



ADVANCES IN ENGINEERING & SURVEYING LICENSES -- YOUR ROLE --

Alabama Section ASCE
Annual Meeting, July 17-19, 2017

Write the equation of
and position of the
time in closed form

$$\Sigma F = D - W =$$

where $D = \text{drag force}$
 $W = \text{weight}$

$a = \text{acceleration}$

$$\text{so } C_D \frac{1}{2} \rho A u^2$$

divide by m $\frac{C_D \rho A}{2m}$

or $\frac{du}{dt} =$

separate u 's
and t 's $du =$

$$du =$$

$$\frac{du}{1 - \frac{C_D \rho A}{2m}}$$

simplify: $\frac{C_D \rho A}{2m}$

say $Z = \frac{C_D \rho A}{2m}$

$$\text{so } \frac{du}{1 - Z^2 u^2}$$

integrate $\int \frac{du}{1 - Z^2 u^2}$

Dan Turner, Ph.D., P.E., P.L.S.



NCEES
advancing licensure for
engineers and surveyors

We must be Leaders and Professionals

Professionals think and act professionally. As leaders they set the way. As role models, they inspire others to follow.

A good leader develops ideas.

A great leader develops people.

The greatest leader develops more leaders.

INTERNATIONAL SNAPSHOT

Engineers throughout the world recognize the P.E. designation as a high level of distinction and seek to become licensed in the United States. As a result, NCEES has agreements to administer the PEI and PE exams in Canada (Alberta), the Emirate of Sharjah, Egypt, Japan, Saudi Arabia, South Korea, and Turkey.

NCEES Credentials Evaluations is a service that evaluates a candidate's academic transcripts and determines if his or her degree is equivalent to a degree from an EAC/ABET-accredited program. Most of these candidates earned their degree outside the United States and are seeking licensure through an NCEES member licensing board. The map below illustrates the number of international engineers in 2013-14 who sought licensure in the United States.



NCEES FACT

1,879
FE EXAMS

453
PE EXAMS

TOTAL NCEES EXAMS ADMINISTERED INTERNATIONALLY

EXAM DEVELOPMENT

Licensed engineers and surveyors volunteer their time and expertise to the exam development process by coming to NCEES headquarters to write and evaluate exam questions. In 2013-14, NCEES welcomed a total of 745 volunteers at 54 exam development meetings. This represents approximately 23,056 hours spent developing exam content for 8 fundamentals exams and 26 professional exams.

745
VOLUNTEERS

54
MEETINGS

23,056
HOURS

NCEES FACT



PERCENTAGE OF
FEMALE EXAM
DEVELOPMENT
VOLUNTEERS

SNAPSHOT: PE MECHANICAL COMMITTEE

2
MEETINGS

18
STATES REPRESENTED

63
ATTENDEES

54 
9 

EXAMS

NCEES exams are a key part of the licensure process. These national exams ensure that professional engineers and surveyors throughout the country meet a uniform minimum standard of competence.

93,360



TOTAL NUMBER OF ENGINEERING BACHELOR'S DEGREES AWARDED IN 2013 AS REPORTED BY THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION (ASEE)



45,362 TOTAL NUMBER OF FE EXAM TAKERS



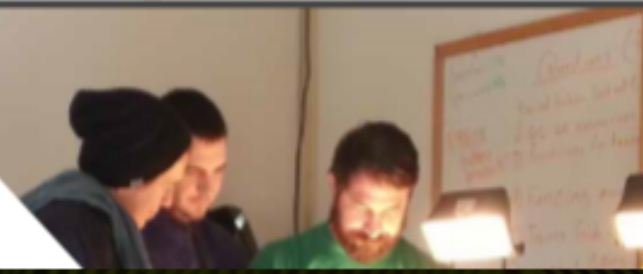
PASS RATE OF
FIRST-TIME FE
EXAM TAKERS
WITH EAC/ABET
BACHELOR'S
DEGREES



PASS RATE
OF ALL OTHER
FIRST-TIME FE
EXAM TAKERS

ENGINEERING

NCEES develops and scores the licensure exams used by all U.S. engineering and surveying boards as part of their licensure process. These exams play a central role in ensuring standard qualifications for licensees.



Our Profession and NCEES Could Use Your Help

- 1. One of our primary jobs to secure the future of our nation's infrastructure.**
- 2. We must also ensure the future availability of a sufficient number of qualified, trained and motivated engineers and surveyors.**
- 3. We must recognize that points 1 and 2 will not occur on their own.**



Why Licensure?

It is a very strong credential

...where will you be in 5 years?

...in 10 years? ...in 20 years?

...how long until the next recession?

...how long until global engineering?

