

ENGINEERING CUSTOMIZED ASSESSMENT BLUEPRINT



Test Code: 7773
Version: 01



Specific competencies and skills tested in this assessment:

Overview of Engineering, Social, Environmental, and Ethics

Identify potential career opportunities related to engineering and technology
Explain educational requirements and professional expectations associated with a chosen technical career path
Explain the interaction between technological development and social change
Explain a contemporary definition of engineering
Describe the history and development of engineering
Explain what engineers do
Describe the principal fields of engineering specialization and identify associated career tracks
Identify education requirements for engineer occupations and locations where programs of study are available
Describe how external issues constrain the engineering design process
Describe the social, economic, and environmental impacts of a technical process, product, or system

Design Process/Problem Solving

Demonstrate fundamental principles of design
Design and conduct experiments along with analysis and interpretation of data
Identify and consider realistic constraints relevant to the design of a system, component, or process
Describe the process of input, output, and feedback that comprise the universal systems model
Demonstrate applications of the universal systems model across the spectrum of technologies
Describe role of time, people, tools and machines, materials, information within the universal systems model
Describe the role of mathematics and science in technological development
Construct a mathematical model for a known technological system
Explain the scientific principles behind a basic machine
Explain the problem solving processes used by engineers, designers, and other technologists
Create a solution to a given problem
Test and evaluate a problem solution
Describe role of problem identification, search, criteria, and communication as activities in the engineering design process
Organize the interactive processes necessary to develop and optimize a design solution
Apply engineering design to the solution of a problem
Apply mathematical models and calculations necessary to complete predictive analysis
Modify a design plan to accommodate unforeseen constraints
Identify appropriate modeling techniques
Evaluate effectiveness of prototyped solution and modify as needed
Develop cost analysis and return on investment calculations
Describe the core concepts of technology
Prepare a report of engineering design activities, including analysis, optimization, and final solution

Engineering – continued

Tools, Measurements and Materials

Identify appropriate modeling techniques
Select and apply appropriate materials, tools, and processes for prototype development
Use laboratory tools and equipment to determine the properties of materials
Explain the criteria for selection of appropriate materials, tools, and processes
Apply appropriate care and maintenance in the use of tools and machines
Describe strategies for selecting materials and processes for developing a technical system or artifact
Demonstrate fundamental materials processing and assembly techniques
Apply analytical tools to the development of optimal solutions for technological problems
Explain the criteria for selection of appropriate materials, tools, and processes
Demonstrate techniques, skills, and knowledge necessary to use and maintain technical products and systems
Demonstrate fundamental materials processing and assembly techniques

Engineering Graphics

Demonstrate fundamentals of technical sketching
Present a technical design using computer-generated visuals
Use multi-view projection and pictorial drawings to communicate design specifications
Apply described geometry and graphical vector analysis to the analysis of engineering design problems
Apply accurate dimensions to a technical drawing, including size and geometric tolerances
Prepare a proposal for an engineering design project
Document engineering design processes using an engineering design notebook

Safety

Safely and effectively manipulate materials, tools, and processes
Apply appropriate care and maintenance in the use of tools and machines

Engineering Systems

Describe the role of mathematics and science in technological development
Construct a mathematical model for a known technological system
Explain the scientific principles behind a basic machine
Describe strategies, select materials and processes necessary to develop a technical system or artifact
Evaluate interdependence of components in a technical system and identify elements critical to correct function
Apply analytical tools to the development of optimal solutions for technological problems

Teamwork, Leadership, and Interpersonal Relations

Explain engineer's responsibility as a team member in design and development of technical products and processes
Demonstrate team approach in applying engineering design to solution of a technological problem
Demonstrate effective communication skills
Demonstrate cooperation and understanding with persons who are ethnically and culturally diverse
Work cooperatively in multi-disciplinary teams
Demonstrate oral communication skills in reporting results of an engineering design activity

Engineering – continued

Written Assessment:

Administration Time: 1 ½ hours

Number of Questions: 93

Areas covered:

11%	Overview of Engineering, Social, Environmental and Ethics
39%	Design Process/Problem Solving
19%	Tools, Measurements and Materials
9%	Engineering Graphics
4%	Safety
11%	Engineering Systems
7%	Teamwork, Leadership and Interpersonal Relations

Sample Questions:

The boundary of a property is shown on a plot plan with a _____ line.

- A. hidden
- B. center
- C. break
- D. phantom

Evaluation is an important step because

- A. it helps determine if the product is of value
- B. it provides a cost analysis
- C. the product can be sold based on the outcome
- D. the product design is easier to reproduce after a good evaluation

Which of the following actions should be taken if a prototype power supply is running hot in a test within the enclosure?

- A. remove the power supply from its enclosure
- B. redesign the circuit to increase the power drawn
- C. place an auxiliary fan to blow across the enclosure
- D. increase the fan capacity of the power supply

What type of coating is best on an outdoor catwalk made of low carbon steel and used in a refinery?

- A. anodized
- B. galvanize
- C. oil based paint
- D. latex based paint

Which of the following is a critical component of an Automatic Vehicle Identification (AVI) system?

- A. HOV lanes
- B. vehicle headlights
- C. AVI antennas
- D. interstate signs