Fundamental of Engineering Examination Review Sessions

January 24, 2018
6:00 PM
1236 Patrick F. Taylor Hall

Coordinator of the Review Sessions

- **Dr. Louay Mohammad**
- **Civil and Environmental Engineering**
- **E-mail: Louaym@Lsu.Edu**

Fundamental of Engineering Examination -- Outline

- **Computer Based Testing**

Why take the FE Exam?

- **Employment**
  - **State agencies requires FE certification**
- **Pursue PE license**
  - **Regulations established by state licensing boards**
  - **General requirements**
    - » **Graduate from an ABET-accredited engineering program**
    - » **<u>Pass FE exam</u>**
    - » **Obtain 4 or more years of engineering experience (some credit given for advanced engineering degree)**
- **Professional Career Advancement**

Why take the FE Exam?

- LAPELS recently changed rule § 1509 allowing Engineer Interns to take the PE exam any time subsequent to becoming certified as an EI with LAPELS.
- The rule became effective July 20, 2014
- Note, there is a risk associated with "early taking" which will be clearly shown on the applications as some states have said that they will not accept a PE exam taken before 4 years of experience are gained. So if anyone thinks they may move to another state in the future, they should research that state board's position on this issue
- At the time of application to LAPELS for professional licensure, the "early taker" applicant will be required to have passed both the FE and PE exams and have gained 4 years of progressive engineering experience. Individuals that wish to wait until they have 4 years of progressive engineering experience can apply at that time. Those applicants will be licensed immediately upon passing the PE exam.

Review Session Overview

- **Review of subjects covered on national FE Exam**
- **January 24 – April 11, 2018**
  - **Wednesday**
  - **6:00pm to 8:00pm**
  - **Review schedule**
  - **http://www.eng.lsu.edu/students/current/resources/fe**
  - Example problems

