
PE Licensure: Supply Power to
Your Career to Help Power the World
Friday, May 21
ANS Events

Professional Engineering Licensure

From Point A to P.E.

Panelists

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NCEES
advancing licensure for engineers and surveyors

The P.E. License
What is it?

A professional engineer

- Has the education, experience, and technical knowledge to lead
- Has an obligation to protect the public

It works both ways:

- You stand out in a crowd as a P.E.
- You have demonstrated an established level of competency
- The public is protected from incompetent or unethical practice

Engineering Practice

(the interface between science and society)

Advantages to Having a P.E. License

- Greater career opportunities
- A higher salary
- A high ethical standard

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

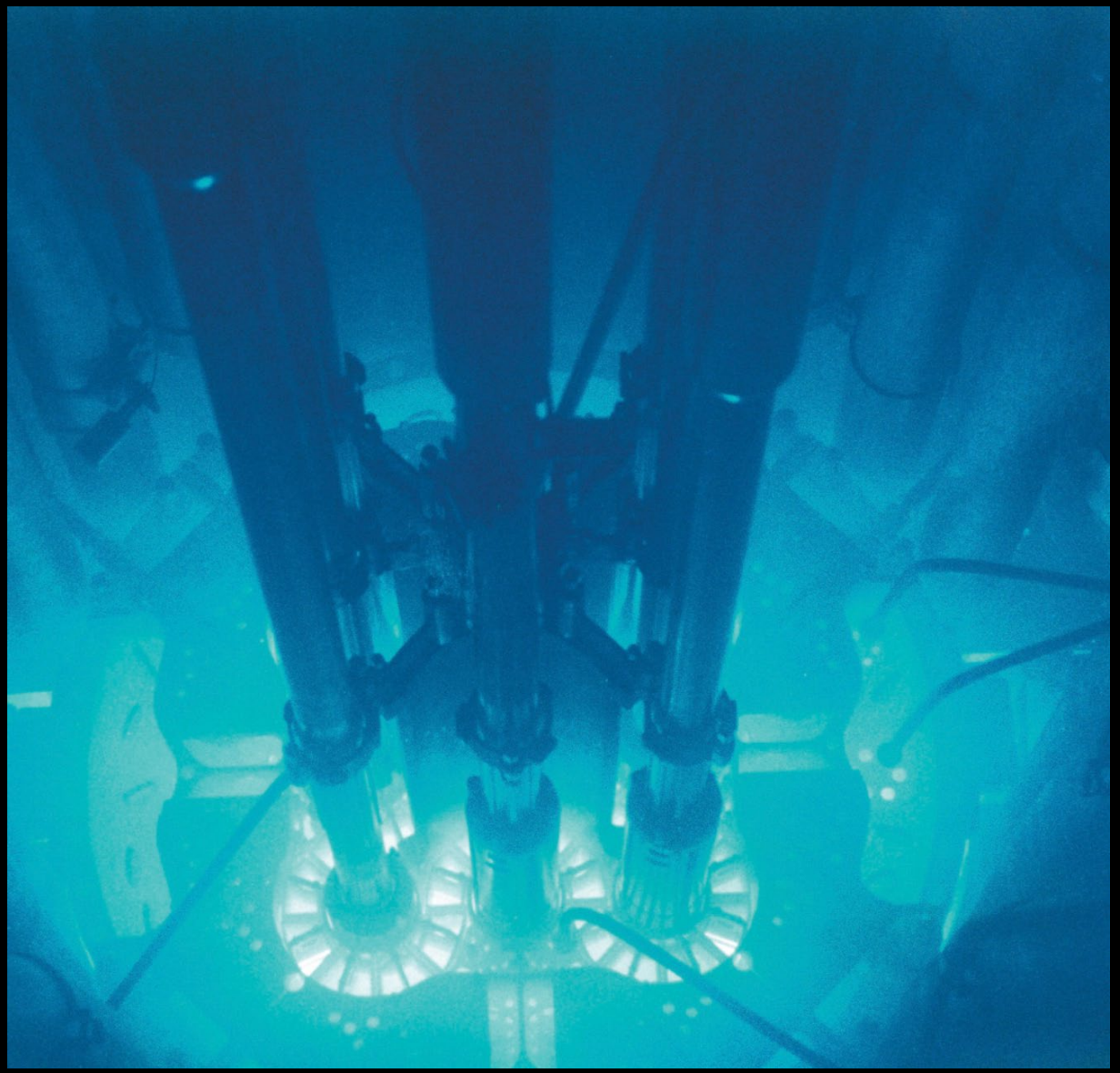
$$\frac{12{,}696}{8} = 827E6 \left(\frac{\pi d^2}{4}\right)(.2) = 1587 = 12$$

