ELT - ELECTRICAL OCCUPATIONS

ELT 102 Commercial Wire I
Commercial Wiring I presents the requirements of a commercial electrical installation. Specific commercial installation methods, techniques, materials and National Electrical Code requirements will be presented.
Upon successful completion of this course, students should be able to:
Define job requirements from the contract documents.
Identify and properly apply different wiring devices.
Size and apply various types of conduits.
Install electrical boxes.
Size and install branch circuits per National Electrical code requirements.
Demonstrate a working knowledge of special raceways, outlets and communication systems.
Read engineering drawings.
Properly apply National Electrical Code requirements to the intended use presented by engineering drawings.
Describe the different types of lighting systems and associated fixtures.
Prerequisites: ELT 101 or ELT 114.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 110 Introduction to Electricity
This introductory course introduces students to the fundamental theories and principles of electricity. These theories and principles include voltage, current, magnetism, Ohm's Law, inductance, capacitance, and resistance, as well as the basics of DC circuits, their applications, and associated symbols. The course emphasizes safe working procedures in a construction environment.
Upon successful completion of this course, students should be able to:
Describe the competitive origins of the infant electric and gas industries in the late 1800s and early 1900s.
Describe the political, social and economic issues that led to industry regulation.
Describe the development of large public power electric systems.
Discuss the impact of siting and environmental issues within the United States and in the Delaware Valley.
Evaluate the impact of moving to a partially deregulated environment.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 112 Electrical Code
This course is designed to help students read and understand the National Electrical Code. The National Electrical Code is the basic code that governs all electrical installations. The course teaches students how to locate code information in Code Manual, as well as how to interpret and apply the appropriate code to all facets of the electrical installation.
Upon successful completion of this course, students should be able to:
Demonstrate an understanding of the National Electrical Code.
Apply the NEC index in referencing an electrical problem or concern.
Identify codes and/or tables applicable to various electrical situations.
Apply minimum Code requirements to a floor plan of a residence.
2 Credits 2 Weekly Lecture Hours

ELT 114 Residential Wire
This course introduces students to the theory and practice of residential wiring. Students learn how to complete new house wiring, including the wiring of lighting receptacles, major appliances, alarm systems, telephone, television, and an electrical service. The course stresses National Electric Code compliance.
Upon successful completion of this course, students should be able to:
Demonstrate knowledge of the general requirements for residential rough-in wiring.
Apply NEC requirements in completing wiring tasks.
Demonstrate understanding of the difference between grounded and ungrounded conductors.
Demonstrate knowledge of electrical services, overhead services, service drop, and service lateral.
Layout and install cable and make connections.
Demonstrate competence in installing basic electrical services.
Demonstrate safe electrical practices.
Prerequisites: ELT 110.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 116 Advanced Electrical Wire
This course teaches students more complex residential electrical installations. Students learn additional wiring methods for single family and multi-family dwellings that include load calculations, service entrance sizing, proper grounding techniques, and associated safety procedures.
Upon successful completion of this course, students should be able to:
Install conduits, wiring, and electrical distribution equipment associated with residential electrical installations.
Identify and apply the criteria for selecting service panel boards and feeder sizes.
Apply the NEC requirements to the intended use presented by engineering drawings.
Calculate feeder loading and determine the minimum feeder conductor size and rating of over-current protective devices.
Tabulate materials required to install an electrical rough-in.
Lay-out an electrical system for a new house.
Prerequisites: ELT 114 or ELT 101.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 118 Troubleshooting and Old Work Wiring
This course introduces students to the issues related to completing electrical work on old houses, as well as doing troubleshooting and preventive maintenance on residential buildings. Students learn how to rewire different areas of old houses properly, with minimal damage to the building, as well as wire major house additions. Additionally, students learn how to troubleshoot electrical problems.
Upon successful completion of this course, students should be able to:
Identify issues involved in completing work on old house wiring.
Evaluate electrical circuits in older homes.
Perform basic circuit checks for shorts, opens, and ground faults.
Perform continuity and resistance checks on relay coils and contacts, overloads, fuses, circuit breakers, switches, and other control circuit components.
Wire and troubleshoot basic electrical control circuits to develop a logical, systematic approach to troubleshooting.
Prerequisites: ELT 116 or ELT 205.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

ELT 190 Electrical Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

ELT 194 Electrical Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Prerequisites: ELT 110 and ELT 112 and ELT 114 and ELT 116 and ELT 118 and ELT 206 and ELT 208.
2 Credits

ELT 199 Electrical Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
3 Credits