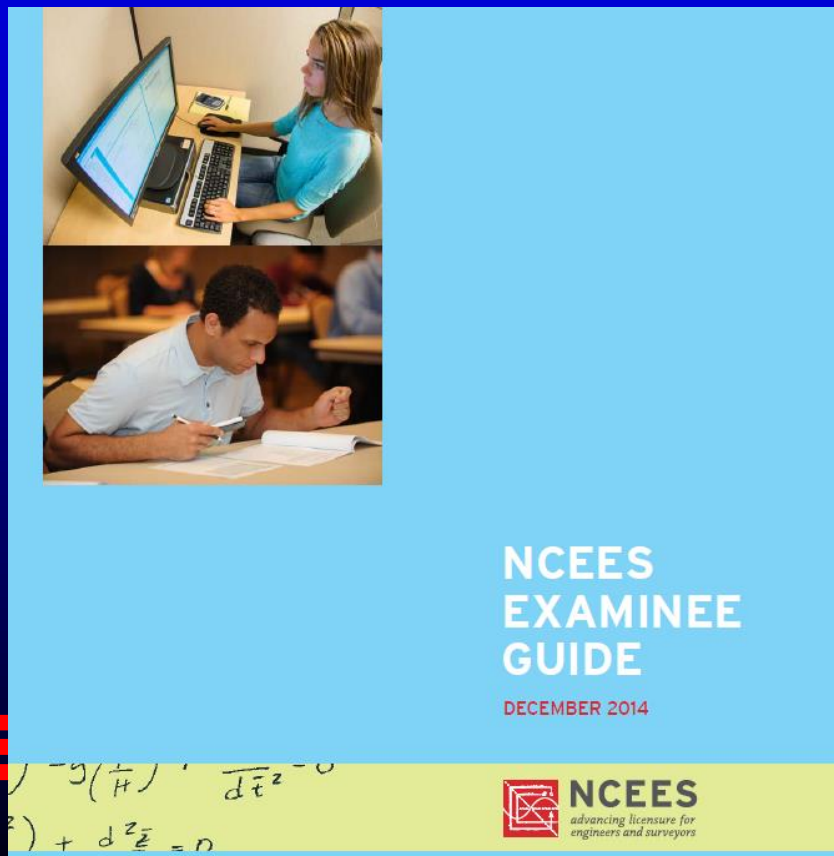
Review Session Schedule

DATE	TOPIC COVERED	INSTRUCTOR	CONTACT
January 24	Introduction	Mohammad	louaym@lsu.edu
January 31	Statics	Moorthy	moorthy@lsu.edu
February 7	Electrical Engineering	Scalzo	jscalz1@lsu.edu
February 21	Strength of Materials	Moorthy	moorthy@lsu.edu
February 28	Dynamics	Ramachandran	pram@lsu.edu
March 14	Thermodynamics	Maris	nmaris@lsu.edu
March 21	Math	Hongchao Zhang	hozhang@math.lsu.edu
April 4	Fluid Mechanics	Tsai	ftsai@lsu.edu
April 11	Engineering Economy	Sarker	bsarker@lsu.edu

***All sessions are from 6:00 PM to 8:00 PM**

Exam Administration

- NCEES computer-based exams are administered exclusively at approved Pearson VUE test centers
- NCEES Examinee Guide – 38 Pages
  - http://ncees.org/wp-content/uploads/2015/07/ExamineeGuide_6-17-16_.pdf
- Website:
  - www.ncees.org



Reference Materials

- **NCEES FE Supplied Reference Handbook**
  - **free download**
  - **Register or log in to MyNCEES to download your free copy of the *FE Reference Handbook***
  - **https://account.ncees.org/login**
- **Familiarize yourself with the e-version of hand book prior to the test**
  - **http://ncees.org/engineering/fe/**
- NCEES YouTube channel
  - Explore the computer-based exam experience
  - https://www.youtube.com/playlist?list=PLiZ0hjHNi9jzR8RW69ndkjIgH8bzj0ew-
    - Pearson VUE exam-day experience
    - How to search the onscreen NCEES reference handbook
    - Pearson VUE reusable booklet
    - How to flag items for review
    - Onscreen calculator for computer-based exams (TI-30XS)
    - Computer-based testing hotkeys
    - Managing your time on exam day

Eligibility

- **No longer apply to *LAPELS* for approval.**
- **Register for the exam directly with *NCEES***
  - **https://account.ncees.org/login**
  - **Current Exam fee: $225 Paid directly to NCEES**
    - **Check website for cancelation/re-fund policy**
  - **Future Exam Fee: Effective January 2018 will be reduced by $50 to $175**

FE CBT Exam Specifications

- Greater scheduling flexibility for candidates, year-round.
  - Exams will be administered 175 days a year
  - Monday through Friday
- Test can be taken up to 3 times in a twelve month period and, but <u>only once</u> per testing window
- Effective January 1, 2016
  - Year-Round Testing (January – December)
  - Testing Windows: four quarters of the year.
    - January – March
    - April – June
    - July – September
    - October - December
- Best time available: Register as far in advance as possible
- Fifteen available seats per testing session.
- Results (P/F): e-mail notification from NCEES within 7-10 days.

Eligibility / Venue

- Can I choose to take pencil and paper version?
  - No
  - FE and FS exams will be offered only on computers at approved Pearson VUE testing centers.
    - http://cbt.ncees.org/where-will-i-take-my-exam/
    - Baton Rouge, Metairie, Shreveport

FE Exam specifications

- Total Duration of Exam: 6:00
  - A nondisclosure agreement: 0:02
  - Tutorial: 0:08 minutes
  - Exam length: 5:20
  - Scheduled Break: 0:25

- Test make up
  - 7 Discipline Specific Exams: http://ncees.org/exams/fe-exam/
    - Chemical
    - Civil
    - Electrical/ Computer
    - Environmental
    - Industrial
    - Mechanical
    - Others
  - 110 multiple choice questions
- Answer all questions
- Passing score
  - Expert committee
  - Level of performance
    - Corresponds with minimal competence in that discipline

Discipline Specific Specifications can be found at:

- Chemical
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Chem-CBT_with-ranges.pdf
- Civil
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Civil-CBT-specs_with-ranges.pdf
- Electrical and Computer
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Ele-CBT-specs_with-ranges.pdf
- Environmental
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Env-CBT-specs_with-ranges.pdf
- Industrial
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Ind-CBT-specs_with-ranges.pdf
- Mechanical
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Mec-CBT-specs_with-ranges.pdf
- Other Disciplines
  - http://cbt.ncees.org/wp-content/uploads/2013/01/FE-Other-CBT-specs_with-ranges.pdf

