

# OZARKS TECHNICAL COMMUNITY COLLEGE

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## Electrical Distribution Systems *Curriculum Outline*

**Catalog Description for Program:** Electric utility line technicians install and repair poles, conductors, cables, and operate and maintain equipment used in electrical power and distribution systems. Students in this program will learn to climb wood pole structures, equipment operation, build and maintain electrical distribution systems, all while placing an emphasis on safe work practices and critical thinking skills. The degree program is intended to prepare individuals for employment at any utility offering an apprenticeship program. Program enrollment is limited and students are selected on a competitive basis.

**Mission Statement:** The mission of the Electrical Distribution Systems Technology program is to prepare students for entry employment at any utility offering an apprenticeship program. The Electrical Distribution Systems Technology program strives to provide high quality, occupationally-oriented courses with an emphasis on safety and critical thinking skills.

1. Obtain and perform an entry-level job as a lineman.
2. Practice all safety procedures when working on utility distribution and transmission equipment.
3. Have a basic knowledge of ohm's law, equipment operation, and electrical distribution and transmission.
4. Understand and be able to climb wood structures, identify hazards, and perform pole maintenance.
5. Apply transformer theory to real-world applications.
6. Know and understand utility distribution system terminology including schematic symbols and be able to read and interpret industrial documentation, manuals, and blueprints.
7. Work with regulation equipment, conductors, metering and perform service.
8. Obtain certifications in OSHA, CPR/First Aid, Flagger, and a Commercial Driver's License.
9. Show a strong foundation of basic electrical knowledge, safety, and best practices for further on-the-job training as an apprentice lineman.
10. Show skills in verbal and written communication within the discipline.
11. Demonstrate critical thinking skills, practical decision-making, and competent work habits with a safety-oriented focus.

**Program Justification:** Missouri has 41 regional electric cooperatives, hundreds of municipal utilities, and also operates Show-Me power generation, yet there are currently no lineman training programs south of the Missouri River. The demand for these graduates is high as other training programs have a lengthy waiting list and only accept a limited number of applicants annually. The job outlook is strong, and placement of qualified individuals will be easily met in this recession-proof type of work.

### Classification of Instructional Programs (CIP): Lineworker (46.0303)

A program that prepares individuals to apply technical knowledge and skills to install, operate, maintain and repair local, long-distance, and rural electric power cables and communication lines; erect and construct pole and tower lines; and install underground lines and cables. Includes instruction in cable installation and repair, fibre-optic technology, trenching, mobile equipment and crane operation, high-voltage installations, maintenance and inspection, safety, remote communications, and applicable codes and standards.

*Examples: [Power Line Electrician], [Power Lineman], [Powerline Technician], [Powerline Technician (Operating)]*

ELECTRICAL DISTRIBUTION SYSTEMS TECHNOLOGY			
Preferred Course Sequence			
Semester One		Credit Hours	Lab Fee
EDS 100	Intro to Electrical Distribution & Transmission	3	
EDS 120	Safety & Prevention Methods ( <i>includes OSHA 10, CPR/First Aid, Flagger</i> )	4	\$75.00
EDS 160	Pole Climbing Skills	4	\$75.00
EDS 151	Commercial Driver License	3	\$1,237.00
EDS 152	Commercial Driver License Lab	3	\$2,475.00
		<b>17</b>	
Semester Two			
EDS 150	Equipment Operation	4	\$75.00
EDS 170	Overhead Power Distribution	4	\$75.00
EDS 237	Transformer Theory	4	\$75.00
PLS 101	American Government & Politics ( <i>allow HST 120 or HST 130 as substitution</i> )	3	
TEC 108	Applied Technical Mathematics ( <i>allow MTH 130 as substitution</i> )	3	
		<b>18</b>	
Semester Three (Summer)			
EDS 290	Co-Operative Ed/Internship (1-3)	1	
		<b>1</b>	
Semester Four			
EDS 200	Electrical Distribution & Transmission II	4	\$75.00
EDS 246	Service Installation & Metering	3	
EDS 250	Gloving & Intro to Live Line Procedures	3	
	Social Science Elective	3	
ENG 101	English Composition I ( <i>allow ENG 100/100A, ENG 102 and ENG 150 as substitutions</i> )	3	
		<b>16</b>	
Semester Five			
EDS 270	Underground Power Distribution	3	\$75.00
EDS 260	Distribution Systems Maintenance	4	\$75.00
EDS 272	Fusing, Substations, & Voltage Regulation	3	\$75.00
COM 105	Public Speaking	3	
TES 140	Technical Physics ( <i>allow PHY 105 as substitution</i> )	4	\$60.00
		<b>17</b>	
PROGRAM TOTAL		<b>69</b>	

## **Course Descriptions:**

### **EDS 100 – Intro to Elec. Distribution & Transmission**

Rationale: Course provides an introduction to electrical distribution systems in use in the power grid.

