Involve the use of diverse resources (for this purpose, resources include people, money, equipment, materials, information and technologies)
Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways

## 8. Choosing a Topic for Capstone Project

- The topic must be chosen keeping the timeframe and financial constraints in consideration.
- The depth and range of the project work should depend on the number of group members. Respective supervisor has the authority to decide on the depth and range of the project depending on the number of group members.
- For Capstone Project Design I, the project should reflect the knowledge of the courses completed from 1<sup>st</sup> year odd semester to 3<sup>rd</sup> year odd semester (e.g., Electronics I & II, Signals and Linear Systems, Control System Engineering, VLSI Circuits and Design I etc.).
- For Capstone Project Design II, the project should reflect the knowledge of the courses completed from 1<sup>st</sup> year odd semester to 4<sup>th</sup> year even semester (e.g., Power Electronics, Digital Signal Processing, Microprocessors and Embedded Systems etc.).
- The chosen project must align with the respective program outcomes.
- The chosen project should have real life significance and be relevant to national development.

## 9. Capstone Project Proposal Form



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### Proposal for Capstone Project Design I (EEE 3202)

<b>1.</b>	<b>Project members</b>	:	1. Name (Roll No.) 2. Name (Roll No.) :
<b>2.</b>	<b>Title of the project</b>	:	
<b>3.</b>	<b>Brief description of the project:</b>		
	<b>(a) Project Background (within 500 words):</b>		
	Some aspects to be addressed are:		
	<ul style="list-style-type: none"> <li>• What problem does your project address?</li> <li>• Mention the existing researches that address this problem with their contributions and research gaps.</li> </ul>		
	<b>(b) Objectives and aims of the project (within 100 words):</b>		
	Mention the objectives of your project-		
	<ul style="list-style-type: none"> <li>• Objective 1</li> <li>• Objective 2</li> <li style="text-align: center;">:</li> </ul>		
	<b>(c) State how does your project address the following program outcomes (PO).</b>		

POs for EEE 3202	PO Statements
PO(e) (Modern tool usage)	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations. <i>Explanation on addressing PO(e) through this project:</i>
PO(i) (Individual work and teamwork)	Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings. <i>Explanation on addressing PO(i) through this project:</i>
PO(j) (Communi- cation)	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. <i>Explanation on addressing PO(j) through this project:</i>
PO(k) (Project manageme- nt and finance)	Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. <i>Explanation on addressing PO(k) through this project:</i>
<b>(d) Methodology to be adopted in the project (detail as far as possible):</b>	
Describe the tools and techniques that will be used to accomplish the project. Add necessary algorithm, flow chart, block diagram etc.	
<b>(e) Expected results:</b>	
Explain the tentative improvements of the problem compared to the current state of the problem. Add necessary data table, graphs, simulation results etc.	
<b>(f) Relevance of the project to national development:</b>	
Mention the real-life implementation of the project that would help in developing the country.	
<b>4.</b>	<b>Basic facilities available in the department for the proposed investigation:</b>
Mention the facilities available in the laboratories that are relevant to the project (if any).	
<b>5.</b>	<b>Key performance indicators of the project:</b>
Mention the key performance parameters related to the project.	
<b>6.</b>	<b>Cost Estimation:</b>

Sl. No.	Item Description		Cost	
	Name of the Item	Quantity	Unit Price (BDT)	Total Cost (BDT)

Project Members:	Supervisor:
(Signature with date) 1. Name: Roll No.: Department of EEE, RUET  (Signature with date) 2. Name: Roll No.: Department of EEE, RUET  :	(Signature with date) Supervisor's Name Designation (Lecturer/.../Professor) Department of EEE, RUET

## 10. Operational Guideline for Capstone Projects

### 10.1. Responsibility of Project Supervisor

Project supervisor will:

- Form the project group and guide the students to select an appropriate project.
- Guide the students to understand how the project addresses the respective POs.
- Mentor the students in technical aspects while developing the project.
- Guide the students to perform the SWOT analysis (S: Strength, W: Weakness, O: Opportunities, T: Threats) on completion of the project
- Examine the project showcasing, project presentation, journal, and project report according to the designated rubrics within the semester timeframe and submit his/her portion of marks with CO attainments.

