COURSE ELT2120:	**ELECTRO-OPTICS**
Level:	Intermediate
Theme:	Communication Systems
Prerequisite:	ELT2100 Radio Communication
Description:	Students demonstrate basic knowledge of lasers and other light wave communication applications in various electronic systems.
Parameters:	Laser experimental kit and related resources.

Curriculum and Assessment Standards

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will:	*Assessment of student achievement should be based on:*	
• identify common types and classes of lasers	• identification of four classes and six types of lasers *Assessment Tool* *ELT2120–1: Presentations/Reports: Lasers and Fibre Optics* *Standard* *Performance rating of 2 for each applicable task*	10
• explain the operation of laser, fibre optic, infrared and hologram light wave technology	• explanation of the operation of various electro-optic devices related to laser, fibre optics, infrared and hologram light wave technology. *Assessment Tool* *ELT2120–1: Presentations/Reports: Lasers and Fibre Optics* *Standard* *Performance rating of 2 for each applicable task*	15
• construct an electro-optical project	• design and construction of an electro-optical device such as: – lasers – fibre-optics – infrared – holograms. *Assessment Tool* *ELTLAB–1: Laboratory Practice, Part 3* *Standard* *Performance rating of 2 for each applicable task*	70

COURSE ELT2120: ELECTRO-OPTICS (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will: • demonstrate established laboratory procedures and safe work practices	*Assessment of student achievement should be based on:* • observed performance in following: – established laboratory procedures – correct handling of electro-optic materials – procedures to prevent eye damage from laser light radiation – correct handling of high voltage including capacitors. *Assessment Tool* *ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices* *Standard* *Performance rating of 2 for each applicable task*	5
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the learning process. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Outcomes	Notes
Safety/Resource Management	*The student should:* • follow safe practices when: – potentially hazardous materials are used in project construction – in the presence of laser light radiation – exposed to high voltages around lasers – using laser classes I, II, III, IV – working with high voltage capacitors.	
Fundamentals	• define the word laser • define fibre optics, infrared, hologram • describe how light can be used as a modulation medium • research Canadian Standards Association (CSA) standards/guidelines for lasers • research laser technology applications	

Concept	Specific Outcomes	Notes
Fundamentals (continued)	*The student should:* • explain terms used in laser technology: – photon – ground state – excited state – spontaneous emission – stimulated emission of radiation – pumping – population inversion – light amplification – lenses – multiwatt lasers • identify and explain operation of the following laser components: – power supply – pumping device – lazing medium – optical resonant cavity • define the following types of lasers: – crystal and glass lasers – gas lasers such as: • helium – neon • helium – cadmium • argon • carbon dioxide • krypton – excimer lasers – chemical lasers – semi-conductor lasers • define lasers in terms of power • draw a block diagram of a laser • explain four unique properties of laser light • explain following terms as related to fibre optics: – reflection – refraction – lenses – focal length – absorption – angle of incidence – bar code – cladding – core – attenuation	

COURSE ELT2120: ELECTRO-OPTICS (continued)

Concept	Specific Outcomes	Notes
Fundamentals (continued)	*The student should:* • explain the operation of infrared communication systems • explain the process of producing a hologram • explain the six major types of lenses • explain the effect prisms have upon light • explain beam splitters • describe the effects the following filters have on light: – coloured gel filters – interference filters – dichroic filters • explain diffraction gratings • draw a diagram of a helium-neon laser.	
Designing and Prototyping	• prototype, experiment and analyze the following light wave communication devices: – a visible LED transmitter – an alarm circuit using a phototransistor or opto coupler – a simple infrared remote control device – use a fiber optic cable to route light to a remote location – transmit an analog data through a fibre using a diode laser – construct a simple alarm using high intensity visible light emitting diode • prototype, analyze and construct an advanced laser, fibre optical, infrared or hologram project; e.g.: – build a He-Ne laser experimenters system – build a pocket laser diode – infrared push-button remote control – infrared wireless speaker system – retrofit old equipment with a remote control – a laser light show – develop a fibre optical communication system – investigate a fibre optic vibration detection system for the home – construct a split-beam transmission hologram.	Use traditional laboratories. Use CAI packages. Use fibre and laser experimental kits. The intent of this SO is for the student to work from easier LED circuits to laser experiments. Depending on the project chosen by the student, additional time may be required – link this course with a Career Transitions course. References: • *The Laser Cookbook, 88 Practical Projects* (Gordon McCombs).