ELT 200 Commercial Wiring
This course provides an in-depth comprehension of commercial wiring. It includes the understanding of electrical power needs and distribution requirements for a typical commercial facility. The course stresses the application of main power components to support calculations necessary to have a safe and efficient commercial installation. Students will become knowledgeable of wiring for special circuits, appliances and loads such as, but not limited to, refrigeration, HVAC, food preparation apparatus and associated loads relative to various types of commercial wiring. The course will include requirements for a thorough study of commercial service entrance equipment from the utility company's service drop to the building's main switchboard.
Upon successful completion of this course, students should be able to:
Demonstrate the application of commercial building plans and specifications and interpret electrical symbols.
Compute the correct service entrance feeder size, number of circuits and identify the criteria for selecting the appropriate service equipment.
Comprehend installation requirements for commercial wiring.
Demonstrate an understanding of the common techniques to determine whether a circuit has a short circuit, a ground fault or an open circuit and trouble shoot common residential electrical system problems.
Draw basic Wye and Delta transformer diagrams and make connections.
Identify and comprehend entrance grounding requirements.
Determine the preferred and required minimum size conductors for lighting, appliances and general purpose branch circuits.
Compute the lighting watts per square foot for a commercial building.
Identify types of lighting fixtures used.
Demonstrate the correct connections for wiring a low-voltage remote control system.
Identify the different types of emergency power systems and all the sub-components and site requirements.
Demonstrate knowledge of transformers, disconnecting devices, service entrances and metering configuration in a commercial building.
Determine the proper raceway type and size dependent on conductors to be installed and box size for approved box fill.
Describe both Wye and Delta connected three-phase services.
Calculate loads for single-phase and three-phase branch circuits.
Calculate loads for a retail store, office building, both single and multi-family dwellings, restaurant and other institutional projects.
Prerequisites: ELT 102.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 202 Industrial Electric II
This course will include heavy coverage in the areas of transformer selection and installation, AC circuits, AC motor control, industrial lighting and electric heat.
Upon successful completion of this course, students should be able to:
Describe the effect of high- and low-power factors on alternating current circuits.
Cite the methods for producing single and multi phase voltages.
State the construction and operating characteristics of transformers, illustrating the various types of transformer connections and discussing the results of these connections.
Detail the construction of various AC motors.
Demonstrate a knowledge of the construction and operation of various types of motorcontrollers and protective devices.
Determine the amount of light required for various areas and types of work.
Lay out and select the correct lighting fixtures for various areas.
Explain the operation of electronic motor controls.
Prerequisites: ELT 201.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 203 Industrial Electrical Systems
This course provides the student with an introduction to various electrical systems and devices used in a manufacturing/commercial facilities environment. Students will learn how to identify the function of electrical components, to include relays, sensors, switching/other devices and circuits. Instruction will include the theory and use of electrical instruments, to install and make repairs as well as identify, troubleshoot isolate and remedy problems. Emphasis will be placed on electric motors and motor controls. Topics of instruction will cover installation of electrical conduit, wiring, motors and other devices.
Upon successful completion of this course, students should be able to:
Define the terminology associated with common/basic electrical systems and devices.
Describe the operational characteristics and applications of various sensing devices.
Identify and describe the function of basic control circuits/components.
Contrast electrical starting and braking methods.
Compare wound rotor, synchronous and consequent pole motors.
Conduct job planning routines for various electrical component and system installations/repairs/replacements.
Determine sizes and install electrical conduit, boxes, wiring, etc. with regard for engineered work plans and appropriate standards.
Install motor controls and motors.
Discuss and troubleshoot sensing devices and circuits, to include ground faults.
Determine a methodology for troubleshooting various distribution and control circuits.
Troubleshoot variable frequency AC motor drives.
Prerequisites: ((ENG 050 and REA 050) or ENG 099 or REA 075) and (MAT 040 or MAT 050) and TCC 111 and TEL 101 and IST 105. Appropriate placement test scores may be accepted.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 204 Introduction to Programmable Logic Controllers
This introductory course is intended to acquaint students in a hands-on mode with the basic skills and knowledge of programmable logic controllers, with respect to Industrial Systems. Students will learn to interpret electrical and Programmable Logic Controller (PLC) input/output diagrams and ladder logic. In addition, they will become acquainted with PLC functions, components, circuitry, testing of PLC programs and troubleshooting a PLC system. This course is recommended for students with little or no programmable logic controller experience.
Upon successful completion of this course, students should be able to:
Discuss terminology associated with PLCs.
Describe the function, uses, and operation of a PLC.
Define the function and operation of input/output diagrams and system networks.
Interpret ladder logic to determine the functions of mechanical equipment.
