

Table 8.4: CO statements and their relationship with POs, learning domain, marks distribution, and assessment tools

CO No.	CLO statement	Corresponding PLO No.	Learning Domain	Internal (50 marks)	External (20 Marks)	Viva Voce (Presentation followed by Q & A) (30 Marks)
CO1	Demonstrate the ability to apply principles of mathematics, science, and engineering to develop a system or mathematical model.	PO(a)	Cognitive Level 3 (Apply)	5 (Thesis book- System model)		
CO2	Analyze the problems for possible solutions to cover the research gaps followed by extensive revisions of existing methods.	PO(b)	Cognitive Level 4 (Analyze)	5 (Thesis book- Objectives)		
CO3	Design innovative engineering solutions considering constraints such as public health, safety, sustainability, and cost.	PO(c)	Cognitive Level 6 (Create)	5 (Thesis book- Model/Program /Hardware Design)	5 (Thesis book- Model/Program /Hardware Design)	
CO4	Investigate the performance of the developed solution with respect to the given specifications, requirements and standards.	PO(d)	Cognitive Level 4 (Analyze)	5 (Results and Discussion)		
CO5	Demonstrate proficiency in using contemporary engineering tools and software to analyze, design, and implement engineering solutions.	PO(e)	Psychomotor Level 3 (Precise)	5 (Thesis book- Simulation and/or Implementation)	5 (Thesis book- Simulation and/or Implementation)	5 (Thesis book- Simulation and/or Implementation)
CO6	Assess the impact of the thesis/project outcome in context of, health, safety, legal, and cultural issues.	PO(f)	Affective Level 2 (Respond)			5 (Impact on Societal, Health, Safety, Legal, and Cultural Issue)
CO7	Justify the sustainability of the proposed solution in societal and environmental context.	PO(g)	Affective Level 5 (Characterize)	5 (Thesis book- Impact of the Project/Thesis on Environment and Sustainability)		
CO8	Practice ethical principle in research/ project activities and decision-making adhering professional codes of conduct.	PO(h)	Affective Level 5 (Characterize)	5 (Continuous evaluation- Originality, Responsibility, Proper citation)		5 (Originality, Proper citation)
CO9	Act effectively as an individual or as a member/leader of a team.	PO(i)	Affective Level 5 (Characterize)	5 (Continuous evaluation)		
CO10	Communicate effectively the concept and outcome of research/project through written reports and oral presentation.	PO(j)	Affective Level 3 (Value)		5 (Complete representation of the thesis book)	5 (Presentation and Q & A)
CO11	Organize projects/thesis within time and budget constraints.	PO(k)	Affective Level 4 (Organize)	5 (Continuous evaluation)		5 (Project/thesis Management and Finance)
CO12	Develop the capability of acquiring new knowledge and skills to remain updated in engineering practice and adjust to emerging technological needs.	PO(l)	Affective Level 2 (Respond)	5 (Thesis book- Lit. review, Future work)	5 (Thesis book- Lit. review, Future work)	5 (Reflection of independent learning)

Table 8.5: Rubrics for Internal Evaluation (Supervisor) of EEE 4000: Project & Thesis