**International
Engineering Alliance**

Licensure: a Universal Standard

❑ Protects health, safety and welfare of the public

❑ *“Engineering licensure is crucial for career advancement and top pay.”*

U.S. News & World Report

❑ Other professions: **Why do we license physicians, attorneys, and accountants?**



We must be Leaders and Professionals

Leadership -- The quality of a leader is reflected in the standards he sets for himself. - *Ray Croc*

State laws and engineering practice

- Protect the Health, Safety and Welfare of the Public
- Only a P.E. can practice engineering
- Examples
 - Owning a firm
 - Consulting
 - Signing/sealing designs
 - Advertising your services

Industrial Exemption

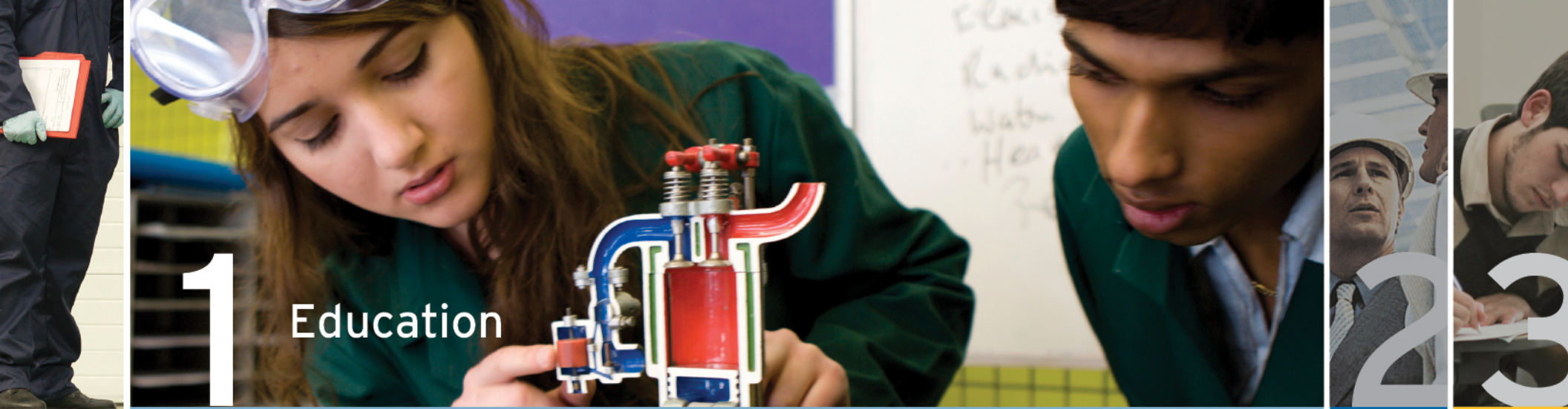


3

steps

INTERESTED?






1 Education

Get an engineering degree from an accredited program.

- Bachelor's or master's (or both)
- The Engineering Accreditation Commission of ABET accredits college engineering programs.
- NCEES evaluates foreign engineering degrees, if requested



1

2

Experience

- Work under the supervision of a P.E.**
- Four years, progressive**
- Your boss(es) verify your experience when you apply for license.**

3



1

2

3

Exams



- Pass the Fundamentals of Engineering exam, usually in your senior year of college or shortly after graduation.**
- Pass the PE exam in your engineering discipline.**

FE exam

- ❑ **Fundamentals:** what you learned in junior and senior years of college
- ❑ **Good info** on NCEES web site
- ❑ **CBT** – the FE is administered via computer at approved Pearson VUE testing locations, schedule your own exam





$$F = PA = 706E3 \left(\frac{.152}{4} \right)^2 \pi$$
$$\frac{12.696}{8} = 827E6 \left(\frac{\pi d^2}{4} \right) \cdot 2$$
$$d = 3.5 \text{ mm}$$

FE exams

- Year-round CBT testing in two-month windows
- 6-hour appointment time at test center
 - Includes tutorial and 25-minute break
 - Exam is 5 hours and 20 minutes, with 110 questions
- Free-standing, discipline-specific exams
Chemical, **Civil**, Electrical and
Computer, Environmental, Industrial,
Mechanical, Other Disciplines

CE FE CBT (18 topics + number questions/topic)

- Mathematics: 7-11
- Probability & Stats: 4-6
- Computational tools: 4-6
- Ethics, Prof Practice: 4-6
- Engineering Econ: 4-6
- Statics: 7-11
- Dynamics: 4-6
- Mechanics of Materials: 7-11
- Materials: 4-6
- Fluid Mechanics: 4-6
- Hydraulics & Hydraulic Systems: 8-12
- Structural Analysis: 6-9
- Structural Design: 6-9
- Geotechnical Engr: 9-14
- Transportation Engr: 8-12
- Environmental Engr: 6-9
- Construction: 4-6
- Surveying: 4-6

