

## **National Electrical Code 2017 – Two-Day Course**

### **A Live Course on Introduction and Review of Key Articles of the National Electrical Code**

**Credit:** 16 PDH's (15 PDH's for NYS Lic.)

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

### **Course description**

This course covers key articles of the 2017 National Electrical Code and a review of per-unit power systems analysis. Upon attending this course, participants will be able to identify codes pertaining to various electrical equipment installations. Participants will learn the methodology associated with analyzing and interpreting key articles in the 2017 National Electrical Code. Some key calculations related to the application of the code will be illustrated, followed by class exercises for knowledge reinforcement purposes. This course is designed for electrical engineers, licensed electrical professional engineers, maintenance engineers, engineering managers, facilities managers and other professionals who are not familiar or current on 2017 NFPA 70, also referred to as, 2017 National Electrical Code. This two-day review of the NEC is an abridged version of the typical one-week course.

### **Learning Objectives & Take-Aways**

1. **Upon attending this course**, participants will gain introduction to the 2017 National Electric Code.
2. **Participants will learn** how to navigate through 2017 National Electric Code.
3. **Participants will get an in-depth** look at key NEC articles that govern electrical equipment installations.
4. **Participants will learn how to** perform calculations required in the application of key articles of 2017 National Electric Code.
5. **Participants will learn the difference between** three-phase AC, “Y” and “ $\Delta$  - Delta” configuration of loads and sources, and know the significance of these configurations from practical power distribution and application perspective.

### **Topics**

1. **Chapter 1:** Part I: Definitions, illustrations and discussion of key terms referred to in the code. Part II: Over 1000 Volts Nominal – definitions. Requirements for electrical installations Part I through IV. Conductor sizing, AWG and kcmil conversion illustrations and associated tables. Terminal temperature limitations.

Installation integrity and sustainability. Working space requirements and conductor spacing and distances. Enclosure selection.

2. **Chapter 2:** Use and identification of grounded conductors. Grounded system connections. Neutral conductors and their connections. Means for identifying grounded conductors. Color-coding of ground and neutral conductors. Identification of grounding conductors and polarity of connections. Multiwire branch circuits disconnecting means. Line-to-Neutral loads. Identification for branch circuits. Equipment grounding conductor. Identification of ungrounded conductors. Branch-Circuit voltage limitations. GFCI's and application of autotransformers and circuits therefrom. Branch circuit ratings. Feeder sizes and protection. Feeder and branch circuit load calculations. Grounding and bonding, with emphasis on grounding electrode conductor for alternating current systems. Dwelling and HVAC system outlets. Table 250.122, minimum ground conductor size. Equipment grounding conductors. Conductor sizing for standard breakers. Article 240, overcurrent protection.
3. **Chapter 3:** General requirements for wiring methods and materials. Conductor sizing and protection against physical damage through conduits, cable trays, busways, bus-ducts, cable bus, wire ducts and raceways. Conductor ampacity assessment. Ambient temperature and other correction factors. Conductor applications and insulation ratings. Emphasis on article 390.4, 394, Table 310.15(B) (16).
4. **Chapter 4:** Switches, switchboards, switchgear, and panel boards. Industrial control panels. Emphasis on overload breakers and conductors sizing. Article 430, MCC's. Y-start, delta run motors. Part III, Motor and branch circuit overload Protection. Part IV, Motor Branch-Circuit Short-Circuit and Ground-Fault Protection. Table 430.52, maximum rating or setting of motor branch-circuit short-circuit and ground-fault protective devices. Disconnecting means and the line of sight requirement. Article 440, HVAC and refrigeration equipment. Tables 430.250 and 430.251. Adjustable speed drive systems. Transformers and Transformer Vaults (Including Secondary Ties). Article 460, capacitors. Storage batteries and Article 480.
5. **Chapter 5:** Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2. Electrical hazard classification and requirements associated with flammable fluid powered vehicle repair and storage facilities, Article 511. Area classifications in aircraft hangers, Article 513. Motor fuel dispensing facilities, Article 514. Bulk storage plants Article 515. Spray application, dipping, coating, and printing processes using flammable or combustible materials, Article 516. Brief review of Articles 517, 520, 522, 525, 530, and 540-590.
6. **Chapter 6:** Fire Pumps - Article 695
7. **Chapter 9:** A cursory review of all tables, with emphasis on Table 8 and 9, properties of conductors

E4s`4S3WQ2 1`

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

1. Have you ever felt somewhat inadequate and ill-equipped in your **technical, electrical code related discussions with electrical engineers and electricians**? If so, then this course or seminar is a must.
2. Do you, as an engineer, engineering manager, or technician, **feel that your knowledge and understanding of the electrical code** is inadequate or insufficient, then you must not miss this seminar.
3. How often do you get a chance to attend a workshop, course, or a seminar that is presented by the author of book on related subject matter - live? In this seminar, you will have the opportunity to interact and learn from **Bobby Rauf, the author of the text, titled, “Electrical Engineering for Non-Electrical Engineers.”**
4. As an electrical engineer, **do you find various articles of the NEC elusive** and hard to comprehend? Then, this seminar will present an excellent opportunity to remedy that.
5. 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.**
6. **Last, but not least** – If you are *not* a licensed Professional Engineer, but aspire to be one, and if you are rusty on the comprehension and application of the National Electrical Code – which is a key component of the NCEES® Electrical Professional Engineering Examination - then this two (2) day course could supplement your preparation for the PE examination.

