NCEES
advancing licensure for engineers and surveyors

Fundamentals of Engineering (FE)
CIVIL CBT Exam Specifications

Effective Beginning with the January 2014 Examinations

- The FE exam is a computer-based test (CBT). It is closed book with an electronic reference.
- Examinees have 6 hours to complete the exam, which contains 110 multiple-choice questions. The 6-hour time also includes a tutorial and an optional scheduled break.
- The FE exam uses both the International System of Units (SI) and the US Customary System (USCS).

Knowledge	Number of Questions
1. Mathematics	**7–11**
A. Analytic geometry	
B. Calculus	
C. Roots of equations	
D. Vector analysis	
2. Probability and Statistics	**4–6**
A. Measures of central tendencies and dispersions (e.g., mean, mode, standard deviation)	
B. Estimation for a single mean (e.g., point, confidence intervals)	
C. Regression and curve fitting	
D. Expected value (weighted average) in decision making	
3. Computational Tools	**4–6**
A. Spreadsheet computations	
B. Structured programming (e.g., if-then, loops, macros)	
4. Ethics and Professional Practice	**4–6**
A. Codes of ethics (professional and technical societies)	
B. Professional liability	
C. Licensure	
D. Sustainability and sustainable design	
E. Professional skills (e.g., public policy, management, and business)	
F. Contracts and contract law	
5. Engineering Economics	**4–6**
A. Discounted cash flow (e.g., equivalence, PW, equivalent annual worth, FW, rate of return)	
B. Cost (e.g., incremental, average, sunk, estimating)	
C. Analyses (e.g., breakeven, benefit-cost, life cycle)	
D. Uncertainty (e.g., expected value and risk)	
6. Statics	**7–11**
A. Resultants of force systems	
B. Equivalent force systems	
C. Equilibrium of rigid bodies	
D. Frames and trusses	

E. Centroid of area
F. Area moments of inertia
G. Static friction

7. Dynamics **4–6**

A. Kinematics (e.g., particles and rigid bodies)
B. Mass moments of inertia
C. Force acceleration (e.g., particles and rigid bodies)
D. Impulse momentum (e.g., particles and rigid bodies)
E. Work, energy, and power (e.g., particles and rigid bodies)

8. Mechanics of Materials **7–11**

A. Shear and moment diagrams
B. Stresses and strains (e.g., axial, torsion, bending, shear, thermal)
C. Deformations (e.g., axial, torsion, bending, thermal)
D. Combined stresses
E. Principal stresses
F. Mohr's circle
G. Column analysis (e.g., buckling, boundary conditions)
H. Composite sections
I. Elastic and plastic deformations
J. Stress-strain diagrams

9. Materials **4–6**

A. Mix design (e.g., concrete and asphalt)
B. Test methods and specifications (e.g., steel, concrete, aggregates, asphalt, wood)
C. Physical and mechanical properties of concrete, ferrous and nonferrous metals, masonry, wood, engineered materials (e.g., FRP, laminated lumber, wood/plastic composites), and asphalt

10. Fluid Mechanics **4–6**

A. Flow measurement
B. Fluid properties
C. Fluid statics
D. Energy, impulse, and momentum equations

11. Hydraulics and Hydrologic Systems **8–12**

A. Basic hydrology (e.g., infiltration, rainfall, runoff, detention, flood flows, watersheds)
B. Basic hydraulics (e.g., Manning equation, Bernoulli theorem, open-channel flow, pipe flow)
C. Pumping systems (water and wastewater)
D. Water distribution systems
E. Reservoirs (e.g., dams, routing, spillways)
F. Groundwater (e.g., flow, wells, drawdown)
G. Storm sewer collection systems

12. Structural Analysis **6–9**

A. Analysis of forces in statically determinant beams, trusses, and frames
B. Deflection of statically determinant beams, trusses, and frames
C. Structural determinacy and stability analysis of beams, trusses, and frames

D. Loads and load paths (e.g., dead, live, lateral, influence lines and moving loads, tributary areas)
E. Elementary statically indeterminate structures

13. Structural Design **6–9**

A. Design of steel components (e.g., codes and design philosophies, beams, columns, beam-columns, tension members, connections)
B. Design of reinforced concrete components (e.g., codes and design philosophies, beams, slabs, columns, walls, footings)

14. Geotechnical Engineering **9–14**

A. Geology
B. Index properties and soil classifications
C. Phase relations (air-water-solid)
D. Laboratory and field tests
E. Effective stress (buoyancy)
F. Stability of retaining walls (e.g., active pressure/passive pressure)
G. Shear strength
H. Bearing capacity (cohesive and noncohesive)
I. Foundation types (e.g., spread footings, deep foundations, wall footings, mats)
J. Consolidation and differential settlement
K. Seepage/flow nets
L. Slope stability (e.g., fills, embankments, cuts, dams)
M. Soil stabilization (e.g., chemical additives, geosynthetics)
N. Drainage systems
O. Erosion control

15. Transportation Engineering **8–12**

A. Geometric design of streets and highways
B. Geometric design of intersections
C. Pavement system design (e.g., thickness, subgrade, drainage, rehabilitation)
D. Traffic safety
E. Traffic capacity
F. Traffic flow theory
G. Traffic control devices
H. Transportation planning (e.g., travel forecast modeling)

16. Environmental Engineering **6–9**

A. Water quality (ground and surface)
B. Basic tests (e.g., water, wastewater, air)
C. Environmental regulations
D. Water supply and treatment
E. Wastewater collection and treatment

17. Construction **4–6**

A. Construction documents
B. Procurement methods (e.g., competitive bid, qualifications-based)
C. Project delivery methods (e.g., design-bid-build, design build, construction management, multiple prime)
D. Construction operations and methods (e.g., lifting, rigging, dewatering and pumping, equipment production, productivity analysis and improvement, temporary erosion control)
E. Project scheduling (e.g., CPM, allocation of resources)
F. Project management (e.g., owner/contractor/client relations)
G. Construction safety
H. Construction estimating

18. Surveying **4–6**

A. Angles, distances, and trigonometry
B. Area computations
C. Earthwork and volume computations
D. Closure
E. Coordinate systems (e.g., state plane, latitude/longitude)
F. Leveling (e.g., differential, elevations, percent grades)