Category	Source	CO No.	PO	Excellent (5)	Good (4)	Satisfactory (3)	Need improvement (2)	Poor (1)
System Model	Thesis Book: System Model	CO1	PO(a)	System model contains novel parts, clearly described with figures, mathematical model is available, system parameters are clearly stated.	System model contains no novel part, clearly described with figures, mathematical model is available, system parameters are clearly stated.	System model contains no novel part, vaguely described with figure, mathematical model is available, system parameters are clearly stated.	System model contains no novel part, vaguely described with figure, mathematical model is not available, system parameters are clearly stated.	System model contains no novel part, vaguely described with figure, mathematical model is not available, system parameters are not clearly stated.
Objectives	Thesis Book: Objectives	CO2	PO(b)	Objectives are concise, clearly stated, motivating, fills-up the current research gaps.	Objectives are not motivating, clearly stated, fills-up the current research gaps.	Objectives are not motivating, clearly stated, does not fill-up the current research gaps.	Objectives are not motivating, vaguely stated, does not fill-up the current research gaps.	Objectives need improvement.
Engineering Design	Thesis book: Model/Program /Hardware Design	CO3	PO(c)	The design of the proposed work has sufficient novelty, methodology is comprehensive, has strong literature support, and addresses feasibility	The design of the proposed work has moderate novelty, methodology is comprehensive, has strong literature support, and addresses feasibility	The design of the proposed work has moderate novelty, methodology is not rigorous, has strong literature support, and addresses feasibility	The design of the proposed work has moderate novelty, methodology is not rigorous, has moderate literature support, and did not address feasibility	The design of the proposed work has minimum novelty, methodology is not rigorous, has poor literature support, and did not address feasibility
Results and Discussion	Thesis book: Results and Discussion	CO4	PO(d)	Result is investigated thoroughly, results are taken following given specifications, and meets standards.	Result is investigated concisely, results are taken following given specifications, and meets standards.	Result is investigated concisely, results are taken following given specifications, but does not meet standards.	Result is investigated concisely, results are not taken following given specifications, but does not meet standards.	Results are unclear.
Simulation and/or Implementation using software/modern tools	Thesis book: Simulation and/or Implementation	CO5	PO(e)	Exceptional implementation or simulation using advanced tools; results are comprehensive, well-analyzed, and directly address research objectives.	Strong implementation or simulation with appropriate tools; results are relevant and analyzed, though may lack minor depth.	Adequate implementation or simulation; results are relevant but analysis is basic or superficial.	Limited implementation or simulation; results show minimal relevance or weak analysis, with some use of tools.	Poor or no implementation/simulation; results are irrelevant or unsupported, with little to no use of modern tools.
Environment and Sustainability	Thesis book: Impact of the Project/Thesis on Environment and Sustainability	CO7	PO(g)	The proposed solution improves the sustainability issue in and environment friendly.	The proposed solution improves the sustainability issue and is environmentally neutral.	The proposed solution improves the sustainability issue but ignores the environmental impact.	The proposed solution does not improve the sustainability issue and ignores the environmental impact.	The proposed solution is not sustainable and its effect on environment is questionable.

Category	Source	CO No.	PO	Excellent (5)	Good (4)	Satisfactory (3)	Need improvement (2)	Poor (1)
Ethical principle in thesis/project activities and decision-making adhering professional codes of conduct.	Continuous evaluation: Originality, responsibility, proper citation	CO8	PO(h)	The work is an original one, the student acted responsibly throughout the research journey, and always cited the right source.	The work is an original one, the student acted responsibly throughout the research journey, but some required citations were missed.	The work is an original one, the student sometimes did not act responsibly throughout the research journey, but some required citations were missed.	The work is an original one, the student did not act responsibly at all throughout the research journey, and missed several required citations.	The originality of the work is questionable, the student did not act responsibly at all throughout the research journey, and missed several some required citations.
Individual and/or team work	Continuous evaluation	CO9	PO(i)	Demonstrates exceptional ability to work independently and collaboratively, with clear contributions, effective communication, and successful teamwork outcomes.	Shows strong capability in both individual and team settings, with clear contributions and effective communication, though minor improvements are needed.	Adequate performance in individual and team settings, with some contributions and basic communication; some areas need improvement.	Limited performance in individual and team settings, with minimal contributions and weak communication; several areas need improvement.	Poor or no demonstration of individual and team work; contributions are unclear or absent, with ineffective communication.
Organize projects/thesis within time and budget constraints.	Continuous evaluation	CO11	PO(k)	Strictly maintains the timeline for the completion of thesis/project, including detailed planning, resource allocation, budgeting, and risk management; shows comprehensive understanding of financial aspects.	Strictly maintains the timeline for the completion of thesis/project with effective planning, resource allocation, and budgeting; good understanding of financial aspects with minor gaps.	The timeline for different phase is exceeded but the thesis completion is maintained within deadline with basic planning, resource allocation, and budgeting; some understanding of financial aspects but lacks depth.	The timeline for different phase is exceeded but the thesis completion is maintained within deadline with minimal planning and budgeting; weak understanding of financial aspects and resource allocation.	The deadline for thesis completion is exceeded, also, it lacks planning, budgeting, and understanding of financial aspects and resource allocation.
Life-long learning	Thesis book- Literature review, Future work	CO12	PO(l)	Thoroughly reviewed relevant literatures with critical evaluation of contributions, research gaps, and suggested meaningful solutions with future directions.	Thoroughly reviewed relevant literatures with critical evaluation of contributions, research gaps, and suggested basic solutions and future directions.	Reviewed relevant literatures with critical evaluation of contributions, and research gaps, but failed to suggest solutions and future directions.	Reviewed relevant literatures with critical evaluation of contributions, but missed some major research gaps, and failed to suggest solutions and future directions.	Reviewed relevant literatures with critical evaluation of contributions, but did not mention anything about research gaps, and suggested no solution and future direction.

