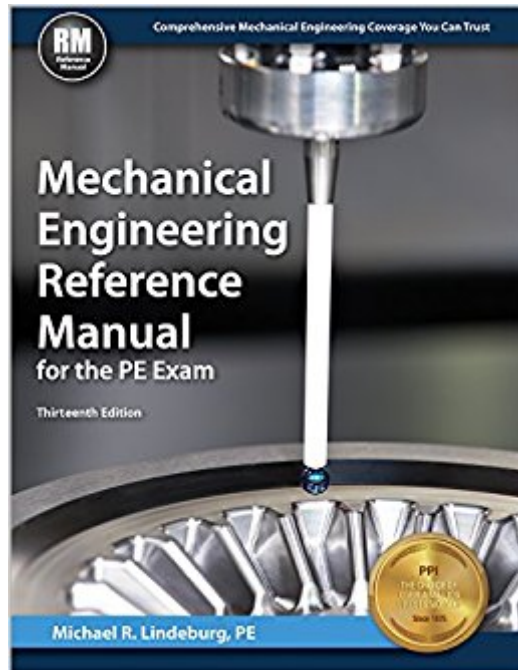




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# Mechanical Engineering Reference Manual For The PE Exam, 13th Ed



## Synopsis

Comprehensive Mechanical Engineering Coverage You Can Trust The Mechanical Engineering Reference Manual is the most comprehensive textbook for the Mechanical PE exam. This book's time-tested organization and clear explanations start with the basics to help you quickly get up to speed on common mechanical engineering concepts. Together, the 76 chapters provide an in-depth review of NCEES Mechanical PE exam topics. The extensive index contains thousands of terms, most indexed in a variety of ways, in anticipation of how you'll search for them.

Features of the Mechanical Engineering Reference Manual: over 120 appendices containing essential support material over 375 clarifying example problems thousands of equations, figures, and tables industry-standard terminology and nomenclature equal support of U.S. customary and SI units

After you pass your exam, the Mechanical Engineering Reference Manual will continue to serve as an invaluable reference throughout your mechanical engineering career.

Topics Covered:

- Dynamics and Vibrations: Kinematics; Kinetics; Power Transmission Systems; Vibrating Systems
- Materials: Engineering Materials Properties and Testing; Thermal Treatment of Metals
- Fluids: Fluid Properties; Fluid Statics; Fluid Flow Parameters; Fluid Dynamics; Hydraulic Machines
- Power Cycles: Vapor, Combustion, and Nuclear Power Cycles; Refrigeration and Gas Compression Cycles
- HVAC: Psychrometrics; Fans, Ductwork, and Ventilation; Heating and Cooling Loads; Air Conditioning Systems
- Heat Transfer: Natural Convection; Evaporation; Condensation; Forced Convection; Radiation
- Machine Design: Basic and Advanced Machine Design; Pressure Vessels
- Thermodynamics: Inorganic Chemistry; Fuels and Combustion; Properties of Substances
- Control Systems: Modeling and Analysis of Engineering Systems
- Plant Engineering: Manufacturing Processes; Instrumentation and Measurements; Materials Handling and Processing; Fire Protection Systems; Environmental Pollutants and Remediation; Hazardous Material Storage and Disposal
- Fundamentals: Math Review; Probability; Statics; Engineering Economic Analysis
- Law and Ethics: Engineering Law; Ethics

What's New in This Edition 36 chapters with new material, and 46 chapters with revisions to existing material 300 new equations, and 128 updated equations 27 new tables, and 31 updated tables 7 new examples, and 34 updated examples 10 new appendices, and 27 updated appendices 35 new figures, and 28 updated figures 1,094 new index entries, and 108 updated index entries

## Book Information

Series: Mechanical Engineering Reference Manual

Hardcover: 1488 pages

Publisher: Professional Publications, Inc.; 13 edition (April 15, 2013)

