

How to Pass the Professional Engineering Licensing Exams (FE and PE): Fall 2008 By Dennis Dahlquist, P.E.

It's time to get ready for the professional engineering exams again and time to review some strategies for passing the Professional Engineering examinations (Fundamentals of Engineering, FE and Professional Engineer, PE). The following are some of the strategies that many people have found useful in preparing for and taking the exam.

If you are interested in taking the Professional Engineering exams, contact the state board of the state in which you want to be licensed (in California; California Board of Engineers and Land Surveyors www.pels.ca.gov). To find the state board contact information, refer to National Council of Examiners for Engineering and Surveying (NCEES) web site, www.ncees.org NCEES has a listing of all the state licensing boards (http://www.ncees.org/licensure/licensing_boards/). You may also consider taking a review course before the exam. Check around. There are many for the FE and some for the PE's (CE, ME, EE, etc.). To find review courses, check with NSPE, www.nspe.org, to find the state society of interest.

The professional licensing examinations require review. They are not to be taken lightly. The State Board of Registration has the latest data on the previous exams; however the pass rates (number of people passing) are in the range of 20% to 50% (National data, 70% to 80%, www.ncees.org/exams/pass_rates). This varies from exam to exam and year to year. The passing data can be confusing. Looking at the national passing data, the passing rates look much higher. Keep in mind however, that these passing scores are averaged with many other states. It is probably best to check with the state board in the state you are going to take the exam in for the best data on the exam passing rates.

The exams are not easy and this is by design. The exams are designed by engineers, for engineers. The key point here is that the exam is a multi-level test of one's engineering ability. To pass the exam, you must engineer your way to the exam and through the exam. You engineer your way to the exam by studying and reviewing the necessary material, and engineer your way through the exam by using good engineering technique. The bad news is that you need to take a different approach to the exam than the old college way (especially if you crammed the night before exams). The good news is that the approach you need to take for the exam is an engineering approach (one you are more familiar with now).

Exam Format

The first of the licensing exam series is the Fundamentals of Engineering (FE). It is a multiple-choice, closed-book test (however, a reference book is provided, www.ncees.org/exams/study_materials/fe_handbook/). The exam includes a morning of general engineering problems and is followed by the afternoon section where you have your choice of a general or a discipline specific exam. The second test of the series, The Professional Engineer exam, is discipline specific. It is also a multiple choice exam, but is an open-book exam with a combination of breadth (morning) and depth (afternoon) of the discipline. You qualify to take this exam after passing the FE and completing some years as a practicing engineer (this varies somewhat state to state, but usually ranges from 2 to 4 years, check with the state board).

Becoming a P.E. (short version)

Acquire a good education, a Bachelors (BS) or a Masters (MS) engineering degree from an ABET (Accreditation Board for Engineering and Technology www.abet.org) accredited school. This will save you some qualifying time for the exams. Take the FE while you are finishing school (if not, take a review

course tailored for people who have been out of school for some time). Work in your discipline for the number of years required by the Board, (this varies based upon education, discipline, and state), and take the PE exam in your discipline. Upon passing the exam you become a Consulting Engineer, also known as a Licensed Professional Engineer (and you can now legally put P.E. after your name).

I am signed up for the exam what do I do now? How do you engineer your way to the exam? Seek out review courses near you or online (exam help seminars and review courses both face to face and online are available at: <http://pe.quartzvalley.com/>). Find others who are planning to take the exam and form a study group. Work problems, problems, problems. Obviously, you have other obligations; however, you want to make a commitment to yourself to pass this exam. Set up a schedule for studying. You are preparing yourself for a mental marathon. Just as you wouldn't try to run 26 miles without training for it, you can't expect to pass the exams without studying. The more problems you work, the better. However, you don't want to just work on the problems you like. Working on the other problems expands your ability to work a larger range of problems.

Materials You Will Need

When working practice problems in preparation for the exam; use the same materials that you will be using on the exam, calculator(s) and reference books. You want to be very familiar with your tools. **Reference books:** For the FE your [FE Reference Handbook](#) will be provided to you (so prior to the exam you want to be familiar with it). The PE is open book, so you can take what you want. But, you had best know the references you are planning to take into the exam, because there is no time during the exam to read books. **Calculators:** No computers or any calculator with communication capability are currently allowed during the exam. To find out the latest information on calculators allowed on the exam, check out [NCEES Calculator Policy](#). Also make sure to check with the state board for the current rules on what is acceptable in the exam.

Exam Preparation and Performance

While you are doing your practice problems, try to not use your calculator very much. "What do you mean? This is engineering; you HAVE to use the calculator!"...you might say. However, remember that the exam is a test of your engineering ability, not how well you use a calculator. This is an engineering exam, not a math test. Calculator time is "dead" time. Every time you use your calculator it is time you are not spending "thinking" about (engineering) the problem at hand. Yes, you will need to use your calculator, just use it wisely. How does one calculate without using a calculator? Use your brain, it is much faster! For example, what is the common log of 1000? Before you reach for your calculator, think about it. What is the power of ten representation of 1000? 1000 is ten to the third power. What is the log of 1000, it is 3! See you can do it without a calculator. Fine you say, but what about the log of 2,354? Well, you can come up with a close approximation of 2,354. You know the log of 1,000 is 3 and the log of 10,000 is 4, so the log of 2,354 is between 3 and 4, and closer to 3. This may be enough information to isolate an answer in a multiple-choice question or at least throw out some answers.