Table 8.6: Rubrics for External Examiner Evaluation of EEE 4000: Project & Thesis

Category	Source	CO	PO	Excellent (5)	Good (4)	Satisfactory (3)	Need improvement (2)	Poor (1)
Engineering Design	Thesis book: Model/Program /Hardware Design	CO3	PO(c)	The design of the proposed work has sufficient novelty, methodology is comprehensive, has strong literature support, and addresses feasibility	The design of the proposed work has moderate novelty, methodology is comprehensive, has strong literature support, and addresses feasibility	The design of the proposed work has moderate novelty, methodology is not rigorous, has strong literature support, and addresses feasibility	The design of the proposed work has moderate novelty, methodology is not rigorous, has moderate literature support, and did not address feasibility	The design of the proposed work has minimum novelty, methodology is not rigorous, has poor literature support, and did not address feasibility
Use of software/modern tool	Thesis book	CO5	PO(e)	Effectively apply a wide range of modern engineering tools and software with advanced features to analyze develop innovative solutions, and execute them with successful outcomes.	Proficient use of tools and software with minor refinements possible. Introduces creative approaches contributing significantly. Achieves satisfactory outcomes.	Shows some creativity, using tools/software appropriately. Adequate execution, occasional integration challenges.	Limited creativity, basic tool/software application. Limited success with respect to expected outcome.	Lacks creativity, ineffective tool/software use for problem-solving. Fails to execute effectively, incomplete or ineffective outcomes.
Complete representation of the thesis book	Thesis book	CO10	PO(j)	Concepts and outcomes are exceptionally clear, precise, and easy to understand. Thesis book is exceptionally well-structured. Exceptional use of relevant evidence and examples to support conclusions.	Concepts and outcomes are clear and mostly easy to understand. Thesis book is well-organized. Good use of relevant evidence and examples to support conclusions.	Concepts and outcomes are generally clear but may lack some precision. Thesis book is adequately organized with a coherent structure. Content covers most key aspects adequately but lacks depth in some areas.	Concepts and outcomes are unclear or confusing in several places. Thesis book lacks clear structure. Limited use of evidence and examples, which are not always relevant or clear.	Concepts and outcomes are completely unclear and confusing throughout. Thesis book is poorly structured. Language is extremely poor, hindering understanding and readability.
Life-long learning	Thesis book- Literature review, Future work	CO12	PO(l)	Thoroughly reviewed relevant literatures with critical evaluation of contributions, research gaps, and suggested meaningful solutions with future directions.	Thoroughly reviewed relevant literatures with critical evaluation of contributions, research gaps, and suggested basic solutions and future directions.	Reviewed relevant literatures with critical evaluation of contributions, and research gaps, but failed to suggest solutions and future directions.	Reviewed relevant literatures with critical evaluation of contributions, but missed some major research gaps, and failed to suggest solutions and future directions.	Reviewed relevant literatures with critical evaluation of contributions, but did not mention anything about research gaps, and suggested no solution and future direction.

