Central Carolina Community College
An Equal Opportunity College

VISIT US ONLINE AT CCCC.EDU

Laser and Photonics Technology
Credential: Associate in Applied Science Degree in Laser and Photonics Technology
A4028000

The Laser and Photonics Technology curriculum is designed to develop the practical knowledge and skills required to be a successful technician in business and industry. Course work includes mathematics, science, Communication, electronics and optics courses. An in-depth sequence of laboratory learning experiences develops the hands-on skills needed for specifying, operating and maintaining laser and photonics-based systems.

Current and emerging job opportunities exist in the areas of fiber optic communications, materials processing, laser surgery, research and a variety of related areas. Program graduates often begin work as technicians in product testing, field service, product development or sales.

Program Length: 5 semesters
Career Pathway Options: Associate in Applied Science in Laser and Photonics Technology
Program Sites:
Harnett Campus - Day Program

Course Requirements for Laser and Photonics Technology Degree

A. General Education Courses (16 SHC)		C-L-SHC
ENG 111	Expository Writing	3-0-3
ENG 111A	Expository Writing Lab	0-2-1
ENG 114	Professional Research and Reporting	3-0-3
MAT 121	Algebra/Trigonometry I	2-2-3
	Humanities Elective	3-0-3
	Social Science Elective	3-0-3

B. Required Major Core Courses (34 SHC)		
ELC 131	DC/AC Circuit Analysis	4-3-5
ELN 131	Electronic Devices	3-3-4
ELN 132	Linear IC Applications	3-3-4
ELN 133	Digital Electronics	3-3-4
LEO 111	Principles of Lasers	1-3-2
LEO 211	Photonics Technology	5-6-7
LEO 212	Photonics Applications	3-3-4
LEO 223	Fiber Optics	3-3-4

C. Other Major Hours Required for Graduation (24/25 SHC)		
CIS 111	Basic PC Literacy	1-2-2
	OR	
CIS 110	Introduction to Computers	2-2-3
EGR 131	Introduction to Electronics Technology	1-2-2
ELC 127	Software for Technicians	1-2-2
ELN 275	Troubleshooting	1-2-2
ISC 221	Statistical Quality Control	3-0-3
LEO 221	PC Interface	3-3-4
MAT 122	Algebra/Trigonometry II	2-2-3
PHY 131	Physics - Mechanics	3-2-4
	Major Elective	2

Total Semester Hours Credit Required for Graduation: 74/75

Major Electives (Choose 2 SHC)
(Major elective combinations must be approved by advisor)

LEO 222	Photonics Applications Project	1-3-2
COE 111	Co-op Work Experience I	0-10-1
COE 121	Co-op Work Experience II	0-10-1
COE 112	Co-op Work Experience I	0-20-2

Semester Curriculum for Laser and Photonics Technology Degree

1st Semester (Fall)		C-L-SHC
CIS 111	Basic PC Literacy	1-2-2
	OR	
CIS 110	Introduction to Computers	2-2-3
EGR 131	Introduction to Electronics Technology	1-2-2
ELC 131	DC/AC Circuit Analysis	4-3-5
ENG 111	Expository Writing	3-0-3
ENG 111A	Expository Writing Lab	0-2-1
MAT 121	Algebra/Trigonometry I	2-2-3
		11-11-16

2nd Semester (Spring)		
ELC 127	Software for Technicians	1-2-2
ELN 131	Electronic Devices	3-3-4
ELN 133	Digital Electronics	3-3-4
LEO 111	Principles of Lasers	1-3-2
MAT 122	Algebra/Trigonometry II	2-2-3
		10-13-15

3rd Semester (Summer)		
ELN 132	Linear IC Applications	3-3-4
PHY 131	Physics - Mechanics	3-2-4
		6-5-8

Non co-op students

4th Semester (Fall - Non-co-op students)		
ELN 275	Troubleshooting	1-2-2
ENG 114	Professional Research and Reporting	3-0-3
LEO 211	Photonics Technology	5-6-7
LEO 212	Photonics Applications	3-3-4
	Humanities Elective	3-0-3
		15-11-19

5th Semester (Spring - Non-co-op students)		
ISC 221	Statistical Quality Control	3-0-3
LEO 221	PC Interface	3-3-4
LEO 222	Photonics Applications Project	1-3-2
LEO 223	Fiber Optics	3-3-4
	Social Science Elective	3-0-3
		13-9-16

Non co-op students graduate after the 5th semester.