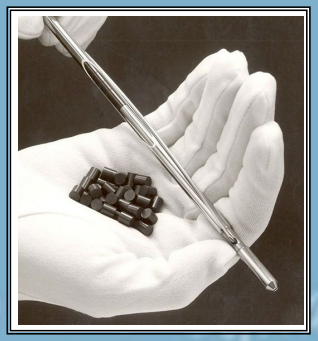
$$d = 3.5\ mm = 0.35\ cm \approx$$

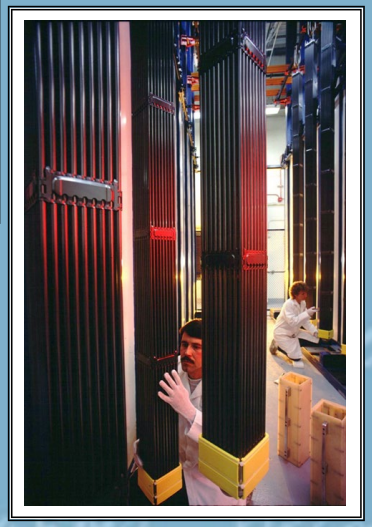
Why Should I Get a P.E. License?

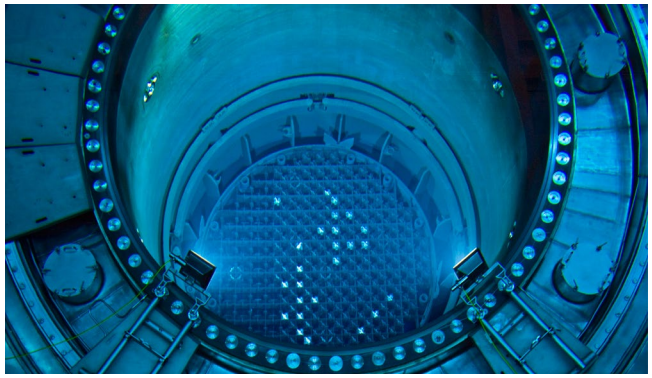
- If a P.E. license is not important, then why not go to a doctor who is not licensed?
- Would you allow a surgeon to operate on you who is not credentialed?
- No, because that is the minimum qualification that you would expect from a medical professional before retaining them.
- Why should clients accept any less from engineers?