### 10.2. Responsibility of the Head of the Department (HoD)

The HoD will:

- Ensure the capstone project process is conducted in alignment with the department's academic standards.
- Approve the assigned supervisors to ensure proper distribution of workload and alignment with expertise.
- Oversee the timely evaluation and submission of marks.
- Address and resolve any disputes or issues related to the capstone projects.

### 10.3. Capstone Projects' Timeline

Week	Activity
1	Assigning the project supervisor
2	Submission of preliminary project proposal
3 - 4	Conducting a detailed literature review to identify gaps in existing solutions.
5 - 6	Developing a methodology and system design
7	Mid-semester presentation on the progress of the project
8 - 10	Developing the project prototype
11-12	Finalization of the project
13	Project showcasing through poster presentation

## 11. Course Outcome (CO)

### 11.1. COs of Capstone Projects (EEE 3202 and EEE 4002)

CO	CO Statements	Corresponding PO
CO1	Develop an electrical, electronic or software project in groups based on the knowledge obtained from 1st year odd semester to 3rd year odd semester following the standard design rules.	PO(e)
CO2	Justify the effective contribution of the student as an individual as well as a group member in the completion of the project.	PO(i)
CO3	Present the project in various stages of its development through justification and stating the worth	PO(j)
CO4	Organize the stages of the design project through economic and technical decision making as an active member of a group.	PO(k)

## 11.2. CO Evaluation

PO	Name	CO	CO Statement	Project Proposal (10 Marks)	Project Work (40 Marks)	Project Report (30 Marks)	Project Demonstration and Poster Presentation (20 Marks)
PO(e)	Modern tool usage	CO1	Develop an electrical, electronic or software project in groups based on the knowledge obtained from 1st year odd semester to 3rd year odd semester following the standard design rules.		<ul style="list-style-type: none"> <li>▪ Development of simulation model: 5</li> <li>▪ Acquiring new skills: 5</li> </ul>	<ul style="list-style-type: none"> <li>▪ Abstract: 4</li> <li>▪ Literature review and rationale of the project: 3</li> <li>▪ Objectives: 2</li> <li>▪ Experimental work/Methodology: 8</li> </ul>	<ul style="list-style-type: none"> <li>▪ Functionality of the project: 5</li> <li>▪ Relevance to modern needs: 5</li> </ul>
PO(i)	Individual work and teamwork	CO2	Justify the effective contribution of the student as an individual as well as a group member in the completion of the project.		<ul style="list-style-type: none"> <li>▪ Contribution to teamwork: 5</li> <li>▪ Responsibility: 5</li> </ul>	Achievement of program outcomes: 4	Poster preparation: 5
PO(j)	Communication	CO3	Present the project in various stages of its development through justification and stating the worth.			<ul style="list-style-type: none"> <li>▪ Results and discussion: 4</li> <li>▪ Conclusion and future work: 2</li> </ul>	Presentation: 5
PO(k)	Project management and finance	CO4	Organize the stages of the design project through economic and technical decision making as an active member of a group.	<ul style="list-style-type: none"> <li>▪ Technical planning: 5</li> <li>▪ Financial planning: 3</li> <li>▪ Objectives: 2</li> </ul>	Project completion: 20	Financial report: 3	

### 11.3. Summary of CO Evaluation

PO	CO	Project Proposal	Project work	Project Report	Project Demonstration and Poster Presentation
PO(e)	CO1		√	√	√
PO(i)	CO2		√	√	√
PO(j)	CO3			√	√
PO(k)	CO4	√	√	√	