Catalog Description: This course will provide an overview and fundamental instructions on electrical power generation, distribution, and transmission systems. The course will also focus on operations, power conversion, quality issues, structures, and equipment used across multiple utilities.

Materials: Refer to syllabus.

### **EDS 120 – Safety & Prevention Methods I**

Rationale: Course provides an introduction to basic safety principles used in the workplace, at job sites, and risks associated with live power.

Catalog Description: This course will provide a solid foundation for practicing safe work practices and identifying risks for the purposes of prevention. Students will learn Occupational Safety and Health Administration (OSHA) rules and regulations associated with this industry and safe work practices from the American Public Power Association Safety Manual. Students will also gain an awareness of hazards associated with electrical distribution systems, environmental safety, and health issues.

Materials: Refer to syllabus.

### **EDS 150 – Equipment Operation**

Rationale: Course provides an introduction to and the basic operation of industry related equipment.

Catalog Description: This course will allow students to learn operation of industry related equipment used in the construction and maintenance of electrical distribution systems. Students will utilize auger/digger and bucket trucks, backhoe, trenching equipment, and hydraulic systems. Students will also learn equipment inspection and maintenance schedules, grounding practices, equipment capacity, and hands-on operation of each item.

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with fuel, equipment operation, maintenance, and simulation activities.

Materials: Refer to syllabus.

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### **EDS 125 – Safety & Prevention Methods 2**

Rationale: Course provides an in-depth look at safety principles used in the workplace, at job sites, and risks associated with live power.

Catalog Description: This course will expand on principles taught in Safety & Prevention Methods I and provide an in-depth opportunity for students to practice safety and prevention through simulations, case study, and application. Students will deepen knowledge of Occupational Safety and Health Administration (OSHA) rules and regulations continue to focus on safe work practices from the American Public Power Association Safety Manual. Students will also deepen focus on identification and prevention of hazards.

Prerequisite: EDS 120

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and simulation activities.

Materials: Refer to syllabus.

### **EDS 160 – Pole Climbing Skills**

Rationale: Course provides an in-depth look at safety principles used in the workplace, at job sites, and risks associated with live power.

Catalog Description: This course introduces students to the proper and safe methods of wood pole climbing. Students must master climbing wood pole structures safely and conduct work practices associated with the electrical utility industry. Upon completion of this course, students will successfully demonstrate two methods of climbing and be able to identify hazards of climbing.

Prerequisite: EDS 100, EDS 120, EDS 150

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and demonstration activities.

Materials: Refer to syllabus.

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### **EDS 170 – Overhead Power Distribution**

Rationale: Course provides an in-depth look at construction and repair methods and the ability of students to identify all aspects of overhead power distribution systems.

Catalog Description: This course will give students a working knowledge of utility service line construction including pole framing, types of construction by sight and definition, and materials used in overhead power distribution. Students will demonstrate knowledge in ground and aerial situations including installation, repair, and removal of poles and related electrical utility equipment through aspects of 12,500; 14,400; and 34,500 volt construction.

Prerequisite: EDS 100, EDS 120

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and demonstration activities.

Materials: Refer to syllabus.

### **EDS 151 – Commercial Driver License**

Rationale: Course provides preparation for the CDL exam.

Catalog Description: This course will give students preparation for the written exam to obtain a valid Class A Commercial Driver's License (CDL) with specified endorsements. Students must be able to maintain a driving record that is eligible for Missouri Class A CDL, 2; obtain a complete and current medical examination and, successfully pass drug screen(s).

Materials: Refer to syllabus.

### **EDS 152 – Commercial Driver License Lab**

Rationale: Course provides preparation for the CDL exam.

Catalog Description: This course will give students preparation for the driving exam to obtain a valid Class A Commercial Driver's License (CDL) with specified endorsements. Students must be able to maintain a driving record that is eligible for Missouri Class A CDL, 2; obtain a complete and current medical examination and, successfully pass drug screen(s).

Lab Fee: Unknown at time of proposal.

Lab Fee Rationale: Course will cover exam for Missouri Class A CDL, 2 with endorsements.

Materials: Refer to syllabus.

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**EDS 200 – Electrical Distribution & Transmission 2**

Rationale: Course provides an in-depth look into electrical distribution systems in use in the power grid.

Catalog Description: This course continues an overview of electrical distribution systems in use. The course will focus on operations, power conversion, quality issues, structures, and equipment used across multiple utilities.

Prerequisite: EDS 100

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and demonstration activities.