Table 8.7: Rubrics for Viva Voce of EEE 4000: Project & Thesis

Category	CO	PO	Excellent (5)	Good (4)	Satisfactory (3)	Need improvement (2)	Poor (1)
Simulation/Implementation	CO(5)	PO(e)	Represent strong evidence of perform simulation and/or implementation by proper use of modern tools and/or software.	Represent reasonable evidence of perform simulation and/or implementation by proper use of modern tools and/or software.	Represent satisfactory evidence of perform simulation and/or implementation by proper use of modern tools and/or software.	Attempts to use tools/software but lacks proficiency; implementation is basic or flawed	Little to no use of modern tools/software; ineffective or incorrect implementation attempts.
Impact on Societal, Health, Safety, Legal and Cultural Issue	CO(6)	PO(f)	Provides an analysis that comprehensively covers one or more societal, health, safety, legal, and cultural issues with exceptional depth, thoroughly exploring each aspect and integrating them well into the discussion.	Provides an analysis that clearly covers one or more societal, health, safety, legal, and cultural issues with substantial depth, with most aspects well-explored and integrated.	Provides an analysis that adequately covers one or more societal, health, safety, legal, and cultural issues, though some aspects may lack depth or integration.	Provides an analysis that covers one or more of the issues but lacks depth and integration, with some aspects superficially addressed.	Provides an analysis that is incomplete or poorly covers one or more societal, health, safety, legal, and cultural issues, with many aspects missing or inadequately addressed.
Originality And proper citation	CO(8)	PO(h)	The work is an original one, always cited the right source.	The work is an original one, but some required citations were missed.	The work is an original one but some required citations were missed.	The work is an original one and missed several required citations.	The originality of the work is questionable and missed several some required citations.
Presentation and Q & A	CO(10)	PO (j)	Clear, coherent, and motivational oral presentation. Good eye contact. Understands the audience. Well prepared and organized slides. Excellent use of visual aids. Quickly grasped questions, clear and apt responses. good control of both theory and findings	Good and coherent oral presentation. Good eye contact. Understands the audience. Well prepared presentation. Good use of visual aids. Mostly clear, good grasp of material, only occasional stumbles, minor uncertainty on some facts or details	Mostly coherent oral presentation. Fairly well prepared and organized slides. Good use of visual aids. Occasional confusion or lack of clarity, occasional gaps in theory or important details, somewhat nervous or jittery	Inconsistent presentation with limited eye contact and visual aids. Confusion or lack of clarity; gaps in theory or details are frequent. Presentation appears nervous or jittery.	Poor oral presentation. Disorganized presentation. Responses are unclear or incorrect. Presentation lacks coherence and confidence.

Project/thesis Management and Finance	CO11	PO(k)	Provides a project/thesis that demonstrates exceptional planning with a clear, detailed, and well-structured timeline and realistic budget to meet all deadlines and expenditures	Provides a project/thesis that shows strong planning and organization, with a clear and detailed timeline and a well-managed budget and meet most of the financial resources and deadlines.	Provides a project/thesis that demonstrates adequate planning and organization, with a reasonable timeline and an adequate budget where some financial resources and deadlines are met, though there may be minor delays.	Provides a project/thesis that shows basic planning and organization, with a vague or incomplete timeline and budget where several financial resources and deadlines are missed or delayed.	Provides a project/thesis that demonstrates poor planning and organization, with no clear timeline and budget where most financial resources and deadlines are missed or significantly delayed.
Reflection of independent learning	CO12	PO(l)	Provides an in-depth reflection of new skills acquired, detailing the development process, challenges faced, applications, lessons learned, and future goals.	Offers a clear reflection of new skills with good detail about the development process and applications, including some lessons learned.	Provides a basic reflection with limited detail on new skill development and applications, mentioning few lessons learned.	Lacks depth in reflection; minimal detail on new skill development and vague applications or lessons learned.	Fails to reflect meaningfully on new skills, with unclear descriptions and no connection to personal growth.