# Electrical Technology

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Post-Secondary Connection</th>
<th>Valid Course Code</th>
<th>Recommended Grade Level</th>
<th>Recommended Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Blueprint Reading</td>
<td>BRX 120</td>
<td>499920</td>
<td>X X X X</td>
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<tr>
<td>Basic Troubleshooting</td>
<td></td>
<td>499925</td>
<td>X X X X</td>
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<tr>
<td>Circuits I</td>
<td>ELT 110</td>
<td>460316</td>
<td>X X X X</td>
<td>1 to 1.5</td>
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<tr>
<td>Circuits II</td>
<td>ELT 114</td>
<td>460319</td>
<td>X X X</td>
<td>1 to 1.5</td>
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<tr>
<td>Co-op (Electrical)</td>
<td>EET 299</td>
<td>460345</td>
<td>X X</td>
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<tr>
<td>Electrical Construction I</td>
<td>EET 154/155</td>
<td>460312</td>
<td>X X X X</td>
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<tr>
<td>Electrical Construction II</td>
<td>EET 252/253</td>
<td>460313</td>
<td>X X X</td>
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<td>Electrical Motor Controls</td>
<td>EET 270/271</td>
<td>460331</td>
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<tr>
<td>Industrial Safety</td>
<td>ISX 100</td>
<td>499930</td>
<td>X X X X</td>
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<tr>
<td>Internship (Electrical)</td>
<td>EET 299</td>
<td>460348</td>
<td>X X</td>
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<tr>
<td>National Electrical Code</td>
<td>EET 250</td>
<td>460339</td>
<td>X X X</td>
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<tr>
<td>Renewable Energy Systems</td>
<td></td>
<td>460342</td>
<td>X X X</td>
<td>1</td>
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<tr>
<td>Renewable Energy System (Special Problems)</td>
<td></td>
<td>460344</td>
<td>X X</td>
<td>.5</td>
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<tr>
<td>Rotating Machinery</td>
<td>EET 264/265</td>
<td>460323</td>
<td>X X X</td>
<td>1</td>
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<tr>
<td>Rotating Machinery Electrical Motor Controls</td>
<td>EET 268/269</td>
<td>460325</td>
<td>X X X</td>
<td>1</td>
</tr>
<tr>
<td>Special Problems – Electrical Technology</td>
<td>EET 281</td>
<td>460377</td>
<td>X X X</td>
<td>1</td>
</tr>
<tr>
<td>Special Topics – Electrical Technology</td>
<td></td>
<td>460399</td>
<td>X X X</td>
<td>.5 to 1</td>
</tr>
<tr>
<td>Sustainable Energy Systems</td>
<td></td>
<td>460340</td>
<td>X X X</td>
<td>1</td>
</tr>
<tr>
<td>Transformers</td>
<td>EET 150/151</td>
<td>460305</td>
<td>X X X</td>
<td>1</td>
</tr>
</tbody>
</table>
ELECTRICAL TECHNOLOGY

Program Description

The Electrical Technology program will provide students with the foundation to become effective electrical workers in the residential, commercial, and industrial fields. Course offerings may include the study of electrical systems in residential wiring, commercial wiring, and industrial motor controls with study in new construction, remodel, and the industrial and commercial industries. Course offerings include everything from entry level trades courses, all the way to national certification. Students will train at the career centers, high schools and at real jobsites. Current and traditional building practices are included, while updated and advanced electrical techniques are emphasized.

Course offerings are intended to promote career pathways for those just entering the industry, as well as industry professionals looking to stay current. There are multiple certificates and degree options and inter-related disciplines at the Career Centers having articulation agreements with various post-secondary institutions.

Career centers may also offer pre-apprenticeship career pathway opportunities into registered apprenticeship programs to secondary students. This is a business and industry driven program to create a pipeline for students to enter post-secondary apprenticeship training.

Students who successfully complete this program may seek entry-level employment as an Electrician Assistant, Industrial Electrician Assistant, Residential Electrician, or be awarded an industry certification through the Kentucky Labor Cabinet, dependent upon which career pathway is offered.
### Sample Career Pathway - Electricity Construction

**KENTUCKY CAREER PATHWAY/PROGRAM OF STUDY 2015-2016**

**COLLEGE/UNIVERSITY:** College / State University  
**CLUSTER:** Construction  
**PATHWAY:** Electrician Assistant / Residential Electrician  
**HIGH SCHOOL (S):** KY ATC/CTC/High School  
**PROGRAM:** Electrical Technology

<table>
<thead>
<tr>
<th>GRADE</th>
<th>ENGLISH</th>
<th>MATH</th>
<th>SCIENCE</th>
<th>SOCIAL STUDIES</th>
<th>REQUIRED COURSES</th>
<th>RECOMMENDED ELECTIVE COURSES</th>
<th>OTHER ELECTIVE COURSES</th>
<th>CAREER AND TECHNICAL EDUCATION COURSES</th>
<th>CREDENTIAL</th>
<th>SAMPLE OCCUPATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>English I</td>
<td>Algebra I</td>
<td>Earth Space Science</td>
<td>World History</td>
<td>Industrial Safety 499930 &amp; EET 250</td>
<td>ETT 110 Circuits 1 460316</td>
<td>National Electric Construction</td>
<td></td>
<td>Electrician Assistant</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>English II</td>
<td>Geometry</td>
<td>Biology I</td>
<td>World Civics</td>
<td>History and Appreciation of Fine Arts</td>
<td>EET 114 Circuits 2 460319</td>
<td>EET 154 Electrical Construction 1</td>
<td></td>
<td>Residential Electrician</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>English III</td>
<td>Algebra II</td>
<td>Physics or Chemistry</td>
<td>U.S. History</td>
<td>EET 252 Electrical Construction 2 460313</td>
<td>Basic Troubleshooting 499925</td>
<td>NCCER Electrical Level 1 Certification</td>
<td></td>
<td>Electricians Assistant</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>English IV</td>
<td>Math Elective</td>
<td>Computer Aided Drafting (elective)</td>
<td>World Geography</td>
<td>EET 268 Rotating Machinery Electrical</td>
<td>Internship (Electrical) 460348</td>
<td>Co-op 1 (Electrical) 460345</td>
<td></td>
<td>Industrial Engineer</td>
<td></td>
</tr>
</tbody>
</table>

