

Mechanical Engineering for Non-Mechanical Engineers

A Live Seminar on Essential Fundamentals of Theoretical and Practical Mechanical Engineering

Credit: 15 PDH's (2-Days); 1.5 CEU's

Lead Instructor: Professor Bobby Rauf, PE, CEM, MBA

Course description

This course caters, mainly, to Engineers, Technicians and Facilities Managers who are not intimately familiar with Mechanical Engineering Principles and Practices. Through this course, attendees are expected to learn basic principles of mechanical engineering in a simple, easy to understand, format. This course will enable attendees to accomplish straightforward and common calculations associated mechanical engineering concepts such as statics, kinetics, kinematics, materials, mechanics of materials, fluid mechanics, hydraulic machines, thermodynamics, refrigeration cycle, financial evaluation and decision making associated with typical engineering projects. Most concepts are presented in basic and easy to understand terms. Mechanical engineering concepts are illustrated by practical numerical problems and case studies. Past experience has shown that even professionals without engineering education can take away a commensurate amount of engineering knowledge from "cross-discipline" skill building seminars, such as this one.

Learning Objectives

1. **Understand** the principles and concepts associated with mechanical energy, work, torque, power – and the inter-conversion between these entities in the engineering realm.
2. **Get familiarized** with methods and strategies utilized by mechanical engineers for analysing forces and moments in beams and truss systems - in static equilibrium.
3. **Understand** how to perform stress, strain, toughness and ductility analyses on engineering materials.
4. **Get familiarized** with – or get refreshed on – basics of dynamics; kinematics and kinetics, in linear and angular motion domains.
5. **Learn** about strengths, thermal and alloying characteristics of materials.
6. **Comprehend** and learn to apply hydrostatics and hydrodynamics principles, laws and equations for analyses of fluid systems.
7. **Gain an introduction** to – or get refreshed on – the four stages/phases of refrigeration cycle, illustrated and supported by DuPont R-134a refrigerant pressure-enthalpy case study.

8. **Get** introduced to some of the basic instruments utilized by mechanical engineers.

Day I:

Morning:

- Fundamentals for mechanical engineering
- Mechanical engineering system of units - Imperial (US) and Metric (SI) Systems.
- Basic mechanical engineering concepts, associated formulas and units
- **Statics:** The statics topic introduces the concepts, laws and problem analysis techniques associated with beams and truss systems in equilibrium, under point and distributed loads.
- Classwork and Q&A

Afternoon:

- **Dynamics – Kinematics:** The kinematics topic provides an introduction to concepts, laws and analytical techniques pertinent to motion in the absence of unbalanced forces.
- **Dynamics – Kinetics:** The kinetics topic introduces the attendees to concepts, laws and problem analysis techniques associated with bodies or objects in motion, when motion is influenced by unbalanced forces.
- Classwork and Q&A

Day II:

Morning:

- **Materials and Mechanics of Materials:** This topic covers concepts such as stress, strain, strengths of materials, alloy phase diagrams, phase equilibrium liquid-solid diagrams.
- **Fluid Mechanics & Hydraulic Machines:** Introduction to mechanical engineering skills and knowledge would be incomplete without some understanding of fluid statics, hydrodynamics and hydraulic machines. This topic consists of a few case studies and practical problems pertaining to fluids.
- **Thermodynamics:** In this segment, the attendee is introduced to some fundamental, yet practical, thermodynamic concepts, principles, laws, problem solving techniques; with emphasis on comprehension and proper application of the saturated steam and superheated steam tables.
- Classwork and Q&A

Afternoon:

- **Refrigeration Cycle:** Basic refrigeration cycle model is covered, coupled with brief explanation of thermodynamic processes associated with each segment of the refrigeration cycle.
- **Engineering Economics & Financial Analysis of Engineering Projects:** This topic is intended to provide engineer and non-engineer attendees with a brief introduction to basic, yet practical, methods for performing simple, financial evaluations of capital projects.
- Classwork and Q&A

Why you shouldn't miss this seminar – How this seminar can benefit your organizations, what is unique about this course:

