**NOVEL ENGINEERING – Technical Training**

**Electricians’ Training through Distance Learning**

*Licensed by the Maine Department of Education*

*Approved by the Maine Electricians’ Examining Board*

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**School Catalog – 2020 and 2021**

NO V EL EN G I N EER I N G  • TECHNICAL TRAINING

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**The Study Process: How it Works**

**Welcome** to Electricians’ Training through Distance Learning. This type of training is not new. Many colleges and other educational institutions have been offering this learning option for many years. Novel Engineering (NE) has successfully instructed electricians and others involved in the electrical field through distance learning since the early 1990s. With technological progress, delivery of education through non-traditional means, including online learning, has become increasingly popular. Instruction is delivered through a variety of methods. The instructor is only an email away or available by way of other modern means.

**The study texts** used in our programs have been carefully chosen. They are heavily illustrated and well suited for this type of learning. We use mainly printed texts, but some e-books are used. Most of the texts are provided by NE, but some are the responsibility of the student. Some courses contain workbooks in addition to the main text and many contain supplemental online or other digital resources. Many of our courses are NEC® based. Texts for these courses are based on the most current edition of the National Electrical Code.® We strive to keep all courses and texts up to date, presenting current information.

**Reading and homework assignments** are required for each course. After completing the assigned reading for a course chapter or unit, students complete and submit a homework assignment. For some of our courses, the homework assignments are done online in the form of tests. The online test platform also accommodates instruction in the form of diagrams, instructor notes, reference information, video links, etc. The student receives instant scoring and feedback after completing an online test. Each course is designed as a 45-hour course of study, unless otherwise noted. 45-Hour courses contain at least 11 homework assignments.

**Course instructions** are provided for each course and contain the complete course syllabus and detailed instructions on completing the course. If a course has an online component, instructions for accessing the online content are provided. Assignments that are not completed online should be mailed to NE for review and grading, or, they can be transmitted by fax or email attachment in Portable Document Format (PDF). Assignments submitted in PDF via email attachment are reviewed and returned by email.

**Study progress** is up to the student. There is no specified time limit for the completion of a course or module. We hope that the student will make steady progress, even if the progress is slow. A student becomes “inactive’ when no assignments have been submitted for one year. A student can be reinstated by contacting NE and paying a small reactivation fee.

**Instructor assistance** is available by several means. The “Ask-a-Question” form works well for regular mail or fax. You may email us at help@novelengineering.com or telephone us at 207-236-0032.

**Proctored final exams** are required. Students must take a proctored/supervised exam for each course studied. Review the document “About the Proctored Exam” for details.

**Resources** are available at our website, [www.novelengineering.com](http://www.novelengineering.com). We are continually adding documents to “Resources” on our site. School policies, course descriptions, programs of study, assignment sheets, proctor selection forms, and other information and material can be found on the site.

**About the Proctored Exam**

**The Proctored Exam** – A proctored final exam is a required component of any quality distance learning course and necessary for approval of our courses by the Maine Electricians’ Examining Board. The purpose of the exam is to ensure that the student has successfully met the course objectives. Exams are generally proctored in person, but remote (online) proctoring may also be possible. Ask about our Instructions for Remote Proctoring of Exams.

**The Proctor –** The student must select a professional person to supervise (proctor) the course final exam. The Proctor Selection Form contains information on who may serve as a proctor. Complete the form and send it to Novel Engineering by mail, fax, or as an email attachment, at any time before you are ready to take an exam. The proctor must be approved by Novel Engineering. We will notify the student if the proctor selected is not approved to administer exams, and advise that another person must be selected to serve as proctor. The proctor will administer the exam for Novel Engineering. At the exam site, the proctor will verify that it is the enrolled student (and not someone else) that is sitting for the exam, examine student reference materials, and time the exam.

**Number of Proctored Exams –** If you are studying a single course rather than a module, you will take a proctored final examination when you are finished the assigned work for that course. Otherwise, you will be taking a proctored exam (an exam for each course) for a group of courses in one sitting, as indicated on the program module information. None of the homework assignments are required to be proctored (supervised).

**Scheduling the Exam –** At the same time that we return your last required assignment (graded) for the course or program, we will send your proctored final exam, with instructions, to the approved proctor. When you receive your last corrected assignment, the front cover of the exam will be included in the mailing. This will show the course(s) being tested and the allotted time for the exam. Also, there is a note to advise the student that the exam has been sent to the proctor. The student should contact the proctor to schedule a mutually acceptable time and place to take the exam.

