PLO 01 - Engineering Knowledge									
An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.									
SLO	**Statement↓**	**Score→**	**Exemplary (5)**	**Proficient (4)**	**Developing (3)**	**Beginning (2)**	**Novice (1)**	**AT**	**W**
1.1	**Apply:** Correctly applies engineering knowledge to the solution of complex engineering problem		Correctly applies engineering specialization to the solution of complex engineering problems	Correctly applies engineering fundamentals to the solution of complex engineering problems	Correctly applies basic sciences to the solution of complex engineering problems	Has difficulty applying mathematics to the solution of complex engineering problems	2	1	

PLO 02 - Problem Analysis									
An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.									
SLO	**Statement↓**	**Score→**	**Exemplary (5)**	**Proficient (4)**	**Developing (3)**	**Beginning (2)**	**Novice (1)**	**AT**	**W**
2.1	**Identify and Formulate:** Mathematically Formulates the identified information.		Completely identifies and formulates all relevant information without any mistakes.	Identifies and formulates more than 75% of all relevant information	Identifies and formulates 25% to 75% of all relevant information	Formulates no relevant information	3	0.15	
2.2	**Research:** Identify and formulates missing information and resolve the ambiguity.		Completely Identifies and formulates all missing information without any mistakes.	Identifies and formulates more than 75% of missing information.	Identifies and formulates 25% to 75% of missing information.	Identifies and formulates no missing informat	2	0.2	

					ion.		
2.3	**Solve:** Completely solve the problem without any mistake with appropriate manipulation of equations and accurate data assembly.	Completely solves the problem without any mistake.	Completely solves the problem but has minor data assembly mistakes leading to a wrong answer.	Arrives at a correct partial solution, leading towards the final answer.	Cannot move beyond the given information.	2	0.5
2.4	**Conclude:** Answers are interpreted and are verified in other ways possible.	Answers are correctly interpreted and are also verified in other ways possible.	Answers are wrongly interpreted but are verified in other ways possible.	Answers are correctly interpreted but are not verified in other ways possible.	Answers are neither interpreted nor verified in other ways possible.	2	0.15

PLO 03 - Design/Development of Solutions

An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations

SLO	Statement↓	Score→	Exemplary (5)	Proficient (4)	Developing (3)	Beginning (2)	Novice (1)	AT	W
3.1	**Design Requirements:** Specify design requirements and constraints.		Specifies health, safety, cultural, societal, and environmental constraints.	Specifies basic design requirements for the engineering problem	Explores and analyzes existing solutions in the context of defined problem statement	Makes no attempt to explore existing solutions to the engineering problem	3	0.2	
3.2	**Feasibility:** Analyze and		Specifies schedules,	Evaluates and analyzes	Suggests alternatives	Makes	2	0.2	

	check feasibility of solution	resource plans and, cost estimates	the potential of a proposed project	methods of achieving the desired outcome	no attempt to analyze requirements and constraints		
3.3	**Conceptualization:** Conceptualize multiple solutions, analyze tradeoffs and perform risk assessment.	Performs risk assessment & minimize likelihood of error.	Evaluates/ Analyzes concepts and tradeoffs.	Provides at least two complete distinct solutions	Fails to provide one complete solution.	2	0.2
3.4	**Preliminary Design:** Select a baseline solution, develop design description and design architecture.	Includes reliability, maintenance, and test features necessary to meet performance and quality requirements	Generates top-level design architecture	Generates high-level design description	Has difficulty selecting a baseline solution	2	0.1
3.5	**Detail Design:** Develop tested and optimized detail design.	Optimizes the design based on test results	Builds a prototype to analyze detail design	Performs simulations to verify detail design	Fails to prove preliminary design	3	0.1
3.6	**Production Planning:** Develop and test production plan.	Performs testing and validation for production	Improves physical design by proper placement and routing	Selects COTS components and performs mapping	Makes no attempt to modify design for production	2	0.05
3.7	**Documentation:** Provide	Provides production	Provides final design	Provides preliminary	Provides	3	0.15

	all necessary documentation	planning document	document	design document	no formal documentation		

PLO 04 - Investigation
An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

SLO	Statement↓ Score→	Exemplary (5)	Proficient (4)	Developing (3)	Beginning (2)	Novice (1)	AT	W
4.1	**Problem Definition:** Define and analyze problem statement / Driving Questions	Evaluates the problem statement / Driving Questions	Defines the problem statement / Driving Questions	Defines the present state and desired state	Makes no attempt to analyses the problem	2	0.2	
4.2	**Design:** Designs a safe experiment plan to answer the driving question	Designs a safe and correct experiment plan that can precisely and accurately answer the driving question	Designs a correct experiment plan that can precisely and accurately answer the driving question	Designs an experiment plan that has the potential of answering the driving question but is faulty and leads to a wrong conclusion	Provides no experiment plan.	3	0.1	
4.3	**Conduct experiment:** correctly follow the procedure for conducting the experiment, while observing all safety measures	Completely conducts the whole experiment without mistakes while observing all safety measures.	Assemble the setup properly and is able to take correct measurements	Assemble the setup correctly but unable to take measurements	Makes no attempt to select the equipment and instruments to be used for the experiment	3	0.25	