FE CBT Exam Example Spec Subtopics:

Ethics & Prof Practice

(4-6 questions)

- Codes of ethics
- Professional Liability
- Licensure
- Sustainability and sustainable design
- Professional skills, public policy, management, business
- Contracts/contract law

Environmental Engineering

(6-9 questions)

- Water quality
- Basic tests (e.g., water, wastewater, air)
- Environmental regulations
- Water supply & treatment
- Wastewater collection and treatment

How to Prepare for the FE Exams

- *NCEES Examinee Guide*
- NCEES computer-based practice exam, \$49.95 each
- *FE Reference Handbook*
 - Free download
 - \$13.95 printed version
- **All are available at [ncees.org/CBT](https://www.ncees.org/CBT)**



$$\frac{12,696}{8} = 827.5 \left(\frac{\pi d^2}{4} \right) (0.2) = 1587 = 129$$
$$d = 3.5 \text{ mm} = 0.35 \text{ cm} \approx 0.$$

We must be Leaders and Professionals

Leadership -- The greatest leader is not necessarily the one who does the greatest things. He is the one that gets the people to do the greatest things. *Ronald Reagan*

The PE exam: the final step

- Reflects real-world practice
- Developed by licensed engineers (your peers)
- Tests for minimal competency
- Find specifications and study materials at NCEES.org
- Open-book: reference materials permitted

Reference materials provided for CBT

CE PE Exam is moving to CBT

Civil Geotech “Breath” PE Exam Specs

Exam Spec Topics, Approximate Number of Questions

- I. Site Characteristics - 5
- II. Soil Mechanics, Lab Testing and Analysis - 5
- III. Field Materials Tests, Methods, Safety - 3
- IV. Earthquake Engineering, Dynamic Loads - 2
- V. Earth Structures - 4
- VI. Groundwater and Seepage - 3
- VII. Problematic Soil and Rock Conditions - 3
- VIII. Earth Retaining Structures (ASD or LRFD) - 5
- IX. Shallow Foundations (ASD or LRFD) - 5
- X. Deep Foundations (ASD or LRFD) – 5

Design Standards – ASCE 7, OSHA 29 CFR

We must be Leaders and Professionals

Leadership -- A great leader's courage to fulfill his vision comes from his passion, not his position.

John Maxwell

Exam Statistics - FE

Exam	Volume	Pass rate
FE Chemical	1,055	79%
FE Civil	5,622	70%
FE Electrical and Computer	1,216	73%
FE Environmental	741	77%
FE Industrial	266	68%
FE Mechanical	3,813	80%
FE Other Disciplines	1,376	80%

Exam Statistics - PE

Agricultural and Biological	79%
Architectural	83%
Chemical	70%
CIVIL: Construction	57%
CIVIL: Geotechnical	65%
CIVIL: Structural	70%
CIVIL: Transportation	65%
CIVIL: Water Resources and Environmental	71%
Control Systems	78%
Electrical & Computer: Computer Engineering	60%
Electrical & Computer: Electrical and Electronics	77%
Electrical & Computer: Power	62%

$$d = 3.5 \text{ mm} = 0.35 \text{ cm} \approx 0.$$

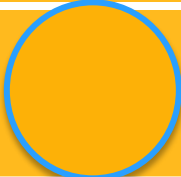
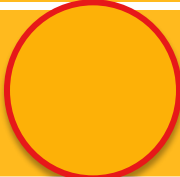
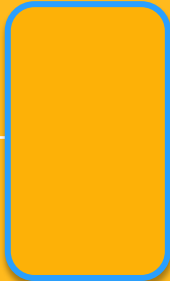
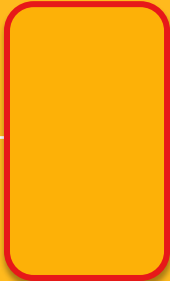
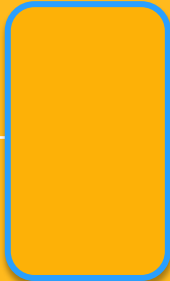
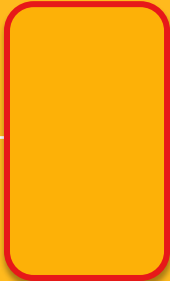
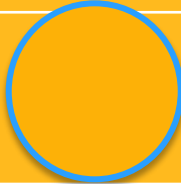
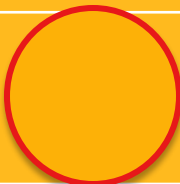


