

# Electronics Engineering Department

## ***Program Outcomes- Competencies-Performance Indicators.***

<b>PO1: Engineering Knowledge:</b> apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.			
<b>Competency</b>		<b>Performance Indicators</b>	
1.1	Demonstrate competence in mathematical modeling	1.1.1	Apply mathematical techniques such as linear algebra, differential calculus, differential equations and integral calculus to solve problems
		1.1.2	Apply concepts of Complex Variable, probability, linear algebra, vector integration and transformation techniques to model and solve electronics engineering problems.
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply electronics engineering concepts to solve engineering problems
<b>PO2: Problem Analysis:</b> identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
<b>Competency</b>		<b>Performance Indicators</b>	
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identify objectives.
		2.1.2	Identify engineering systems, variables, and parameters to solve a problem
		2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe complex problems into interconnected sub-problems.
		2.2.2	Identify, assemble and evaluate information and resources
		2.2.3	Identify existing solution/methods for solving the problem, including forming justified approximations and assumptions
		2.2.4	Compare and contrast alternative solution/methods to select the best methods.

2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Combine scientific principles and engineering concepts to formulate model/s (mathematical or otherwise) of a system or process that is appropriate in terms of applicability and required accuracy.
		2.3.2	Identify assumptions (mathematical and physical) necessary to allow modeling of a system at the level of accuracy required.
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Apply engineering mathematics to implement solution
		2.4.2	Analyze and interpret the results using contemporary tools.
		2.4.3	Identify the limitations of the solution and sources/causes of error.
		2.4.4	Arrive at conclusions with respect to the objectives.
<b>PO3: Design &amp; Development of Solutions:</b> design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.			
<b>Competency</b>		<b>Performance Indicators</b>	
3.1	Demonstrate an ability to define a complex/open-ended problem in engineering terms	3.1.1	Recognize that need analysis is key to good problem definition
		3.1.2	Able to identify and document system requirements from stakeholders.
		3.1.3	Ability to review state of the art literature to synthesize requirements.
		3.1.4	Extract engineering requirements from relevant engineering codes and standards defined by ISO/IEC/IEEE.
		3.1.5	Explore and synthesize engineering requirements considering health, safety, risks, environment, cultural and societal issues
		3.1.6	Determine design, objectives, functional requirements and arrive at specifications
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Ability to explore design alternatives.
		3.2.2	Build models/prototypes to develop diverse set of design solutions
		3.2.3	Identify suitable criteria for evaluation of alternate design solutions
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.

		3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)
		3.4.2	Generate information through appropriate tests to improve or revise design
<b>PO4: Conduct Investigation of Complex Problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.			
<b>Competency</b>		<b>Performance Indicators</b>	
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purpose of investigation, its scope and importance
		4.1.2	Choose appropriate methods, algorithms, hardware/software tools and techniques of experiment design, system calibration, data acquisition, analysis and presentation
		4.1.3	Apply appropriate hardware/software tools to conduct the experiment
		4.1.4	Establish a relationship between measured data and underlying physical principles
4.2	Demonstrate an ability to design experiments to solve open ended problems	4.2.1	Design and develop experimental approach, specify appropriate equipment and procedures
		4.2.2	Understand the importance of statistical design of experiments and choose an appropriate experimental design plan based on the study objectives
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data
		4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions

<b>PO5: Modern Tools Usage:</b> 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.			
Competency		Performance Indicators	
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools techniques and resources for engineering activities
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2	Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information (ii) modeling and simulating (iii) monitoring system performance, and (iv) creating engineering designs
		5.2.2	Demonstrate proficiency in using discipline specific tools
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources
		5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
<b>PO6: The Engineer and Society:</b> apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
Competency		Performance Indicators	
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at global, regional and local level.
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to professional engineering practice and explain its contribution to the protection of the public.
<b>PO7: Environment &amp; Sustainability:</b> understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
Competency		Performance Indicators	
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity
		7.1.2	Understand the relationship between the technical, socioeconomic and environmental dimensions of sustainability

7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline
<b>PO8: Ethics:</b> apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.			
<b>Competency</b>		<b>Performance Indicators</b>	
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives
8.2	Demonstrate an ability to apply the code of ethics	8.2.1	Identify tenets of code of ethics given by the professional bodies like IEEE.
		8.2.2	Examine and apply moral & ethical principles to known case studies
<b>PO9: Individual &amp; Team work:</b> function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.			
<b>Competency</b>		<b>Performance Indicators</b>	
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas etc.) of effective team work, to accomplish a goal
9.2	Demonstrate effective individual and team operations--- communication, problem solving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem solving, conflict resolution and leadership skills
		9.2.2	Treat other team members respectfully
		9.2.3	Listen to other members
		9.2.4	Maintain composure in difficult situations
9.3	Demonstrate success in a team based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts
<b>PO10: Communication:</b> 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.			
<b>Competency</b>		<b>Performance Indicators</b>	
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents

		10.1.3	Create flow in a document or presentation- a logical progression of ideas so that the main point is clear
10.2	Demonstrate competence in listening, speaking and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others
		10.2.2	Deliver effective oral presentations to technical and nontechnical audiences
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation
<b>PO11: Project management &amp; Finance:</b> demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.			
<b>Competency</b>		<b>Performance Indicators</b>	
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity
		11.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering project
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity and the resources required to complete the tasks
		11.3.2	Use project management tools to schedule an engineering project so it is completed on time and on budget
<b>PO12: Life-long Learning:</b> recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			
<b>Competency</b>		<b>Performance Indicators</b>	
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for requirement for continuing professional development
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
12.2		12.2.1	Identify historic points of technological advance in engineering that required

	Demonstrate an ability to identify changing trends in engineering knowledge and practice		practitioners to seek education in order to stay current
		12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field.
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information
		12.3..2	Analyze sourced technical and popular information for feasibility, viability, sustainability etc.

***Program Specific Outcomes- Competencies-Performance Indicators.***

<b>PSO1: troubleshoot electronic circuits, systems and products</b>			
<b>Competency</b>		<b>Performance Indicators</b>	
13.1	Ability to identify faults in circuits, systems and products	13.1.1	Select and use the suitable tools and methodology for identification of faults
		13.1.2	Able to locate and classify the fault
		13.1.3	Follow safety precautions and standard procedures used in testing
13.2	Ability to rectify faults in circuits, systems and products	13.2.1	Select and use the suitable tools and methodology for rectification of faults
		13.2.2	Able to eliminate fault with optimum efforts for proper functioning of circuits, systems and products.
<b>PSO2: use open source tools for engineering practice</b>			
<b>Competency</b>		<b>Performance Indicators</b>	
14.1	Ability to use open source tools	14.1.1	Recognize need of open source tools
		14.1.2	Identify and use the available open source tool for a given task
		14.1.3	Develop or modify open source tool for custom applications
<b>PSO3: draft patent and research paper as per the publication standards</b>			
<b>Competency</b>		<b>Performance Indicators</b>	
15.1	Ability to draft patent	15.1.1	Comprehend literature, carry out background search & prior art, create a flowchart or diagram to bring clarity in invention and summarize the invention.
15.2	Ability to draft and present research paper	15.2.1	Draft research paper adhering to publication standards of professional bodies like IEEE.

		15.2.2	Demonstrate communication skills and affective domain skills of attitude, value and desire for learning during research paper presentation
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