4.4	**Collect data:** Collect all relevant, accurate and precise data over the entire range of interest with the help of relevant tools and techniques.	Data acquisition includes all relevant sensitivity and calibration information	Data covers entire range of interest, as well as some additional points / configurations that might be of interest	Data is accurate and precise and covers more than 50% of the range of interest	Makes no attempt to collect any relevant data or collected relevant data which is inaccurate	2	0.25
4.5	**Analyze & Interpret data:** simplify and analyze the experimental data in order to evaluate the results	Interprets the information obtained from the experimental data.	Compares extracted information with the other data sources or theoretical models	Extracts unknown information from collected data	No attempt is made to analyze the data.	2	0.1
4.6	**Synthesis:** derive valid conclusions for the conducted experiment and make valid recommendations.	Discusses the limitations and proposes applications/ future work as an extension to this experiment	Derives all valid conclusions from the results and establishes if any valuable new information has been uncovered	Concludes with some valid answers to the driving questions	Makes no attempt to conclude with any valid answers to the driving questions	3	0.1
PLO 05 - Modern Tool Usage							
An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.							

SLO	Statement↓ Score→	Exemplary (5)	Proficient (4)	Developing (3)	Beginning (2)	Novice (1)	AT	W
5.1	**Identification:** Identifies only relevant techniques, resources and modern IT tools that can be used to solve / simulate a complex engineering activity	5.1.4 + Identifies only relevant modern IT tools that can be used to solve / simulate a complex engineering activity	5.1.3 + Identifies only relevant resources that are needed to solve / simulate a complex engineering activity	Identifies only relevant techniques / algorithms that can be used to solve / simulate a complex engineering activity	Makes no attempt to Identify any technique/algorithm that can be used to solve / simulate a complex engineering activity	3	0.15	
5.2	**Selection/Creation:** Compares, selects and creates techniques, resources and modern IT tools to solve / simulate a complex engineering activity	Creates/ develops techniques, resources and modern IT tools to solve / simulate a complex engineering activity	Correctly compares and selects amongst the identified modern IT tools that are to be used to solve / simulate a complex engineering activity	Correctly compares and selects amongst the identified resources that are to be used to solve / simulate a complex engineering activity	Cannot correctly compare identified techniques/ algorithms that are to be used to solve / simulate a complex engineering activity	2	0.25	
5.3	**Application:** Applies the	Demonstrates mastery	Appropriately uses the	Adequately uses the	Makes	2	0.3	

	selected and developed techniques resources and modern IT tools to solve / simulate a complex engineering activity	of the techniques / modern IT tools that can be used to solve / simulate a complex engineering activity	selected / developed modern IT tool to solve / simulate a complex engineering activity	selected / developed resources to solve / simulate a complex engineering activity	no attempt to implement selected technique / algorithm to solve / simulate a complex engineering activity		
5.4	**Verification and Improvement:** Verify and improve the developed solution / model	Improves the techniques / algorithms to develop a better solution / model	Technically lists the limitations / shortcomings of the techniques / algorithms along with those of the proposed model/ solution	Can technically and correctly justify the model / solution and the validity of the implemented techniques / algorithms	Makes no attempts to verify the model / solution	2	0.15
5.5	**Analysis and Synthesis:** Analyzes and syntheses information obtained from the developed model / solution.	Discusses the limitations of analysis and proposes applications/ future work as an extension to the current development and modeling	Predict results through simulation and modeling	Analyzes the results obtained through simulation and modeling	Cannot present a valid model / solution	2	0.15
PLO 06 - The Engineer and Society							
An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.							

SLO	Statement↓	Score→	Exemplary (5)	Proficient (4)	Developing (3)	Beginning (2)	Novice (1)	AT	W
6.1	**Assessing Issues:** Assess societal, health, safety, legal and cultural issues relevant to professional engineering practice and solution.		Correctly assess issues regarding all five areas (societal, health, safety, legal and cultural).	Correctly assess issues regarding four areas (societal, health, safety, legal and cultural).	Correctly assess issues regarding three areas (societal, health, safety, legal and cultural).	Unable to assess issues regarding any of the five areas (societal, health, safety, legal and cultural)	2	0.7	
6.2	**Assessing Responsibilities:** Assess societal, health, safety, legal and cultural responsibilities relevant to professional engineering practice and solution.		Correctly assess professional responsibilities regarding all five areas (societal, health, safety, legal and cultural).	Correctly assess professional responsibilities regarding four areas (societal, health, safety, legal and cultural).	Correctly assess professional responsibilities regarding three areas (societal, health, safety, legal and cultural).	Unable to assess professional responsibilities regarding any of the five areas (societal, health, safety, legal and cultural)	2	0.3	
PLO 07 - Environment and Sustainability									
An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.									
SLO	**Statement↓**	**Score→**	**Exemplary (5)**	**Proficient (4)**	**Developing (3)**	**Beginning (2)**	**Novice (1)**	**AT**	**W**
7.1	**Societal Impact:** Analyze the impact of professional engineering solutions in		Incorporate the proposed modifications to the engineering	Proposes modifications to the engineering solution in the context	Identifies the societal impact of the engineering solution on	Makes no attempt	2	0.5	

