

Railroad Electronics Certificate

This certificate is a comprehensive program of study that covers the fundamental electronic principles used by railroad signal control systems technicians. Upon successful completion of this program, the student should be able to apply basic digital and analog theory required in the maintenance of right-of-way crossing and train control systems.

Enrollment in the program is subject to the approval of the BNSF training director and JCCC division administrator.

For information visit the National Academy of Railroad Sciences (<http://www.railroadtraining.com>). Hover your cursor over the "New Careers" tab and choose from the list.

(Major Code 4540; State CIP Code 49.0208)

Required Courses

RREL 180	Introduction to Railroad Electronics*	1
RREL 181	Circuit Analysis DC/AC*	6
RREL 182	Semiconductor Devices and Circuits*	6
RREL 183	Digital Techniques*	6
RREL 284	Electronic Communications*	6
RREL 285	Microprocessor Techniques*	6
RREL 286	Applied Microprocessors*	2
Total Hours		33

Total Program Hours: 33

Courses

RREL 110 Introduction to Railroad Signal Systems* (4 Hours)

Prerequisites: Approval of the railroad training administrator and the JCCC department approval

This course is the first of a series of four designed to provide entry (apprentice) level training to new signal employees, or those seeking to enter this trade. Upon successful completion of this course, the student should be able to describe basic company organization, operating and safety rules pertaining to signalmen, basic principles of electricity and measurement as well as protective devices. Also he or she should have a basic understanding of signal systems, track circuits, and Federal Railroad Administration (FRA) rules. 44 hrs. lecture 16 hrs. instructional lab/total.

Associated Costs: These are additional (out-of-pocket) expense considerations that students should expect in addition to the course tuition, fees, and textbooks. \$924.

RREL 112 Track Circuits and Systems* (4 Hours)

Prerequisites: Successful completion of RREL 110 and approval of the railroad training administrator and the JCCC department approval

This course is the second of a series of four designed to provide entry (apprentice) level training to new signal employees, or those seeking to enter this trade. Upon successful completion of this course, the student should be able to describe and explain the operation of various track circuits, relay and control circuits, traffic control systems, locks, and applicable rules and standards. 44 hrs. lecture 16 hrs. instructional lab studio/total.

Associated Costs: These are additional (out-of-pocket) expense considerations that students should expect in addition to the course tuition, fees, and textbooks. \$924.

RREL 114 Traffic Control, Switch Machines Locks* (4 Hours)

Prerequisites: RREL 112 and approval of the railroad training administrator and the JCCC department approval

This course is the third of a series of four designed to provide entry (apprentice) level training to new signal employees, or those seeking to enter this trade. Upon successful completion of this course the student should be able to describe and maintain automatic block signaling systems, centralized traffic systems, power switches and locks. He should also be familiar with ground testing and isolation, as well as applicable rules and standards. 44 hrs. lecture 16 hrs. instructional lab studio/total.

Associated Costs: These are additional (out-of-pocket) expense considerations that students should expect in addition to the course tuition, fees, and textbooks. \$924.

RREL 116 Interlocking, Classification, Crossings Gates* (4 Hours)

Prerequisites: RREL 114 and approval of the railroad training administrator and the JCCC department approval

This course is the last of a series of four designed to provide entry (apprentice) level training to new signal employees, or those seeking to enter this trade. Upon successful completion of this course, the student should be able to perform interlocking plant and route plant analysis, explain classification yards, grade crossing warning systems, gates, and other devices, as well as applicable rules and standards. 44 hrs. lecture 16 hrs instructional lab/total.

Associated Costs: These are additional (out-of-pocket) expense considerations that students should expect in addition to the course tuition, fees, and textbooks. \$924.

RREL 180 Introduction to Railroad Electronics* (1 Hour)

Prerequisites: Approval of the railroad training administrator and the JCCC department approval

This course is designed to meet the needs of railroad electronic maintainers. Upon successful completion of this course, the student should be able to state basic safety procedures in electronics, explain basic principles of electronics, perform basic electronic calculations and use basic electronic tools. 2.5 hrs. lecture, 2.5 hrs. lab/wk.

RREL 181 Circuit Analysis DC/AC* (6 Hours)

Prerequisites: RREL 180 and the approval of the railroad training administrator and the JCCC department approval

This course is designed to meet the needs of the railroad electronic maintainers. Upon successful completion of this course, the student should be able to identify and use fundamental DC circuit concepts such as Kirchhoff's laws, power and energy formulas, Ohm's Law, Thevenin's Theorem and Norton's Theorem as they apply to resistive circuits. Also upon successful completion of this course, the student should be able to analyze circuits involving resistors, capacitors and inductors driven by time-variant sources. This analysis will involve both time and frequency responses. 3 hrs. lecture, 2 hrs. lab, 3 hrs. alternate deliver/wk.

RREL 182 Semiconductor Devices and Circuits* (6 Hours)

Prerequisites: RREL 181 and the approval of the railroad training administrator and the JCCC department approval

This course is designed to meet the needs of railroad electronic maintainers. Upon successful completion of this course, the student should be able to describe the characteristics of basic semiconductor devices, explain practical circuits using semiconductor devices and analyze these circuits for DC and AC quantities. 3 hrs. lecture, 2 hrs. lab., 3 hrs. alternate delivery/wk.

RREL 183 Digital Techniques* (6 Hours)

Prerequisites: RREL 182 and approval of the railroad training administrator and the JCCC department approval

This course is designed to meet the needs of railroad electronic maintainers. Upon successful completion of this course, the student should be able to analyze basic digital circuitry consisting of arrangements of gates and flip-flops using TTL and CMOS integrated circuits, as well as relay logic. This analysis will include the application of elementary Boolean algebra, truth tables and timing diagrams. 3 hrs. lecture, 2 hrs. lab., 3 hrs. alternate delivery/wk.

RREL 284 Electronic Communications* (6 Hours)

Prerequisites: RREL 183 and approval of the railroad training director and the JCCC department approval

This course is designed to meet the needs of railroad electronic maintainers. Upon successful completion of this course, the student should be able to state the principles of amplitude, frequency, phase and pulse modulation and describe the technologies of transmitters, receivers, antennas, local area networks, wide-area networks and telephone systems. 3 hrs. lecture, 2 hrs. lab, 3 hrs. activity/wk.

RREL 285 Microprocessor Techniques* (6 Hours)

Prerequisites: RREL 183 and approval of the railroad training director and the JCCC department approval

This course is designed to meet the needs of railroad electronic maintainers. Upon successful completion of this course, the student should be able to analyze and troubleshoot 6800 family microprocessor circuitry as well as microprocessor interface circuitry. 3 hrs. lecture, 2 hrs. lab, 3 hrs. activity/wk.

RREL 286 Applied Microprocessors* (2 Hours)

Prerequisites: RREL 285 and approval of the railroad training director and the JCCC department approval

This course is designed to provide an introduction to advanced microcomputer concepts and applications. This course is a continuation of topics introduced in the microprocessor course, with specific applications in general-purpose microcomputers (PCs) and dedicated microprocessor-based control systems. Included are hardware and software training in operating systems, peripherals, monitors, processors, storage media, maintenance, diagnostics and troubleshooting. Analog and digital data acquisition and processing, as well as voice digitization and playback, will be demonstrated. Presentations and labs will include incorporation of these functions into a PC, Harmon HLC and the Servo 9000 hot box detector. 1 hr. lecture, 2 hrs. lab/wk.