Why the Nuclear P.E. License is Necessary









Reactor Core Energy

1 pellet: 5/8-inch in length

1 fuel pin: 11 ft long

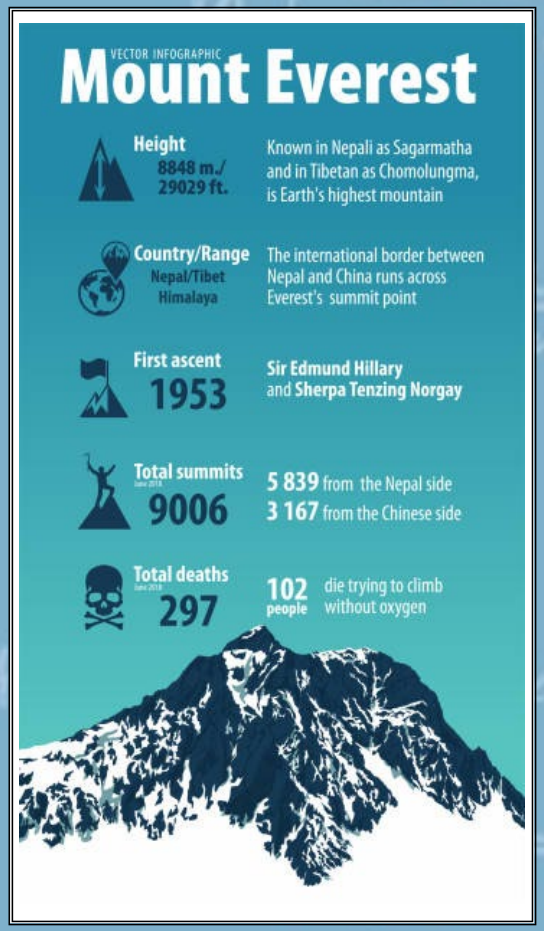
~211 pellets per pin

Fuel Bundles: [17x17] and [14x14]

~250 fuel pins per bundle

193 bundles in a PWR
(~3,400 MWt plant)

48,000 pins in reactor core
10 million fuel pellets per reactor



Reactor Core Equivalent Energy

1 fuel pellet = 2 cords wood

10 million fuel pellets per reactor

1 reactor = 20 million cords of wood

1 cord of wood = 128 ft^3

1 $reactor_{(wood)}$ = 2,560,000,000 ft^3

1 acre = 43,560 ft^2 (~ size of a football field)

A pile of wood covering 1 acre would be ~59,000 ft in height.

Two times as high as Mt. Everest, which is 29,000 ft.

Professional Licensure Matters

- Engineering is not merely knowing and being knowledgeable, like a walking encyclopedia;
- Engineering is not merely analysis;
- Engineering is not merely the possession of the capacity to get elegant solutions to non-existent engineering problems…
- Engineering is practicing the art of the organized, forcing technological change... Engineers operate at the interface between science and society...

3 steps

Getting from point A to P.E.

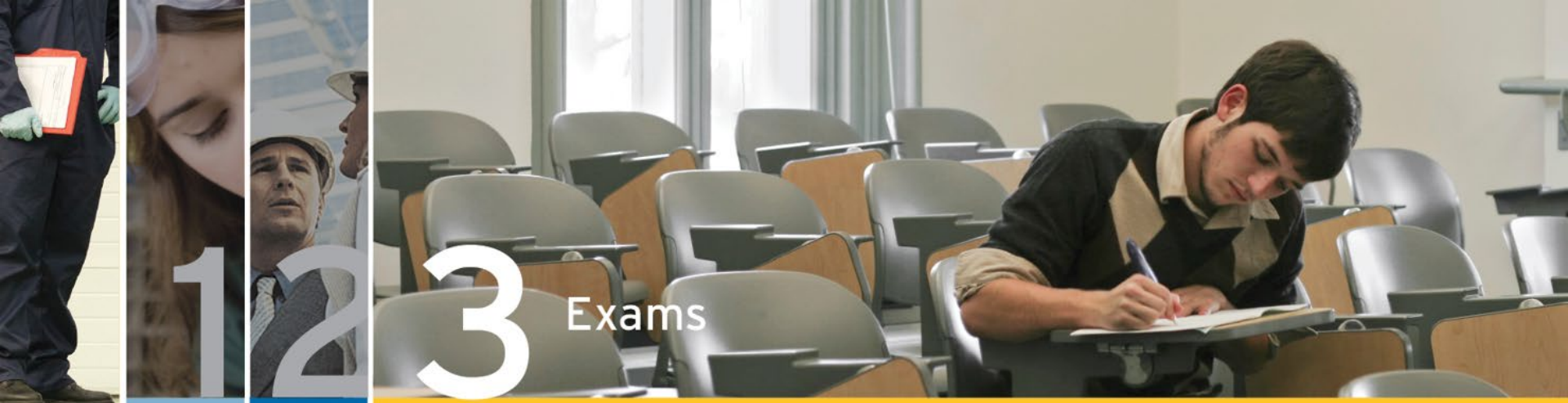
- Education
- Experience
- Exams

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.

