

**NCEES Fundamentals of Engineering (FE) Examination  
OTHER DISCIPLINES EXAM SPECIFICATIONS**

**Effective Beginning with the April 2010 Examinations**

- The FE examination is an 8-hour supplied-reference examination: 120 questions in the 4-hour morning session and 60 questions in the 4-hour afternoon session.
- Examinees work all questions in the morning session and all questions in the afternoon module.
- The FE examination uses both the International System of Units (SI) and the US Customary System (USCS).
- **Beginning with the April 2010 examination, the General module was renamed Other Disciplines.** The module was renamed to better describe it to the examinees for whom it is intended. No other changes were made to the FE exam specifications for April 2010.

**MORNING Session (120 questions in 12 topic areas)**

Topic Area	Approximate Percentage of AM Test Content
<b>I. Mathematics</b>	<b>15%</b>
A. Analytic geometry	
B. Integral calculus	
C. Matrix operations	
D. Roots of equations	
E. Vector analysis	
F. Differential equations	
G. Differential calculus	
<b>II. Engineering Probability and Statistics</b>	<b>7%</b>
A. Measures of central tendencies and dispersions (e.g., mean, mode, standard deviation)	
B. Probability distributions (e.g., discrete, continuous, normal, binomial)	
C. Conditional probabilities	
D. Estimation (e.g., point, confidence intervals) for a single mean	
E. Regression and curve fitting	
F. Expected value (weighted average) in decision-making	
G. Hypothesis testing	
<b>III. Chemistry</b>	<b>9%</b>
A. Nomenclature	
B. Oxidation and reduction	
C. Periodic table	
D. States of matter	
E. Acids and bases	
F. Equations (e.g., stoichiometry)	
G. Equilibrium	
H. Metals and nonmetals	

- IV. Computers** **7%**
- A. Terminology (e.g., memory types, CPU, baud rates, Internet)
  - B. Spreadsheets (e.g., addresses, interpretation, “what if,” copying formulas)
  - C. Structured programming (e.g., assignment statements, loops and branches, function calls)
- V. Ethics and Business Practices** **7%**
- A. Code of ethics (professional and technical societies)
  - B. Agreements and contracts
  - C. Ethical versus legal
  - D. Professional liability
  - E. Public protection issues (e.g., licensing boards)
- VI. Engineering Economics** **8%**
- A. Discounted cash flow (e.g., equivalence, PW, equivalent annual FW, rate of return)
  - B. Cost (e.g., incremental, average, sunk, estimating)
  - C. Analyses (e.g., breakeven, benefit-cost)
  - D. Uncertainty (e.g., expected value and risk)
- VII. Engineering Mechanics (Statics and Dynamics)** **10%**
- A. Statics
    - 1. Resultants of force systems
    - 2. Concurrent force systems
    - 3. Equilibrium of rigid bodies
    - 4. Frames and trusses
    - 5. Centroid of area
    - 6. Area moments of inertia
    - 7. Friction
  - B. Dynamics
    - 1. Linear motion (e.g., force, mass, acceleration, momentum)
    - 2. Angular motion (e.g., torque, inertia, acceleration, momentum)
    - 3. Mass moments of inertia
    - 4. Impulse and momentum applied to:
      - a. particles
      - b. rigid bodies
    - 5. Work, energy, and power as applied to:
      - a. particles
      - b. rigid bodies
    - 6. Friction
- VIII. Strength of Materials** **7%**
- A. Shear and moment diagrams
  - B. Stress types (e.g., normal, shear, bending, torsion)
  - C. Stress strain caused by:
    - 1. axial loads
    - 2. bending loads
    - 3. torsion
    - 4. shear
  - D. Deformations (e.g., axial, bending, torsion)
  - E. Combined stresses
  - F. Columns
  - G. Indeterminant analysis
  - H. Plastic versus elastic deformation