	societal context and improve it.	solution.	of sustainable development.	the lives of future generations.	to identify the societal impact of the engineering solution on the life of current generation.			
7.2	**Environmental Impact:** Analyze the impact of professional engineering solutions in environmental context and improve it.	Incorporate the proposed modifications to the engineering solution.	Proposes modifications to the engineering solution in the context of sustainable development.	Identifies the environmental impact of the engineering solution on the lives of future generations.	Makes no attempt to identify the environmental impact of the engineering solution on the life of current generation.	2	0.5	
PLO 08 - Ethics								
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.								
SLO	**Statement↓**	**Score→**	**Exemplary (5)**	**Proficient (4)**	**Developing (3)**	**Beginning (2)**	**Novice (1)**	**AT**	**W**

8.1	**Apply and Commit:** Apply and Commit to ethical principles.	Remains committed to professional responsibilities.	Remains committed to professional ethics	Remains committed to norms of engineering practice.	Has difficulty understanding ethical principles and professional responsibilities	3	1

PLO 09 - Individual and Team Work
An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings

SLO	**Statement↓**	**Score→**	**Exemplary (5)**	**Proficient (4)**	**Developing (3)**	**Beginning (2)**	**Novice (1)**	**AT**	**W**
9.1	**Work effectively:** work effectively, as an individual or in a team, in multidisciplinary settings		Takes ownership and helps others	Actively participates in group discussions/ meetings and workshops	Completes assigned task on time without any help	Does not work	3	1	

PLO 10 - Communication
An ability to communicate effectively, orally as well as in writing, 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.

SLO	**Statement↓**	**Score→**	**Exemplary (5)**	**Proficient (4)**	**Developing (3)**	**Beginning (2)**	**Novice (1)**	**AT**	**W**
10.1	**English:** Writes/ speaks grammatically correct English.		No errors in grammar, punctuation and spelling	0.2% to 0.5% errors in grammar, punctuation and spelling	0.5% to 1% errors in grammar, punctuation and spelling	Student has not written anything			
10.2	**Organization:** Organizes the report/presentation into logical and coherent sections		Includes all major/minor, logically developed sections, which form a complete,	Includes major sections such as Problem Statement / Purpose, Conclusion / Summary,	Includes major sections such as Problem Statement / Purpose, Conclusion / Summary,	Makes no attempt to			

		coherent and well organized unit.	References and they form a strong, complete coherent, logical unit	References but they are ambiguous, confusing, weak and inadequate.	organize this work into logical sections.		
10.3	**Contents:** Presents well researched, relevant and verified information while demonstrating thorough understanding of the topic	Presents well researched, relevant and verified information while demonstrating thorough understanding of the topic	Includes relevant and accurate information while demonstrating basic understanding of the topic	Includes irrelevant and inaccurate information while demonstrating general understanding of the topic	Demonstrates no understanding of the topic		
10.4	**Contribution:** Presents all work in his/her own words with adequate citations	Presents all work in his/her own words	Copies less than 5% of the text, verbatim, from other sources with citation	Copies more than 5% of the text, verbatim, from other sources with citation	Presents no information in this own words		
10.5	**Written Presentation:** Creates a format/ diagram to improve the understanding of the reader / listener and/or follows a standard one.	10.5.4 + Improves / creates a format/ diagram to improve the understanding of the reader / listener	Completely follows a format/ standard with no nonconformities. All diagrams/ figures are labeled and readable	Follows a format/ standard but with frequently nonconformities. All diagrams/ figures are labeled and readable	No format/standard is followed		
10.6	**Oral Presentation Delivery:** Clearly presents the topic with confidence while captivating engaging the audience.	Strong, clear speaking voice easily understood by audience; recovers easily from speaking errors. Uses physical gestures effectively.	Good speaking voice, Speaker is in command of the topic but appears slightly nervous. Use of physical gesture and facial expression appears artificial at times.	Clarity of speech is uneven; Speaker is not completely sure of topic and appears nervous. No use of physical gestures.	Reading from the slides, does not know the basic communication skills for delivering a		