**Year 13**  
- ENG 101 Writing I  
- MT 110 Applied Mathematics  
- ASTR 104 Astronomy  
- College Chemistry  
- PSY 100 Introduction to Psychology  
- EET 270 Electrical Motor Controls 1  
- Occurrence  
- Electrician

**Year 14**  
- ENG 200 IntroLiterature  
- Math 200  
- WLD 221 Certification Lab  
- HIS 109 US History  
- EET 276 Programmable Logic Controllers  
- Materials Science  
- EET 272 Electrical Motor Controls 2  
- Associates Degree  
- Electrical Foreman / Manager

**Year 15**  
- ENG 200 IntroLiterature  
- MAT 250  
- PHYS 236 University Physics I  
- CIV 102 WORLD CIV. II  
- PHY 195 METHODS OF ENGLISH  
- CIV 102 WORLD  
- CIV. II  
- CAD 200 Intermediate Computer Aided Design

**Year 16**  
- PHY 140 Intro. Computing Apps.  
- MAT 308  
- PHYSICS I  
- PHYSICS II  
- PHYS 259  
- MAT 309 CALCULUS II  
- MAT 411 DIFFERENTIALS  
- TECHNICAL  
- PHY 330

**Year 17**  
- PHY 344 Fluid Mechanics  
- PHYS 359 Mechanics of Materials  
- MECH 201 Modern Physics  
- CHE 201 GENERAL CHEMISTRY  
- HUM 211 HUMANITIES  
- ITD 102 CAD  
- PHY 346 HEAT TRANSFER  
- PHYS 375 MATERIALS  
- PHY 390 ENGINEERING MEASUREMENTS  
- TECHNICAL  
- FREE ELECTIVE  
- HUM/FA ELECTIVE

**Other Elective Courses**

**Career and Technical Education Courses**

**Credit-Based Transition Programs** (e.g. Dual/Concurrent Enrollment, Articulated Courses, 2+2+2)  
(Mandatory Assessments, Advising, and Additional Preparation)

**Certification given through the Warren County Area Technology Center**  
Degree given through the Bowling Green Technical College KCTCS  
Degree given through the Murray State University  
Degree given through the Western Kentucky University

**Funded by the U.S. Department of Education**  
(V555W020005)  
Revised Jan 2005  
October 2006 - CTE Kentucky  
KCTCS Community College
### ELECTRICIAN ASSISTANT
**CIP 46.0302.01**

**PATHWAY DESCRIPTION:** This program prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems in residential, commercial, and industrial electric-power wiring, DC and AC motors controls, and electrical distribution panels. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.

### BEST PRACTICE CORE

**Foundational Skills Necessary for Career-Ready Measure:**
*(KOSSA/Industry Certification)*

*Complete (3) THREE CREDITS*

- 460312 Electrical Construction I
- 460313 Electrical Construction II
- 460316 Circuits I

*Complete (1) CREDIT from the following:*

- 460319 Circuits II
- 499930 Industrial Safety* AND 460339 National Electrical Code*
- 460345 Co-op (Electrical) OR 460348 Internship (Electrical)

Note: (*) Indicates half-credit course

### EXAMPLE ILP-RELATED CAREER TITLES

- Construction Laborer
- Construction Manager
- Construction Tradesperson
- Electrical Engineer
- Electrical Engineering Tech
- Electrician
INDUSTRIAL ELECTRICIAN ASSISTANT
CIP 46.0302.02

**PATHWAY DESCRIPTION:** This program prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems in residential, commercial, and industrial electric-power wiring, DC and AC motors controls, and electrical distribution panels. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.

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<thead>
<tr>
<th>BEST PRACTICE CORE</th>
<th>EXAMPLE ILP-RELATED CAREER TITLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational Skills Necessary for Career-Ready Measure: (KOSSA/Industry Certification)</td>
<td>Construction Laborer</td>
</tr>
<tr>
<td>Complete (4) <strong>FOUR CREDITS:</strong></td>
<td>Construction Manager</td>
</tr>
<tr>
<td>• 460312 Electrical Construction I</td>
<td>Construction Tradesperson</td>
</tr>
<tr>
<td>• 460316 Circuits I</td>
<td>Electrical Engineer</td>
</tr>
<tr>
<td>• 460319 Circuits II</td>
<td>Electrical Engineering Tech</td>
</tr>
<tr>
<td>• 460331 Electrical Motor Controls</td>
<td>Electrician</td>
</tr>
<tr>
<td>• 499930 Industrial Safety* <strong>AND</strong> 460339 National Electrical Code*</td>
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</tr>
<tr>
<td>• 460345 Co-op (Electrical) <strong>OR</strong> 460348 Internship (Electrical)</td>
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</tr>
</tbody>
</table>

Note: (*) Indicates half-credit course
### Residential Electrician

**CIP 46.0302.03**

**PATHWAY DESCRIPTION:** This program prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems in residential, commercial, and industrial electric-power wiring, DC and AC motors controls, and electrical distribution panels. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.

**BEST PRACTICE CORE**

**Foundational Skills Necessary for Career-Ready Measure:** (KOSSA/Industry Certification)

*Complete (4) FOUR OR MORE CREDITS:*

- 460312 Electrical Construction I
- 499925 Basic Troubleshooting
- 460316 Circuits I
- 499930 Industrial Safety* AND 460339 National Electrical Code*
- 460345 Co-op (Electrical) OR 460348 Internship (Electrical)

Note: (*) Indicates half-credit course

**EXAMPLE ILP-RELATED CAREER TITLES**

- Construction Laborer
- Construction Manager
- Construction Tradesperson
- Electrical Engineer
- Electrical Engineering Tech
- Electrician
### Construction - Electrical Track

**CIP 46.0302.99**

**Pathway Description:** The Construction Electrical TRACK is designed as a pre-apprenticeship program to provide career pathway opportunities into registered apprenticeship programs for secondary students and creates a pipeline for students to enter post-secondary apprenticeship training. This program prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems in residential, commercial, and industrial electric-power wiring, DC and AC motors controls, and electrical distribution panels. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards. Each student must pass an End of Program assessment and complete eight OSHA safety modules listed on the “Track” website [http://www.laborcabinetetrain.ky.gov/track.html](http://www.laborcabinetetrain.ky.gov/track.html) to be eligible to receive credit and preference in an organization that sponsors a registered apprenticeship program. Course credit will be considered at the discretion of training provider (grades and attendance can be taken into consideration).