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Exams

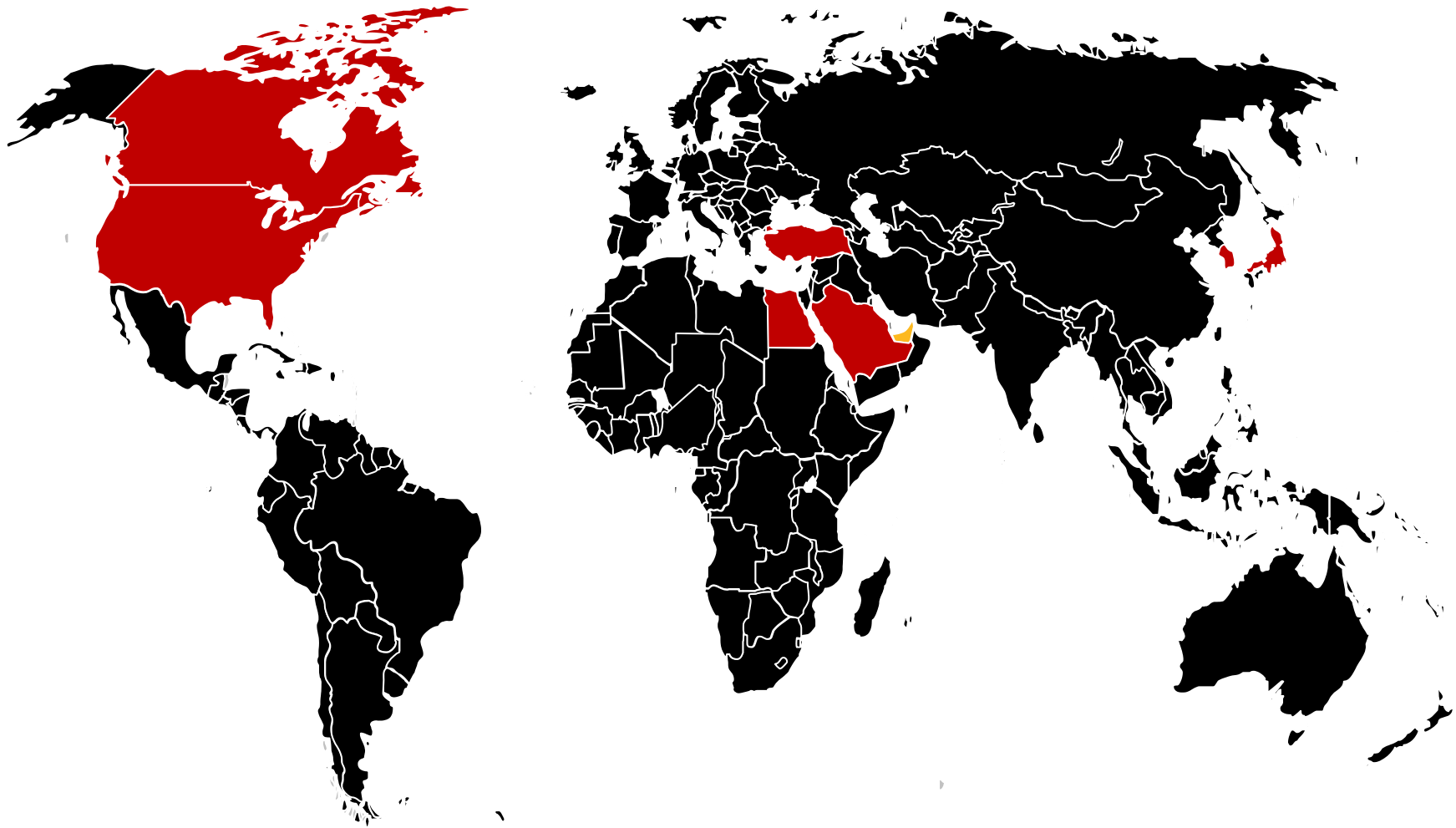
Exam Type and Year	Age of Youngest Passer	Age of Oldest Passer
FE 2016		
FS 2016		
PS 2016		
PE 2016		

We must be Leaders and Professionals

Leadership -- Example is not the main thing in influencing others, it is the only way.

Albert Schweitzer

NCEES - 2015



Removal of *Arbitrary* Constraints



THE RIGHT TO EARN A LIVING

Our Profession and NCEES Could Use Your Help

- **Recruit tomorrow's workforce**
- **Support engineering and surveying student clubs**
- **Hire and train summer interns**
- **Volunteer to mentor/teach capstone design projects**
 - **Help students think professionally**
 - **Encourage professional licensure**
 - **Consider becoming an NCEES exam prep volunteer**
- **Think of yourself as a professional and a licensure advocate, become a spokesperson, and be prepared to explain how you protect public health and safety**

My Wish for You

Leadership – May your grandchildren be in awe of the magnificence of your engineering projects, and dream that someday they can be Professional Engineers. May your friends respect your reputation and the quality of your work. May younger engineers be grateful that you took time to mentor them. And may you sleep soundly each night, knowing that you are a true professional in every way.

Dan Turner