Curriculum Standard for Engineering and Technology: Electrical Engineering Technology

Career Cluster: Science, Technology, Engineering, Mathematics**

Cluster Description: Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, and engineering) including laboratory and testing services, and research and development services.

Pathway: Engineering and Technology | **Effective Term:** Fall 2016 (2016*03)

Program Majors Under Pathway

Program Major / Classification of Instruction Programs (CIP) Code		Credential Level(s) Offered	Program Major Code
Biomedical Equipment Technology	CIP Code: 15.0401	AAS/Diploma/Certificate	A50100
Computer Engineering Technology	CIP Code: 15.1201	AAS/Diploma/Certificate	A40160
Electrical Engineering Technology	CIP Code: 15.0399	AAS/Diploma/Certificate	A40180
Electronics Engineering Technology	CIP Code: 15.0303	AAS/Diploma/Certificate	A40200
Laser and Photonics Technology	CIP Code: 15.0304	AAS/Diploma/Certificate	A40280
Telecommunications and Network Engineering Technology	CIP Code: 15.0305	AAS/Diploma/Certificate	A40400

Pathway Description: These curriculums are designed to prepare students through the study and application of principles from mathematics, natural sciences, and technology and applied processes based on these subjects.

Course work includes mathematics, natural sciences, engineering sciences and technology.

Graduates should qualify to obtain occupations such as technical service providers, materials and technologies testing services, process improvement technicians, engineering technicians, construction technicians and managers, industrial and technology managers, or research technicians.

Program Description: Choose one of the following 4th paragraphs to use in conjunction with the first three paragraphs of the pathway description above for documentation used to identify each Program Major:

Biomedical Equipment Technology: A course of study that prepares the students to use basic engineering principles and technical skills to install, operate, troubleshoot, and repair sophisticated devices and instrumentation used in the health care delivery system. Includes instruction in instrument calibration, design and installation testing, system safety and maintenance procedures, procurement and installation procedures, and report preparation. With an AAS degree and two years' experience, an individual should be able to become a certified Biomedical Equipment Technician.

Computer Engineering Technology: A course of study that prepares the students to use basic engineering principles and technical skills for installing, servicing, and maintaining computers, peripherals, networks, and microprocessor and computer controlled equipment. Includes instruction in mathematics, computer electronics and programming, prototype development and testing, systems installation and testing, solid state and microminiature circuitry, peripheral equipment, and report preparation. Graduates should qualify for employment opportunities in electronics technology, computer service, computer networks, server maintenance, programming, and other areas requiring knowledge of electronic and computer systems. Graduates may also qualify for certification in electronics, computers, or networks.

Electrical Engineering Technology: A course of study that prepares the students to apply basic engineering principles and technical skills in electrical maintenance and management or in the design, planning, construction, development, and installation of electrical systems, machines, and power generating equipment. Includes instruction in electrical circuitry, prototype development and testing, systems analysis and testing, systems maintenance, instrument calibration, and report preparation. Graduates may seek employment as technicians, engineering assistants, technical managers, or salespersons in electrical generation/distribution, industrial maintenance, electronic repair, or other fields requiring a broad-based knowledge of electrical and electronic concepts.

**Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.*

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Electronics Engineering Technology: A course of study that prepares the students to apply basic engineering principles and technical skills to become technicians who design, build, install, test, troubleshoot, repair, and modify developmental and production electronic components, equipment, and systems such as industrial/computer controls, manufacturing systems, communication systems, and power electronic systems. Includes instruction in mathematics, basic electricity, solid-state fundamentals, digital concepts, and microprocessors or programmable logic controllers. Graduates should qualify for employment as electronics engineering technician, field service technician, instrumentation technician, maintenance technician, electronic tester, electronic systems integrator, bench technician, and production control technician.

Laser and Photonics Technology: A course of study that prepares the students to apply basic engineering principles and technical skills for specifying, operating, and maintaining laser-based systems. Includes instruction in mathematics, science, communications, electronics, and optics courses emphasizing laboratory learning experiences that develops the hands-on skills needed. Graduates of the curriculum qualify for current and emerging employment opportunities in fiber optic communications, materials processing, laser surgery, research, and a variety of related fields.

Telecommunications and Network Engineering Technology: A course of study that prepares the students to apply basic engineering principles and technical skills for positions in the telecommunication networking industry. Includes instruction in mathematics, basic electricity, solid-state fundamentals, digital concepts, microprocessors, telecommunications and network systems with an emphasis on analyzing and troubleshooting telecommunications and network systems. Graduates should qualify for employment as electronic engineering technician, field service technician, maintenance technician, network system technician, network specialist, network systems integrator, and network administrator.