**Exam Content and Reference Materials** – The exams consist mainly of multiple-choice questions, but some questions may be encountered that require written answers and/or an indication of whether a statement is True or False. All proctored exams are open-book timed exams. Any books may be used (except for the NEC® exam) along with a calculator and blank scratch paper. For the NEC® exam, only the National Electrical Code® book itself is permitted, to best simulate the actual licensing exam conditions.

**Passing the Exam** – If you have done reasonably well on the lesson assignments, you should have no trouble completing the exam within the allotted time. In the unlikely event that you should fail a proctored exam, arrangements can be made to re-test once at no additional cost. Based on our records for a period of 20+ years, a student has a better than 95% chance of passing the exam on the first attempt and completing it within the allotted time.

**Exam Results –** After we have received the completed exam from your proctor and graded the exam, we will mail or email a Student Progress Report, and, where applicable, a certificate of completion or transcript. The report will inform you of your exam score, your average lesson score, and of your overall course score. Also, Novel Engineering will advise you of any incorrect answers on the proctored exam, and will provide corrective information.

**Curriculum author and Principal Instructor - biography**

**Patrick S. Ouillette, P.E.**

**Patrick S. Ouillette** is a certified teacher by the Maine Department of Education in the areas of electricity and electronics, and has served as an adjunct faculty member for the Maine Community College System, working as a National Electrical Code® instructor. He has conducted NEC® training for major industries in Maine, such as Bath Iron Works (shipbuilders for the U.S. Navy) and Maine Yankee Atomic Power. Mr. Ouillette has broad electrical experience, having been involved in the design, installation, and inspection of industrial, commercial, and residential electrical systems.

Mr. Ouillette has been employed in the position of State Electrical Inspector for the Maine Electricians’ Examining Board for 15 years, including 7 years as the Senior State Electrical Inspector. He has also owned and operated an engineering consulting business, Novel Engineering, since 1995. He has authored several texts concerned with changes in the NEC® beginning with *Revisions for the 1996 National Electrical Code*®.

Mr. Ouillette is the author of *Significant Changes of the 2008 National Electrical Code*® and *Significant Changes of the 2011 National Electrical Code*®, published by American Technical Publishers, Inc.

Mr. Ouillette holds a BS degree in Applied Science and Technology from Thomas A. Edison State College in Trenton, New Jersey and has been registered as a Professional Engineer in Maine since 1995, having tested in the electrical engineering discipline. He has held a Maine Master Electrician’s license since 1973.

**Accreditation**

Novel Engineering – Technical Training is licensed by the Maine Department of education under *Private Business, Trade or Technical School – Correspondence School*, in accordance with Title 20-A, MRSA Chapter 323, Sections 9501-9508.

The school’s training programs and individual courses are approved by the Maine Electricians’ Examining Board, satisfying Board educational requirements to sit for electrician’s license exams in Maine.

**Master/Journeyman Electrician Program (585 hours)**

This program fulfills all of the coursework required by the Maine Electricians’ Examining Board, including the minimum 126 hours of approved electives, to qualify to sit for the master or journeyman electrician’s examination.

**Module #1 [$695.00] Module #2 [$695.00] \***

Technical Mathematics Electrical Print-Reading and Sketching

Electricity I Controls I: Residential Wiring

Electricity II Introduction to Electronics

*Proctored Examination Proctored Examination*

**Module #3 [$695.00] Module #4 [$695.00]**

Controls II: Commercial Wiring Low-Voltage Circuits and Systems (elective)

Transformers Business Communications (elective)

Motors and Controls: Industrial Wiring Introduction to Business (elective)

*Proctored Examination Proctored Examination*

**National Electrical Code®** (current edition) website price

*Proctored Examination*

Each course is designed as a 45-hour course of study.

Most course textbooks are supplied with the course materials. However, the student is responsible for the cost of the ebook for *Introduction to Electronics* and for the Module 3 ebook, a total cost of about $150.

\* For students who wish to sit for the Limited to House Wiring electrician’s licensing exam after Module 2, the current edition of the NEC® should be studied after completing this module.

**Limited Electrician in House Wiring Program (225 hours)**

After completion, credit for these courses may be transferred to the Master/Journeyman program.

