

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: LEO-210

Department: Laser Electro-Optics Technology

Course Title: Laser Materials Processing

Semester: Spring Year: 2017

Objectives/Competencies

Course Objective	Competencies
1. Understand the basic operation and output characteristics of the various types of lasers used in industrial laser materials processing	<ul style="list-style-type: none">• Describe the basic operation of a CW and pulsed lasers• Explain the output characteristics of CW and pulsed lasers• Describe the process of Q-switching• Describe the operation and output characteristics of CO₂ lasers• Describe the operation and output characteristics of solid state Nd: YAG lasers• Describe the operation and output characteristics of semiconductor lasers• Describe the operation and output characteristics of Ytterbium fiber lasers• Identify and select the appropriate laser system for a particular materials processing application
2. Determine laser operating parameters for specific materials processing applications	<ul style="list-style-type: none">• Select appropriate beam delivery system for a particular operation• Determine required laser output parameters for welding, cutting and drilling of metals and other materials• Determine required laser output parameters for marking and etching of metals and other materials• Determine required laser beam delivery method for a particular laser and application• Determine laser beam quality factor M^2• Select appropriate nozzle configuration for cutting and welding operations

	<ul style="list-style-type: none"> • Identify laser safety requirements for specific laser operations
3. Understand the nature of light-material interactions	<ul style="list-style-type: none"> • Describe the process of laser ablation with UV lasers • Identify the thermal effects of laser-material interaction with IR lasers • Describe the impact of heat-affected zone (HAZ) • Describe the impact of laser pulse parameters on taper • Determine required fluence level for a particular application
4. Perform basic cutting, marking and etching operations on small format CO ₂ and fiber laser systems	<ul style="list-style-type: none"> • Create and download 2D DXF or DWG files to laser operating system • Select appropriate laser parameters for optimal cutting, marking and etching of various materials • Inspect finished product according to engineering specifications
5. Perform basic cutting, marking and etching operations on large format CO ₂ and fiber laser systems	<ul style="list-style-type: none"> • Create and download 2D DXF or DWG files to laser operating system • Select appropriate laser parameters for optimal cutting, marking and etching of various materials • Inspect finished product according to engineering specifications
6. Perform laser welding using DPSS laser	<ul style="list-style-type: none"> • Select appropriate laser parameters for optimal welding of various metals • Prepare cross-section of weld sample for inspection • Inspect weld using inspection microscope according to standard metrology specifications