Part-time co-op students

4th Semester (Fall – Part-time co-op students)		
COE 111	Co-op Work Experience I	0-10-1
ELN 275	Troubleshooting	1-2-2
ENG 114	Professional Research and Reporting	3-0-3
LEO 211	Photonics Technology	5-6-7
LEO 212	Photonics Applications	3-3-4
		12-21-17

5th Semester (Spring – Part-time co-op students)		
COE 121	Co-op Work Experience II	0-10-1
ISC 221	Statistical Quality Control	3-0-3
LEO 221	PC Interface	3-3-4

LEO 223	Fiber Optics	3-3-4
	Social Science Elective	3-0-3
	Humanities Elective	3-3-3
		15-19-18

Part-time co-op students graduate after the 5th semester.

Full-time Co-op Students ONLY

4th Semester (Fall - Full-time co-op students)

COE 112	Co-op Work Experience I	0-20-2
		0-20-2

5th Semester
(Spring - Full-time co-op students)

ISC 221	Statistical Quality Control	3-0-3
LEO 221	PC Interface	3-3-4
LEO 223	Fiber Optics	3-3-4
	Social Science Elective	3-0-3
	Humanities Elective	3-0-3
		15-6-17

6th Semester (Fall - Full-time co-op students)

ELN 275	Troubleshooting	1-2-2
ENG 114	Professional Research and Reporting	3-0-3
LEO 211	Photonics Technology	5-6-7
LEO 212	Photonics Applications	3-3-4
		12-11-16

Full-time co-op students graduate after their 6th semester.

Total Semester Hours Credit: 74/75

COURSE DESCRIPTIONS

CIS 110 Introduction to Computers 2-2-3
This course introduces computer concepts, including fundamental functions and operations of the computer. Topics include identification of hardware components, basic computer operations, security issues, and use of software applications. Upon completion, students should be able to demonstrate an understanding of the role and function of computers and use the computer to solve problems. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in natural science/mathematics (Quantitative Option).*

CIS 111 Basic PC Literacy 1-2-2
This course provides an overview of computer concepts. Emphasis is placed on the use of personal computers and software applications for personal and fundamental workplace use. Upon completion, students should be able to demonstrate basic personal computer skills.

COE 111 Co-op Work Experience I 0-10-1
Prerequisite: Approval of Instructor or Department Chairperson
This course provides work experience with a college-approved employer in an area related to the student's program of study. Emphasis is placed on integrating classroom learning with related work experience. Upon completion, students should be able to evaluate career selection, demonstrate employability skills, and satisfactorily perform work-related competencies.

COE 112 Co-op Work Experience I 0-20-2
Prerequisite: Approval of Instructor or Department Chairperson
This course provides work experience with a college approved employer in an area related to the student's program of study. Emphasis is placed on integrating classroom learning with related work experience. Upon completion, students should be able to evaluate career selection, demonstrate employability skills, and satisfactorily perform work-related competencies.

COE 121 Co-op Work Experience II 0-10-1
Prerequisite: Approval of Instructor or Department Chairperson
This course provides work experience with a college-approved employer in an area related to the student's program of study. Emphasis is placed on integrating classroom learning with related work experience. Upon completion, students should be able to evaluate career selection, demonstrate employability skills, and satisfactorily perform work-related competencies.