**Module #1 [$595.00] Module #2 [$695.00]**

Electricity I Controls I: Residential Wiring

Electricity II Electrical Print-Reading and Sketching

National Electrical Code® (current edition)

*Proctored Examination Proctored Examination*

Each course is designed as a 45-hour course of study.

Textbooks are supplied with the course materials.

**Limited Electrician in Low Energy Program (315 hours)**

After completion, credit for these courses may be transferred to the Master/Journeyman program.

**Module #1 [$695.00] Module #2 [$695.00]**

Electricity I Controls I: Residential Wiring

Electricity II Electrical Print-Reading and Sketching

Introduction to Electronics Low-Voltage Circuits and Systems\*

 National Electrical Code® (current edition, with a low-energy component)

*Proctored Examination Proctored Examination*

Each course is designed as a 45-hour course of study.

Most course textbooks are supplied with the course materials. However, the student is responsible for the cost of the ebook for *Introduction to Electronics* and for one of the *NEC* course texts, a total cost of about $150.

\*This course is not required for licensing by the Maine Electricians’ Examining Board, but is an approved elective appropriate for most licensees. The student may omit this course if he or she has work experience in low-voltage installations. The module price remains the same.

# Technical Mathematics

**Text:** Elementary Technical Mathematics, 8th, 9th, 10th, and 11th editions; Copyright ©

 2003, 2007, 2011, and 2015 by Brooks/Cole – Cengage Learning; authored by Dale

 Ewen and C. Robert Nelson

**Prerequisites:** High school mathematics

***Course description:*** *This course introduces and reviews basic math concepts and skills required in the trades. Topics covered include whole numbers, fractions, decimals, percentages, signed numbers and powers of ten, the metric system, exponents, ratios, and proportions. The course also covers basic algebra, plane and solid geometry, graphs, and trigonometry limited to right triangle applications.*

**Course objectives**

After completing *Technical Mathematics* the student will be able to:

* Perform mathematical operations with whole numbers
* Use fractions in calculations
* Derive and apply decimal forms of numbers
* Derive and apply percentages
* Understand the metric system and perform measurement conversions
* Use exponents
* Understand and apply ratios and proportions
* Work with basic algebraic equations
* Determine the area of plane figures
* Determine the volume of solid bodies
* Understand and draw graphs of equations and data
* Understand right-triangle mathematics
* Solve practical mathematics problems

The textbook chapters that the course covers (in whole or in part) are as follows:

Ch. 1 Basic Concepts, 1.1 – 1.15

Ch. 2 Signed Numbers and Powers of Ten, 2.1 – 2.7 (except 2.4)

Ch. 3 The Metric System, 3.1 – 3.7

Ch. 5 Polynomials: An Introduction to Algebra, 5.1 and 5.2

Ch. 6 Equations and Formulas, 6.1 – 6.9

Ch. 7 Ratio and Proportion, 7.1 and 7.2

Ch. 8 Graphing Linear Equations, 8.1 and 8.2

Ch. 12 Geometry: 12.1 – 12.3, 12.5, 12.7 – 12.10

Ch. 13 Right Triangle Trigonometry, 13.1 – 13.4

Ch. 15 Basic Statistics, 15.1 – 15.5, 15.13 and 15.14 (15.12 and 15.13 in 9th edition)

# Electricity I

**Text:** Delmar’s Standard Textbook of Electricity, 5th or 6th Edition, Copyright © 2011-2016

 by Delmar, Cengage Learning, Authored by Stephen L. Herman

**Prerequisites:** Basic mathematical skills are necessary for the successful completion of Electricity I. Where the student has not completed “Technical Mathematics” with Novel Engineering, a short math supplement is included that addresses the math used in these courses.

