Engineering Clinic Consultant: What's All This Licensure Stuff, Anyway?*

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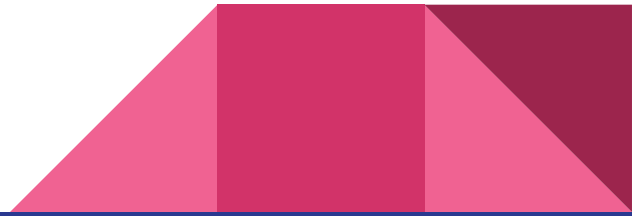
*A credit nod to Bob Pease for "What's all this…"

The Role of Licensure in Consulting (& Engineering)

- What is a Professional Engineer (P.E.)?
- Who needs the P.E.?
- Pathways to the P.E.?
- Maintaining the P.E.
- Tales from the crypt…



What is a Professional Engineer (P.E.)?

- An engineer who has met the requirements defined by a State's Board of Professional Engineers and Land Surveyors
  - There is no universal licensure—just like Teachers, Doctors, and Lawyers and such
  - Some states have reciprocity arrangements with other states

- What are typical steps?
  - Earn an accredited engineering degree (counts as 4 years)
  - Pass the Fundamentals of Engineering (F.E.) exam
  - Complete a minimum period of work under a P.E.
  - Pass the P.E. exam

What is a Professional Engineer (P.E.)?

45:8-28. Definitions (a) The term "professional engineer" within the meaning and intent of this chapter shall mean a person who by reason of his **special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience**, is qualified to practice engineering as hereinafter defined as attested by his license as a professional engineer.

Who Needs a P.E.?

The State Board of Professional Engineers and Land Surveyors regulates the **practice**, licensure and certification of **engineers**, land surveyors, **engineers-in-training**, land surveyors-in-training and **companies offering professional engineering and land surveying services in the State of New Jersey in order to safeguard life, health and property, and promote the public welfare**.

➔ If you're performing ("practicing") engineering in NJ, you need a license. Exceptions: You work for a company that is licensed; you work for the Federal government; you teach…

Who Needs a P.E.?

45:8-42. Employment of licensed engineers by governmental departments No department, institution, commission, board or body of the State Government, or of any political subdivision thereof shall designate, **appoint or employ an engineer or any person to be in responsible charge of professional engineering work other than a duly qualified professional engineer who has been licensed by the State of New Jersey**, prior to the designation, appointment or employment by such department, institution, commission, board or body of the State Government, or any political subdivision thereof.

Pathways to the P.E.—New Jersey State Board of Professional Engineers and Land Surveyors

- **Website:** https://www.njconsumeraffairs.gov/pels/Pages/default.aspx
  Contact: Keith Miller
  Email: MillerK@dca.njoag.gov
  Phone: (973) 504-6460
  Fax: (973) 273-8020
  Address:124 Halsey Street, Third Floor
  Newark, New Jersey 07102
  United States

- **Members**

Manar Alsharaa P.E.
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Pathways to the P.E.—New Jersey State Board of Professional Engineers and Land Surveyors

a. **Graduation from a board approved curriculum in engineering of four years** or more; a specific record of **an additional four years or more of experience in engineering work of a character satisfactory to the board**, and indicating that the applicant is **competent to be placed in responsible charge** of such work; and successfully **passing all parts of the written examination**;

a. Graduation from a board approved curriculum in engineering or engineering technology of four years or more; and successfully **passing the fundamentals portion of the written examination** which is designated as Part F.

Pathways to the P.E.—New Jersey State Board of Professional Engineers and Land Surveyors

Part F--**Fundamentals of Engineering-**--This examination is intended to assess the applicant's competency in the fundamental engineering subjects and basic engineering sciences, such as **mathematics, chemistry, physics, statistics, dynamics, materials science, mechanics of materials, structures, fluid mechanics, hydraulics, thermodynamics, electrical theory, and economics.** A knowledge of P.L.1938, c.342 (C.45:8-27 et seq.) is also required.

https://ncees.org/wp-content/uploads/2022/09/FE-Electrical-and-Computer-CBT-specs.pdf

FE: ECE Specifications

1. **Mathematics** (11-17) A. Algebra and trigonometry B. Complex numbers C. Discrete mathematics D. Analytic geometry E. Calculus (e.g., differential, integral, single-variable, multivariable) F. Ordinary differential equations G. Linear algebra H. Vector analysis
2. **Probability and Statistics** (4–6) A. Measures of central tendencies and dispersions (e.g., mean, mode, standard deviation) B. Probability distributions (e.g., discrete, continuous, normal, binomial, conditional probability) C. Expected value (weighted average)
3. **Ethics and Professional Practice (**4–6) A. Codes of ethics (e.g., professional and technical societies, NCEES Model Law and Model Rules) B. Intellectual property (e.g., copyright, trade secrets, patents, trademarks) C. Safety (e.g., grounding, material safety data, PPE, radiation protection)