1. Have you ever felt somewhat inadequate and ill-equipped in your **technical discussions with mechanical or civil engineers**? If so, then this course or seminar is a must.
2. Do you, as an engineer, manager, or technician, feel that your knowledge and understanding of **static or dynamic mechanical system analyses, trusses and beams in static equilibrium, fluid systems, refrigeration cycles, heat engines, sensible and latent heat calculations** is inadequate or weak? Not to worry, this seminar/course will help you bridge that gap
3. How often do you get a chance to attend a workshop, course or a seminar that is **presented by the author of a text book pertinent to the subject**? Your instructor is the author of “Thermodynamics Made Simple for Energy Engineers (A copy of the book available at additional cost)
4. As an engineer, technician or manager **have you ever found the concept of thermal and mechanical properties of engineering materials, phase diagrams and Lever's Rule elusive** and hard to comprehend? Then, this workshop will present an excellent opportunity for you to remedy that.
5. **Imagine yourself, as an engineer or manager with little or no mechanical engineering background, at 2 o'clock in the morning, in a triage situation, leading a team of mechanical engineers, maintenance engineers, utilities engineers - trying to troubleshoot** the root cause of failure of a complex mechanical system. This seminar is an opportunity for you to bridge that mechanical engineering gap in your knowledge and fortify your confidence to lead multidiscipline teams of engineers and enable you to make informed objective decisions.
6. How often do you get an **opportunity to understand abstract and complex mechanical concepts through relatively simple analogies and explanation**? This seminar will provide you that invaluable opportunity.
7. Some workshops and seminars end up being monotonous monologues from the presenter to the audience. Not this one. **In this seminar you will get an opportunity to exercise the skills and concepts through classwork and engage the instructor in discussions.**
8. **Last, but not least** – If you are not a licensed Professional Engineer, but aspire to be one and if you are rusty in the fundamentals of mechanical engineering concepts and principles, then this two (2) day course could serve as a **“warm-up”** on many mechanical engineering principles, concepts and problem analyses techniques.

Who should attend:

- **Licensed Professional Engineers**, who need to meet the annual or biennial license renewal PDH (Professional Development Hour) or CEU (Continuing Education Units) requirements.
- **Engineers and Architects** who do not possess current working knowledge of mechanical engineering and are interested in broadening their engineering knowledge base through basic cross-training.
- **Facility Managers, Maintenance Engineers, Maintenance Managers, Engineering Managers, Program/Project Managers and other professionals in leadership role** who sense a lack of current and adequate mechanical engineering knowledge to hold meaningful technical discussions and to make informed decisions when interacting with their mechanical engineering direct reports or colleagues.
- **Non-engineers**, including **technical writers** responsible for developing operations and maintenance manuals for mechanical, civil and HVAC systems
- **Procurement/purchasing professionals** who are responsible for acquisition of mechanical, civil and HVAC systems
- Candidates aspiring to take the **FE or PE exams**.
- **Energy Managers and Construction Managers**,
- **Patent attorneys** and attorneys who specialize in construction, workplace safety and workmanship litigation cases.
- **Other professionals** whose annual **PLP, Performance and Learning Program**, includes engineering/technical courses/seminars/workshops.

Instructor Bio:

Professor S. Bobby Rauf, P.E, C.E.M, MBA; Member, ASEE, American Society of Engineering Education.

Professor Bobby Rauf is the President, Chief Consultant and a Senior Instructor at Sem-Train, LLC. Bobby has over 25 years of experience in teaching undergraduate and post graduate Engineering, Science, Math, Business Administration and MBA courses, seminars and workshops. Prof. Rauf is registered (PE) **Professional Engineer**, in the State of North Carolina, a **Certified Energy Manager** and a **certified ergonomist**.

Prof. Rauf was inducted as “**Legend in Energy**” by AEE, in 2014. He is a published author of multiple engineering and energy books, and professional development courses. He holds a patent in process controls technology.

Prof. Rauf develops and instructs PDH (Professional Development Hour) and, continuing education, engineering skill building courses. He conducts these course in form of webinars, live on-site presentations, workshops, pre-recorded audio and self-study texts. Some his major clients include **Texas A&M University, Saudi Aramco – KSA, University of North Carolina at Charlotte, McNeese University, Lamar University, Clemson University, Association of Energy Engineers, EPIC College - Canada; US Bureau of Reclamation, BHP Billiton, PDHengineer, CED, Y-F Asia, and PDH Source.**

Prof. Rauf's last full-time engineering employment, in the corporate world, was at PPG Industries, Inc. where he served as a **Senior Staff Engineer**. He brings to this program more than 25 years of hands-on experience in a broad spectrum of areas within large industrial plant engineering and plant maintenance departments, including electrical, controls, energy and mechanical projects. Professor Rauf has served as **Adjunct Professor at Gardner-Webb University** since 1989, where he has instructed classes in both the B.A. and M.B.A. programs.