**Course description:** *Commonly referred to as “Introduction to Electricity” or “Introduction to DC Circuits.” Safety, atomic structure, electrical quantities, static electricity, small sources of electricity, and resistors used in series, parallel, and combination circuits are introduced. Circuit laws and theorems are explained. Operation of digital and analog meters, conductor sizing, voltage drop calculations, and magnetic induction are discussed.*

**Course objectives**

*Electricity I* is designed to give the student an understanding of:

* Safety rules for working with electricity
* What electricity is and how it is produced
* Ohm’s law and the units used to identify the elements of electricity
* The types and uses of resistors
* Series circuits and resistance in series circuits
* Parallel circuits and resistance in parallel circuits
* Circuits with both series and parallel resistors
* Electrical measurements using ammeters, voltmeters, and ohmmeters
* The selection of conductors, and voltage drop calculations
* The principles of magnetic induction

**The textbook units** that are assigned for *Electricity I* have the following headings:

 Safety Overview

1. Atomic Structure
2. Electrical Quantities and Ohm’s Law
3. Static Electricity
4. Magnetism
5. Resistors
6. Series Circuits
7. Parallel Circuits
8. Combination Circuits

9. Kirchhoff’s Laws, Thevenin’s, Norton’s, and Superposition Theorems

10. Measuring Instruments

11. Using Wire Tables and Determining Conductor Sizes

12. Conduction in Liquids and Gases

13. Batteries and Other Sources of Electricity

14. Magnetic Induction

# Electricity II

**Text:** Delmar’s Standard Textbook of Electricity, 5th or 6th Edition, Copyright © 2011-2016

 by Delmar, Cengage Learning, Authored by Stephen L. Herman

**Prerequisites:** Basic mathematical skills are necessary for the successful completion of Electricity II. Where the student has not completed “Technical Mathematics” with Novel Engineering, a short math supplement is included that addresses the math used in these courses.

**Course description:** *Commonly referred to as “Introduction to AC Circuits” or “AC Circuit Theory.” Building on the basic principles studied in Electricity I, Electricity II explains the basics of AC and introduces inductance and capacitance. Basic trigonometry and vectors are explained. Series and parallel circuits containing resistance, inductance, and capacitance are analyzed. True power, reactive power, apparent power, and power factor are examined.*

**Course objectives**

*Electricity II* is designed to give the student an understanding of:

* The Pythagorean theorem, basic trigonometry, and vectors
* The generation and characteristics of AC waveforms
* Inductance in AC circuits, and principles and applications of inductance
* The types of capacitors, their operation, and applications
* How to calculate inductive reactance, and the effects of inductance in a circuit
* How to calculate capacitive reactance, and the effects of capacitance in a circuit
* The analysis of series circuits that contain combinations of resistance, inductance, and capacitance
* The analysis of parallel circuits that contain combinations of resistance, inductance, and capacitance
* Power and power factor, and how they are calculated

**The textbook units** that are assigned for *Electricity II* have the following headings:

15. Basic Trigonometry and Vectors

16. Alternating Current

17. Inductance in AC Circuits

18. Resistive-Inductive Series Circuits

19. Resistive-Inductive Parallel Circuits

20. Capacitors

21. Capacitance in AC Circuits

22. Resistive-Capacitive Series Circuits

23. Resistive-Capacitive Parallel Circuits

24. Resistive-Inductive-Capacitive Series Circuits

 25. Resistive-Inductive-Capacitive Parallel Circuits

# Electrical Print-Reading and Sketching

**Text:** Blueprint Reading for Electricians, 2nd and 3rd Edition; Copyright © 2008 and 2010 by the

 National Joint Apprenticeship Training Committee (NJATC)

**Prerequisites:** There are no prerequisites to this course. However, persons with practical experience in electrical construction or general building construction will find that experience helpful for the completion of the course.

**Course description:** *This course introduces basic drawing and sketching techniques, framing and construction types, and construction drawings. Recognition and application of electrical and other symbols used on drawings is covered. Site plans, floor plans, elevations, details, sections, and schedules are analyzed. Residential, commercial, and industrial prints and specifications are studied. Plans on CD are included. The course also contains a brief introduction to estimating.*

**Course objectives**

After successfully completing *Electrical Print-Reading and* *Sketching,* the student will be able to:

* Perform basic drawing and sketching
* Recognize and draw orthographic, isometric, and oblique projections
* Scale and dimension drawings
* Identify different types and styles of construction
* Understand the types and functions of prints found in a set of construction drawings
* Identify electrical, mechanical, and other symbols used on prints
* Use schedules and specifications
* Read residential, commercial, and industrial prints
* Understand what is involved in estimating electrical projects