Language: English

ISBN-10: 1591264146

ISBN-13: 978-1591264149

Product Dimensions: 8.5 x 2.5 x 11 inches

Shipping Weight: 6 pounds

Average Customer Review: 4.6 out of 5 stars 165 customer reviews

Best Sellers Rank: #47,590 in Books (See Top 100 in Books) #16 in Books > Engineering & Transportation > Engineering > Chemical > Fluid Dynamics #30 in Books > Science & Math > Physics > Dynamics > Thermodynamics #55 in Books > Textbooks > Science & Mathematics > Mechanics

## Customer Reviews

Michael R. Lindeburg, PE, is one of the best-known authors of engineering textbooks and references. His books and courses have influenced millions of engineers around the world. Since 1975, he has authored over 40 engineering reference and exam preparation books. He has spent thousands of hours teaching engineering to students and practicing engineers. He holds bachelor of science and master of science degrees in industrial engineering from Stanford University.

I just recently passed the mechanical PE exam (fluids discipline), and I thought I would share the studying strategy that seemed to work for me. The very first thing you should do is purchase this book, the Mechanical Engineering Reference Manual (MERM), even if you do not plan to take the PE for several years. This is an excellent book that is useful for any mechanical engineer to have. Plus, if you begin to use it now, it will only help to make you more comfortable with it for the exam. Begin your study about 5-6 months before the exam. At this point you should also purchase the associated Practice Problems for the MERM. Each day, read a chapter and then try to work the practice problems from that chapter. This will take you about 1-2 hours per day. The key is to not burn yourself out, so begin early and only do a set amount per day. On some days when the chapter is short, or you have extra time you could read and work problems for an extra chapter or two. Also, I decided to skip the math and statistics chapters because I felt like I still remembered the basics and there are no general math questions on the exam. So if you feel the same way, you can eliminate 12-13 chapters right off the bat. At this pace, in about 3 months you will have read the entire book (around 1500 pages) and at least attempted every single practice problem. At this point

you will be in full panic mode, because you won't feel comfortable with any of the practice problems because as I said, they are much harder than what is on the exam. Relax! The practice problems for the MERM are infinitely more complicated than what you will encounter on the exam. So do not worry too much if you don't exactly know how to do them. Just try to work each problem, if you get stuck just read through the solution and try to understand. Keep in mind that no one can work all the problems in that book, so you are no different. Just do your best. When you have finished the book, it should be right about the time that you have to choose your specific mechanical discipline for the exam. Since you have seen all the types of problems, you should be able to make an informed decision on which of the three that you are best at. As a general rule of thumb for the exam, anything you can think of that will save you any time is worth it. The MERM is absolutely jam-packed with charts, tables, graphs, etc. As you are reading through and working problems, you will start to notice you refer to some of them fairly often. It's a good idea to put a tab on the page where the useful information is located. By the time I took the exam, my MERM had tons of tabs. When you have finished the MERM and its practice problems, purchase ALL THREE (fluids, mechanical systems, HVAC) sample problems and solution booklets from the NCEES. The first 40 questions are exactly the same in the three booklets, but the next 40 will be different. It's still worth it to buy all three, because in the morning session of the exam, you could encounter any of these problems. Make yourself out a schedule where you work 10-15 problems per day. This time, you will need to actually be able to do the problems, unlike the MERM problems. These problems are designed to represent what is on the test, and also to be able to be completed in 6 minutes. You will start to feel a lot more comfortable at this point because the questions are much easier than what you've seen so far. Work all 160 questions over and over in groups of 10-15 per day until the day of the exam. By now you should be very comfortable, and ready to tackle whatever they throw at you.