EGR 131 Introduction To Electronics Tech 1-2-2
This course introduces the basic skills required for electrical/electronics technicians. Topics include soldering/desoldering, safety practices, test equipment, scientific calculators, AWG wire table, the resistor color code, electronic devices, problem solving, and use of hand tools. Upon completion, students should be able to solder/desolder, operate test equipment, apply problem-solving techniques, and use a scientific calculator.

ELC 127 Software for Technicians 1-2-2
This course introduces computer software which can be used to solve electrical/electronics problems. Topics include electrical/electronics calculations, applications, and controls. Upon completion, students should be able to utilize a personal computer for electrical/electronics- related applications.

ELC 131 DC/AC Circuit Analysis 4-3-5
Corequisites: MAT 121
This course introduces DC and AC electricity with an emphasis on circuit analysis, measurements, and operation of test equipment. Topics include DC and AC principles, circuit analysis laws and theorems, components, test equipment operation, circuit simulation software, and other related topics. Upon completion, students should be able to interpret circuit schematics; design, construct, verify, and analyze DC/AC circuits; and properly use test equipment.

ELN 131 Electronic Devices 3-3-4
Corequisites: ELC 112, ELC 131 or ELC 140
This course includes semiconductor-based devices such as diodes, bipolar transistors, FETs, thermistors, and related components . Emphasis is placed on analysis, selection, biasing, and applications in power supplies, small signal amplifiers, and switching and control circuits. Upon completion, students should be able to construct, analyze, verify, and troubleshoot discrete component circuits using appropriate techniques and test equipment.

ELN 132 Linear IC Applications 3-3-4
Prerequisites: ELN 131 or BMT 113
This course introduces the characteristics and applications of linear integrated circuits. Topics include op-amp circuits, differential amplifiers, instrumentation amplifiers, waveform generators, active filters, PLLs, and IC voltage regulators. Upon completion, students should be able to construct, analyze, verify, and troubleshoot linear integrated circuits using appropriate techniques and test equipment.

ELN 133 Digital Electronics 3-3-4
This course covers combinational and sequential logic circuits. Topics include number systems, Boolean algebra, logic families, MSI and LSI circuits, AC/DC converters, and other related topics. Upon completion, students should be able to construct, analyze, verify, and troubleshoot digital circuits using appropriate techniques and test equipment.

ELN 275 Troubleshooting 1-2-2
Prerequisites: ELN 133 and either ELN 132 or ELN 140
This course covers techniques of analyzing and repairing failures in electronic equipment. Topics include safety, signal tracing, use of service manuals, and specific troubleshooting methods for analog, digital, and other electronics-based circuits and systems. Upon completion, students should be able to logically diagnose and isolate faults and perform necessary repairs to meet manufacturers' specifications.

ENG 111 Expository Writing 3-0-3
Prerequisites: RED 090 and ENG 090 or appropriate placement test scores
Corequisites: ENG 111A
This course is the required first course in a series of two designed to develop the ability to produce clear expository prose. Emphasis is placed on the writing process including audience analysis, topic selection, thesis support and development, editing, and revision. Upon completion, students should be able to produce unified, coherent, well-developed essays using standard written English. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in English composition.*

ENG 111A Expository Writing Lab 0-2-1
Prerequisites: RED 090 and ENG 090 or appropriate placement test scores
Corequisites: ENG 111
This writing laboratory is designed to apply the skills introduced in ENG 111. Emphasis is placed on the editing and revision components of the writing process. Upon completion, students should be able to apply those skills in the production of final drafts in ENG 111. The computer is used as a writing and design tool for this course.

ENG 114 Prof. Research and Reporting 3-0-3
Prerequisites: ENG 111
This course, the second in a series of two, is designed to teach professional communication skills. Emphasis is placed on research, listening, critical reading and thinking, analysis, interpretation, and design used in oral and written presentations. Upon completion, students should be able to work individually and collaboratively to produce well-designed business and professional written and oral presentations. The computer is used as a writing and design tool for this course. *This course has been approved to satisfy the Comprehensive Articulation Agreement general education core requirement in English composition.*

ISC 221 Statistical Qual Control 3-0-3
Prerequisites: Completion of curriculum mathematics requirement
This course covers the principles and techniques of statistical process control for the improvement of productivity. Emphasis is placed on basic statistics for quality control, organization and procedures for efficient quality control including inspections, process control, and tests of significance. Upon completion, students should be able to apply statistical principles and techniques to enhance production.