**The textbook contains the following chapter headings:**

1. Drawing and Sketching
2. Projections and Perspectives
3. Related Math (Optional study)
4. Scaling and Dimensions
5. Construction Types
6. Architectural Considerations
7. Electrical Symbology
8. Mechanical Symbology
9. Hydraulic and Pneumatic Symbology
10. Specialized Symbology
11. Site Plans
12. Floor Plans
13. Elevations
14. Details and Sections
15. Schedules and Specifications
16. Residential Print Reading
17. Commercial Print Reading
18. Industrial Print Reading

# Controls I: Residential Wiring

***eBook*** Modern Residential Wiring, 11th Edition; Copyright © 2018 by The

 Goodheart-Wilcox Company, Inc., authored by Harvey N. Holzman

 The 2020 National Electrical Code®, Copyright © 2019 by the National Fire

 Protection Association®

**Prerequisites:** There are no prerequisites to this course. However, persons with knowledge of basic electricity and working electricians will find their knowledge and experience helpful for the completion of the course.

***Course description:*** *This is an introductory course in practical wiring with an emphasis on residential wiring. The course covers basic wiring principles including electrical devices and equipment, conductor selection, wire connections and splices, outlet and switch boxes, wiring methods, and grounding for safety. Residential services and feeders, and planning residential installations are also covered. This is an NEC*®*-based course and will involve some use of the 2020 NEC*® *text.*

**Course Objectives**

After completing *Controls I: Residential Wiring* the student will be able to:

* Implement safe wiring practices
* Understand basic wiring principles
* Properly connect switches and receptacles
* Select appropriate overcurrent devices for various applications
* Select the size and type of conductors
* Understand residential and commercial wiring methods
* Install residential services, properly grounded
* Connect appliance outlets and other special outlets
* Perform basic wiring for mobile home services
* Perform basic wiring for farms, swimming pools, motors, emergency and standby systems, and telephone and computers
* Modernize older electrical installations

# Introduction to Electronics

***eBook*** Electricity & Electronics 11th Edition, Copyright © 2021 by The Goodheart-Willcox

 Company, Inc., authored by Howard H. Gerrish, William E. Dugger, Jr., and Richard

 M. Roberts

**Prerequisites:** *Electricity I and II*, or permission from the instructor

***Course description:*** *This course introduces semiconductors and describes their function in a wide range of circuits and systems. The coverage is broad, introducing the student to tuned circuits and RLC networks, power supplies, amplifiers, integrated circuits, digital circuits, and oscillators. The course also provides an introduction to radio communications, electronic display systems, fiber optics and lasers, personal computers, networking fundamentals, wireless technology, and microcontrollers.*

**Course objectives**

After completing *Introduction to* *Electronics,* the student will be able to:

* Explain and calculate resonant frequency
* Understand the operation of filter circuits
* Identify various types of semiconductors and explain their operating principles
* Understand the function of various types of diodes and transistors in circuits
* Apply semiconductor devices in power supplies and rectifier circuits
* Understand the operation of transistors and their use in amplification and switching
* Describe the use of SCRs and Triacs in control circuits
* Explain the operation of the 555 timer integrated circuit and the operational amplifier
* Understand the operation of logic gates and the applications of digital circuits
* Identify various oscillators and their operation
* Understand AM and FM radio communications
* Identify and explain television and electronic display systems
* Explain the transmission of light as data and the benefits of fiber-optic systems
* Understand the basics of personal computers (PCs)
* Identify network classifications, protocols, and components
* List components in wireless systems and understand their operation
* Explain the advantages and disadvantages of using microcontrollers in industry

**Controls II: Commercial Wiring**

***ebook*** Novel Engineering – Technical Training, M/J Training Program, Module 3

 Copyright © 2021 by Pearson Learning Solutions

**Prerequisites**: Modules I and II of the Mater/Journeyman electricians’ program or equivalent

***Course description:*** *This course introduces commercial wiring methods along with devices, appliances, and equipment used in commercial wiring systems. Feeders and services are analyzed. Other topics covered include lamps and luminaires, overcurrent protection, short-circuit protection, and hazardous locations.*

**Course Objectives**

After completing *Controls II: Commercial Wiring* the student will be able to:

* Understand lighting terminology and selection of appropriate lamps and luminaires
* Design basic circuits and systems for commercial applications using appropriate wiring methods and equipment
* Select panelboards appropriate for the application
* Install electrical circuits and systems used in commercial applications
* Calculate the electrical service and feeder load
* Properly ground and bond an electrical distribution system
* Understand the design and construction of commercial electrical feeders
* Install Code-compliant commercial electrical services and distribution systems
* Select the proper size and type of overcurrent devices for commercial applications
* Calculate short-circuit current
* Protect equipment and conductors from dangerous short-circuit currents
* Understand and implement coordinated overcurrent protection