2 Experience

- Work under the supervision of a P.E.
- Four years, progressive

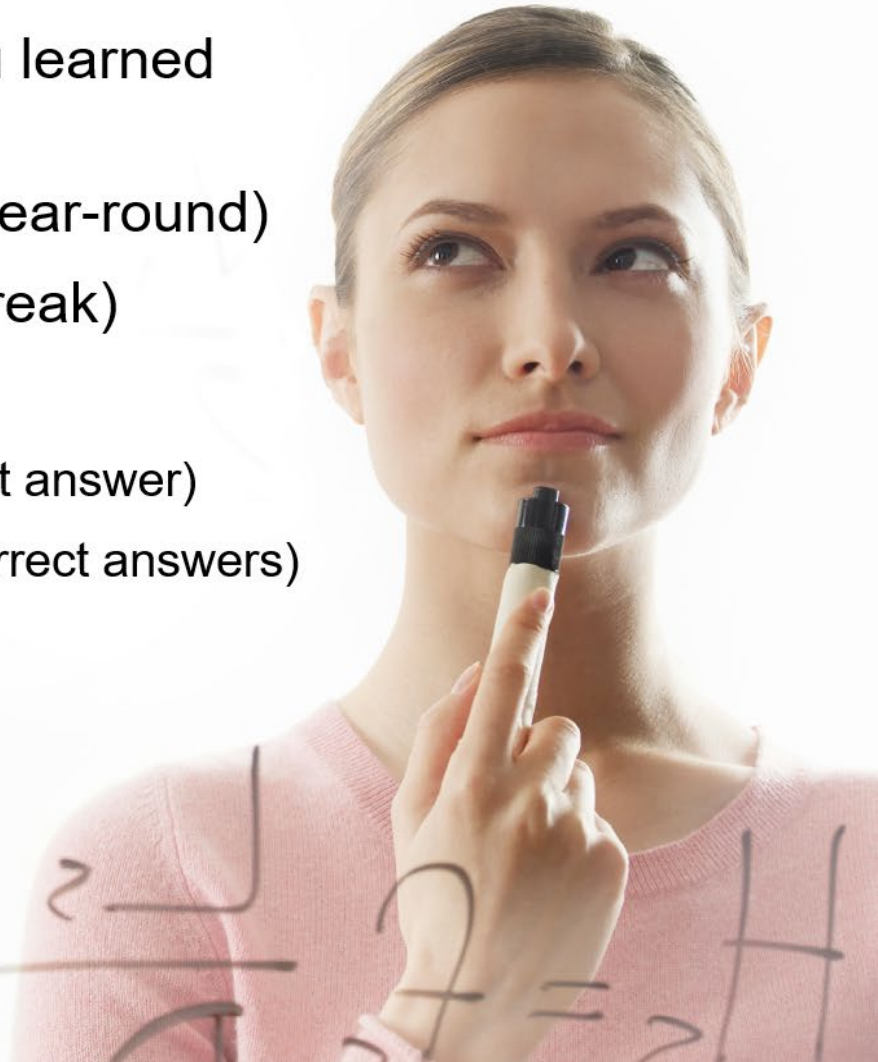


3 Exams

- ☐ Pass the FE exam 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 college
- Computer-Based Test (year-round)
- 6-hour exam (optional break)
- 110 questions
  - multiple choice (one correct answer)
  - multiple option (multiple correct answers)
  - point and click
  - drag and drop
  - fill in the blank



FE Exam Knowledge Domains (Other Disciplines)