FE Exam specifications – Example of Industrial

Knowledge	Number of Questions
1. Mathematics	**6–9**
A. Analytic geometry	
B. Calculus	
C. Matrix operations	
D. Vector analysis	
E. Linear algebra	
2. Engineering Sciences	**5–8**
A. Work, energy, and power	
B. Material properties and selection	
C. Charge, energy, current, voltage, and power	
3. Ethics and Professional Practice	**5–8**
A. Codes of ethics and licensure	
B. Agreements and contracts	
C. Professional, ethical, and legal responsibility	
D. Public protection and regulatory issues	
4. Engineering Economics	**10–15**
A. Discounted cash flows (PW, EAC, FW, IRR, amortization)	
B. Types and breakdown of costs (e.g., fixed, variable, direct and indirect labor)	
C. Cost analyses (e.g., benefit-cost, breakeven, minimum cost, overhead)	
D. Accounting (financial statements and overhead cost allocation)	
E. Cost estimation	
F. Depreciation and taxes	
G. Capital budgeting	
5. Probability and Statistics	**10–15**
A. Combinatorics (e.g., combinations, permutations)	
B. Probability distributions (e.g., normal, binomial, empirical)	
C. Conditional probabilities	
D. Sampling distributions, sample sizes, and statistics (e.g., central tendency, dispersion)	
E. Estimation (e.g., point, confidence intervals)	
F. Hypothesis testing	
G. Regression (linear, multiple)	
H. System reliability (e.g., single components, parallel and series systems)	
I. Design of experiments (e.g., ANOVA, factorial designs)	
6. Modeling and Computations	**8–12**
A. Algorithm and logic development (e.g., flowcharts, pseudocode)	
B. Databases (e.g., types, information content, relational)	
C. Decision theory (e.g., uncertainty, risk, utility, decision trees)	
D. Optimization modeling (e.g., decision variables, objective functions, and constraints)	
E. Linear programming (e.g., formulation, primal, dual, graphical solutions)	
F. Mathematical programming (e.g., network, integer, dynamic, transportation, assignment)	
G. Stochastic models (e.g., queuing, Markov, reliability)	
H. Simulation	
7. Industrial Management	**8–12**
A. Principles (e.g., planning, organizing, motivational theory)	

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H. Simulation	
7. Industrial Management	**8–12**
A. Principles (e.g., planning, organizing, motivational theory)	

B. Tools of management (e.g., MBO, reengineering, organizational structure)	
C. Project management (e.g., scheduling, PERT, CPM)	
D. Productivity measures	
8. Manufacturing, Production, and Service Systems	**8–12**
A. Manufacturing processes	
B. Manufacturing systems (e.g., cellular, group technology, flexible)	
C. Process design (e.g., resources, equipment selection, line balancing)	
D. Inventory analysis (e.g., EOQ, safety stock)	
E. Forecasting	
F. Scheduling (e.g., sequencing, cycle time, material control)	
G. Aggregate planning	
H. Production planning (e.g., JIT, MRP, ERP)	
I. Lean enterprises	
J. Automation concepts (e.g., robotics, CIM)	
K. Sustainable manufacturing (e.g., energy efficiency, waste reduction)	
L. Value engineering	
9. Facilities and Logistics	**8–12**
A. Flow measurements and analysis (e.g., from/to charts, flow planning)	
B. Layouts (e.g., types, distance metrics, planning, evaluation)	
C. Location analysis (e.g., single- and multiple-facility location, warehouses)	
D. Process capacity analysis (e.g., number of machines and people, trade-offs)	
E. Material handling capacity analysis	
F. Supply chain management and design	
10. Human Factors, Ergonomics, and Safety	**8–12**
A. Hazard identification and risk assessment	
11. Work Design	**8–12**
A. Methods analysis (e.g., charting, workstation design, motion economy)	
B. Time study (e.g., time standards, allowances)	
C. Predetermined time standard systems (e.g., MOST, MTM)	
D. Work sampling	
E. Learning curves	
12. Quality	**8–12**
A. Six sigma	
B. Management and planning tools (e.g., fishbone, Pareto, QFD, TQM)	
C. Control charts	
D. Process capability and specifications	
E. Sampling plans	
F. Design of experiments for quality improvement	