Professor Rauf's publications include (Available through AEE, Amazon.com, and Barnes and Noble):

- 1) Text book titled "**Thermodynamics Made Simple for Energy Engineers,**" Published in 2012 through Fairmont Press and CRC Press – Worldwide distribution.
- 2) Text book titled "**Finance and Accounting for Energy Engineers,**" Published in 2011 through Fairmont Press and CRC Press – Worldwide distribution.
- 3) Text book titled "**Electrical Engineering for Non-Electrical Engineering,**" The Second Edition of this book was published in 2016 through Fairmont Press and CRC Press – Worldwide distribution.

Mr. Rauf of Sem-Train has provided training and/or consulting services to the following organizations over the last fifteen years:

1. **BHP Billiton**
2. **Saudi Aramco (Dammam, Kingdom of Saudi Arabia)**
3. **US Bureau of Reclamation (Hoover Dam)**
4. **CED**
5. **Balfour Beatty**
6. **Shaw Group**
7. **McNeese University**
8. **North Carolina State University**
9. **University of North Carolina, Charlotte**
10. **Texas A&M University,**
11. **Clemson University,**
12. **PPG Industries, Inc.,**
13. **PDHengineer,**
14. **PPI, Professional Publications**
15. **University of Maryland Baltimore County,**
16. **EPIC (Canada)**
17. **Y-F Asia - Singapore**

"SemTrain, LLC, is an approved sponsor and course provider with NY, NYSED, Maryland, NCBELS, North Carolina Board of Examiners for Engineers, New Jersey, and FBPE, Florida Board of Professional Engineers, for the provision of CPC, Continuing Professional Competency, courses."

“SemTrain, LLC, is approved for US Federal Government Contract Work, and is SAM and CAGE registered.

Testimonials from clients:

- 1) Kimberly T., 2011: Bobby, I would like to say that even though I am not an engineer, I am really glad that I took this. You have helped me to dissect and visualize some of the terms and concepts that were not tangible to me prior to this class.
- 2) Jim L. S. PE, CMRP, Manager Engineering: “....Bobby is an outstanding instructor and the material was very well presented.....We will want to do this again next year...
- 3) Gregory (Greg) V. D., P.E.: “Hi Bobby, I've enjoyed both of your pdhengineer.com webinars that I've attended.....I don't know how you get through a full 8 hours at such a high energy level!”

Lead Instructor's Phone: (704) 477-9166

Important Notes for Participants:

- In order to enhance the learning experience, the class size is limited – register early.
 - Seminars are subject to cancellation if the minimum registration threshold is not met. Registration fees will be refunded in entirety if a seminar is cancelled.
 - Name on the attendance certificate will be as it appears on the registration documents. Please Note: If an admin associate registers you, have them enter YOUR name on the registration/payment form.
 - Verify exact location of venue before the seminar date. *
 - Bring valid ID and copy of registration information. *
 - Light refreshments will be served. *
 - Certificates of attendance will be provided.
 - The handouts for the course will be provided via “Drop Box.”
 - Seminar Hours – Each Day: 8:00 am - 5:00 pm. One hour for lunch. *
 - Venue Wi-Fi where available. *
- * This information applies to in-person, face to face, seminars only.

SEMINAR HOURS

- Seminar Hours Day 1: 8:00 am - 4:30 pm. One-hour lunch break.
- Seminar Hours Day 2: 8:00 am – 4:30 pm. One-hour lunch break.

Cancellation Policy: Full refund granted if registration is cancelled **30 days** or more prior to the scheduled date of the seminar; otherwise, registrant can apply the course credit toward attendance at another, scheduled, equivalent event, in the region, at a later date.

Sem-Train, LLC, reserves the right to cancel the seminar when minimum registration threshold is not met. In such case, Sem-Train, LLC, will issue full refund to the registrant.

Registrants, in some cases, may be given the option to attend the on-line, live, webinar, version of the seminar.

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