### 12. Assessment Policy

The sequence of weightage is: Supervisor-Average of all. Also, all values in parenthesis are in %

Course No.	Project Proposal	Project work	Project Report	Project Demonstration and Poster Presentation	Overall Contribution
EEE 3202	10 Marks (100-0)	40 Marks (100-0)	30 Marks (100-0)	20 Marks (0-100)	(80 – 20)
EEE 4002	10 Marks (100-0)	40 Marks (100-0)	30 Marks (100-0)	20 Marks (0-100)	(80 – 20)

## 13. Rubrics

### 13.1. Rubrics for Project Proposal

CO	PO	Source	Marks Distribution				
CO4	PO(k)	Technical planning (5 Marks)	<b>5:</b> Highly detailed, well-structured, and feasible plan with clear technical specifications, methodologies, and innovative aspects.	<b>4:</b> Technical plan is moderately clear with minor missing details or less innovation.	<b>3:</b> Basic technical plan with some clarity but lacks details in methodology or feasibility.	<b>2:</b> Poorly structured plan, missing feasibility and technical clarity.	<b>0:</b> Technical planning not completed.
		Financial planning (3 Marks)	<b>3:</b> Comprehensive and realistic budget with proper justification of costs.	<b>2:</b> Budget is provided but lacks clarity or justification.	<b>1:</b> Unrealistic budget with missing cost details.	<b>0:</b> Financial Planning not completed	
		Objectives (2 Marks)	<b>2:</b> Well-defined and achievable project objectives aligned with the problem statement.	<b>1:</b> Objectives are vague and lack alignment with the project goals.	<b>0:</b> Objectives are not defined.		

### 13.2. Rubrics for Project Work

CO	PO	Source	Marks Distribution				
CO1	PO(e)	Development of simulation model (5 Marks)	<b>5:</b> Simulation model is well- optimized, and accurately represents the system.	<b>4:</b> Model is functional with minor inefficiencies or inaccuracies.	<b>3:</b> Model meets requirements but lacks optimization.	<b>2:</b> Basic model with errors or inefficiencies.	<b>0-1:</b> Inaccurate model.
		Acquiring new skills (5 Marks)	<b>5:</b> Demonstrates exceptional ability to learn and apply new skills.	<b>4:</b> Acquires and applies necessary new skills effectively.	<b>3:</b> Learns new skills but applies them with some difficulty.	<b>2:</b> Struggles to apply new skills effectively.	<b>0-1:</b> Unable to acquire or apply new skills.
CO2	PO(i)	Contribution to teamwork (5 Marks)	<b>5:</b> Actively collaborates and contributes ideas to the team.	<b>4:</b> Works well in a team and contributes effectively.	<b>3:</b> Participates in teamwork with average engagement.	<b>2:</b> Inconsistent participation and minimal contribution.	<b>0-1:</b> Does not engage in teamwork or causes conflicts.
		Responsibility (5 Marks)	<b>5:</b> Consistent in completing the assigned tasks ensuring quality work through the leadership of tasks.	<b>4:</b> Responsible and completes tasks on time with minimal supervision.	<b>3:</b> Meets deadlines but requires reminders.	<b>2:</b> Occasionally misses deadlines and lacks accountability.	<b>0-1:</b> Fails to meet deadlines and avoids responsibility.
CO4	PO(k)	Project completion (20 Marks)	<b>(19-20):</b> Project is completed and attains all of the objectives.	<b>(15-18):</b> Project completed with minor deviations from objectives.	<b>(10-15):</b> Project meets most objectives but with some gaps.	<b>(5-10):</b> Project is completed, but basic requirements are not achieved.	<b>(0-5):</b> Project is incomplete.