Materials: Refer to syllabus.

**EDS 237 – Transformer Theory**

Rationale: Course provides an in-depth look into transformer theory, installation, and application.

Catalog Description: This course will allow students to gain an in-depth knowledge of transformer theory and installation. Single-phase and three-phase configurations with different types of connections will be included. Other topics include: over voltage and over current protection, equipment grounding, cutout protection, proper cover-up techniques, lightning arrester application and installation, basic troubleshooting practices, and current and potential transformers use and safety.

Prerequisite: EDS 100, EDS 160

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and demonstration activities.

Materials: Refer to syllabus.

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### **EDS 246 – Metering**

Rationale: Course provides an in-depth look into metering installation and application.

Catalog Description: This course will allow students to gain extensive knowledge of single and three-phase watt-hour meters, meter locations, and the different types of copper and aluminum conductors. Students will also gain practical experience in the sizing, proper connection types, installation, stringing, sagging, dead-ending, and splicing of overhead and underground service conductors. Students will be exposed to meter loops and poles, instrument metering, temporary metering, compression sleeves, and related connectors and tools. Students will also deepen focus on theft deterrent measures, identification of safe work practices including proper grounding techniques, and prevention of hazards.

Prerequisite: EDS 100, EDS 160

Materials: Refer to syllabus.

### **EDS 270 – Underground Power Distribution**

Rationale: Course provides an in-depth look at construction and repair methods and the ability of students to identify all aspects of underground power distribution systems.

Catalog Description: This course will give students a working knowledge of the different types of underground distribution systems, able to identify the types of cable used in underground distribution, describe proper cable installation procedures, demonstrate proper cable preparation techniques using manufacturers specifications for splicing and terminating cable, list safe work procedures and demonstrate the proper techniques for isolation and grounding underground cable sections.

Prerequisite: EDS 100, EDS 120

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and demonstration activities.

Materials: Refer to syllabus.

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**EDS 250 – Applied Certifications**

Rationale: Course provides preparation for OSHA 10, CPR/First Aid, and Flagger certifications.

Catalog Description: The student will learn the hazards and safe work practices of an electrical line technician as it relates to required certifications within the utility industry. This course will give students preparation for the exams and certifications associated with OSHA 10, CPR/First Aid, and Flagger.

Materials: Refer to syllabus.

**EDS 251 – Applied Certifications Lab**

Rationale: Course provides preparation for OSHA 10, CPR/First Aid, and Flagger certifications.

Catalog Description: This course will give students preparation for and allow students to sit for the exams and certifications associated with OSHA 10, CPR/First Aid, and Flagger.

Lab Fee: Unknown at time of proposal.

Lab Fee Rationale: Course will cover exams and certifications.

Materials: Refer to syllabus.

**EDS 260 – Distribution Systems Maintenance**

Rationale: Course provides preparation for all aspects of distribution systems maintenance.

Catalog Description: This course will give students a working knowledge of systems maintenance including commonly used equipment, poles, overhead and underground distribution lines; meter, transformer, and conductor maintenance, preventative and predictive maintenance; expected life cycle and failure points; shop maintenance; work order resolution; inventory and system logging.

Prerequisite: EDS 170, EDS 270, EDS 200, EDS 237, EDS 246

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, simulation, and demonstration activities.

Materials: Refer to syllabus.



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**EDS 272 – Fusing, Substations, and Voltage Regulation**

Rationale: Course provides an in-depth look into Fusing, Substations, and Voltage Regulation. Practical experience in the grounding, inspection, maintenance and operation of basic substations will also be gained.

Catalog Description: This course will familiarize students with the different types and methods of system coordination, substations, capacitors, voltage regulators, and auto-transformers. Upon completion of this course, students will be able to demonstrate a working knowledge of oil reclosures, sectionalizers and the application/coordination of fuses. Students will also be introduced with installation and operation of single and three-phase regulators, gang operated air break and load break switches, and substation fuses and reclosures. Practical experience in the grounding, inspection, maintenance and operation of basic substations will also be gained.

Prerequisite: EDS 237

Lab Fee: \$75.00

Lab Fee Rationale: Course will cover consumable costs associated with equipment, maintenance, and demonstration activities.

Materials: Refer to syllabus.

**EDS 290 – Co-Operative Ed/Internship/Related Elective (1-3)**

Rationale: Course provides opportunity for internship or related elective.

Course Description: This course entails a supervised work experience in the major field, which provides the opportunity to make practical application of the knowledge and skills attained. An individualized instructional management plan determines goals to be accomplished. Seminars may also be required.

Prerequisite: Completion of 30 credit hours of program specific courses and 2.0 GPA and approval of department chair.

Materials: Refer to syllabus.