The textbook topics/modules that primarily pertain to this course are as follows:

 Electric Lighting

 Practical Applications of Lighting

 Load Calculations: Branch and Feeder Circuits

 Conductor Selection and Calculations

 Overcurrent Protection

 Commercial Electrical Services

 Standby and Emergency Systems

 Hazardous Locations

**Transformers**

***ebook*** Novel Engineering – Technical Training, M/J Training Program, Module 3

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**Prerequisites**: Modules I and II of the Mater/Journeyman electricians’ program or equivalent

***Course description:*** *This course covers transformer theory and the construction and operation of transformers. It discusses single-phase and three-phase transformer types. Three-phase delta and wye connections are covered, along with transformer maintenance and troubleshooting. Control and specialty transformers are included in the coverage.*

**Course Objectives**

After completing *Transformers,* the student will be able to:

* Understand the operating principle of transformers
* Identify the various types of transformers and their applications
* Understand transformer applications in distribution systems
* Make single-phase transformer connections
* Perform single-phase transformer calculations
* Identify the characteristics of delta and wye transformers and connections
* Make three-phase transformer connections
* Perform three-phase transformer calculations
* Calculate system power factor
* Maintain and troubleshoot transformers

The textbook topics/modules that primarily pertain to this course are as follows:

Distribution Equipment

Transformers

Specialty Transformers

**Motors and Controls: Industrial Wiring**

***eBook*** Novel Engineering – Technical Training, M/J Training Program, Module 3

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**Online Motor Control Training Lab** –free download at

[Technical Training Software | PLC - motor control training software (koldwater.com)](https://koldwater.com/)

Motor Control Training Demo – 309M

**Prerequisites**: Modules I and II of the Mater/Journeyman electricians’ program or equivalent

***Course description:*** *This course introduces direct current motors, single-phase motors, and three-phase motors. It covers the construction, types, operation, and installation of motors. The course also involves the study of various motor control devices and circuits, and includes an introduction to DC drives and variable-frequency drives. The course includes an online motor control lab.*

**Course Objectives**

After completing *Motors and Controls: Industrial Wiring,* the student will be able to:

* Interpret motor diagrams, including ladder diagrams
* Understand the operation and use of various motor control devices
* Design and wire motor control circuits, including circuits for reversing and braking
* Understand the construction and operation of different types of dc motors
* Connect and control the speed of different types of dc motors
* Know how different types of single-phase motors are constructed and how they operate
* Change the direction of rotation of single-phase motors
* Understand the construction and operation of different types of three-phase motors
* Change the direction of rotation of three-phase motors
* Connect dual voltage motors to the line
* Understand the operation and installation of motor drives
* Perform various motor calculations

The textbook topics/modules that primarily pertain to this course are as follows:

Motors: Theory and Application

Motor Calculations

Motor Controls

Advanced Controls

Online lab (MC Trainer)

# Low-Voltage Circuits and Systems

**Media used in this course**

Online instruction:*Premises Cabling (Copper, Fiber, and Wireless***)**

Online video:*Fire Alarm Basics*

Online text:*Advanced Fire Training Manual* published by Potter Electric Signal Company,

 LLC, revised 5/17

Printed text: Mike Holt’s Illustrated Guide to Understanding the National Electrical Code,® Volume 2, based on the 2020 NEC;® Copyright © 2020 Charles Michael Holt, Mike Holt Enterprises

**Prerequisites:** None

**Course description:** *This course provides a low-voltage component for journeyman and master electrician training and for electricians specializing in low-energy installations. It is a 3-part course. It begins by introducing wired and wireless theory and installations for voice, data, and video applications. Topics discussed include structured cabling, cabling standards, signals, terminations, and testing. In Part 2, fire alarm system basics are covered. The course concludes with NEC® study of the requirements for installation of low-voltage and limited-energy systems.*

**Course objectives**

After completing *Low-Voltage Circuits and Systems* the student will be able to:

* Understand cabling terminology
* Understand wired media and its primary purpose
* Understand cabling standards and how they form the basis of rules and implementation of technology
* Distinguish signals and various types of signal transmission, and the differences between analog and digital signals
* Identify proper cabling types and connectors for twisted-pair, coaxial, and fiber-optic cabling applications
* Understand the purpose of structured cabling and the modular concept behind structured cabling
* Plan and install premises cabling systems
* Install basic fire alarm systems and components
* Apply NEC® requirements for limited-energy and communications circuits

**Business Communications**

**Text:** BCOM 8th (or earlier editions, 5th – 8th); Copyright © 2017 Cengage Learning; authored

 by Carol Lehman, Debbie DuFrene, Robyn Walker

**Prerequisites:** There are no prerequisites to this course.

***Course description:*** *This course provides thorough coverage of written and verbal communications principles and practices. Topics include communication foundations and analysis; communication through electronic, voice, and written messages; communication through reports and business presentations; and communication for employment. There are writing assignments included in this course.*

**Course objectives**

After completing *Business Communications,* the student will be able to:

* Understand the principles of written and verbal communications in various settings
* Understand nonverbal messages
* Consider legal and ethical constraints in communications
* Plan written and spoken messages
* Listen as a communication skill
* Choose a channel and media for communicating a message
* Practice communicating effectively through voice, written, and electronic means
* Understand the use of graphics in communication
* Understand the report process and research for business presentations
* Prepare reports and proposals
* Design and deliver business presentations
* Prepare résumés and employment messages

**Textbook headings**

The textbook contains 14 chapters organized under the following parts:

 Part 1 Communication Foundations

 Part 2 Communication Analysis

 Part 3 Communication through Voice and Digital Messages

 Part 4 Communication through Reports and Business Presentations

 Part 5 Communication for Employment

**Introduction to Business**

**Text:** BUSN 7th, 8th, or 9th Edition; Copyright © 2015, 2016, 2017 Cengage Learning;

 authored by Marce Kelly and Chuck Williams

**Prerequisites:** There are no prerequisites to this course.

***Course description:*** *This course introduces the basic principles of business. Topics include economics, the business environment, creating a business, financing a business, marketing a business, and managing a business. The course is well suited for entrepreneurs seeking to start a small business.*

**Course objectives**

After completing *Introduction to* *Business,* the student will be able to:

* Understand business principles
* Understand the changing business environment
* Consider ethics and responsibility in business
* Choose an appropriate format for a business
* Prepare a business plan
* Fund a business
* Effectively market a product
* Understand the strengths of small business and entrepreneurship
* Understand and apply leadership and motivational skills
* Manage human resources
* Manage a small business

**Textbook headings**

The textbook contains 17 chapters organized under the following parts:

Part 1 The Business Environment

Part 2 Creating a Business

Part 3 Financing a Business

Part 4 Marketing a Business

Part 5 Managing a Business

# 2020 National Electrical Code®

**Texts:** Electrical Systems Based on the 2020 NEC®, e-book or softbound, Copyright © 2020

 by American Technical Publishers, Inc., authored by Michael I. Callanan and Bill

 Wusinich

The 2020 National Electrical Code®, Copyright © 2019 by the National Fire Protection Association®

**Prerequisites:** Experience as an electrician or completion of coursework in a minimum of *Electricity I* and *Controls I* is required for successful completion of this course.

**Course description:** *This course covers Chapters 1-4 of the NEC® and other articles from Chapter 5 – Special Occupancies and Chapter 6 – Special Equipment. An optional course component covers many Code articles related to renewable energy systems. Details of many Code topics relevant to residential, commercial, and industrial wiring applications are studied. The course covers branch circuits, feeders, load calculations, services, grounding, wiring methods and materials, motors and transformers, hazardous locations, and other special occupancies and equipment. Course coverage may be modified for students seeking a limited electrician’s license. The course serves as a preparation for passing the electrician’s license exam. It is appropriate for electricians and electrical engineers.*

**Course objectives**

After completing *2020 National Electrical Code®,* the student will be able to:

* Use, navigate, interpret, and apply the Code
* Understand the basic Code rules for the safeguarding of persons and property
* Perform load calculations
* Install various wiring methods in accordance with the Code
* Size conductors and apply proper overcurrent protective devices
* Install services in accordance with the Code
* Install circuit conductors, raceways, enclosures, equipment, and other electrical materials per *NEC* requirements
* Connect grounding conductors and systems in accordance with the Code
* Install switches, receptacles, and other devices per *NEC* requirements
* Connect transformers and motors and related equipment
* Understand the Code requirements and installation practices for A/C, refrigeration, and fire pumps
* Understand *NEC* requirements and installation practices for hazardous (classified) locations and other special occupancies
* Understand Code requirements related to renewable energy systems (optional component)
* Use the Code effectively when writing the state examination for electrician’s licensing