Update in response to some questions: On test day, you will see people walk into the exam with dozens of books. Some even stand up all the books vertically on their table like a little library bookshelf. You will immediately wonder if you did not bring enough material. Rest assured! If you go into the test relying on this many books, then you are in trouble. There simply isn't enough time to think about which book to open and then search for the answer. I went into the exam with only the following materials and it was more than enough:

- Mechanical Engineering Reference Manual
- Practice Problems for the Mechanical Engineering Reference Manual
- NCEES Sample Questions and Solutions (Thermal and Fluids Systems)
- NCEES Sample Questions and Solutions (Mechanical Systems and Materials)
- NCEES Sample Questions and Solutions (HVAC and Refrigeration)
- A 1" Three Ring Binder of helpful

equations, saturation tables, and conversion factors that I accumulated during the study process! I hope this has helped, and most importantly, good luck!

I passed the October 2015 Mechanical Engineering PE exam (I chose to take the Mechanical Systems and Materials in the afternoon), and I would like to share with you how I prepared for the exam. I did not enroll in a course, but I used the following four resources, all purchased on Amazon:

- (1) Mechanical Engineering Reference Manual for the PE Exam, 13th Ed
- (2) PE Exam Review for Mechanical Systems and Materials: PE Review Book for ME
- (3) PE Mechanical Engineering: Mechanical Systems and Materials Practice Exam
- (4) Six-Minute Solutions for Mechanical PE Exam Mechanical Systems and Materials Problems, 2nd Ed

The first of these four resources, of which this review concerns, is by far the most essential. I repeatedly used Lindeburg's Mechanical Engineering Reference Manual during the actual test. While the other three resources were helpful, and I recommend that you purchase and use them, the Mechanical Engineering Reference Manual was by far the most helpful. Most of the chapters contain material that is "fair game" on the exam. You can compare what the exam covers versus the chapters in this book. You will notice that some chapters contain material that is no longer covered on the exam. I skipped these chapters. For the chapters that did contain material on the exam (which was a majority of the book), I read them completely, and I worked through all examples. Most example problems have solutions in both S.I. and U.S. systems, and this is helpful because the exam can use either system. I switched back and forth: if I solved one example problem using S.I., then I would solve the next using the U.S. system. Furthermore, to get extra studying time, I studied during my lunch break at work. I ate for about 15 minutes and studied for about 45 minutes. If you do this 5 days per week, then that is an extra 3.75 hours of study per week that you did not have to do at home. Plus, when you bring a really big book to work and read it, people will look and think you look really smart. I will also review the other three resources listed in this review. In my opinion, the afternoon exam is orders of magnitude harder than the morning exam, so prepare for the afternoon exam even more than the morning exam. Best of luck, I wish you well!

Great preparation guide and a great general reference. Spend time with it before the exam so you know where everything (generally) is, and tab out the book so you know how to get to places you need to use. A good rule of thumb that I used was, any time I took a practice exam and used the MERM for a lookup, I stickynoted that page, knowing that I needed to tab it later. The book takes you back to first principles, and derives many of the equations you will need to find and use on the

exam. It also rigorously uses constants of gravity in the USCS versions of equations. This may inspire you to needlessly divide a pound-force by a pound-mass just for the sake of clearing out units. However, this may be useful to you should gravity not be a constant in the particular problem you're working. It treated me well as my last-ditch effort to get an equation I needed - and in fact it saved my butt at least a couple of times. However, getting those equations to work for me took some trial and error because they weren't in the final form I needed to use. Cameron Hydraulic Data and the ASHRAE Pocket Guide may serve you better for equations that are ready to use right away. Cameron Hydraulic Data especially has a number of equations that you just insert your flowrate in GPM and your pipe size in inches, and out pops your velocity in FPM or your velocity head in feet. Shortcut equations, easy. Not a strong point of the MERM. I went into the test with Cameron, ASHRAE Pocket Guide, ASHRAE Handbook 4-pack, my favorite Thermodynamics textbook (Cengel & Boles 4e from college), Property Tables from Cengel and Boles, and about 20-30 pages of my own handwritten thermo, fluids and HVAC notes. That was enough, I don't think the MERM alone would have been.

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