### Best Practice Core

**Foundational Skills Necessary for Career-Ready Measure: (KOSSA/Industry Certification)**

*Complete (4) FOUR CREDITS:*

- 460312 Electrical Construction I
- 460313 Electrical Construction II
- 460316 Circuits I
- 460319 Circuits II

**Note:** (*) Indicates half-credit course

### Example ILP-Related Career Titles

- Electrical Engineer
- Electrical Engineering Tech
- Electrician

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The Tech Ready Apprentices for Careers in Kentucky (TRACK) pre-apprenticeship program is a partnership between The Kentucky Department of Education’s Office of Career and Technical Education and The Kentucky Labor Cabinet to provide pre-apprenticeship career pathway opportunities into registered apprenticeship programs to secondary students. This is a business and industry driven program to create a pipeline for students to enter post-secondary apprenticeship training.

Upon successful completion, the student will be awarded an industry certification by the employer or training organization through The Kentucky Labor Cabinet and all on-the-job hours worked will be counted towards the apprenticeship, if applicable. The certification will also count towards the local school district’s college and career ready accountability index.

The specifics of the TRACK program vary and interested parties will need to confer with the Office of Career and Technical Education for the implementation process. There are no costs involved except wages for the student employee. The employer must have a registered apprenticeship program with The Kentucky Labor Cabinet. For more information, please refer to: [http://education.ky.gov/CTE/cter/Pages/TRACK.aspx](http://education.ky.gov/CTE/cter/Pages/TRACK.aspx)

As career pathways continue to expand, the ultimate rationale is that if an employer is willing to implement a Registered Apprenticeship program, a pipeline at the secondary level can be developed utilizing the TRACK program.
Upon completion of a pathway, additional coursework to enhance student learning is encouraged. Credits earned in Advanced or Complementary Coursework “Beyond the Pathway” may not be substituted for pathway courses in order to achieve Preparatory or Completer status.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>499920</td>
<td>Basic Blueprint Reading</td>
</tr>
<tr>
<td>460342</td>
<td>Renewable Energy Systems</td>
</tr>
<tr>
<td>460344</td>
<td>Renewable Energy Systems (Special Problems)</td>
</tr>
<tr>
<td>460323</td>
<td>Rotating Machinery</td>
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<td>460325</td>
<td>Rotating Machinery Electrical Motor Controls</td>
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<td>Special Topics – Electrical Technology</td>
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<tr>
<td>460340</td>
<td>Sustainable Energy Systems</td>
</tr>
<tr>
<td>460305</td>
<td>Transformers</td>
</tr>
</tbody>
</table>

Career Options

JAG Courses
Basic Blueprint Reading

499920

<table>
<thead>
<tr>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course presents basic applied math, lines, multitier drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Content/Process</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>a)</td>
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<tr>
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</table>

Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS BRX 120
*CTSO—SkillsUSA
### Course Description

This course explores the science of troubleshooting and the importance of proper maintenance procedures: how to work well with others, aids in communication, and trade responsibilities; examines actual troubleshooting techniques, aids in troubleshooting, and how to use schematics and symbols; focuses on specific maintenance tasks such as solving mechanical and electrical problems, breakdown maintenance, and the how’s and whys of planned maintenance.

### Content/Process

<table>
<thead>
<tr>
<th>Workplace Safety and Knowledge:</th>
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</thead>
<tbody>
<tr>
<td>a) Identify equipment and materials of the trade</td>
<td></td>
</tr>
<tr>
<td>b) Identify safe and proper use of tools of the trade</td>
<td></td>
</tr>
<tr>
<td>c) Identify the characteristics of a safe work site</td>
<td></td>
</tr>
<tr>
<td>d) Identity OSHA's 1926.10 Construction Standards and who enforces OSHA Rules and Regulation in Kentucky</td>
<td></td>
</tr>
<tr>
<td>e) Identify and use personal protective equipment</td>
<td></td>
</tr>
<tr>
<td>f) Demonstrate ladder safety</td>
<td></td>
</tr>
<tr>
<td>g) Demonstrate electrical safety (i.e., GFCI, cord use, grounding)</td>
<td></td>
</tr>
<tr>
<td>h) Identify different types of chemical, biological, and physical hazards</td>
<td></td>
</tr>
<tr>
<td>i) Interpret hazardous chemical communication (i.e., MSDS, HAZWOPER)</td>
<td></td>
</tr>
<tr>
<td>j) Demonstrate knowledge and understanding of blood borne pathogens</td>
<td></td>
</tr>
<tr>
<td>k) Demonstrate knowledge and understanding of blueprints (i.e., symbols, specifications, layout)</td>
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<tr>
<td>l) Demonstrate knowledge and understanding of schematics and line diagrams</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MATH AND SCIENCE OF ELECTRICITY:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Demonstrate an understanding of Ohm's Law</td>
<td></td>
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<tr>
<td>b) Demonstrate an understanding of DC Circuits</td>
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<tr>
<td>c) Demonstrate an understanding of AC Circuits</td>
<td></td>
</tr>
<tr>
<td>d) Demonstrate an understanding of transformers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic Troubleshooting:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Explain the reason efficient troubleshooting is important in a production plant</td>
<td></td>
</tr>
<tr>
<td>b) Demonstrate good communication skills when dealing with plant personnel</td>
<td></td>
</tr>
<tr>
<td>c) List the steps in troubleshooting a machine/system</td>
<td></td>
</tr>
<tr>
<td>d) List the questions that should be asked when a machine system fails</td>
<td></td>
</tr>
<tr>
<td>e) Identify a pictorial diagram, a blocking diagram, and a schematic diagram</td>
<td></td>
</tr>
<tr>
<td>f) Use schematics when troubleshooting</td>
<td></td>
</tr>
<tr>
<td>g) Identify differences in schematics when troubleshooting</td>
<td></td>
</tr>
<tr>
<td>h) Use a troubleshooting chart</td>
<td></td>
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<td>---</td>
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</tr>
<tr>
<td>i)</td>
<td>Identify current voltage characteristics of wire</td>
</tr>
<tr>
<td>j)</td>
<td>Demonstrate how to troubleshoot an electrical problem</td>
</tr>
<tr>
<td>k)</td>
<td>Identify bearing wear problems</td>
</tr>
<tr>
<td>l)</td>
<td>Identify pump failure problems and solutions</td>
</tr>
<tr>
<td>m)</td>
<td>Identify types of hosing</td>
</tr>
<tr>
<td>n)</td>
<td>List the information that should be recorded in a machine equipment record</td>
</tr>
<tr>
<td>o)</td>
<td>Identify calibration standards</td>
</tr>
<tr>
<td>p)</td>
<td>List preventive maintenance procedures</td>
</tr>
<tr>
<td>q)</td>
<td>List the signs of a machine in need of service</td>
</tr>
<tr>
<td>r)</td>
<td>List the questions that should be asked when a machine/system fails</td>
</tr>
<tr>
<td>s)</td>
<td>Identify different troubleshooting test equipment</td>
</tr>
<tr>
<td>t)</td>
<td>Apply all safety rules when working with electrical equipment</td>
</tr>
</tbody>
</table>

Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*CTSO--SkillsUSA
# Course Description

Introduction to basic theory of DC and AC circuits, including circuit analysis techniques, introductory magnetism, and transformer principles.

## Content/Process

<table>
<thead>
<tr>
<th>1</th>
<th>Workplace Safety and Knowledge:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Identify equipment and materials of the trade</td>
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### Circuits I:

- a) Demonstrate an understanding of resistance, capacitance, and inductance
- b) Explain simple DC voltage and current divider circuits
- c) Demonstrate an understanding of Ohm's law and be able to perform a basic calculation
- d) Solve simple time-constant circuits, both R-C and R-L
- e) Use Kirchoff's Laws to analyze DC circuits
- f) Solve series and parallel DC circuits
- g) Understand basic theory of and applications to electric circuits for Series Circuits, Parallel Circuits, and Series-Parallel Circuits
- h) Demonstrate an understanding of basic transformers
- i) Demonstrate basic soldering skills
- j) Exhibit verbal and written communication skills through teamwork and technical reports
- k) Demonstrate an understanding of basic electrical measuring instruments such as those used for: voltage measurement, current measurement, and resistance measurement
- l) Demonstrate proficiency in the use of common electrical laboratory instrumentation
- m) Demonstrate an understanding of electrical safety principles
- n) Describe the use of hand tools and basic test equipment
- o) Demonstrate an understanding of basic magnetism and AC principles

### Connections:

* Common Core State Standards
* KOSSA
* Common Core Technical Standards
* New Generation Science Standards
* Post-Secondary: KCTCS ELT 110
* CTSO-- SkillsUSA
Course Description

Complex alternating current and direct current circuits. Emphasis is on impedance, reactance, power and electrical energy, electrical measurement instruments, and circuit analysis.

<table>
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| **MATH AND SCIENCE OF ELECTRICITY:** |
| a) Demonstrate an understanding of Ohm's Law |
| b) Demonstrate an understanding of DC Circuits |
| c) Demonstrate an understanding of AC Circuits |
| d) Demonstrate an understanding of transformers |

| **Circuits II:** |
| a) Explain the design of complex DC and AC series, parallel, and series/parallel circuits |
| b) Use Thevenin, Norton, Loop, and Mesh analysis and superposition to solve AC and DC circuits |
| c) Demonstrate an understanding of AC power, electrical energy, and power factor correction |
| d) Demonstrate an understanding of transformers, 1- and 3- phase |
| e) Exhibit a working knowledge of phasors and complex numbers (polar and rectangular forms) |
| f) Explain the design of simple low-pass, high-pass, and band-pass passive filter circuits |
| g) Demonstrate a working knowledge of 3- phase AC |
| h) Exhibit verbal and written communication skills through teamwork |
and technical reports

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<td>*CTSO--SkillsUSA</td>
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</table>

i) Demonstrate an understanding of Resonance in AC circuits
## Course Description

Co-op I (Electrical) provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

## Content/Process

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<td>e) Earn funds to help finance education expenses</td>
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Connections:
- Common Core State Standards
- KOSSA
- Common Core Technical Standards
- New Generation Science Standards
- Post-Secondary: KCTCS EET 299
- CTSO--SkillsUSA
# Electrical Construction I

## Course Description

Involves the study of materials and procedures used in construction wiring.

## Content/Process

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### EQUIPMENT FOR GENERAL USE - National Electrical Code Articles 400 – 490:

- a) Interpret code regulations of equipment for general use (i.e., cords, switches, fixtures)
- b) Apply knowledge of luminaires, lampholders, and lamps
- c) Apply knowledge of appliances and equipment

### WIRING AND PROTECTION - National Electrical Code Articles 200 – 285:

- a) Exhibits use and identification of grounded conductors
- b) Interpret code regulations of branch circuits
- c) Interpret code regulations of feeders
- d) Apply branch-circuit, feeder, and service calculations
- e) Interpret code regulations of services
- f) Calculate overcurrent protection
- g) Interpret code regulations of grounding and bonding

### GENERAL - National Electrical Code Articles 100 – 110:

- a) Exhibits previously learned material by recalling facts, terms, and basic concepts related to the National Electrical Code
- b) Locates information using electrical installations regulation
- c) Demonstrates an understanding of electrical installations regulation

### Electrical Construction I:

- a) Draw wiring diagrams to specifications
- b) Compile a bill of materials from wiring diagrams drawn to specifications
- c) Estimate total cost of a specific installation
- d) Install temporary service *(Articles 590.4)*
- e) Inventory equipment, materials, and supplies
- f) Mark location of switches and outlets on studding
- g) Locate room center for ceiling outlets
- h) Mark location of single system components
- i) Layout and install single and ganged boxes both flush and surface mounted (new construction) *(Article 314.20)*
- j) Layout and install ganged boxes both flush and surface mounted (old construction) *(Article 314.20)*
- k) Install line and low voltage thermostats *(Articles 424.20)*
- l) Install radio, TV, and telephone outlets *(Article 314.1, 314.2, 720.11)*
- m) Install underground and overhead service entrances *(Article 230.2)*
- n) Install main distribution panel *(Article 110.26, 408.1)*
- o) Install circuits using non-metallic sheathed cable *(Article 334)*
- p) Install and connect branch circuit grounding *(Articles 210.5, 250.4)*
- q) Install power feeder wiring system to equipment *(Articles 215.1, 220.1, 225.11)*
- r) Install non-metallic conduits for above and below ground installation *(Article 352)*
- s) Install conductors in conduit or raceway and terminate *(Articles 310, 314.1)*
- t) Install underground cable *(Article 340.10)*
u) Install wire terminals and lugs (Articles 110.14)
v) Make splices using approved methods (Article 110.14)
w) Install flexible and liquid tight conduit (Articles 348.1, 350.1)
x) Install, identify, and label circuit breakers, fuses, and fuse adapter in distribution panels (including AFCI breakers)
y) Test circuits for proper operation
z) Install lighting dimmer systems (Article 404.14)