FE: ECE Specifications

4. **Engineering Economics** (5–8) A. Time value of money (e.g., present value, future value, annuities) B. Cost estimation C. Risk identification D. Analysis (e.g., cost-benefit, trade-off, break-even)
5. **Properties of Electrical Materials** (4–6) A. Semiconductor materials (e.g., tunneling, diffusion/drift current, energy bands, doping bands, p-n theory) B. Electrical (e.g., conductivity, resistivity, permittivity, magnetic permeability, noise) C. Thermal (e.g., conductivity, expansion)
6. **Circuit Analysis (DC and AC Steady State)** (11–17) A. KCL, KVL B. Series/parallel equivalent circuits C. Thevenin and Norton theorems D. Node and loop analysis E. Waveform analysis (e.g., RMS, average, frequency, phase, wavelength) F. Phasors G. Impedance

FE: ECE Specifications

7. **Linear Systems** (5–8) A. Frequency/transient response B. Resonance C. Laplace transforms D. Transfer functions
8. **Signal Processing** (5–8) A. Sampling (e.g., aliasing, Nyquist theorem) B. Analog filters C. Digital filters (e.g., difference equations, Z-transforms)
9. **Electronics** (7–11) A. Models, biasing, and performance of discrete devices (e.g., diodes, transistors, thyristors) B. Amplifiers (e.g., single-stage/common emitter, differential, biasing) C. Operational amplifiers (e.g., ideal, nonideal) D. Instrumentation (e.g., measurements, data acquisition, transducers) E. Power electronics (e.g., rectifiers, inverters, converters)

FE: ECE Specifications

10. **Power Systems (**8–12) A. Power theory (e.g., power factor, single and three phase, voltage regulation) B. Transmission and distribution (e.g., real and reactive losses, efficiency, voltage drop, delta and wye connections) C. Transformers (e.g., single-phase and three-phase connections, reflected impedance) D. Motors and generators (e.g., synchronous, induction, dc)
11. **Electromagnetics** (4–6) A. Electrostatics/magnetostatics (e.g., spatial relationships, vector analysis) B. Electrodynamics (e.g., Maxwell equations, wave propagation) C. Transmission lines (high frequency)
12. **Control Systems (**6–9) A. Block diagrams (e.g. feedforward, feedback) B. Bode plots C. Closed-loop response, open-loop response, and stability D. Controller performance (e.g., steady-state errors, settling time, overshoot)

FE: ECE Specifications

13. **Communications** (5–8) A. Basic modulation/demodulation concepts (e.g., AM, FM, PCM) B. Fourier transforms/Fourier series C. Multiplexing (e.g., time division, frequency division, code division) D. Digital communications
14. **Computer Networks (**4–6) A. Routing and switching B. Network topologies (e.g., mesh, ring, star) C. Network types (e.g., LAN, WAN, internet) D. Network models (e.g., OSI, TCP/IP) E. Network intrusion detection and prevention (e.g., firewalls, endpoint detection, network detection) F. Security (e.g., port scanning, network vulnerability testing, web vulnerability testing, penetration testing, security triad)

FE: ECE Specifications

15. **Digital Systems** (8–12) A. Number systems B. Boolean logic C. Logic gates and circuits D. Logic minimization (e.g., SOP, POS, Karnaugh maps) E. Flip-flops and counters F. Programmable logic devices and gate arrays G. State machine design H. Timing (e.g., diagrams, asynchronous inputs, race conditions and other hazards)
16. **Computer Systems** (5–8) A. Microprocessors B. Memory technology and systems C. Interfacing
17. **Software Engineering** (4–6) A. Algorithms (e.g., sorting, searching, complexity, big-O) B. Data structures (e.g., lists, trees, vectors, structures, arrays) C. Software implementation (e.g., iteration, conditionals, recursion, control flow, scripting, testing)

Pathways to the P.E.—New Jersey State Board of Professional Engineers and Land Surveyors

Completion of a **master's degree in engineering** shall be considered as equivalent to **one year of engineering experience** and completion of a **doctor's degree in engineering** shall be considered as equivalent to **one additional year of engineering experience**. In considering the qualifications of applicants, **engineering teaching experience** may be considered as engineering experience for a **credit not to exceed two years**.

Pathways to the P.E.—New Jersey State Board of Professional Engineers and Land Surveyors

Part P--**Specialized Training-**--This examination is intended to assess the extent of the applicant's more **advanced and specialized professional training** and experience especially in his chosen field of engineering.

https://ncees.org/exams/pe-exam/electrical-and-computer/

PE ELECTRICAL AND COMPUTER:

COMPUTER ENGINEERING

ELECTRONICS, CONTROLS, AND COMMUNICATIONS

POWER

Pathways to the P.E.—New Jersey State Board of Professional Engineers and Land Surveyors

Engineering experience of a character satisfactory to the board shall be determined by the board's evaluation of the applicant's experience relative to the ability to design and supervise engineering projects and works so as to insure the safety of life, health and property.

➔ Provide documentation, letters of reference

The mere execution, as a contractor, of work designed by a professional engineer, or the supervision of construction of such work as a foreman or superintendent, or the observation of construction as an inspector or witness shall not be deemed to be experience in engineering work.

Maintaining the P.E.

- Renewal Fee
- Completion of Continuing Education Units (Credits)

➔ If your registration lapses, you will have to reapply!

Tales From the Crypt

- Expert Witness(ing)
  - Field work
  - Reports of opinions
- Working w/ Lawyers
  - Depositions
  - Court testimony
- Review, review, review
- Write, write, write
- “Yes” or “No”
- Those hoof beats are…..