Mathematics (8-12)	Statics (9-14)
Probability and Statistics (6-9)	Dynamics (9-14)
Chemistry (5-8)	Strength of Materials (9-14)
Instrumentation and Controls (4-6)	Materials (6-9)
Engineering Ethics and Societal Impacts (5-8)	Fluid Mechanics (12-18)
Safety, Health, and Environment (6-9)	Basic Electrical Engineering (6-9)
Engineering Economics (6-9)	Thermodynamics and Heat Transfer (9-14)

FE Exam Knowledge Domains (Mechanical Discipline)

Mathematics (6-9)	Mechanics of Materials (9-14)
Probability and Statistics (4-6)	Material Properties and Processing (7-11)
Ethics and Professional Practice (4-6)	Fluid Mechanics (10-15)
Engineering Economics (4-6)	Thermodynamics (10-15)
Electricity and Magnetism (5-8)	Heat Transfer (7-11)
Statics (9-14)	Measurements, Instrumentation, and Controls (5-8)
Dynamics, Kinematics, and Vibrations (10-15)	Mechanical Design and Analysis (10-15)

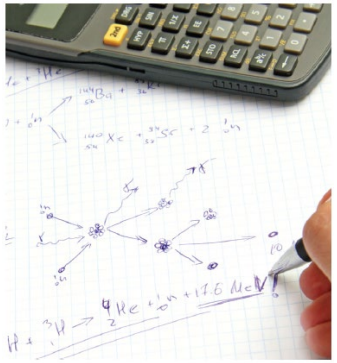
The PE exam: the final step

- Reflects real-world practice
- Developed by your peers
- Tests for minimal competency
- Find specifications and study materials at NCEES.org
- Single reference handbook provided at testing center

The Nuclear PE examination

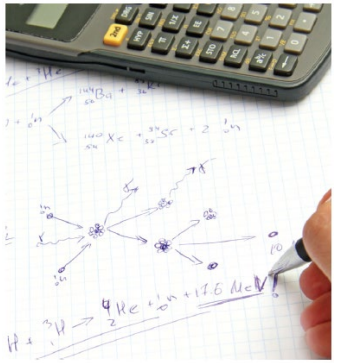
- Computer-Based Test (offered once per year – October)
- 9.5-hour exam (optional break)
- 85 questions
  - multiple choice (one correct answer)
  - multiple option (multiple correct answers)
  - point and click
  - drag and drop
  - fill in the blank

Nuclear P.E. Examination Knowledge Domains



1. Radiological Analysis and Consequences (18-27)
2. Nuclear Fuel Cycle (9-14)
3. Nuclear Systems and Components (13-20)
4. Reactor Physics and Criticality Safety (19-29)
5. Safety Analysis (11-17)

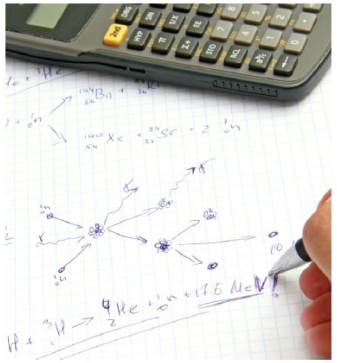
Example Problems



For 2-MeV gamma rays, the linear attenuation coefficient (cm^{-1}) for concrete (ρ = 2.53 gm/cc) is most nearly:

(a) 0.0240
(b) 0.0445
(c) 0.0607
(d) 0.1130

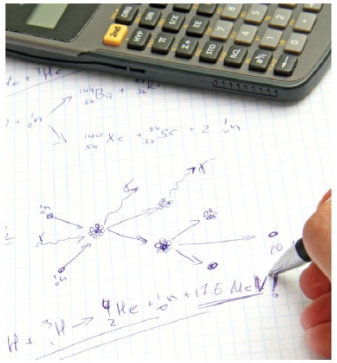
Example Problems



In a Boiling Water Reactor, if the normal heat removal system is operable when the reactor is tripped, then shutdown cooling is provided by:

(a) condensate/feedwater system
(b) reactor core isolation cooling system
(c) makeup service water system
(d) suppression pool system

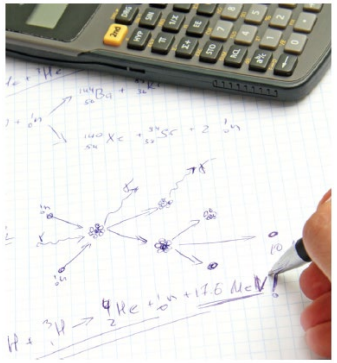
Example Problems



The frequency for loss of offsite power is 0.052/year. The probability that offsite power is lost during the 40-year lifetime of the plant is most nearly:

(a) 0.11
(b) 0.36
(c) 0.88
(d) 1.0

Example Problems



If an 80-kg person is found to have 8,000 Bq of K-40 (beta energy = 1.33 MeV followed by gamma of 1.46 MeV) in their body, the annual dose to the person in micro-sieverts (μS) due to beta decay from K-40 is closest to:

(a) 200
(b) 700
(c) 1,000
(d) 1,500

The big picture

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

Study Materials

We Are Here to Help

The Nuclear PE

Professional Engineering Licensure for Nuclear Engineers

The Credential that Gives you the Edge

The American Nuclear Society offers the following materials to help you prepare for the PE Nuclear Exam:

PE Nuclear Exam Preparation Module Program
A self-study video-based program covering the specification areas that make up the PE Nuclear Exam.

ANS Study Guide for the Professional Engineering Examination in Nuclear Engineering

https://www.ans.org/pe/

Study Materials

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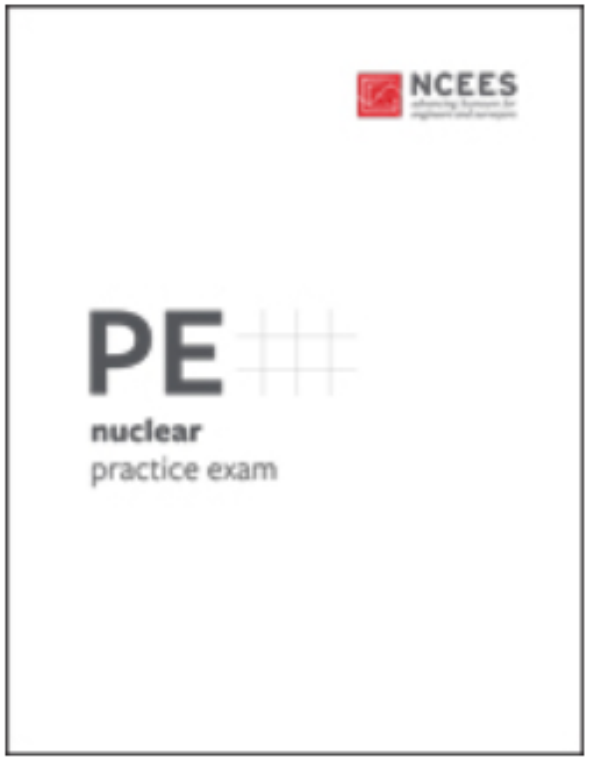

https://account.ncees.org/exam-prep/384

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Key Takeaways / Conclusions

- Obtain meaningful, progressive engineering experience
- Take advantage of prep courses / study materials
- Take exams as soon as you are eligible

https://ncees.org/engineering/pe/nuclear/

https://ncees.org/supplemental/launch-login/

Create a myNCEES account MyNCEES

Download a FREE version of the Nuclear PE Single Reference Handbook.

Licensure

Take the Next Step

- Practicing engineers should demand more from our education system, the engineering profession, and ourselves.
- Licensure is the mark of a professional.
- It's a standard recognized by employers and their clients, by governments and by the public as an assurance of dedication, skill and quality.
- Why should we settle for anything less?