aa) Install switches - single pole, three-way, and four-way (Article 404.2)
bb) Install duplex and special purpose receptacles (including GFCI) (Article 210.18, 406.4)

cc) Install lighting fixtures (incandescent, fluorescent, LED, recessed and surfaced) (Article 410)

dd) Install door chime, switches, and transformer (Article 404, 450, 720)
ee) Connect automatic garage door opener
ff) Install overhead fan or fanlight with controls (Article 314.28)

 gg) Connect or troubleshoot water heaters (Article 422.10, 422.13)

hh) Install single-phase dual voltage motors (Article 430)

ii) Test emergency lighting system
jj) Complete an accident or incident report

kk) Apply National Electrical Code (NEC) terms and concepts (Articles 100)

ll) Summarize the NEC style (Articles 90)

mm) Use formal methods in finding code requirements

nn) Determine the purpose, scope, and enforcement of the NEC (Articles 90)

 oo) Examine the mandatory rules and formal interpretation of the NEC

pp) Apply definitions for proper understanding and application of the NEC rules (Articles 100)

qq) Examine working space and working space entrances for electrical equipment (Articles 110.26)

Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS EET 154/155
*CTSO--SkillsUSA
## Course Description

Expands the knowledge and skills needed to work in commercial and industrial construction wiring.

### Content/Process

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- e) Interpret code regulations of services
- f) Calculate overcurrent protection
- g) Interpret code regulations of grounding and bonding

### GENERAL - National Electrical Code Articles 100 – 110:

- a) Exhibits previously learned material by recalling facts, terms, and basic concepts related to the National Electrical Code
- b) Locates information using electrical installations regulation
- c) Demonstrates an understanding of electrical installations regulation

### Electrical Construction II:

- a. Install electrical metallic tubing *(Article 358)*
- b. Install under-floor raceways *(Article 390)*
- c. Install lay-in duct work (wireways) *(Articles 376, 378)*
- d. Run fiber optic cable in raceways *(Articles 770.24, 770.110)*
- e. Install rigid conduit *(Articles 344.10 through 344.60)*
- f. Install explosion proof fixtures and devices *(Article 501.15)*
- g. Install feeder busways *(Article 368.10 through 368.60)*
- h. Install plug-in busways *(Article 368.10 through 368.60)*
- i. Ground service to metallic bonding systems *(Article 250.94)*
- j. Draw external power diagrams
- k. Install intercom and public address systems *(Articles 800.18, 170, 110.3)*
- l. Install multi-conductor cables *(Article 250.119)*
- m. Install low-voltage lighting controls *(Article 411)*
- n. Install snow and ice melting equipment *(Article 426)*
- o. Connect emergency backup systems (rotary and solid-state types) *(Article 700)*
- p. Lace cable and wires in open raceways and control panels *(Articles 300, 336, 409)*
- q. Install photo-electric control *(Article 404.2 (C) 7)*
- r. Connect PC-based climate control equipment *(Articles 440, 750)*
- s. Install dynamic, switching, and resistive sensing devices
- t. Draw control panel diagrams
- u. Apply National Electrical Code (NEC) terms and concepts *(Article 100)*
- v. Summarize the NEC style *(Article 90)*
w. Use formal methods in finding code requirements
x. Determine the purpose, scope, and enforcement of the NEC (**Article 90**)
y. Examine the mandatory rules and formal interpretation of the NEC
z. Apply definitions for proper understanding and application of the NEC rules (**Article 100**)
aa. Examine working space and working space entrances for electrical equipment (**Article 110.26**)
## Course Description

This course addresses the diversity of control devices and applications used in industry today. Safety and electrical lockouts are also included.

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<th>Workplace Safety and Knowledge:</th>
<th>Electrical Motor Controls:</th>
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<tbody>
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<td>a) Identify equipment and materials of the trade</td>
<td>a) Connect point starters for DC motors</td>
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<td>b) Identify safe and proper use of tools of the trade</td>
<td>b) Connect push button stations</td>
</tr>
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<td>c) Identify the characteristics of a safe work site</td>
<td>c) Demonstrate an understanding of schematics (wiring diagrams, ladder diagrams, etc.)</td>
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<td>d) Identify OSHA's 1926.10 Construction Standards and who enforces OSHA Rules and Regulation in Kentucky</td>
<td>d) Connect control relay systems</td>
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<td>e) Identify and use personal protective equipment</td>
<td>e) Connect potential type motor-starting relays</td>
</tr>
<tr>
<td>f) Demonstrate ladder safety</td>
<td>f) Connect magnetic starters</td>
</tr>
<tr>
<td>g) Demonstrate electrical safety (i.e., GFCI, cord use, grounding)</td>
<td>g) Connect selector switches</td>
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<td>h) Identify different types of chemical, biological, and physical hazards</td>
<td>h) Connect time delay relays</td>
</tr>
<tr>
<td>i) Interpret hazardous chemical communication (i.e., MSDS, HAZWOPER)</td>
<td>i) Connect sensing devices (non-electric)</td>
</tr>
<tr>
<td>j) Demonstrate knowledge and understanding of blood borne pathogens</td>
<td>j) Connect overload relays into starting control circuits</td>
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<tr>
<td>k) Demonstrate knowledge and understanding of blueprints (i.e., symbols, specifications, layout)</td>
<td>k) Connect motor for automatic controls</td>
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<td>l) Demonstrate knowledge and understanding of schematics and line diagrams</td>
<td>l) Test magnetic starters</td>
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<td>m) Connect reduced voltage starters</td>
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<td>n) Connect motor control circuits for plugging</td>
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<td>o) Connect automatic reduced voltage starter for DC motor control</td>
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<td>p) Connect limit switches</td>
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<td>q) Connect dynamic braking circuit for DC motors</td>
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</table>
Connections:
* Common Core State Standards
* KOSSA
* Common Core Technical Standards
* New Generation Science Standards
* Post-Secondary: KCTCS EET 270/271
* CTSO-- SkillsUSA
# Industrial Safety

460301

## Course Description

This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.