					presentation.		
10.7	**Oral Presentation Time Management:** Finishes Presentation in allocated time	Finishes presentation in the allocated time	Finishes presentation with in ±5% of the allocated	Finishes presentation with in ±5% to ±10% of the allocated	Makes no attempt to manage time		
10.8	**Oral Presentation Engaging Audience:** Engages with the audience during presentation.	Makes eye contact and Interacts with audience during presentation	Makes eye contact and Interacts with audience at the end of the presentation	Limited eye contact with audience.	Makes no attempt to interact with audience		
10.9	**Comprehension:** Follows clearly stated oral/written instructions without deviation and help	Follows clearly stated oral instructions without deviation.	Follows clearly written instructions correctly without any help.	Follows clearly stated oral instructions but sometimes gets stuck or deviates from the given instructions	Cannot follow oral/ written instructions		

PLO 11 - Project Management

An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

SLO	Statement↓	Score→	Exemplary (5)	Proficient (4)	Developing (3)	Beginning (2)	Novice (1)	AT	W
11.1	**Integration and Scope Management:** Defines and plans the project and processes to control its execution, change and configuration.		Exercises configuration management practices	Exercises change control practices	Develops work breakdown structure	Makes no attempt to develop project management	3	15	

					plan		
11.2	**Time Management:** Plans and exercises conscious control over the amount of time spent on specific activities to increase efficiency or productivity.	Demonstrates skills to control schedule and the project finishes within ±5% of the scheduled time	Demonstrates skills to control schedule and the project finishes within ±10% of the scheduled time	11.2.1 + Estimates activity duration and envelops activity schedule	Makes no attempt to define and sequence activities	2	20
11.3	**Cost Management:** Plans and controls the budget of a project	Demonstrates skills to control costs and the final cost remains within ± 10% of the allocated budget	Demonstrates skills to control costs and the final cost remains within ± 25% of the allocated budget	11.3.1 + Estimates costs and allocates Budgets	Makes no attempt to perform resource identification and planning	2	15
11.4	**Quality Management:** Plans and controls activities and tasks needed to maintain a desired level of excellence	Suggests workable/ manageable actions to improve quality	Calculates cost of quality	11.4.1 + Assures and controls quality	Makes no attempt to develop a quality management plan	2	15
11.5	**Human Resource Management:** Manages people within a team to achieve desired outcome while maintaining a productive working relationship.	Resolves conflicts effectively using predefined strategies while the team maintains a productive working relationship	Work is effectively and fairly distributed between team members and the team maintains a productive working relationship	Member roles are defined according to their skills.	There is no delineation of who does what in the	2	20

					project		
11.6	**Communication Management:** planning, implementing, monitoring, and revision of all the channels of communication	Gathers, summarizes, and distributes all relevant information in a formal final report on the completion of the project	Performance information are collected, analyzed, and disseminated in performance reports	Data regarding different aspects of the project during its execution is collected effectively and is distributed to the shareholders in a timely manner	Makes no attempt to develop a communications management plan	2	15

PLO 12 - Lifelong Learning

An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

SLO	Statement↓	Score→	Exemplary (5)	Proficient (4)	Developing (3)	Beginning (2)	Novice (1)	AT	W
12.1	**Recognize & Search:** Recognize the need of and independently search and analyze relevant information from multiple sources to acquire new knowledge or skill.		Gathers relevant information from multiple sources and analyses it for quality.	Gathers relevant information from multiple sources without analysis of quality.	Gathers relevant information, from a single source.	Does not go beyond minimum requirement for the completion of an assignment.	3	20	
12.2	**Acquire:** Independently acquire new knowledge or skill from gathered information.		Independently acquires all relevant knowledge or skill to solve a problem.	Independently acquires 75% of relevant knowledge or skill to solve a problem.	Independently acquires 25% of relevant knowledge or skill to solve a problem.	Makes no attempt to consolidate the	3	20	

					gathered information.		
12.3	**Apply:** Independently apply the new acquired knowledge or skill towards the solution of a problem.	Independently applies the acquired knowledge or skill to completely solve a problem.	Independently applies the acquired knowledge or skill to solve 75% of a problem.	Independently applies the acquired knowledge or skill to solve 25% of a problem.	Unable to apply the acquired knowledge or skill to solve a problem.	2	50
12.4	**Reflect & Teach:** Reflect on the merits and/or shortcomings of applied knowledge or skills, evaluate personal performance and suggest appropriate steps for improvement.	Evaluates personal performance and progress and suggests steps for improvement.	Can effectively teach/communicate the acquired knowledge or skills.	Recognizes merits and/or deficiencies of applied knowledge or skills and suggests appropriate steps for improvement.	Unable to recognize merits and/or shortcomings of applied knowledge or skills and evaluate personal performance.	3	10