**Who should attend:**

- **Licensed Professional Electrical 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 the NEC.
- **Facility Managers, Engineering Managers, Program/Project Managers and other professionals** who feel a lack of adequate familiarity with the NEC to hold meaningful discussions and to make informed decisions when interacting with their electrical subordinates or colleagues.
- **Procurement/purchasing professionals** who are responsible for acquisition of electrical installation services.
- Candidates aspiring to take the **FE or PE exams**.
- **Construction Managers**
- **Maintenance Engineers and Maintenance Managers**

- **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.**

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, Math, Business Administration and MBA courses, seminars and workshops. Professor Rauf is registered (PE) **Professional Engineer**, in the State of North Carolina and is a **Certified Energy Manager**.

Mr. 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.

Professor Rauf is certified to instruct various engineering, ergonomics, and industrial safety courses. He has conducted certification training and trained engineers for Professional Engineering licensure exams in the United States, The United Kingdom, Kingdom of Saudi Arabia, The Netherlands and Ukraine, over the past ten years.

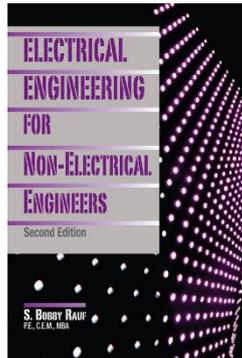
Mr. Rauf develops and instructs PDH (Professional Development Hour) and, continuing education, engineering skill building courses. He conducts these courses in form of webinars, live on-site presentations, workshops, pre-recorded audio and self-study texts. Some his major clients include **Texas A&M 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, PDH Engineers, CED, and PDH Source**. He is also an Adjunct Professor at Gardner-Webb University.

Professor Rauf has also developed and published several self-study books that cater to the continuous professional development needs of Engineers, Technicians and Technical Managers.

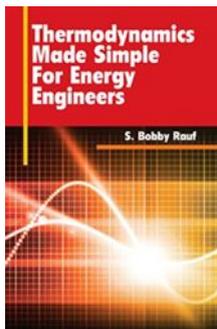
Mr. Rauf’s last full-time engineering employment, in the corporate world, was at PPG Industries, Inc. where he served as a **Senior Staff Engineer**. During his long career at PPG, his responsibilities included development and management of energy and ergonomics programs for multiple manufacturing plants, in the US and overseas. He also provided consultation and training services in, energy, electrical engineering, industrial safety, ergonomics and arc flash arena. His extensive engineering experience includes, power design, control system design, project management, process management, energy and utilities management, energy audits/assessments, plant maintenance, robotics, manufacturing automation, HVAC audits, and design of ergonomic equipment.

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

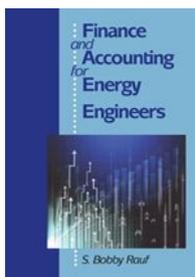
- 1) Text book titled **“Electrical Engineering for Non-Electrical Engineering,”** The Second Edition of this book was published in 2016 through Fairmont Press and CRC Press – Worldwide distribution.



- 2) Text book titled **“Thermodynamics Made Simple for Energy Engineers,”** Published in 2012 through Fairmont Press and CRC Press – Worldwide distribution.



- 3) Text book titled **“Finance and Accounting for Energy Engineers,”** Published in 2011 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. **University of North Carolina, Charlotte**
9. **Texas A&M University,**
10. **Clemson University,**
11. **PPG Industries, Inc.,**
12. **PDHengineer,**
13. **PPI, Professional Publications**
14. **University of Maryland Baltimore County,**
15. **EPIC (Canada)**
16. **Y-F Asia - Singapore**

### **Testimonials from clients:**

- 1) Timothy M., CEM, CDSM: “Bobby: I wanted to pass on my thoughts concerning the recently completed, Electrical Engineering for Non-Electrical Engineers. I found it to be very helpful, especially the section on Power Factor. I have had it explained to me a number of times, but your explanation was the best.
- 2) Kimberly T.: Bobby, I would like to say that even though I am not an engineer, I am really glad that I took this class (EE for Non-EE). You have helped me to dissect and visualize some of the terms and concepts that were not tangible to me prior to this class.
- 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!”
- 4) Dr. A. P., Professor and Dean: “Dear Bobby, it was such a pleasure to meet you and having you as the great instructor of our Electrical Engineering seminar. As I understood from the attendees they really enjoyed your course and learned a lot...”

Sem-Train LLC ©

All Rights Reserved.

Prices subject to change without notice.