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## TO PE OR NOT TO PE ... THE SEQUEL

By Steven F. Barrett and Mitchell A. Thornton

**Why become a licensed professional software engineer? What's the process? New initiatives have emerged to provide a path.**

Editor's note: In 2006, I published an article on professional licensure, "To P.E. or not to P.E.," in the *IEEE-USA Today's Engineer* magazine. That publication reran the article last summer due to high interest in the topic. In this column, I highlight some of the information from that and other *Today's Engineer* articles about whether and why to seek professional licensure, while Mitchell A. Thornton offers a perspective from industry.

—Steven F. Barrett

**M**any engineers practice in areas that affect the public health, safety, and welfare, and each US jurisdiction (states and territories) has licensing laws to ensure that these engineers meet some level of minimal competence. Such competence might be defined as the minimum threshold of knowledge to ensure protection of the public. This licensing process wasn't designed to grade a candidate's ability, but rather to determine if the candidate exceeds the threshold of minimal competence.

Becoming a licensed professional engineer requires dedication and hard work. Given this, the question of why to pursue a license is a valid one. Many US jurisdictions' licensing laws have provisions for an "industry exemption" clause. According to such clauses, individuals who practice engineering exclusively for their

employer don't need to be licensed if they offer no engineering services to the public. In a dynamic and rapidly changing economy, however, a professional engineering (PE) license offers several benefits, including that it lets you provide full- or part-time engineering consulting services. The February 2010 issue of *Today's Engineer* discussed several other reasons for pursuing licensure (see [www.todaysengineer.org/2010/Feb/PE.asp](http://www.todaysengineer.org/2010/Feb/PE.asp)).

### The Licensing Process

To become a licensed professional, you must successfully complete two examinations and have documented experience in the practice of engineering. The National Council of Examiners for Engineering and Surveying wrote the Model Law to help jurisdictions establish their licensing regulations. The NCEES, a national nonprofit organization headquartered in Clemson, South Carolina, is composed of engineering and land surveying licensing boards representing all US states and territories. The NCEES is also responsible for administering the exams that engineers must pass to obtain professional engineer certification. The law governing engineering licensure practice within a given jurisdiction is written and enforced by the jurisdiction's licensing board. Therefore, it's important to review the specific process for becoming a licensed engineer within your particular state or territory; the NCEES

Web site ([www.ncees.org](http://www.ncees.org)) has links to information for all jurisdictions.

Although specific details vary, to obtain a PE license, most jurisdictions require that candidates

- complete a bachelor of science degree in engineering in a program accredited by the Accreditation Board for Engineering and Technology (ABET),
- pass the Fundamentals of Engineering (FE) examination,
- have experience in actual engineering practice, and
- pass the Professional Engineering (PE) examination.

The FE exam tests engineering fundamentals in two different parts: a 120-question, four-hour morning session; and a 60-question, four-hour afternoon session. All questions are multiple choice. The morning session covers basic science, mathematics, engineering, economics, and ethics. The afternoon session is discipline-specific, covering all primary subject areas within a given discipline. The NCEES Web site provides a detailed specification of the examination, as well as study materials and practice exams, which are also available from other publishers. During the exam, candidates are allowed to use the *NCEES Reference Handbook* (also available on the NCEES Web site) which contains key equations and helpful information.

## PROFESSIONAL ORGANIZATIONS

To learn more about licensure and registration, see:

- IEEE-USA's Licensure and Registration Committee: [www.ieeeusa.org/volunteers/committees/lrc](http://www.ieeeusa.org/volunteers/committees/lrc).
- The National Society of Professional Engineers: [www.nspe.org](http://www.nspe.org).
- The National Council of Examiners for Engineering and Surveying: [www.ncees.org](http://www.ncees.org)

Before you can take the PE exam, most jurisdictions require that you have experience in the engineering field—typically four years of practice. An advanced engineering degree also counts toward this requirement. As before, you should review specific requirements in your jurisdiction. Engineering practice is usually documented by asking your employment supervisors to certify your completed engineering work. It's your responsibility to initiate this documentation process, and it's best to start the process early. Once you've met your jurisdiction board's requirements of proper engineering experience, you can take the PE examination.

