

ENGINEERING LICENSURE

From Point A to P.E.

Write the equation of
and position of
time in closed form

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

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

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

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

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

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

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

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

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

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

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

Washington Board of Registration for PE & LS
 George Twiss, PLS, Executive Director
 Michael Villnave, PE, Deputy Exec. Director



NCEES
 advancing licensure for
 engineers and surveyors



Into the great unknown

- Do you know what you'll do when you graduate?
- Where do you see yourself in five years?
- What about 10 years? 20? 30?



It's about showing what you can do

- What do hiring firms look for?
- Degrees, work references, technical skills
- What if there were a universal standard that is recognized throughout the profession?

$$F = pA = 706E3 \left(\frac{.152}{4} \right)^2 \pi = 12,696$$
$$\frac{12,696}{8} = 827E6 \left(\frac{\pi d^2}{4} \right) (.2) = 1587 = 12$$
$$d = 3.5 \text{ mm} = 0.35 \text{ cm} \approx$$

Licensure: a universal standard

- “[Engineering] licensure is crucial for career advancement and top pay.” –*U.S. News & World Report*
- Think about other professions:
 - Why do we license professionals?



The P.E. license

- A professional engineer
 - Has the education, experience, and technical knowledge to lead
 - Has the respect of the public's trust and confidence
 - Has an obligation to protect the public

$$F = pA = 706E3 \left(\frac{.152}{4} \right)^2 \pi = 12,696$$

$$\frac{12,696}{8} = 827.56 \left(\frac{\pi d^2}{4} \right) (.2) = 1587 = 129$$

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



3

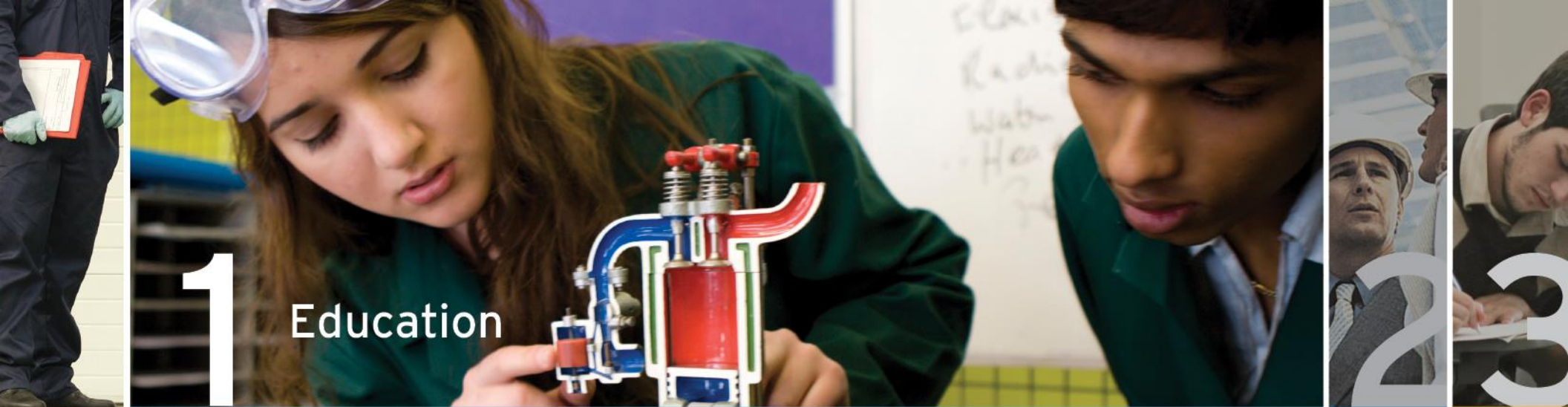
steps

Getting from point A to P.E.



1 2 3





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.
- ❑ In Washington a degree is not a requirement for licensure but it is the best way.



1

2

Experience

- Work under the supervision of a P.E. is desirable but not always required.
- Four years showing progressive levels of responsibility and decision making after degree.