## Content/Process

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<td>b) Apply personal safety rules and procedures</td>
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<td>c) Apply fire prevention rules and procedures</td>
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<td>d) Obtain first aid certification</td>
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<td>e) Obtain CPR certification (Recommended but not required)</td>
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<td>f) Demonstrate hazardous communications procedures</td>
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<td>g) Describe and demonstrate universal precautions procedures</td>
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<td>h) Obtain OSHA 10 certification (recommended but not required)</td>
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## Connections:

*Common Core State Standards  
*KOSSA  
*Common Core Technical Standards  
*New Generation Science Standards  
*Post-Secondary: KCTCS ISX 100  
*CTSO --SkillsUSA
## Course Description

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Internship do not receive compensation.

## Content/Process

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Connections:
* Common Core State Standards
* KOSSA
* Common Core Technical Standards
* New Generation Science Standards
* Post-Secondary: KCTCS EET 198
* CTSO--SkillsUSA
Course Description

Emphasizes the importance of the National Electrical Code as it applies to electrical installations: electrical safety issues, prevention of fire due to the use of electrical energy, prevention of loss of life and property from the hazards that might arise from the use of electrical energy, and proper selection of electrical equipment for hazardous and non-hazardous environments. A learning resource in the preparation for electrical licensing examinations.

Content/ Process

**National Electric Code (NEC):**

a) Summarize the NEC style  
b) Use formal methods in finding code requirements  
c) Determine the purpose, scope, and enforcement of the NEC  
d) Examine the mandatory rules and formal interpretation of the NEC  
e) Determine guidelines for electrical equipment approval  
f) Apply National Electrical Code (NEC) terms and concepts  
g) Apply definitions for proper understanding and application of the NEC rules  
h) Utilize NEC rules for installing raceway systems and their associated wiring methods, including box size and conduit fill calculations  
i) Apply NEC tables to determine conductor size and de-rating factors for general wiring  
j) Apply NEC rules for conductor termination and splices  
k) Apply general code requirements for conductors, such as insulation markings, ampacity ratings, and their use  
l) Determine installation location and primary uses for a variety of cable and electrical raceways  
m) Determine the types and approval for use of flexible cords and cables  
n) Determine the rules for multiwire branch circuits  
o) Apply NEC rules for receptacles and lighting in dwelling units  
p) Protect circuits with overcurrent protection devices, such as fuses and circuit breakers in a variety of locations and occupancies  
q) Utilize the NEC requirements for installing lighting fixtures, lamp holders, lamps and receptacles  
r) Size conductors and calculate overcurrent protection for a variety of appliances  
s) Calculate wire size for continuous and non-continuous loads  
t) Define feeder and how it relates to service and branch circuit conductors  
u) Calculate conductor and overcurrent protection size for feeders  
v) Demonstrate an understanding of the general requirements for all wiring methods by occupancy listed in the NEC, including dwelling optional load calculations  
w) Examine working space and working space entrances for electrical
| x) | Utilize methods to identify disconnects and circuits |
| y) | Identify requirements for high-leg conductors |
| z) | Demonstrate an understanding of requirements for clearances, grounding, and raceways for outside branch circuits and feeders |
| aa) | Utilize code requirements for service disconnecting means |
| bb) | Determine NEC rules for overhead and lateral services |
| cc) | Determine the number and grouping of service disconnect means by occupancy |
| dd) | Apply the rules for working space and dedicated space for switchboards and panel boards |
| ee) | Associate the difference between a grounded and neutral conductor |
| ff) | Determine the purpose of a grounded conductor |
| gg) | Differentiate between a grounded and grounding conductor |
| hh) | Use methods to identify the grounded and grounding conductor |
| ii) | Apply grounding to equipment through permitted NEC bonding measures |
| jj) | Identify bonding methods for services and communication equipment |
| kk) | Identify bonding methods for services and communication equipment |
| ll) | Determine when equipment is considered effectively grounded |
| mm) | Utilize the NEC to determine disconnecting means, overcurrent protection and conductor sizing of air-conditioning and refrigeration equipment |
| nn) | Bond separately derived electrical systems |
| oo) | Calculate primary and secondary overcurrent protection for transformers |
| pp) | Determine the rules for temporary wiring on construction sites |
| qq) | Apply code requirements for installing transformers and transformer vaults |
| rr) | Determine installation requirements for electrical space heating, motors, motor circuits and controllers |

Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS EET 250
*CTSO-SkillsUSA
## Course Description

Examines the need for alternative and renewable energy resources as a survey course providing citizens from all walks of life an understanding for responsible stewardships of technologies that will contribute to the sustainability of energy in our present and future societies. The object of this course is to take a more in-depth look at renewable energy forms and the replacement of fossil fuels in our society. Through wind, solar, and biomass this class will focus on live projects and scientific studies and comparisons of feasibility.

## Content/Process

<table>
<thead>
<tr>
<th></th>
<th><strong>Renewable Energy Systems:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Define renewable energy</td>
</tr>
<tr>
<td></td>
<td>b) Identify and describe different types of renewable energy</td>
</tr>
<tr>
<td></td>
<td>c) Determine costs and tradeoffs of various renewable options</td>
</tr>
<tr>
<td></td>
<td>d) Identify and describe sources of renewable energy and how they are delivered to customers</td>
</tr>
<tr>
<td></td>
<td>e) Identify and describe the impact of renewable energy to the environment and the economy</td>
</tr>
<tr>
<td></td>
<td>f) List and discuss overall issues associated with energy availability, effectiveness, distribution, and regulation</td>
</tr>
</tbody>
</table>

**Connections:**
*Common Core State Standards*  
*KOSSA*  
*Common Core Technical Standards*  
*New Generation Science Standards*  
*CTSO--SkillsUSA*
<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<tr>
<td>The object of this course is to take a more in-depth look at renewable energy forms and the replacement of fossil fuels in our society. Through scientific research methods, portfolio and presentations, students will focus on live projects, social energy issues problems and solutions using comparisons of feasibility.</td>
</tr>
</tbody>
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<table>
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<tr>
<td><strong>1</strong></td>
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</tbody>
</table>

