Railroad Electronics, A.A.S.

The associate of applied science in railroad electronics degree program is a restricted access program for those students enrolled in the railroad electronics certificate program who wish to progress to a degree. The certificate program has been an active program on the JCCC campus since 1993, with a total enrollment to date of almost 400 students.

The certificate program consists of 33 credit hours of electronics courses, previously designated as ELEC courses, currently designated as RREL courses. The total program content is equivalent to the electronics degree program, but the delivery differs. content is divided into courses differently. Examples tend to be railroad-related where possible, and courses are delivered in alternative format, combining distance learning (using a remote access server) and classroom presentations.

Electronics technology influences almost every aspect of modern life. Skilled electronics technicians are needed to support growth in the railroad industry. These technicians must be able to fabricate, tect, install, operate and maintain highly technical systems, such as communications systems networks, medical delivery systems, computers and computer networks, and industrial process control systems. The program focuses on the underlying principles of electronic devises used extensively in railroad signaling, circuit analysis and digital electronics and will provide a broad systems view of electronics.

Students in railroad electronics technology program will work with outstanding facilities and the latest laboratory equipment. Graduates of the program will have the opportunity for employment in today's most challenging and exciting railroad signal career field.

No new courses are required for this program. All RREL courses are offered as closed courses for BNSF Railway, with the railroad furnishing all equipment, trainers, computers and software.

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 2820; State CIP Code 49.0208)

Associate of Applied Science Degree

First Semester

RREL 180	Introduction to Railroad Electronics*	1
RREL 181	Circuit Analysis DC/AC*	6
ENGL 121	Composition I*	3
Science and/or Mathematics Elective ^		3
Total Hours		13

^ Science and/or Mathematics Elective (http://catalog.jccc.edu/fall/degreecertificates/electives/sci-and-or-math-aas)

Second Semester

RREL 182	Semiconductor Devices and Circuits*	6
RREL 183	Digital Techniques*	6
Humanities Elective ^		3
Total Hours		15

^ Humanities Elective (http://catalog.jccc.edu/fall/degreecertificates/electives/humanities-aas)

Third Semester

Technical Electives (see below)		6
RREL 284	Electronic Communications*	6
Social Science/Economics Elective ^		3
Total Hours		15

^ Social Science/Economics Elective (http://catalog.jccc.edu/fall/degreecertificates/electives/social-sci-econ-aas)

Fourth Semester

Technical Electives (see below)		6
RREL 285	Microprocessor Techniques*	6
RREL 286	Applied Microprocessors*	2
Communications Elective ^		3
Health and/or Physical Education Elective ^^		1
Total Hours		18

^ Communications Elective (http://catalog.jccc.edu/fall/degreecertificates/electives/communications-aas)

^^ Health and/or Physical Education Elective (http://catalog.jccc.edu/fall/degreecertificates/electives/health-and-or-physical-ed-aas)

Note: MATH 111 and MATH 115 will not meet math requirements

Technical Electives

ASTR 120	Fundamentals of Astronomy	3
AUTO 121	Small Engine Service	3
AUTO 122	Introduction to Automotive Glass	3
AUTO 125	Introduction to Automotive Shop Practices	3
BOT 101	Computerized Keyboarding	1
BOT 103	Business English	3
BOT 105	Keyboarding and Formatting I	3
BOT 115	Electronic Calculators	1
BOT 150	Records Management*	3
CET 105	Construction Methods	3
CET 129	Construction Management	3
CPCA 105	Introduction to Personal Computers: Windows	1
CPCA 106	Introduction to Personal Computers: Macintosh	1
CPCA 128	PC Applications: MS Office	3
CIS 124	Introduction to Computer Concepts and Applications	3
DRAF 120	Introduction to Drafting	2
CS 134	Programming Fundamentals	4
DRAF 123	Interpreting Machine Drawings*	2
DRAF 129	Interpreting Architectural Drawings	2
DRAF 132	Exploring AutoCAD	3
DRAF 140	Topics in CAD I:	2
DRAF 238	Architectural Design and Drafting*	3
ELEC 120	Introduction to Electronics	3
ELEC 126	Microcomputer A+ Preparation	4
ELEC 125	Digital Electronics I	4
ELEC 131	Introduction to Sensors and Actuators	3
ELEC 133	Programmable Controllers	3
ELEC 185	LAN Cabling and Installation	3
ENGR 121	Engineering Orientation	2
GEOS 130	General Geology	5
GEOS 140	Physical Geography	3
GEOS 145	World Regional Geography	3
HVAC 125	Energy Alternatives	2
HVAC 143		2
HVAC 146		3
HVAC 150		1
HVAC 155		1
HVAC 167	Sheet Metal Layout and Fabrication	3

INDT 125	Industrial Safety/OSHA 30	3
INDT 155	Workplace Skills	1
IT 205	Implementing Windows Client	3
MFAB 152	Manufacturing Materials and Processes	3
MFAB 180	Blueprint and Symbols Reading for Welders	2
MFAB 240	Metallurgy	2
RRT 120	History of Railroading	3
RRT 121	Railroad Technical Careers	3
RRT 150	Railroad Operations	3
RRT 165	Railroad Safety, Quality and Environment	3

Total Program Hours: 64

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.