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I. General Education Academic Core

[*Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 1D SBCCC 400.97(3)]*: *Degree programs must contain a minimum of 15 semester hours including at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural sciences/mathematics. Degree programs must contain a minimum of 6 semester hours of communications. Diploma programs must contain a minimum of 6 semester hours of general education; 3 semester hours must be in communications. General education is optional in certificate programs.*

Engineering and Technology: Electrical Engineering Technology

General Education Academic Core				**AAS**	**Diploma**	**Certificate**
Minimum General Education Hours Required:				**15 SHC**	**6 SHC**	**0 SHC**
Courses listed below are recommended general education courses for this curriculum standard. Colleges may choose to include additional or alternative general education courses to meet local curriculum needs. **Recommended certificate and diploma level curriculum courses. These courses may <u>not</u> be included in associate degree programs.*						
Communications:						
*COM	101	Workplace Communication	3 SHC	**6 SHC**	**3-6 SHC**	**Optional**
COM	110	Introduction to Communication	3 SHC			
COM	120	Intro Interpersonal Com	3 SHC			
COM	231	Public Speaking	3 SHC			
ENG	101	Applied Communications I	3 SHC			
*ENG	102	Applied Communications II	3 SHC			
ENG	110	Freshman Composition	3 SHC			
ENG	111	Expository Writing	3 SHC			
ENG	114	Professional Research & Reporting	3 SHC			
ENG	116	Technical Report Writing	3 SHC			
Humanities/Fine Arts:						
*HUM	101	Values in the Workplace	2 SHC	**3 SHC**	**0-3 SHC**	**Optional**
HUM	110	Technology and Society	3 SHC			
HUM	115	Critical Thinking	3 SHC			
HUM	230	Leadership Development	3 SHC			
PHI	230	Introduction to Logic	3 SHC			
PHI	240	Introduction to Ethics	3 SHC			
Social/Behavioral Sciences:						
ECO	151	Survey of Economics	3 SHC	**3 SHC**	**0-3 SHC**	**Optional**
ECO	251	Prin of Microeconomics	3 SHC			
GEO	110	Introduction to Geography	3 SHC			
GEO	111	World Regional Geography	3 SHC			
GEO	131	Physical Geography I	4 SHC			
*PSY	101	Applied Psychology	3 SHC			
*PSY	102	Human Relations	2 SHC			
PSY	118	Interpersonal Psychology	3 SHC			
PSY	135	Group Processes	3 SHC			
PSY	150	General Psychology	3 SHC			
*SOC	105	Social Relationships	3 SHC			
SOC	210	Introduction to Sociology	3 SHC			
SOC	215	Group Process	3 SHC			
Natural Sciences/Mathematics:				**3 SHC**	**0-3 SHC**	**Optional**
MAT	120	Geometry and Trigonometry	3 SHC			
MAT	121	Algebra/Trigonometry I	3 SHC			
MAT	161	College Algebra	3 SHC			
MAT	171	Precalculus Algebra	3 SHC			
MAT	175	Precalculus	4 SHC			
MAT	223	Applied Calculus	3 SHC			
MAT	271	Calculus I	4 SHC			

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II. Major Hours. AAS, diploma, and certificate programs must include courses which offer specific job knowledge and skills. Work-based learning may be included in associate in applied science degrees up to a maximum of 8 semester hours of credit; in diploma programs up to a maximum of 4 semester hours of credit; and in certificate programs up to a maximum of 2 semester hours of credit. Below is a description of each section under Major Hours.

A. Technical Core. The technical core is comprised of specific courses which are required for all Program Majors under this Curriculum Standard. A diploma program offered under an approved AAS program standard or a certificate which is the highest credential level awarded under an approved AAS program standard must include a minimum of 12 semester hours credit derived from the curriculum core courses or core subject area of the AAS program.

B. Program Major(s). The Program Major must include a minimum of 12 semester hour's credit from required subjects and/or courses. The Program Major is in addition to the technical core.

C. Other Major Hours. Other major hours must be selected from prefixes listed on the curriculum standard. A maximum of 9 semester hours of credit may be selected from any prefix listed, with the exception of prefixes listed in the core.

Engineering and Technology: Electrical Engineering Technology	**AAS**	**Diploma**	**Certificate**
Minimum Major Hours Required:	**49 SHC**	**30 SHC**	**12 SHC**
A. Technical Core:	**24-28 SHC**		
Analog			
ELN 131 Analog Electronics I 4 SHC			
Circuits			
ELC 131 Circuit Analysis I 4 SHC			
OR			
ELC 138 DC Circuit Analysis 4 SHC			
AND			
ELC 139 AC Circuit Analysis 4 SHC			
Digital			
ELN 133 Digital Electronics 4 SHC			
B. Program Major(s). *For AAS Degree select one program major plus additional courses from the prefixes listed within the same program major for a minimum of (12) semester hours of credits.*			
I. Electrical Engineering Technology			
ELC 128 Intro to PLC 3 SHC			
OR			
ELN 260 Prog Logic Controllers 4 SHC			
ELC 135 Electrical Machines I 3 SHC			
ELC 231 Electric Power Systems 4 SHC			
Electronics Engineering Technology			
Choose at least 2 courses:			
ATR 214 Advanced PLCs 4 SHC			
ELC 128 Intro to PLC 3 SHC			
ELC 228 PLC Applications 4 SHC			
ELN 232 Intro to Microprocessors 4 SHC			
ELN 234 Communication Systems 4 SHC			
ELN 260 Prog Logic Controllers 4 SHC			

