NCEES
advancing licensure for engineers and surveyors

Principles and Practice of Engineering Examination
MECHANICAL—MACHINE DESIGN AND MATERIALS CBT Exam Specifications

Effective beginning October 2025

- The exam is computer based. It is closed book with an electronic reference.
- Examinees have 9 hours to complete the exam, which contains 80 questions. The 9-hour time includes a tutorial and an optional scheduled break. Examinees work all questions
- The exam uses both the International System of units (SI) and the U.S. Customary System (USCS).
- The exam is developed with questions that require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.

	Number of Questions
1. Basic Engineering Practice	**11–17**
A. Engineering Terms, Symbols, and Drawings	
B. Project Management and Economic Analysis	
C. Design Methodology (e.g., design requirements, risk assessment, verification and validation)	
D. Physical Properties of Materials	
2. Mechanics of Materials	**17–26**
A. Axial Loading	
B. Shear and Transverse Loading	
C. Bending	
D. Buckling	
E. Torsion	
F. Combined Loading	
G. Static Failure	
H. Fatigue Failure	
I. Thermal Stresses and Interference Stresses	
3. Mechanical Attachments	**9–14**
A. Bonds (e.g., welds, brazing, chemical bonds, adhesives)	
B. Non-threaded Fasteners (e.g., lugs, shackles, retaining rings, pins, anchors, rivets)	
C. Threaded Fasteners (e.g., screws, bolts, studs, anchors)	

Number of Questions

4. Power Transmission **9–14**

A. Gears and Gear Trains
B. Bearings
C. Belts, Chains, Clutches, Brakes, and Power Screws
D. Shafts and Keys
E. Motors and Engines

5. Mechanical Components and Assemblies **16–24**

A. Pressurized Vessels and Piping
B. Hydraulic and Pneumatic Components
C. Beams, Trusses, and Frames
D. Springs
E. Vibrating Systems
F. Basic Machines and Mechanisms
G. Basic Mechatronics (e.g., electromechanical interfaces, sensors, basic circuits, basic controls)

6. Supportive Knowledge (Machine Design and Materials) **8–12**

A. Manufacturing Methods (e.g., material removal, heat treatment, assembly, additive manufacturing, forming, surface treatment)
B. Fits and Tolerances
C. Codes and Standards
D. Computational Methods (e.g., finite element analysis/method, computer-aided engineering, numerical methods)
E. Instrumentation, Testing, Inspection, and Quality
F. Chemical Processes (e.g., corrosion, oxidation, embrittlement)