FE Exam specifications

Discipline						
Chemical	**Civil**	**Electrical**	**Environmental**	**Industrial**	**Mechanical**	**Other**
Mathematics	Mathematics	Mathematics	Mathematics	Mathematics	Mathematics	Mathematics and Advanced Engineering Mathematics
Probability and Statistics	Probability and Statistics	Probability and Statistics	Probability and Statistics	Engineering Sciences	Probability and Statistics	Probability and Statistics
Engineering Sciences	Computational Tools	Ethics and Professional Practice	Ethics and Professional Practice	Ethics and Professional Practice	Computational Tools	Chemistry
Computational Tools	Ethics and Professional Practice	Engineering Economics	Engineering Economics	Engineering Economics	Ethics and Professional Practice	Instrumentation and Data Acquisition
Material Science	Engineering Economics	Properties of Electrical Materials	Material Science	Probability and Statistics	Engineering Economics	Ethics and Professional Practice
Chemistry	Statics	Engineering Sciences	Environmental Science and Chemistry	Modeling and Computations	Electricity and Magnetism	Safety, Health, and Environment
Fluid Mechanics/Dynamic	Dynamics	Circuit Analysis (DC and AC Steady State)	Risk Assessment	Industrial Management	Statics	Engineering Economics
Thermodynamics	Mechanics of Materials	Linear Systems	Fluid Mechanics	Manufacturing, Production, and Service Systems	Dynamics, Kinematics, and Vibrations	Statics
Material /Energy Balances	Materials	Signal Processing	Thermodynamics	Facilities and Logistics	Mechanics of Materials	Dynamics
Heat Transfer	Fluid Mechanics	Electronics	Water Resources	Human Factors, Ergonomics, and Safety	Material Properties and Processing	Strength of Materials
Mass Transfer and Separation	Hydraulics and Hydrologic Systems	Power	Water and Wastewater	Work Design	Fluid Mechanics	Materials Science
Chemical Reaction Engineering	Structural Analysis	Electromagnetics	Air Quality	Quality	Thermodynamics	Fluid Mechanics and Dynamics of Liquids
Process Design and Economics	Structural Design	Control Systems	Solid and Hazardous Waste	Systems Engineering	Heat Transfer	Fluid Mechanics and Dynamics of Gases
Process Control	Geotechnical Engineering	Communications	Groundwater and Soils		Measurements, Instrumentation, and Controls	Electricity, Power, and Magnetism
Safety, Health, and Environment	Transportation Engineering	Computer Networks			Mechanical Design and Analysis	Heat, Mass, and Energy Transfer
Ethics and Professional	Environmental Engineering	Digital Systems				

FE Exam specifications -- What can you bring to the exam room?

- Enhanced security for exam content
  - Check-in: government issued ID, photo taken, and palm-vein scan
  - *Watch the video*
  - http://www.ncees.org/Exams/Study_materials/Download_FE_Supplied-Reference_Handbook.php

- Permitted
  - Calculators
  - Check Calculator Policy
    - » http://ncees.org/exams/calculator/
  - Small dry-erase board will be supplied for calculations
  - FE Reference Manual will be embedded in the computer in a searchable pdf file format
  - Watch the video
  - http://www.ncees.org/Exams/Study_materials/Download_FE_Supplied-Reference_Handbook.php

Suggestions for Taking the FE Exam

- **Start with subject areas you are familiar with**
  - **Stronger areas to weaker areas.**
- **Manage your time wisely**
  - **Don’t spend more than 3-5 minutes on a question**
  - **return to the question later**
  - **At about 20 minutes before finish time**
    - » **return to the skipped questions**
  - **At about 5 minutes from the end, guess**
    - » **Wrong answers have no penalty**

Useful Web site

- www.eng.lsu.edu
- www.ncees.org
- www.lapels.com

Good Luck