1

2

3

Exams



- Pass the Fundamentals of Engineering exam in your senior year of college (or shortly after graduation).
- Pass the PE exam in your engineering discipline after acquiring additional four years of experience.

$$\int \frac{1}{1-z^2u^2} du = \int g dt$$

$$\int \frac{1}{(1+zu)(1-zu)} du = \int g dt$$

side $\frac{1}{1-x^2}$

$$\left(\frac{1}{1+x} + \frac{1}{1-x} \right) = \frac{(1-x) + (1+x)}{(1+x)(1-x)} = \frac{2}{1-x^2}$$

$$\frac{1}{1-x^2} = \frac{1}{2} \left(\frac{1}{1+x} + \frac{1}{1-x} \right)$$

$$\frac{1}{2} \int \left(\frac{1}{1-zu} + \frac{1}{1+zu} \right) du = \int g dt$$

$$\frac{1}{2z} \ln \left(\frac{1+zu}{1-zu} \right) = gt + C_0$$

$$e^{\ln \left(\frac{1+zu}{1-zu} \right)} = e^{2z(gt + C_0)}$$

$$\frac{1+zu}{1-zu} = e^{2zgt} e^{2zC_0}$$

$$\text{let } e^{2zC_0} = C$$

so the equation becomes

$$\frac{1+zu}{1-zu} = C e^{2zgt} \quad z = \sqrt{\frac{C_0 PA}{2mg}}$$

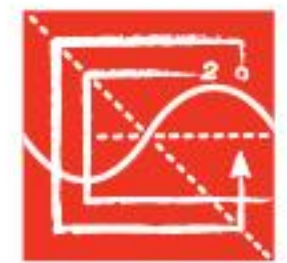
To simplify equation, let $C e^{2zgt} = A$

so it becomes $1+zu = A(1-zu) = A - Azu$

$$zu + Azu = A - 1$$

$$z(1+A)u = A - 1$$

THE FE EXAM



NCEES

FE exam

- Fundamentals: what you learned in college
- Computer-based exams
- Offered year-round at approved Pearson VUE test centers:

☞ Washington State:

Spokane

Seattle (2)

Yakima



FE exam format and content

- 7 freestanding discipline-specific exams
 - Chemical, Civil, Computer and Electrical, Environmental, Industrial, Mechanical, Other Disciplines
- 110 multiple-choice questions
- Exam specifications (what's on the exam)
 - Available at ncees.org/exams
- *FE Reference Handbook*
- Practice exams

FE Electrical and Computer exam: Knowledge areas and number of questions

- Mathematics 11–17
- Probability and Statistics 4–6
- Ethics and Professional Practice 3–5
- Engineering Economics 3–5
- Properties of Electrical Materials 4–6
- Engineering Sciences 6–9
- Circuit Analysis (DC and AC Steady State) 10–15
- Linear Systems 5–8
- Signal Processing 5–8
- Electronics 7–11
- Power 8–12
- Electromagnetics 5–8
- Control Systems 6–9
- Communications 5–8
- Computer Networks 3–5
- Digital Systems 7–11
- Computer Systems 4–6
- Software Development 4–6

FE exam administration

- Approved Pearson VUE test centers
- Year-round testing windows
 - January/February, April/May, July/August, October/November
- 6-hour exam appointment, which includes
 - Nondisclosure agreement (2 minutes)
 - Tutorial (8 minutes)
 - Exam (5 hours and 20 minutes)
 - Scheduled break (25 minutes)
 - Brief survey

$$\frac{12,696}{8} = 827.56 \left(\frac{\pi d^2}{4} \right) (2) = 1587 = 129$$
$$d = 3.5 \text{ mm} = 0.35 \text{ cm} \approx 0.$$

$$\int \frac{1}{1-z^2u^2} du = \int g dt$$

$$\int \frac{1}{(1+zu)(1-zu)} du = \int g dt$$

side $\frac{1}{1-x^2}$

$$\left(\frac{1}{1+x} + \frac{1}{1-x} \right) = \frac{(1-x) + (1+x)}{(1+x)(1-x)} = \frac{2}{1-x^2}$$

$$\frac{1}{1-x^2} = \frac{1}{2} \left(\frac{1}{1+x} + \frac{1}{1-x} \right)$$

$$\frac{1}{2} \int \left(\frac{1}{1+zu} + \frac{1}{1-zu} \right) du = \int g dt$$

