

## NETAJI SUBHASH INSTITUTE OF TECHNOLOGY, BIHTA, PATNA Affilted to Bihar Engineering University

Bachelor of Technology

Department of Civil Engineering

Program Outcome

Program Outcomes- Competency- Performance Indicator			
PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems			
Competency	Indicators		
	1.1.1 Apply mathematical techniques such as calculus, linear algebra, and statistics to solve problems		
1.1 Demonstrate competence in mathematical modelling	1.1.2 Apply advanced mathematical techniques to model and solve civil 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 fundamental engineering concepts to solve engineering problems		
1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply civil engineering concepts to solve engineering problems		
	e, and analyse complex engineering problems reaching substantiated conclusions using first principles of		
Competency	Indicators		
	2.1.1 Articulate problem statements and identify objectives		
2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.2 Identify engineering systems, variables, and parameters to solve the problems		
	2.1.3 Identify the mathematical, engineering and other relevant knowledge that applies to a given problem		
	2.2.1 Reframe complex problems into interconnected sub-problems		
2.2 Demonstrate an ability to formulate a solution plan and	2.2.2 Identify, assemble and evaluate information and resources.		
methodology for an engineering problem	2.2.3 Identify existing processes/solution methods for solving the problem, including forming justified approximations and assumptions		
	2.2.4 Compare and contrast alternative solution processes to select the best process.		
	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 Demonstrate an ability to formulate and interpret a model	2.3.2 Identify assumptions (mathematical and physical) necessary to allow modeling of a system at the level of accuracy required		
	2.4.1 Apply engineering mathematics and computations to solve mathematical models		
2.4 Demonstrate an ability to execute a solution process and	2.4.2 Produce and validate results through skilful use of contemporary engineering tools and models		
analyze results	2.4.3 Identify sources of error in the solution process, and limitations of the solution		
	2.4.4 Extract desired understanding and conclusions consistent with objectives and limitations of the analysis		
PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.			
Competency	Indicators		
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 Elicit and document, engineering requirements from stakeholders		
	3.1.3 Synthesize engineering requirements from a review of the state-of-the-art		
	3.1.4 Extract engineering requirements from relevant engineering Codes and Standards such as ASME, ASTM, BIS, ISO and ASHRAE.  3.1.5 Explore and synthesize engineering requirements considering health, safety risks, environmental,		
	cultural and societal issues		
	3.1.6 Determine design objectives, functional requirements and arrive at specifications		
	3.2.1 Apply formal idea generation tools to develop multiple engineering design solutions		

3.2 Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.2 Build models/prototypes to develop a diverse set of design solutions
	3.2.3 Identify suitable criteria for the evaluation of alternate design solutions
3.3 Demonstrate an ability to select an optimal design scheme	3.3.1 Apply formal decision-making tools to select optimal engineering design solutions for further development
for further development	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	3.4.1 Refine a conceptual design into a detailed design within the existing constraints (of the resources)
defined end state	3.4.2 Generate information through appropriate tests to improve or revise the design
PO 4: Conduct investigations of complex problems: Use researd data, and synthesis of the information to provide valid conclusi	h-based knowledge and research methods including design of experiments, analysis and interpretation of ons.
Competency	Indicators
	4.1.1 Define a problem, its scope and importance for purposes of investigation
4.1 Demonstrate an ability to conduct investigations of technical	4.1.2 Examine the relevant methods, tools and techniques of experiment design, system calibration, data acquisition, analysis and presentation
issues consistent with their level of knowledge and understanding	4.1.3 Apply appropriate instrumentation and/or software tools to make measurements of physical quantities
	4.1.4 Establish a relationship between measured data and underlying physical principles
4.2 Demonstrate an ability to design experiments to solve open-	4.2.1 Design and develop an experimental approach, specify appropriate equipment and procedures
ended problems	4.2.2 Understand the importance of the statistical design of experiments and choose an appropriate experimental design plan based on the study objectives
	4.3.1 Use appropriate procedures, tools and techniques to conduct experiments and collect data
4.3 Demonstrate an ability to analyze data and reach a valid	4.3.2 Analyze data for trends and correlations, stating possible errors and limitations
conclusion	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
PO 5: Modern tool usage: Create, select, and apply appropriate	conclusions techniques, resources, and modern engineering and IT tools including prediction and modelling to
complex engineering activities with an understanding of the lin	
Competency	Indicators 5.1.1 Identify modern engineering tools such as computer-aided drafting, modeling and analysis; techniques
5.1 Demonstrate an ability to identify/ create modern	and resources for engineering activities
engineering tools, techniques and resources	5.1.2 Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2 Demonstrate an ability to select and apply	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.
discipline specific tools, techniques and resources	5.2.2 Demonstrate proficiency in using discipline-specific tools
5.3 Demonstrate an ability to evaluate the suitability and	5.3.1 Discuss limitations and validate tools, techniques and resources
limitations of tools used to solve an engineering problem	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.
PO 6: The engineer and society: Apply reasoning informed by the responsibilities relevant to the professional engineering practic	ne contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent se.
Competency	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 the global, regional and local level
	6.2.1 Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
PO 7: Environment and sustainability: Understand the impact on the impact of the impac	f the professional engineering solutions in societal and environmental contexts, and demonstrate the
Competency	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, socio-economic 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

8.1 I dentify stuations of unchical professional conduct and propose ethical alternatives  8.2 Examine and apply moral & ethical professional conduct and propose ethical alternatives  8.2 Examine and apply moral & ethical principles to known case studies  8.2 Examine and apply moral & ethical principles to known case studies  8.2 Examine and apply moral & ethical principles to known case studies  8.2 Examine and apply moral & ethical principles to known case studies  8.2 Examine and apply moral & ethical principles to known case studies  8.2 Examine and apply moral & ethical principles to known case studies  9.3 Demonstrate an ability to form a tream and define a role for section members  9.4 Examine and apply moral & ethical principles to known case studies  9.2 Demonstrate and ability to form a tream and define a role for section members  9.2 Demonstrate and ability to form a tream and define a role for section members  9.2 Demonstrate effective individual and team operations—  9.2 Demonstrate effective individual effective in	PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice		
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9.1.2 Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal seam member are large to the control of the	Competency	Indicators	
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12.3 Demonstrate an ability to identify and access sources for	12.3.1 Source and comprehend technical literature and other credible sources of information
new information	12.3.2 Analyze sourced technical and popular information for feasibility, viability, sustainability, etc