Connections:
* Common Core State Standards
* KOSSA
* Common Core Technical Standards
* New Generation Science Standards
* CTSO--SkillsUSA
Rotating Machinery

Course Description

Focuses on the underlying principles of rotating electrical equipment including DC and AC motors and generating equipment construction, operating applications, and the maintenance of DC and AC motors and generating equipment.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Workplace Safety and Knowledge:</strong></td>
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<td>a) Identify equipment and materials of the trade</td>
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<td>b) Identify safe and proper use of tools of the trade</td>
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<td>c) Identify the characteristics of a safe work site</td>
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<td>d) Identity OSHA's 1926.10 Construction Standards and who enforces OSHA Rules and Regulation in Kentucky</td>
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<td>e) Identify and use personal protective equipment</td>
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<td>f) Demonstrate ladder safety</td>
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<tr>
<td>g) Demonstrate electrical safety (i.e., GFCI, cord use, grounding)</td>
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<tr>
<td>h) Identify different types of chemical, biological, and physical hazards</td>
</tr>
<tr>
<td>i) Interpret hazardous chemical communication (i.e., MSDS, HAZWOPER)</td>
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<tr>
<td>j) Demonstrate knowledge and understanding of blood borne pathogens</td>
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<tr>
<td>k) Demonstrate knowledge and understanding of blueprints (i.e., symbols, specifications, layout)</td>
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<tr>
<td>l) Demonstrate knowledge and understanding of schematics and line diagrams</td>
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</tbody>
</table>

| **Rotating Machinery:** |
| a) Describe the installation and measurement of DC series motor speed/torque characteristics |
| b) Describe the installation and measurement of DC shunt motor speed/torque characteristics |
| c) Describe the installation and measurement of DC compound motor speed/torque characteristics |
| d) Describe the installation and measurement of DC series generator counter torque/voltage/speed characteristics |
| e) Describe the installation and measurement of DC shunt generator counter torque/voltage/speed characteristics |
| f) Describe the installation and measurement of DC compound generator counter torque/voltage/speed characteristics |
| g) Explain how to change the output voltage of DC generators |
| h) Explain how to vary the output voltage on AC alternators through field excitation |
| i) Describe connection of instrumentation to measure frequency in AC alternators |
j) Describe how to parallel-connect two three-phase AC alternators so their voltages and frequencies are synchronized
k) Use the National Electrical Code to size and install AC alternators
l) Use electrical control equipment to vary the speed of single-phase AC motors
m) Use mechanical and electrical instruments to measure the start and run torque of motors
n) Explain how to vary the input voltage and measure speed/torque characteristics of single-phase AC motors
o) Describe how to measure the speed/torque characteristics of capacitor-start, single-phase AC motors
p) Use the National Electrical Code to size and install AC alternators
q) Use electrical control equipment to vary the speed of single-phase AC motors
r) Use mechanical and electrical instruments to measure the start and run torque of motors
s) Explain how to vary the input voltage and measure speed/torque characteristics of single-phase AC motors
t) Describe how to measure the speed/torque characteristics of capacitor-start, single-phase AC motors
u) Describe how to measure the speed/torque characteristics of capacitor-run, single-phase AC motors
v) Describe how to measure the speed/torque characteristics of repulsion-induction, single-phase AC motors
w) Describe how to measure the speed/torque characteristics of shaded-pole, single-phase AC motors
x) Describe how to measure the speed/torque characteristics of split-phase, single-phase AC motors
y) Use manual and automatic means to change the direction of three-phase AC motors
z) Utilize electrical control equipment to vary the speed of three-phase AC motors
aa) Configure three-phase AC motor stators to operate in delta
bb) Configure three-phase AC motor stators to operate in wye
c) Explain how to measure the speed/torque characteristics of three-phase synchronous AC motors
d) Explain how to measure the speed/torque characteristics of three-phase squirrel-cage AC motors
e) Explain how to measure the speed/torque characteristics of three-phase wound-rotor AC motors
f) Describe the preventative and permanent maintenance on AC and DC electrical rotary equipment
g) Size feeder conductors and overcurrent protection for AC and DC rotating equipment according to the standards summarized in the National Electrical Code

Connections:
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<td>New Generation Science Standards</td>
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<tr>
<td>Post-Secondary: KCTCS EET 264/265</td>
</tr>
<tr>
<td>CTSO--SkillsUSA</td>
</tr>
</tbody>
</table>
Course Description

This course focuses on the construction, operation and maintenance of DC motors and generators and AC motors and alternators. This course addresses the diversity of control devices and applications used in industry today. Safety and electrical lockouts are also included.

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<td>g) Demonstrate electrical safety (i.e., GFCI, cord use, grounding)</td>
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<td>h) Identify different types of chemical, biological, and physical hazards</td>
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<tr>
<td>i) Interpret hazardous chemical communication (i.e., MSDS, HAZWOPER)</td>
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<td>j) Demonstrate knowledge and understanding of blood borne pathogens</td>
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<tr>
<td>k) Demonstrate knowledge and understanding of blueprints (i.e., symbols, specifications, layout)</td>
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</tr>
<tr>
<td><strong>2 Rotating Machinery Electrical Motor Controls:</strong></td>
</tr>
<tr>
<td>a) Change the output voltage of alternators</td>
</tr>
<tr>
<td>b) Measure the frequency of alternators</td>
</tr>
<tr>
<td>c) Install two three-phase alternators in parallels</td>
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<tr>
<td>d) Install alternators</td>
</tr>
<tr>
<td>e) Change speed of single phase motors</td>
</tr>
<tr>
<td>f) Measure the torque of motors</td>
</tr>
<tr>
<td>g) Connect single-phase motor to run on different voltages</td>
</tr>
<tr>
<td>h) Connect and test capacitor start motors</td>
</tr>
<tr>
<td>i) Connect and test capacitor run motors</td>
</tr>
<tr>
<td>j) Connect and test repulsion-induction motors</td>
</tr>
<tr>
<td>k) Connect and test shaded pole motors</td>
</tr>
<tr>
<td>l) Replace split-phase motors</td>
</tr>
<tr>
<td>m) Change the direction of rotation of electrical motors</td>
</tr>
<tr>
<td>n) Connect three-phase motors to run on different voltages</td>
</tr>
<tr>
<td>o) Connect three-phase motor stator for delta operations</td>
</tr>
<tr>
<td>p) Connect three-phase motor stator for star operations</td>
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<tr>
<td>q) Connect and test synchronous motors</td>
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<tr>
<td>r) Connect and test three-phase induction motors</td>
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</tbody>
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Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS EET 268/269
*CTSO--SkillsUSA
### Course Description

A course designed for the student who has demonstrated specific special needs.