### 13.3. Rubrics for Project Report

CO	PO	Source	Marks Distribution				
CO1	PO(e)	Abstract (4 Marks)	<b>4:</b> Mentioned the four information- what is done, why it is done, how it is done, and major outcomes.	<b>3:</b> Missed any one of the four pieces of information- what is done, why it is done, how it is done, and major outcomes.	<b>2:</b> Missed any two of the four pieces of information- what is done, why it is done, how it is done, and major outcomes.	<b>1:</b> Missed any three of the four pieces of information- what is done, why it is done, how it is done, and major outcomes.	<b>0:</b> Missed all of the four information- what is done, why it is done, how it is done, and major outcomes.
		Literature review and rationale of the project (3 Marks)	<b>3:</b> The rationale of the project and literature review are adequate.	<b>2:</b> Either the rationale of the project or the literature review is inadequate.	<b>1:</b> Either the rationale of the project or the literature review is absent, or both are inadequate.	<b>0:</b> Both the rationale of the project and the literature review are absent.	
		Objectives (2 Marks)	<b>2:</b> Objectives are precise and logical to achieve.	<b>1:</b> Objectives are not precise or illogical to achieve.	<b>0:</b> Objectives are not precise and illogical to achieve.		
		Experimental work/Methodology (8 Marks)	<b>8-7:</b> Presents a well-structured system model with a detailed and accurate description. It includes a well-explained algorithm, a correctly structured flowchart, and a precise block diagram with clear logical connections. System parameters are presented in properly labelled and well-organized tables. Provides a detailed prototype design with well-labelled, high-quality figures, and	<b>6-5:</b> System model, algorithm, flowchart, and block diagram are presented with sufficient description but lack minor details or justifications. Tables and prototype designs are included but with minor formatting or labelling issues.	<b>4-3:</b> Some elements are missing, or descriptions lack clarity and depth. Tables or figures may have missed or unclear values.	<b>2-1:</b> Major components are missing, descriptions are vague, or figures are unclear. System parameters and prototype design lack relevance or contain major errors.	<b>0:</b> No system model, algorithm, flowchart, block diagram, system parameters, or prototype design provided.

CO	PO	Source	Marks Distribution				
			effectively links figures to design implementation.				
CO2	PO(i)	Achievement of program outcomes (4 Marks)	<b>4:</b> The justifications for achieving the POs by completing the project are clearly and correctly stated.	<b>3:</b> The justifications for achieving the POs by completing the project are clearly stated, but some are incorrect.	<b>2:</b> The justifications for achieving the POs by completing the project are clearly stated, but most are incorrect.	<b>1:</b> The justifications for achieving the POs by completing the project are unclear.	<b>0:</b> The justifications for achieving the POs by completing the project are not stated.
CO3	PO(j)	Results and discussion (4 Marks)	<b>4:</b> All the required results are shown visually and numerically. Obtained results are interpreted through discussion.	<b>3:</b> Most of the required results are shown visually and numerically. Obtained results are interpreted through discussion.	<b>2:</b> Some of the required results are shown visually and numerically. Obtained results are interpreted through discussion.	<b>1:</b> Most required results are missing, and no result has been interpreted through discussion.	<b>0:</b> The results and discussion section is missing.
		Conclusion and future work (2 Marks)	<b>2:</b> The conclusion section contains a discussion on the achievement of objectives. Future work direction is present.	<b>1:</b> Either the conclusion section does not discuss achieving objectives, or the future work direction is absent.	<b>0:</b> Both conclusion and future work are absent.		
CO4	PO(k)	Financial report (3 Marks)	<b>3:</b> The financial report is detailed and reasonable.	<b>2:</b> The financial report is detailed but not reasonable.	<b>1:</b> The financial report is missing most of the items.	<b>0:</b> The financial report is missing.	