$$\frac{1}{2z} \ln \left(\frac{1+zu}{1-zu} \right) = gt + C_0$$

$$e^{\ln \left(\frac{1+zu}{1-zu} \right)} = e^{2z(gt + C_0)}$$

$$\frac{1+zu}{1-zu} = e^{2zgt} e^{2zC_0}$$

$$\text{let } e^{2zC_0} = C$$

so the equation becomes

$$\frac{1+zu}{1-zu} = C e^{2zgt} \quad z = \sqrt{\frac{C_0 PA}{2mg}}$$

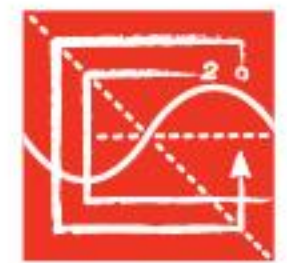
To simplify equation, let $C e^{2zgt} = A$

so it becomes $1+zu = A(1-zu) = A - Azu$

$$zu + Azu = A - 1$$

$$u(z+A) = A-1$$

THE PE EXAM



NCEES

The PE exam: the final step

- Reflects real-world practice
- Developed by your peers
- Tests for minimal competency
- Find specifications and study materials at [ncees.org/exams](https://www.ncees.org/exams).
- Open-book: reference materials permitted

$$F = P \cdot A = 10825 \left(\frac{\pi d^2}{4} \right) = 12,696$$
$$\frac{12,696}{8} = 827.56 \left(\frac{\pi d^2}{4} \right) (2) = 1587 = 129$$
$$d = 3.5 \text{ mm} = 0.35 \text{ cm} \approx 0.$$

PE Electrical and Computer exam

- 8-hour exam
- Morning breadth, afternoon depth
- Choose your afternoon module:
 - Computer Engineering
 - Electrical and Electronics
 - Power
- Download specifications online at ncees.org/exams/pe-exam.

WHAT'S NEXT?



NCEES

Washington State Board of Registration For Professional Engineers and Land Surveyors.

- Web: <http://www.dol.wa.gov/business/engineerslandsurveyors/>
- Email: Engineers@dol.wa.gov
- Phone: 360-664-1575
- Fax: 360-664-2551
- Street Address: 405 Black Lake Blvd., Olympia, 98507
- Mailing Address: PO Box 9025, Olympia, 98507-9025

$$F = pA = 706 \text{E}3 \left(\frac{.152}{4} \right)^2 \pi = 12,696$$

$$\frac{12,696}{8} = 827 \text{E}6 \left(\frac{\pi d^2}{4} \right) (.2) = 1587 = 129$$

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

The National Council of Examiners for Engineering and Surveying

- Web: ncees.org
- Phone: 800-250-3196
- Fax: 864-654-6033
- Street Address: 280 Seneca Creek Road,
Clemson, South Carolina 29678
- Mailing Address: P.O. Box 1686
Clemson, South Carolina 29633

$$F = pA = 706 \text{E}3 \left(\frac{.152}{4} \right)^2 \pi = 12,696$$

$$\frac{12,696}{8} = 827 \text{E}6 \left(\frac{\pi d^2}{4} \right) (.2) = 1587 = 129$$

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

Mobility of Licensure

- ❑ Once licensed a new world opens up.
- ❑ The US PE license is mobile; state to state and beyond.
- ❑ Most states have the same or very similar requirements.

Washington:

8 years of progressive experience (including education)

Passage of PE and FE exams

Completed application and fee



The background of the slide is a photograph of a large industrial port. In the foreground, two men are standing on a concrete pier. One man is wearing a bright orange jumpsuit and a yellow hard hat, while the other is wearing a dark suit and a yellow hard hat. They are both looking at a tablet held by the man in the suit. Behind them are several large red gantry cranes. In the distance, there is a body of water, a city skyline, and an industrial facility with various tanks and structures under a clear sky.

The big picture

- It's tough—for a reason.
- Keep your eye on the target.
- There are resources that can help you get there.



ENGINEERING LICENSURE

Write the equation of
and position of
time in closed form

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

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

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

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

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

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

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

simplify: $\frac{C_D \rho A}{2mg} u^2 =$

say $Z = \frac{C_D \rho A}{2mg} u^2$

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

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

Washington Board of Registration for PE & LS
George Twiss, PLS, Executive Director
Michael Villnave, PE, Deputy Exec. Director



NCEES
advancing licensure for
engineers and surveyors