Discuss event driven sequencing as it relates to the input and output terminals of the PLC.
Compare the operations of a PLC to manual and automatic control devices.
Decipher which inputs and outputs are controlling internal counters and math functions.
Interface wiring ladder logic diagrams with controller equipment.
List the functions and types of timer instructions and give applications.
Diagnose a PLC program, as it relates to a mechanical environment.
Use PLC diagnostic equipment.
Diagnose a motor control program in both manual and automatic modes.
Analyze the consequences of changing a PLC program on the system being controlled.
Identify the function and operation of a program interlock and give an application.
Troubleshoot various levels of PLC systems to include up and down counter, timer and branching instructions.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 206 Commercial Wire
This course provides an overview of commercial wiring. It includes the understanding of electrical power needs and distribution requirements for a typical commercial facility. The course stresses the application of main power components to support calculations necessary to have a safe and efficient commercial installation.
Upon successful completion of this course, students should be able to:
Demonstrate the application of commercial building plans and specifications and interpret electrical symbols.
Demonstrate an understanding of installation requirements for commercial wiring.
Compute the lighting watts per square foot for a commercial building.
Identify types of lighting fixtures used in commercial work.
Demonstrate knowledge of transformers, disconnecting devices, service entrances and metering configuration in a commercial building.
Calculate loads for a retail store, office building, and both single and multi-family residences.
Prerequisites: ELT 116 or ELT 205.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 208 Solar Photovoltaic System Design and Installation
This International Renewable Energy Council (IREC) focused course is designed to introduce students to grid tied photovoltaic (PV) systems. In this course, students will learn the benefits of a grid tied system and the positive impact on the environment these systems can have. At the conclusion of this course, students will have the basic knowledge and understanding in design and installation of residential and commercial buildings. This course is patterned after the Job Task Analysis set by the North American Board of Certified Energy Practitioners (NABCEP) Entry-Level Solar PV exam and also fulfills the prerequisite of related experience and education required to sit for the industry certification. The certification is not included in the course. NOTE: Alternative Pre-requsite Certified Electrical License
Upon successful completion of this course, students should be able to:
Demonstrate a thorough knowledge of the safety requirements applicable to solar PV system installation and maintenance, including electrical, work-site, and personal safety.
Accurately interpret and apply the National Electrical Code to solar PV system design and installation, with emphasis on a thorough working knowledge of NEC Article 690 "Solar Photovoltaic Systems", and PV system grounding & bonding, overcurrent protection, wire and conduit type and sizing, and PV system labeling.
Identify PV system monitoring and maintenance needs, and specify service procedures and schedule to keep a system operating safely and efficiently throughout service life.
Identify the appropriate layout, orientation, and mounting method for the modules/array, inverters, and other system components, with attention to electrical efficiency, mechanical integrity, site requirements, maintenance access, and safety.
Conduct an accurate site survey to determine location suitability for a solar PV system, including adequate solar access, sufficient area and structure, proper orientation, and options for placement of PV modules, inverters, and other equipment.
Install inverters, charge controllers, disconnects and overcurrent protection devices, meters, surge protection and grounding equipment, junction boxes, batteries and enclosures, system monitoring equipment, conduit, and other system hardware in conformance with equipment manufacturers' guidelines, the system design, the NEC, the utility company, and the local authority having jurisdiction.
Draw a basic site plan, showing site details and equipment layout.
Obtain and accurately interpret solar radiation and temperature data for the site and solar PV module and inverter performance specifications, determine customer energy use and needs, and then calculate the required PV system output and configure a solar PV system from available components to produce the required output.
Determine the local requirements for utility interconnection, and select an appropriate utility interconnection point and method in conformance with the local utility company, the local authority having jurisdiction, and the NEC.
Identify opportunities to reduce energy demand through building performance and/or electric equipment upgrades in order to optimize PV system size and create an efficient, integrated electrical system.
Calculate design voltages and currents for all circuits within the PV system, and select the appropriate conductor type and rating for each circuit, taking into account all de-rating factors and voltage drop.
Verify that the array operating voltages and currents are within the operating limits for the inverters or charge controllers that the capacity and insulation ratings of all conductors conform to NEC requirements, and that voltage drop losses are within acceptable limits.
Determine the proper size, rating, and location for PV system overcurrent protection and disconnect devices, and for all grounding, bonding, surge suppression, and lightning arrest equipment.
Draw complete one-line and three-line wiring diagrams for grid-tied and off-grid solar PV systems.
Properly identify and connect all system equipment, conduit and conductors, specify conduit and conductor type and size, and specify location and text of all NEC required labels.