LEO 111 Lasers and Applications 1-3-2
Corequisites: MAT 122
This course covers the basic principles of laser operations and applications with a particular emphasis on laser safety. Topics include the properties of laser light, laser components, laser beam characteristics, and laser safety. Upon completion, students should be able to make measurements of laser beam characteristics and conduct a safety audit and hazards analysis of a laser facility.

LEO 211 Photonics Technology 5-6-7
Prerequisites: LEO 111, ELN 132, and ELN 133
This course covers optical theory, optical equipment, optical components, and laser systems. Topics include generation and control of light using optical components such as lasers, lenses, mirrors, diffraction gratings, filters, and polarizer's. Upon completion, students should be able to construct, analyze, verify, and troubleshoot optical systems using appropriate techniques and equipment.

LEO 212 Photonics Applications 3-3-4
Corequisites: LEO 111
This course provides knowledge and skills related to emerging photonics applications in North Carolina industry. Topics include applications such as materials processing, bar code scanning, surgical applications, optical data storage, and optical computers. Upon completion, students should be able to describe and analyze the critical issues attendant to a variety of photonics applications.

LEO 221 PC Interface 3-3-4
Prerequisites: ELN 133
This course covers the interaction of hardware and software in PC-based control systems. Topics include programming, I/O circuits, A/D and D/A converters, communications, and other related applications. Upon completion, students should be able to construct, program, verify, analyze, and troubleshoot both hardware and software for a basic PC-interface.

LEO 222 Photonics Apps Project 1-3-2
Prerequisites: ELN 132 and LEO 211
This course provides a structured approach to an applications-oriented photonics project. Emphasis is placed on selecting, planning, implementing, testing, and presenting the project. Upon completion, students should be able to present and demonstrate their photonics project.

LEO 223 Fiber Optics 3-3-4
Prerequisites: ELN 132 and ELN 133
This course covers the principles of fiber optics, particularly as a communications transmission medium. Topics include digital communications systems, optical fibers, cables, splices, connectors, optical transmitters and receivers, installation techniques, component testing, and system testing. Upon completion, students should be able to splice and connectorize a fiber, make measurements of fiber optic systems, and test and troubleshoot fiber optic components and systems.

MAT 121 Algebra/Trigonometry I 2-2-3
Prerequisites: MAT 070 or MAT 080 or appropriate placement test scores
This course provides an integrated approach to technology and the skills required to manipulate, display, and interpret mathematical functions and formulas used in problem solving. Topics include simplification, evaluation, and solving of algebraic and radical functions; complex numbers; right triangle trigonometry; systems of equations; and the use of technology. Upon completion, students should be able to demonstrate an understanding of the use of mathematics and technology to solve problems and analyze and communicate results.

MAT 122 Algebra/Trigonometry II 2-2-3

Prerequisites: MAT 121, MAT 161, MAT 171, or MAT 175

This course extends the concepts covered in MAT 121 to include additional topics in algebra, function analysis, and trigonometry. Topics include exponential and logarithmic functions, translation and scaling of functions, Sine Law, Cosine Law, vectors and statistics. Upon completion, students should be able to demonstrate an understanding of the use of technology to solve problems and to analyze and communicate results.

PHY 131 Physics-Mechanics 3-2-4

Prerequisites: MAT 121, MAT 161, MAT 171, or MAT 175

This algebra/trigonometry-based course introduces fundamental physical concepts as applied to engineering technology fields. Topics include systems of units, problem-solving methods, graphical analysis, vectors, motion, forces, Newton's laws of motion, work, energy, power, momentum, and properties of matter. Upon completion, students should be able to apply the principles studied to applications in engineering technology fields.