Try to check your answers as much as possible. I realize that you are under time restrictions; however, you want to at least estimate your answer. Under the, "stress of test" you can hit extra keys on the calculator (or maybe make a calculation error) and by mentally estimating or doing an alternate solution, you will be able to catch these errors.

Study hard and study well. You want to practice exam conditions when solving the practice problems. This means you probably will not have a TV (or computer) during the exam, so don't study with the TV. On the other hand, you probably will not have a completely quiet and isolated room either, so study accordingly.

[FE Reference Handbook](#): For the **FE exam**, get a hard copy of the book and use it while you are studying.

You will want to be as familiar with this reference as you can, it will be the only reference you will have during the exam. You will not be able to take in your copy of the FE Reference Handbook to the FE exam, but they will give you a new copy at the exam (so, make sure when you are studying you are using the version that will be at the FE exam).

For the **PE exam**, I would also recommend getting a hard copy of the Fundamentals of Engineering Reference Handbook and including it with your reference materials you take into the exam. The FE Reference Handbook has the discipline specific information, which would make it a good reference for the PE exams. It would certainly help on the breath section of the exam (the morning part of the PE exam).

Just before the exam, get two good nights of sleep. This is not to imply that you sleep for 16 hours before the exam. That will create another set of problems. It seems that today's society is run by a lot of people under sleep deprivation and you want a useful rested brain for the exam.

Don't cram before the exam. This may have worked in college, but it doesn't work well for the Professional Engineering exams. Being rested for the exams is very important. You will know a lot of information for the exam if you have studied along the way. However, it will be of no use to you if your brain is asleep on the exam day.

Strategies during the Exam

You want to develop a plan for the exam. One I recommend is to read the exam. Read through all the questions and classify them into; "easy", "will require some work", and "I don't know ". This should take 6 - 12 minutes, depending on the exam and you. Implement your plan. The easy ones are best to answer during the first pass through as you read them; however, watch the time. Don't spend all of your time on the problem(s) you like. Get them done as soon as possible. You are going to have to spend your time on the others, i.e., the ones you don't like as much. If the whole exam is easy for you, great, do it and go home. For most people, there aren't enough of the "easy" problems for them to pass the exam (otherwise the pass rates would be higher).

On the "will require some work" problems, don't spend your time completely calculating the problems. A natural human reaction is to start at the beginning and serially move to the end. You don't have time for that. Check as you are calculating, to see if you have enough information to isolate the answer. For multiple-choice questions, if two answers are correct and there is a selection for "all", select it and go on. Don't take the time to prove to yourself all the answers are correct. Use the answers from multiple choice questions to back calculate, this can save you time. You need to be efficient with your time.

Make sure that when you are answering a question, you are filling in the answer for that question. For example, if you are answering question 33, make sure you are filling in the answer for 33. It may seem unnecessary to even mention this; of course for problem 33 you would fill the answer for problem 33. But you must remember during the stress of test you might not. Many times I have heard from people after taking the exam. They thought they had done quite well upon leaving the exam realized their answer sheet did not reflect the questions they had skipped over. Taking the last 5 to 10 minutes of the exam to check your answers will not work very well on these exams. You will need to develop your own methods of check to make sure you have answered the correct question.

By reading the "I don't know" problems again, you may discover that they can be moved into the category of "may require some work". If not, do some intelligent guessing. If you find yourself in a problem and it just looks too hard, remind yourself that you are not "looking" at it correctly. This helps in two main ways. First is that this will cause you to re-look at the problem and there may be something you missed. The second is more of a psychological help. If you think it is too hard for you, you may convince yourself and give up. Don't give up; just look at it differently. That is the main point of being an engineer. Don't give up; try another way. That's what being an engineer is all about, trying until you find a solution. The people who give up are not engineers; the people who get it done are engineers.

Summary Check List: Before the exam:

- Check with the Board for an Application and current requirements for the exams.
- Develop a plan for the exam. How are you going to engineer your way to and through the exam? One specialty area is not enough to pass the exam.
- Study for the exam, take a review course, and/or form a study group.
- Familiarize yourself with your calculator and reference materials.
- Make sure you going into the exam fully rested.

On the exam:

- Read all the problems and sort by difficulty.
- Estimate as much as possible.
- Make efficient use of the calculator and your time.
- Keep in mind, if it looks too hard you are not looking at it correctly.
- Check the answers; make sure your answer is the answer to the question asked.

Good luck, on your path to becoming a professional engineer.

Links for further information:

ABET, Accreditation Board for Engineering and Technology www.abet.org

State Board locator: http://www.ncees.org/licensure/licensing_boards/

California State Board of Registration: <http://www.pels.ca.gov/>

NSPE, National Society of Professional Engineers: www.nspe.org

How to pass **FE(EIT) and PE exam seminars** and review courses: <http://pe.quartzvalley.com/>

NCEES, National Council of Examiners for Engineering and Surveying (NCEES): www.ncees.org

FE your reference book www.ncees.org/exams/study_materials/fe_handbook

Calculator Policy www.ncees.org/exams/calculators

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