- IX. Material Properties** **7%**
- A. Properties
    - 1. chemical
    - 2. electrical
    - 3. mechanical
    - 4. physical
  - B. Corrosion mechanisms and control
  - C. Materials
    - 1. engineered materials
    - 2. ferrous metals
    - 3. nonferrous metals
- X. Fluid Mechanics** **7%**
- A. Flow measurement
  - B. Fluid properties
  - C. Fluid statics
  - D. Energy, impulse, and momentum equations
  - E. Pipe and other internal flow
- XI. Electricity and Magnetism** **9%**
- A. Charge, energy, current, voltage, power
  - B. Work done in moving a charge in an electric field (relationship between voltage and work)
  - C. Force between charges
  - D. Current and voltage laws (Kirchhoff, Ohm)
  - E. Equivalent circuits (series, parallel)
  - F. Capacitance and inductance
  - G. Reactance and impedance, susceptance and admittance
  - H. AC circuits
  - I. Basic complex algebra
- XII. Thermodynamics** **7%**
- A. Thermodynamic laws (e.g., 1st Law, 2nd Law)
  - B. Energy, heat, and work
  - C. Availability and reversibility
  - D. Cycles
  - E. Ideal gases
  - F. Mixture of gases
  - G. Phase changes
  - H. Heat transfer
  - I. Properties of:
    - 1. enthalpy
    - 2. entropy

## AFTERNOON Session (60 questions in 9 topic areas)

Topic Area	Approximate Percentage of PM Test Content
<b>I. Advanced Engineering Mathematics</b>	<b>10%</b>
A. Differential equations	
B. Partial differential calculus	
C. Numerical solutions (e.g., differential equations, algebraic equations)	
D. Linear algebra	
E. Vector analysis	
<b>II. Engineering Probability and Statistics</b>	<b>9%</b>
A. Sample distributions and sizes	
B. Design of experiments	
C. Hypothesis testing	
D. Goodness of fit (coefficient of correlation, chi square)	
E. Estimation (e.g., point, confidence intervals) for two means	
<b>III. Biology</b>	<b>5%</b>
A. Cellular biology (e.g., structure, growth, cell organization)	
B. Toxicology (e.g., human, environmental)	
C. Industrial hygiene [e.g., personnel protection equipment (PPE), carcinogens]	
D. Bioprocessing (e.g., fermentation, waste treatment, digestion)	
<b>IV. Engineering Economics</b>	<b>10%</b>
A. Cost estimating	
B. Project selection	
C. Lease/buy/make	
D. Replacement analysis (e.g., optimal economic life)	
<b>V. Application of Engineering Mechanics</b>	<b>13%</b>
A. Stability analysis of beams, trusses, and frames	
B. Deflection analysis	
C. Failure theory (e.g., static and dynamic)	
D. Failure analysis (e.g., creep, fatigue, fracture, buckling)	
<b>VI. Engineering of Materials</b>	<b>11%</b>
A. Material properties of:	
1. metals	
2. plastics	
3. composites	
4. concrete	
<b>VII. Fluids</b>	<b>15%</b>
A. Basic hydraulics (e.g., Manning equation, Bernoulli theorem, open-channel flow, pipe flow)	
B. Laminar and turbulent flow	
C. Friction losses (e.g., pipes, valves, fittings)	
D. Flow measurement	
E. Dimensionless numbers (e.g., Reynolds number)	
F. Fluid transport systems (e.g., pipes, ducts, series/parallel operations)	
G. Pumps, turbines, and compressors	
H. Lift/drag	

- VIII. Electricity and Magnetism** **12%**
- A. Equivalent circuits (Norton, Thevenin)
  - B. AC circuits (frequency domain)
  - C. Network analysis (Kirchhoff laws)
  - D. RLC circuits
  - E. Sensors and instrumentation
  - F. Electrical machines
- IX. Thermodynamics and Heat Transfer** **15%**
- A. Thermodynamic properties (e.g., entropy, enthalpy, heat capacity)
  - B. Thermodynamic processes (e.g., isothermal, adiabatic, reversible, irreversible)
  - C. Equations of state (ideal and real gases)
  - D. Conduction, convection, and radiation heat transfer
  - E. Mass and energy balances
  - F. Property and phase diagrams (e.g., T-s, h-P)
  - G. Tables of thermodynamic properties
  - H. Cyclic processes and efficiency (e.g., refrigeration, power)
  - I. Phase equilibrium and phase change
  - J. Thermodynamic equilibrium
  - K. Combustion and combustion products (e.g., CO, CO<sub>2</sub>, NO<sub>x</sub>, ash, particulates)
  - L. Psychrometrics (e.g., humidity)