### 13.4. Rubrics for Project Demonstration and Poster Presentation

CO	PO	Source	Marks Distribution				
CO1	PO(e)	Functionality of the project (5 Marks)	<b>5:</b> The project operates flawlessly, meets all intended objectives, and demonstrates full functionality with excellent user interaction.	<b>4:</b> The project functions well with minor issues that do not significantly affect performance or usability.	<b>3:</b> The project works but has noticeable limitations or partial functionality.	<b>2:</b> The project has major issues affecting performance and usability, requiring significant improvements.	<b>1:</b> The project is non-functional or barely operational, failing to meet the core objectives.
		Relevance to modern needs (5 Marks)	<b>5:</b> The project effectively addresses modern technological and societal needs while introducing significant new knowledge for students. It demonstrates innovation, real-world applicability, and educational value.	<b>4:</b> The project aligns well with technological and societal trends, with moderate innovation and learning opportunities. Some aspects may need further enhancement.	<b>3:</b> The project has some relevance to modern needs but lacks strong innovation or impact. It provides only basic learning opportunities.	<b>2:</b> The project has minimal relevance to modern needs, with limited innovation and educational value.	<b>1:</b> The project does not address modern technological or societal needs and lacks learning opportunities.
CO2	PO(i)	Poster preparation (5 Marks)	<b>5:</b> The poster is well-organized, visually appealing, and contains all essential sections (title, introduction, methodology, results, conclusion). High-quality figures, diagrams, and tables enhance understanding. Text is concise, clear, and professional. Technical details are	<b>4:</b> The poster is mostly well-structured with minor formatting or readability issues. Figures and diagrams are relevant but could be better labelled. Some sections need slight improvement in clarity or conciseness.	<b>3:</b> The poster is somewhat organized but may lack clarity or have inconsistent formatting. Some figures and diagrams are unclear or not well-integrated. Technical details contain minor errors.	<b>2:</b> The poster lacks organization, has readability issues, and is missing key sections. Figures and diagrams are unclear or irrelevant. Technical details contain major inaccuracies.	<b>1:</b> The poster is poorly structured, visually unappealing, and missing critical content. It does not effectively convey the project details.

CO	PO	Source	Marks Distribution					
			accurate and correctly presented.					
CO3	PO(j)	Presentation (5 Marks)	<p><b>5:</b> All the five aspects are satisfactorily addressed-</p> <ul style="list-style-type: none"> <li>▪ Clear explanation.</li> <li>▪ Eye contact and engagement with the audience.</li> <li>▪ Stays within the allotted time.</li> <li>▪ Demonstrates confidence and positive body language.</li> <li>▪ Answers questions thoughtfully.</li> </ul>	<p><b>4:</b> Any one of the five aspects are not satisfactorily addressed:</p> <ul style="list-style-type: none"> <li>▪ Clear explanation.</li> <li>▪ Eye contact and engagement with the audience.</li> <li>▪ Stays within the allotted time.</li> <li>▪ Demonstrates confidence and positive body language.</li> <li>▪ Answers questions thoughtfully.</li> </ul>	<p><b>3:</b> Any two of the five aspects are not satisfactorily addressed:</p> <ul style="list-style-type: none"> <li>▪ Clear explanation.</li> <li>▪ Eye contact and engagement with the audience.</li> <li>▪ Stays within the allotted time.</li> <li>▪ Demonstrates confidence and positive body language.</li> <li>▪ Answers questions thoughtfully.</li> </ul>	<p><b>2:</b> Any three of the five aspects are not satisfactorily addressed:</p> <ul style="list-style-type: none"> <li>▪ Clear explanation.</li> <li>▪ Eye contact and engagement with the audience.</li> <li>▪ Stays within the allotted time.</li> <li>▪ Demonstrates confidence and positive body language.</li> <li>▪ Answers questions thoughtfully.</li> </ul>	<p><b>1:</b> Any four of the five aspects are not satisfactorily addressed:</p> <ul style="list-style-type: none"> <li>▪ Clear explanation.</li> <li>▪ Eye contact and engagement with the audience.</li> <li>▪ Stays within the allotted time.</li> <li>▪ Demonstrates confidence and positive body language.</li> <li>▪ Answers questions thoughtfully.</li> </ul>	