



**Bismarck State College**  
**National Energy Center of Excellence**  
**Operator Maintenance Technical Apprenticeship Program**

**ELPW 101 – Basic Computer Skills – 3 Credits or CSCI 101 – Introduction to Computers – 3 Credits**

**ELPW 101**

This course is designed to give students a general understanding of computers, both hardware and software. Students will learn to access the Internet and navigate through their online courses and utilize the system tools. This course will also include a basic study of MS Word, MS Excel and MS PowerPoint. Students must have access to these XP/2003 software applications.

**CSCI 101**

This course introduces students to general computer topics such as input and output devices, the computer's impact on society, programming languages, and software. Students will learn to access the Internet and navigate through their online courses and utilize the system tools. Includes hands-on experience in word processing, spreadsheets, data management, and presentations. Students must have access to the Microsoft Office 2007 software applications (MS Word, MS Excel, MS Access, MS PowerPoint).

**ENRT 103 – Applied Math – 3 Credits or ETST 242 – Applied Mathematics for System Operators – 2 Credits**

**ENRT 103**

This course will teach basic math skills and apply those to energy industry situations. Students will learn the metric system, basic volume and area calculations as well as algebra and trigonometry and how they apply to industry specific situations.

**ETST 242**

This course is designed to provide a review of basic mathematical concepts required for work as an electrical transmission systems operator. In addition to basic mathematics, students will study basic trigonometry, vectors and phasors, and the relationship these mathematical functions have to work as a system operator.

**ENRT 106 – DC Fundamentals – 2 Credits**

This course covers basic direct current theories and applies those theories to the electrical system and related equipment. Students will study methods of producing a voltage, such as batteries, magnetic fields, basic series and parallel circuits. Students will also study basic DC circuit calculations.

**ENRT 108 – AC Fundamentals – 3 Credits**

This course is designed to cover basic alternating current theories and applies those theories to electrical transmission and distribution systems and related equipment. This course also covers generator and motor design, construction and operating principles.

**ELPW 109 – Electrical Industry Safety – 3 Credits**

This course covers the general safety practices and information employees need while working in any segment of the electrical industry, and the Federal Agencies responsible for insuring a safe working environment. Students will also gain an understanding of the Workers Right to Know regulations and awareness of Public Safety issues.

**TPC 307 – Basic Hydraulics**

Covers hydraulic principles, types of hydraulic fluids and their characteristics. Describes components of the hydraulic system and their functions, including filters and strainers, reservoirs and accumulators, pumps, piping, tubing and hoses, control valves, relief valves, and actuating devices. Covers a variety of cylinders and hydraulic motors.

**TPC 309 – Basic Pneumatics**

Covers how work, force, and energy are applied to principles of pneumatics. Shows operating principles of reciprocating, positive displacement, rotary, and dynamic air compressors. Covers primary and secondary air treatment. Includes valves, logic devices, cylinders, and air motors.

**TPC 310 – Developing Pneumatic Troubleshooting Skills**

Covers pneumatic systems, schematic symbols and diagrams, installing system components, planned maintenance, system diagnosis, and troubleshooting. Includes maintenance of air compressors, control valves, air motors, electrical components, and hybrid systems.

**TPC 207 – Operating and Maintaining Single Phase Systems**

Covers the types and operating principles of common single-phase motors. Explains NEMA motor standards. Explains how to identify motor leads on split-phase, capacitor-start, capacitor-run, permanent split capacitor, and repulsion motor. Also covers universal motors, shaded-pole motors, and other special types, including synchro and servo systems. Gives general maintenance procedures on all single-phase motors.

**TPC 208 – Operating and Maintaining Three Phase Systems**

Covers three-phase motor principles for induction, synchronous, and multi-speed dual-voltage motors. Gives recommended maintenance practices for large AC motors. Covers principles of three-phase motor starters, part winding, reversing, jogging, alternator principles and operation. Describes three-phase power distribution.

**TPC 210 – Electrical Troubleshooting**

Covers use of schematic diagrams, determining sequence of operation, and use of building diagrams and single-line diagrams. Includes troubleshooting procedures for control circuits and combination starters. Explains troubleshooting practices on DC and AC motors, identifying unmarked leads on three-phase delta and Y-connected motors, and troubleshooting lighting systems.

**TPC 205 – Motor Branch Circuit Protection**

Examines electrical hazards and stresses the importance of electrical safety. Covers the equipment and procedures necessary to work safely with electricity, including PPE, lockout/tagout, and first aid. Explains the importance of grounding. Describes many kinds of fuses, circuit breakers, and motor protection devices and their uses.

**TPC 202 – Storage Batteries and Chargers**

Covers how electrochemical action is used. Covers batteries, electrolytic action, electroplating. Characteristics of storage batteries, application and maintenance of lead-acid, nickel-alkaline, and nickel-cadmium batteries, putting batteries into service, charging batteries, maintaining recorded, fundamentals of DC circuits, and using Ohm's Law to solve problems in DC series, parallel, and series-parallel circuits.

**APP 120 – Troubleshooting and Emergency Repair of DC Systems and Equipment**

This course provides a basic understanding of how to locate problems in DC systems and equipment and make temporary repairs. Particular emphasis is placed on industrial DC systems, subsystems, units, and components commonly in use.

**APP 119 – Troubleshooting and Emergency Repair of AC Systems and Equipment**

This course provides a basic understanding of how to locate problems in AC systems and equipment and make temporary repairs.

**TPC 204 – Using Electrical Test Equipment**

Covers the principles on which electrical test instruments operate. Basic instruments covered include voltmeter, ammeter, wattmeter, ohmmeter, and megohmmeter. Covers AC metering, split-core ammeter, use of current and potential transformers. Includes detailed coverage of modern multimeters. Explains functions and uses of oscilloscopes.

**TPC 280 – Safety, Calibration and Testing Procedures**

Covers the responsibilities of employer, employee, and regulatory agencies in maintaining safety. Discusses ways of identifying and handling chemical, electrical, biological, radiation, and mechanical hazards. Discusses importance of maintenance (including calibration) and proper record keeping. Describes use of common electrical and electronic test instruments. Offers guidelines for handling heavy equipment, decontaminating and servicing pneumatic and hydraulic equipment, and troubleshooting.

**TPC 209 – Understanding Basic AC Control Equipment, Synchronous Motor and Controller Maintenance**

Covers the broad range of industrial motor starting and control equipment, including NEMA sizes and ratings. Includes pushbutton control station, limit switches, mercury switches, mechanical and magnetic plugging, foot switches, and pressure, temperature, and float switches. Covers control panel wiring and special applications.