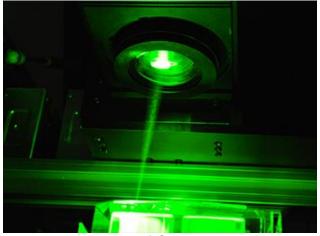


3-Dimensional Glass Laser Etching System



University of Central Florida

Department of Electrical Engineering and Computer Science Department of Photonics Science and Engineering Dr. Lei Wei Dr. David Hagan

Sponsor: Dr. M.J. Soileau

Senior Design I Table of Contents

Submission Date: November 2nd, 2016

Group 20

Monushka Sicar	Electrical Engineer	monushkasicar@knights.ucf
Phillip Lane	Electrical Engineer	plane94@knights.ucf.edu
Burdley Colas	Photonics Science & Engineer	b.colas@knights.ucf.edu
Nicolas Ramirez	Computer Engineer	nicolas.ramirez@knights.ucf.edu



Table of Contents

1.0 2.0	Executive Summary(1 page) Project Description
	2.1 Motivation(1 page)
	2.2 Goals and Objectives
	2.2.1 Current System(1 page)
	2.2.2 Customer Needs(0.5 page)
	2.3 Specifications
	2.3.1 Optical Specifications(1 page)
	2.3.2 Software Specifications(1 page)
	2.3.3 Electrical Specifications
	2.3.4 Mechanical Specifications
	2.4 Requirements
	2.4.1 Optical Requirements(1 page)
	2.4.2 Software Requirements(1 page)
	2.4.3 Electrical Requirements
	2.4.4 Mechanical Requirements(1 page)
	2.5 House of Quality & Project Constraints(1 page)
3.0	Project Management
5.0	3.1 Roles and Responsibilities(2 pages)
	3.2 Milestones(1 page)
	3.3 Project Budgeting and Financing(1 page)
4.0	Research
4.0	4.1 Optical Research
	4.1.1 Types of Lasers(3 page)
	4.1.2 Selection of Laser
	4.1.3 Laser Cooling System(1 page)
	4.1.4 Lenses (1 page) 4.1.5 Mirrors(1 page)
	4.1.6 Polarizer(1 page)
	4.1.7 Quarter Wave Plate(1 page)
	4.1.8 Cleaning Optics(1 page)
	4.1.8 Clearling Optics(1 page) 4.2 Software Research
	4.2.1 Programming Language(1 pages)
	4.2.2 Python GUI Toolkits(5 pages) 4.2.3 3D Conversion(3 pages)
	4.2.4 STL Slicer / Gcode Generator(2 pages)
	4.2.5 GCode Streamer(1 pages)
	4.2.6 RS-232 Interfacing(1 pages) 4.2.7 PySerial Module(1 pages)
	4.3 Electronics Research
	4.3.1 Power
	4.3.1.1 DC vs. AC Power Supply(2.5 pages) 4.3.1.2 A/D Conversion(1 pages)
	4.3.2.3 Voltage Regulation(5 pages)
	4.3.2.3 Voltage Negulation(3 pages)



4.3.2.4 Protection Circuit(1.5 Pages) 4.3.2 Microcontrollers (4 pages)
4 3 2 Microcontrollers (4 pages)
4.3.2.1 Relevant Capabilities(1 page)
4.3.2.2 ATmega 328P and ATmega 32U4(1 page
4.3.2.3 ATtiny86(0.5 page) 4.3.3 Motors
4.3.3.1 Servo Motors
4.3.3.2 Stepper Motors
4.3.3.4 Position feedback Control
4.4 Mechanical Research
4.4.1 Optical Breadboard(0.5 page
4.4.2 Safety Shielding Assembly Materials(3 pages)
4.4.3 Scanning Mirror Approach(1 page
5.0 Related Standards
5.1 Existing Project
5.1.2 Senior Design Project(1 page)
5.2 Software Standards (0.5 pages)
5.3 Optical Standards(1 page)
5.3.1 ANSI Z 87.1 (1989)
5.3.2 ANSI Z 136.1 (1993)
5.3.3 CDRH/FDA (21 CFR 1040)
5.4 Electrical Standards(1 page)
6.0 Design
6.1 Software Design
6.1.1 Software Design Summary(2 pages
6.1.2 GUI Design
6.1.3 3D Conversion
6.1.4 G-code Construction and Streaming(2 pages)
6.1.5 RS-232 Interface(1 page
6.1.5 RS-232 Interface
6.1.5 RS-232 Interface (1 page) 6.1.6 Laser Engraving Process (3 pages) 6.2 Optical Design 6.2.1 Optical System Design (2 pages) 6.2.2 Safety Shielding Assembly (1 page) 6.3 Electrical Design 6.3.1 Electrical Design Summary 2 pages 6.3.2 Power 2 pages 6.3.3 Control Electronics
6.1.5 RS-232 Interface
6.1.5 RS-232 Interface
6.1.5 RS-232 Interface (1 page 6.1.6 Laser Engraving Process (3 pages) 6.2 Optical Design (2 pages) 6.2.1 Optical System Design (2 pages) 6.2.2 Safety Shielding Assembly (1 page) 6.3 Electrical Design 6.3.1 Electrical Design 2 pages 6.3.2 Power 2 pages 6.3.3 Control Electronics 6.3.3 Control Electronics 6.3.3.1 User Computer Base Station (0.5 pages 6.3.3.2 Laser ICE Unit (optional) (0.5 pages 6.3.3.3 Micrcontroller (MCU) (1.5 pages)
6.1.5 RS-232 Interface (1 page 6.1.6 Laser Engraving Process (3 pages) 6.2 Optical Design (2 pages) 6.2.1 Optical System Design (2 pages) 6.2.2 Safety Shielding Assembly (1 page) 6.3 Electrical Design (1 page) 6.3.1 Electrical Design Summary 2 pages 6.3.2 Power 2 pages 6.3.3 Control Electronics 6.3.3.1 User Computer Base Station (0.5 pages 6.3.3.2 Laser ICE Unit (optional) (0.5 pages 6.3.3.3 Micrcontroller (MCU) (1.5 pages) 6.3.3.4 Motors (1.5 pages)
6.1.5 RS-232 Interface (1 page 6.1.6 Laser Engraving Process (3 pages) 6.2 Optical Design (2 pages) 6.2.1 Optical System Design (2 pages) 6.2.2 Safety Shielding Assembly (1 page) 6.3 Electrical Design (1 page) 6.3.1 Electrical Design Summary 2 pages 6.3.2 Power 2 pages 6.3.3 Control Electronics 6.3.3.1 User Computer Base Station (0.5 pages 6.3.3.2 Laser ICE Unit (optional) (0.5 pages 6.3.3.3 Micrcontroller (MCU) (1.5 pages) 6.3.3.4 Motors (1.5 pages) 6.4 Final Design Summary (3 pages)
6.1.5 RS-232 Interface
6.1.5 RS-232 Interface (1 page 6.1.6 Laser Engraving Process (3 pages) 6.2 Optical Design (2 pages) 6.2.1 Optical System Design (2 pages) 6.2.2 Safety Shielding Assembly (1 page) 6.3 Electrical Design (1 page) 6.3.1 Electrical Design Summary 2 pages 6.3.2 Power 2 pages 6.3.3 Control Electronics 6.3.3.1 User Computer Base Station (0.5 pages 6.3.3.2 Laser ICE Unit (optional) (0.5 pages 6.3.3.3 Micrcontroller (MCU) (1.5 pages) 6.3.3.4 Motors (1.5 pages) 6.4 Final Design Summary (3 pages)



Total Estimated Page Count: 127