The PE exam is eight-hours long and completely discipline specific. The NCEES Web site offers detailed specifications for each engineering discipline examination. The Electrical and Computer Engineers exam, for example, is an 80-question multiple-choice test divided into a morning and an afternoon session. Examinees must choose a specific test version (power, computer engineering, or electrical and electronics) and can bring reference materials to the exam. It's important to carefully choose key textbooks from each of the exam's different areas, as well as an engineering mathematics textbook. As with the FE exam, the NCEES provides study material and practice examinations for the PE exam, as do private vendors.

Several years ago, the NCEES decided to limit the choice of calculators that people could use during the FE and PE exams to protect the exams' integrity. It's best to use an approved model during both self-study and exam preparation. Currently, only the following models are approved for use on the FE and PE exams:

- *Casio*: All fx-115 models (any Casio calculator must contain fx-115 in its model name).
- *Hewlett Packard*: All HP 33s and HP 35s models.
- *Texas Instruments*: All TI-30X and TI-36X models.

The NCEES Web site offers additional guidelines on acceptable calculators.

### Exam Creation and Licensing Initiatives

The NCEES staff consists of dedicated professionals who coordinate the efforts of hundreds of licensed professional engineers and surveyors, who in turn donate their time and expertise to formulate and create the actual exams.

As an example, the Electrical and Computer PE exam committee consists of approximately 30 registered professional engineers from industry and academia who represent different technical specialties within this area. What all committee members share is a deep commitment to and respect for the discipline and the registration process; they consider their exam construction efforts both a great honor and a great responsibility.

Committee members originate some of the questions and edit others submitted by volunteers. In late March 2009, an exam writer's workshop was held in Dallas, Texas, to train new licensed volunteers on the process of exam construction and item writing. Each examination is thoroughly reviewed by a team of dedicated professionals, as is each exam question before it becomes part of an exam. Furthermore, each exam is subjected to a battery of post-exam statistical analyses by an external audit

agency to ensure that each question measures up under the scrutiny of impartial experts.

There are several new licensing initiatives of interest to IEEE members. Some jurisdictions now allow an FE examination waiver if you have a PhD in engineering. Also, several licensure organizations—including the IEEE-USA Licensure and Registration Committee, the IEEE Computer Society, the National Society of Professional Engineers, and the Texas Board of Professional Engineers—have established a path of licensure for software engineers. This initiative recently cleared some major goals; the examination development effort will begin soon and the first software engineering licensure examination should occur with 24 months.

### A Personal View

As a licensed engineer, I've often reflected on the value of the professional licensure process and whether it was worth the time and effort. The answer is always a resounding "yes!" Aside from duties as a full-time faculty member, I offer a consulting service on embedded systems design applications for industry. This consulting work would not have been possible without a professional license. Also, I originally obtained my PE license in Colorado and registered in that state. Upon accepting a teaching position in Wyoming, I applied for licensing there through a *comity* procedure, which lets engineers register in other jurisdictions. Although state requirements vary, having licensure in one state and establishing an NCEES record can greatly simplify acceptance in multiple jurisdictions. This is especially important if your consulting

## A VIEW FROM INDUSTRY


By Mitchell A. Thornton

I obtained my PE license in 1991, four years after graduating with a BSEE degree. After graduation, I was employed by a defense contractor and worked in the aerospace industry. One of my mentors was a senior aerospace engineer who encouraged me to become licensed. At that time, I viewed licensure with great respect. I understood that it was a commitment to hold public health, safety, and welfare in the highest regard, and was glad to have reached the point where achieving licensure was possible. What I didn't realize, however, was all of the other privileges and opportunities that I'd gain, and how licensure would effect my future professional life.

After becoming licensed, I gradually realized practical and personal benefits. It allowed me to pursue independent consulting opportunities, network with talented and interesting people across the US, and—most importantly to me—to give something back to the engineering profession that I enjoy so much. As a young engineer with only four years' experience, such benefits weren't apparent, much less in the forefront of my mind. Now, however, with more than 25 years of experience, these activities are among the most rewarding of my professional career.

Licensure is more than just a professional credential. It has enabled me to grow and to obtain a level of professional career satisfaction that I didn't fully appreciate when I was starting out. I highly recommend that all engineering students and young professionals investigate and pursue licensure so they, too, can realize its benefits.

work takes you to many different jurisdictions. The sidebar, "A View from Industry," describes the licensing experience from the industry side.


If you're interested in pursuing licensure, the first step is to contact the appropriate state licensing board to review detailed procedures within the jurisdiction. Also, I strongly recommend that you obtain study materials and start preparing for the examinations. If you're already licensed and interested in serving as a volunteer, contact the NCEES for details. 

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