*Note: Some of the course objectives are not applicable to limited license programs.*

**Introduction to Photovoltaics**

**Text:** Solar Photovoltaic Systems Installer, Trainee Guide; Copyright © 2011 by the National

 Center for Construction Education and Research (NCCER); published by Pearson

 Education, Inc.

**Prerequisites:** This course is designed for trained electricians with field experience. Otherwise, special permission from Novel Engineering – Technical Training is required.

**Course description:** *This is a thorough course on photovoltaic (PV) principles and system installation. It consists of an introduction to PV, site assessment, system design, system installation and inspection, and maintenance and troubleshooting. The course content follows the NABCEP Solar PV Installer Job Task Analysis. This course qualifies for 40 hours of advanced training required for NABCEP’s PV Installation Professional certification.*

**Course objectives**

After completing *Introduction to Photovoltaics* the student will be able to:

* Understand photovoltaic (PV) principles
* Identify system components and their functions
* Assess site-specific safety hazards and installation considerations
* Perform a complete site assessment
* Plan and design PV systems
* Identify structural support members and install PV mounting hardware and raceway
* Install PV systems in accordance with the National Electrical Code®
* Maintain and troubleshoot PV systems

**The textbook contains the following modules:**

 Module 57101-11 – Introduction to Solar Photovoltaics

 Module 57102-11 – Site Assessment

 Module 57103-11 – System Design

 Module 57104-11 – System Installation and Inspection

 Module 57105-11 – Maintenance and Troubleshooting

**Grading Policy**

Assignment grades will count for two-thirds of the final course grade. The proctored exam will count for one-third of the final course grade. Students will receive a number grade, expressed as a percent, for all required assignments and the proctored exams. The final course score will be a letter grade equating to the following percentage scores:

A 93%-100%

A- 90%-92%

B+ 88%-89%

B 83%-87%

B- 80%-82%

C+ 78%-79%

C 73%-77%

C- 70%-72%

D+ 68%-69%

D 63%-67%

D- 60%-62%

F Less than 60% - failing grade

**Refund Policy**

In the event that a student is not completely satisfied with the contents of a course or program, or for some other reason wishes to terminate enrollment, the student may contact Novel Engineering – Technical Training to request a refund. A full refund, less a $50.00 administrative fee, will be given for any course or module if study materials are returned in the condition in which they were received within 30 days of enrollment. Students will be responsible for return shipping. After 30 days, refunds will be pro-rated according to the schedule below, minus the $50.00 administrative fee.

Within 90 days of enrollment 75% of course or module fee

After 90 days and within 6 months of enrollment 65% of course or module fee

After 6 months and within 9 months of enrollment 55% of course or module fee

After 9 months and within 1 year of enrollment 45% of course or module fee

After 1 year from enrollment Contact Novel Engineering

The pro-rated refund is contingent upon the return of study texts in the condition in which they were received. The student may elect to purchase the text(s). It is the student’s responsibility to pay for return shipping. Refunds will be issued within 30 days of receipt of the study materials.

**Policy for Timely Completion of Coursework**

The written correspondence and online (on-demand) methods of delivering training offer a great deal of scheduling flexibility for the student. There is no specific start time or time limit for the completion of a course or module. However, the student is expected to make steady progress, even if the progress is slow-paced. By making steady progress, the student will adjust to workable study habits and maintain continuity of the subject matter being studied. We recommend that students complete a 45-hour course within six months. A student will be given “inactive” status if no assignments are submitted for a period of one year. Students may resume studies within one year of going on inactive status by contacting Novel Engineering and by submitting a $40.00 administration fee. There may be other fees assessed, such as textbook costs, if a change has been made to the program while the student was on inactive status.

**Policy for Re-Taking a Proctored Exam**

If a student fails to score at least 60% on any proctored exam, the exam can be re-taken once at no additional cost. If a passing grade is still not achieved, the instructor will assign additional coursework for a fee of one-third of the course fee. A proctored exam will be administered following completion of the additional coursework.