

Central Carolina Community College

Program Planning Guide

Laser and Photonics Technology

Credential: Associate in Applied Science Degree in Laser and Photonics Technology (A40280)

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. Coursework 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

Suggested Course Schedule:	HOURS			Grade	Semester	Notes
	Class	Lab	Credit			
1st Semester (Fall)						
CIS 111	Basic PC Literacy	1	2	2		
OR CIS 110	Introduction to Computers	2	2	3		
EGR 131	Intro 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	2		
MAT 121	Algebra/Trigonometry I	2	2	3		
		11/12	11	16/17		
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		
4th Semester (Fall)						
ELN 275	Troubleshooting	1	2	2		
ENG 114	Professional Research & Reporting	3	0	3		
LEO 211	Photonics Technology	5	6	7		
LEO 212	Photonics Applications	3	3	4		
	Humanities/Fine Arts Elective	3	0	3		
		15	11	19		

Central Carolina Community College Program Planning Guide

5th Semester (Spring)

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/Behavioral Science Elective	3	0	3			
		13	9	16			

Total Semester Hours Credit: 74/75

Course Descriptions Laser & Photonics Technology:

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 for transfer under the CAA and ICAA as a premajor and/or elective course requirement.

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.

EGR 131 Introduction To Electronics Technology 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 1-3-2

This course introduces computer software which can be used to solve electrical/electronics problems. Topics include electrical/electronics calculations and applications. 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

Local Corequisite: MAT 121 or MAT 161

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, 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 Semiconductor Applications 3-3-4

Local Corequisite: ELC 112, ELC 131, or ELC 140

This course introduces the characteristics and applications of semiconductor devices and circuits. Emphasis is placed on analysis,

selection, biasing, and applications. 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

Local Prerequisite: ELN 131 or BMT 113 or ELC 140

This course introduces the characteristics and applications of linear integrated circuits. Topics include op-amp circuits, waveform generators, active filters, IC voltage regulators, and other related topics. 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

Local Prerequisite: ELN 131 or Instructor Approval

This course covers combinational and sequential logic circuits. Topics include number systems, Boolean algebra, logic families, MSI and LSI circuits, AC/DC conversion, 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 1-3-2

Local 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: Take one set: RED 090 and ENG 090, ENG 095, 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 for transfer under the CAA and ICAA as a general education course in English Composition.

Central Carolina Community College Program Planning Guide

ENG 111A Expository Writing Laboratory 0-2-1

Prerequisites: Take one set: RED 090 and ENG 090, ENG 095, 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 Professional Research and Reporting 3-0-3

Prerequisite: 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 for transfer under the CAA and ICAA as a general education course in English Composition.

ISC 221 Statistical Qual Control 3-0-3

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

Corequisite: 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 polarizers. 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

Corequisite: 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

Prerequisite: 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 Applications 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

Prerequisite: Take one set: MAT 060 and MAT 070, MAT 060 and MAT 080, MAT 060 and MAT 090, MAT 095, MAT 120, MAT 121, MAT 161, MAT 171, MAT 175, 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

Prerequisite: Take one: 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

Prerequisite: Take one: 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.