### Content/Process

<table>
<thead>
<tr>
<th></th>
<th>Special Problems - Electrical Technology:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Selected tasks/problems as determined by the instructor</td>
</tr>
</tbody>
</table>

Connections:
* Common Core State Standards
* KOSSA
* Common Core Technical Standards
* New Generation Science Standards
* Post-Secondary: KCTCS EET 281
* CTSO--SkillsUSA
## Course Description

Instruction related to Electrical Technology but not described in the other courses.

### Content/Process

<table>
<thead>
<tr>
<th></th>
<th><strong>Special Topics · Electrical Technology</strong>&lt;br&gt;a) Selected tasks/problems as determined by the instructor</th>
</tr>
</thead>
</table>

Connections:
* Common Core State Standards
* KOSSA
* Common Core Technical Standards
* New Generation Science Standards
* CTSO--SkillsUSA
# Sustainable Energy Systems

## Course Description

Examines the sustainability of various energy resources. An overview of energy technology, energy resources, and emerging future energy technologies coupled with our energy use will bring into context the strengths and weaknesses of different energy methodologies in developing a working concept of sustainable energy.

## Content/Process

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<tr>
<th>1</th>
<th><strong>Workplace Safety and Knowledge:</strong></th>
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<td>f)</td>
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<td>g)</td>
<td>Demonstrate electrical safety (i.e., GFCI, cord use, grounding)</td>
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<td>h)</td>
<td>Identify different types of chemical, biological, and physical hazards</td>
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<td>i)</td>
<td>Interpret hazardous chemical communication (i.e., MSDS, HAZWOPER)</td>
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<td>j)</td>
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<td>k)</td>
<td>Demonstrate knowledge and understanding of blueprints (i.e., symbols, specifications, layout)</td>
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<tr>
<td>l)</td>
<td>Demonstrate knowledge and understanding of schematics and line diagrams</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Sustainable Energy Systems:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Define sustainable energy</td>
</tr>
<tr>
<td>b)</td>
<td>Define and convert various common energy sources to units of measurements in terms of BTU’s of energy and power in terms of Watts</td>
</tr>
<tr>
<td>c)</td>
<td>Demonstrate a basic understanding of the physics of heat</td>
</tr>
<tr>
<td>d)</td>
<td>Explain how energy systems interact with local, regional and global environments</td>
</tr>
<tr>
<td>e)</td>
<td>Analyze the basic operation of passive and active solar energy systems and associated sustainability issues</td>
</tr>
<tr>
<td>f)</td>
<td>Describe the basic operation of tidal energy systems and associated sustainability issues</td>
</tr>
<tr>
<td>g)</td>
<td>Explain the basic operation of wind energy systems and associated sustainability issues</td>
</tr>
<tr>
<td>h)</td>
<td>Describe the basic operation of fossil fuel energy systems and associated sustainability issues</td>
</tr>
<tr>
<td>i)</td>
<td>Describe the basic operation of nuclear power energy systems and associated sustainability issues</td>
</tr>
<tr>
<td>j)</td>
<td>Explain how renewable energy systems contribute to the</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th>Sustainability of energy sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>k)</td>
<td>Describe the basic operation of biomass energy systems and associated sustainability issues</td>
</tr>
<tr>
<td>l)</td>
<td>Describe the basic operation of hydropower systems and associated sustainability issues</td>
</tr>
<tr>
<td>m)</td>
<td>Assess the basic operation of electrical power generation and associated sustainability issues</td>
</tr>
<tr>
<td>n)</td>
<td>Categorize the sustainability issues associated with residential and commercial building designs</td>
</tr>
</tbody>
</table>

Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*CTSO--SkillsUSA
Transformers

460305

Course Description

Focuses on the operation, installation and application of AC single-phase and three-phase transformers. Testing and maintaining transformer equipment are emphasized, with safety integrated as a core component of the study.

<table>
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</table>

<table>
<thead>
<tr>
<th>Transformers:</th>
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<tbody>
<tr>
<td>a) Connect a dual voltage transformer for its highest input and output voltages</td>
</tr>
<tr>
<td>b) Connect a dual voltage transformer for the low voltage input and output</td>
</tr>
<tr>
<td>c) Connect an ammeter to high voltage line using a current transformer</td>
</tr>
<tr>
<td>d) Connect an auto transformer to give a variety of voltages</td>
</tr>
<tr>
<td>e) Connect transformers to supply 3-phase power, 4-2 configuration</td>
</tr>
<tr>
<td>f) Connect transformers to supply 3-phase power, delta configuration</td>
</tr>
<tr>
<td>g) Connect transformers to supply 3-phase power, Y configuration</td>
</tr>
<tr>
<td>h) Connect the secondary of a 3-phase bank to give a 4-wire delta system</td>
</tr>
<tr>
<td>i) Connect 3-single phase transformers to form a delta-delta configuration</td>
</tr>
<tr>
<td>j) Connect 3-single phase transformers to form a delta-star configuration</td>
</tr>
<tr>
<td>k) Connect 3-single phase transformers to form a star-delta 3-phase bank</td>
</tr>
<tr>
<td>l) Connect 3-single phase transformers to form a star-star 3-phase bank</td>
</tr>
<tr>
<td>m) Connect 2 single-phase transformers in an open-delta configuration</td>
</tr>
<tr>
<td>n) Connect 2 single-phase transformers in parallel</td>
</tr>
<tr>
<td>o) Connect a voltmeter using a potential transformer to determine voltage</td>
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</tr>
<tr>
<td><strong>p)</strong> Test transformer for output and performance under resistive, capacitive, and inductive loads</td>
</tr>
<tr>
<td><strong>q)</strong> Connect buck-boost transformer to increase voltage</td>
</tr>
<tr>
<td><strong>r)</strong> Connect buck-boost transformer to decrease voltage</td>
</tr>
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</table>

Connections:
*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS EET 150/151
*CTSO--SkillsUSA