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Computer Engineering Technology

Choose one course:

CET 111	Computer Upgrade/Repair I	3 SHC
CTI 130	OS and Device Foundation	6 SHC
CTS 120	Hardware/Software Support	3 SHC

Choose at least one:

CSC 133	C Programming	3 SHC
CSC 134	C ++ Programming	3 SHC
CSC 139	Visual BASIC Prog	3 SHC
CSC 151	JAVA Programming	3 SHC
ELN 232	Intro to Microprocessors	4 SHC
NOS 110	Operating Systems Concepts	3 SHC

Telecommunications and Networking Engineering Technology

CET 130	Operating System Prin	3 SHC

Choose one pair of courses:

TNE 111	Campus Networks I	3 SHC
AND		
TNE 121	Campus Networks II	3 SHC
	OR	
NET 125	Introduction to Networks	3 SHC
AND		
NET 126	Routing Basics	3 SHC

Laser and Photonics Engineering Technology

LEO 211	Photonics Technology	7 SHC
LEO 212	Photonics Applications	4 SHC

Biomedical Equipment Technology

BMT 111	Intro to Biomed Field	2 SHC
BMT 212	BMET Instrumentation I	6 SHC

Choose at least one:

CET 111	Computer Upgrade/Repair I	3 SHC
NET 110	Networking Concepts	3 SHC
NET 125	Introduction to Networks	3 SHC
SEC 110	Security Concepts	3 SHC

C. Other Major Hours. ***To be selected from the following prefixes:***

AHR, ALT, ATR, BAT, BIO, BMT, BPR, CET, CHM, CIS, CSC, CTI, CTS, DBA, DEA, DFT, EGR, ELC, ELN, EPP, HYD, ISC, LEO, MAT, MEC, MNT, NET, NOS, OMT, PCI, PHY, SEC, SGD, SST, TNE, WBL, WEB, and WLD

Up to two semester hour credits may be selected from ACA.

Up to three semester hour credits may be selected from the following prefixes: ARA, ASL, CHI, FRE, GER, ITA, JPN, LAT, POR, RUS and SPA.

III. Other Required Hours

A college may include courses to meet graduation or local employer requirements in a certificate (0-1 SHC), diploma (0-4 SHC), or an associate in applied science (0-7 SHC) program. These curriculum courses shall be selected from the Combined Course Library and must be approved by the System Office prior to implementation. Restricted, unique, or free elective courses may not be included as other required hours.

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IV. Employability Competencies

Fundamental competencies that address soft skills vital to employability, personal, and professional success are listed below. Colleges are encouraged to integrate these competencies into the curriculum by embedding appropriate student learning outcomes into one or more courses or through alternative methods.

A. Interpersonal Skills and Teamwork – The ability to work effectively with others, especially to analyze situations, establish priorities, and apply resources for solving problems or accomplishing tasks.

B. Communication – The ability to effectively exchange ideas and information with others through oral, written, or visual means.

C. Integrity and Professionalism – Workplace behaviors that relate to ethical standards, honesty, fairness, respect, responsibility, self-control, criticism and demeanor.

D. Problem-solving – The ability to identify problems and potential causes while developing and implementing practical action plans for solutions.

E. Initiative and Dependability – Workplace behaviors that relate to seeking out new responsibilities, establishing and meeting goals, completing tasks, following directions, complying with rules, and consistent reliability.

F. Information processing – The ability to acquire, evaluate, organize, manage, and interpret information.

G. Adaptability and Lifelong Learning – The ability to learn and apply new knowledge and skills and adapt to changing technologies, methods, processes, work environments, organizational structures and management practices.

H. Entrepreneurship – The knowledge and skills necessary to create opportunities and develop as an employee or self-employed business owner.

An **Employability Skills Resource Toolkit has been developed by NC-NET for the competencies listed above. Additional information is located at: http://www.nc-net.info/employability.php*

**The *North Carolina Career Clusters Guide was developed by the North Carolina Department of Public Instruction and the North Carolina Community College system to link the academic and Career and Technical Education programs at the secondary and postsecondary levels to increase student achievement. Additional information about Career Clusters is located at: http://www.nc-net.info/NC_career_clusters_guide.php or http://www.careertech.org.*

Summary of Required Semester Hour Credits (SHC) for each credential:

	AAS	Diploma	Certificate
Minimum General Education Hours	15	6	0
Minimum Major Hours	49	30	12
Other Required Hours	0-7	0-4	0-1
Total Semester Hours Credit (SHC)	**64-76**	**36-48**	**12-18**

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