SAN DIEGO COMMUNITY COLLEGE DISTRICT
COLLEGE OF CONTINUING EDUCATION
COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER

CLTX 613

COURSE TITLE

LASER AND 3D PRINTING ON TEXTILES

TYPE COURSE

NON- FEE VOCATIONAL

CATALOG COURSE DESCRIPTION

The course is a unique opportunity to explore the fusion of advanced technologies with the traditional world of textiles. This innovative course introduces students to the cutting-edge techniques of laser etching and three-dimensional (3D) printing, allowing them to create intricate and custom designs on fabric, while pushing the boundaries of textile art and production. (FT)

LECTURE/LABORATORY HOURS

72 - 80

ADVISORIES

Completion of CLTX 611 Introduction to Digital Textile Printing with a grade of ‘C’ or better, or equivalent.

RECOMMENDED SKILL LEVEL

Knowledge of general math and basic computer skills.

INSTITUTIONAL STUDENT LEARNING OUTCOMES

1. Social Responsibility
   SDCCE students demonstrate interpersonal skills by learning and working cooperatively in a diverse environment.
2. Effective Communication
   SDCCE students demonstrate effective communication skills.
3. Critical Thinking

SDCCE students critically process information, make decisions, and solve problems independently or cooperatively.

4. Personal and Professional Development
   SDCCE students pursue short term and life-long learning goals, mastering necessary skills and using resource management and self-advocacy skills to cope with changing situations in their lives.
5. Diversity, Equity, Inclusion, Anti-Racism, and Access
   SDCCE students critically and ethically engage with local and global issues using principles of equity, civility, and compassion as they apply their knowledge and skills: exhibiting awareness, appreciation, respect, and advocacy for diverse individuals, groups, and cultures.

COURSE GOALS

1. Gain an understanding of the principles, applications, and capabilities of laser etching and cutting when applied to textiles.
2. Explore the fundamentals of laser etching and cutting technology.
3. Learn to laser etch and cut designs on textiles.
4. Explore the types of 3D printing technology applicable to textiles.
5. Explore 3D printing and adding dimension and texture to textiles.
6. Learn to select the right fabrics for laser etching and 3D printing and understand the necessary pre-processing steps.
7. Develop basic skills to design patterns, motifs, and 3D structures suitable for textiles applications, using design software and modeling tools.
8. Gain hands-on experience in operating laser etching and 3D printing equipment, as well as maintaining and troubleshooting the machines.
9. Discuss the environmental and ethical implications of laser and 3D printing technologies in textile production.
10. Gain an understanding of entrepreneurial mindset and its importance in the industry.

COURSE OBJECTIVES

Upon successful completion of the course, students will be able to:

1. Create laser etched textile surface embellishments and textile cutting sample portfolios
2. Explain laser etching technologies, terminology, laser types, laser settings and the effects on textiles.
3. Create basic graphic image design files and prepare the file for etching or cutting using the laser.
4. Explain the types of 3D printing technology currently used with textiles in the industry.
5. Create 3D printed textile applications demonstrating the addition of dimension and texture to the textile.
6. Create a resource file of textiles and fibers with their characteristics when used with

laser technology or 3D printing technology.

7. Locate, manipulate, or create basic 3D design motifs, patterns or structures using industry standard modeling software.
8. Demonstrate the safe operation and maintenance of classroom lab laser equipment and 3D printing machines.
9. Explain the ecological and ethical concerns and benefits of using laser etching and 3D printing on textiles.
10. Explain entrepreneurial and soft skills and their application in the industry and workplace.

SECTION II

COURSE CONTENT AND SCOPE

1. Introduction to Laser and 3D Printing on Textiles and the Product & Textile Surface Treatments: Digital Printing Certificate Program
   - 1.1. Clothing and Textile (CLTX programs and pathways
     - 1.1.1. San Diego College of Continuing Education (SDCCE) programs and pathways
     - 1.1.2. Credit by exam
   - 1.2. Course learning management system
     - 1.2.1. Canvas
     - 1.2.2. Other supporting software used
2. Essential Entrepreneurial and Soft Skills in the Classroom and Work Environments
   - 2.1. Definition of entrepreneurial and soft skills
   - 2.2. Examples of entrepreneurial and soft skills
     - 2.2.1. Communication skills
     - 2.2.2. Conflict resolution skills
     - 2.2.3. Problem solving
     - 2.2.4. Design thinking
     - 2.2.5. Digital tool skills
3. Laser and 3D Printing on Textiles
   - 3.1. History
   - 3.2. Applications
   - 3.3. Innovations
   - 3.4. Manufacturing – micro-factories
     - 3.4.1. Cost factors
     - 3.4.2. On-demand
4. Laser Technology Equipment and Tools
   - 4.1. Laser types
     - 4.1.1. Power
     - 4.1.2. Parts and their functions
   - 4.2. Desktop equipment vs large format equipment
   - 4.3. Workspace ergonomics, ventilation, and safety when working with lasers
   - 4.4. Pretreatment equipment
5. 3D Printing Technology Equipment and Tools

- 5.1. Types of 3D printers and their uses
- 5.2. Desktop equipment vs large format equipment
- 5.3. Printing mediums and filaments
- 5.4. Workspace ergonomics, climate control, and safety when working with 3-D printers

6. Textile and Product Selection
   - 6.1. Fibers and their etching or 3D printable characteristics
   - 6.2. Sourcing
   - 6.3. Testing
   - 6.4. Costing analysis
7. Digital Image Design and 3D Modeling Software
   - 7.1. Software for etching or printing needs and preferences
   - 7.2. Design development with software tools
     - 7.2.1. Interface
     - 7.2.2. File types
   - 7.3. Intellectual property
     - 7.3.1. Artificial intelligence and graphic image creation
8. Laser and 3D Machine Operation
   - 8.1. Operating software and systems
   - 8.2. Filaments
   - 8.3. Extrusion nozzles
   - 8.4. Laser tubes
   - 8.5. Maintenance and disposal of by-products
   - 8.6. Safety
9. Quality Control and Production Efficiency
   - 9.1. Principles of quality control for laser etching and 3D printing technologies and techniques
   - 9.2. Inspection, testing, and correction techniques for products created with laser or 3D printing equipment
   - 9.3. Sustainable practices and materials
   - 9.4. Reducing waste
10. Documentation of Skills
    - 10.1. Portfolio
11. Career Options and Job Opportunities
    - 11.1. Payroll employee
    - 11.2. Self-employment
    - 11.3. Freelancing
    - 11.4. Employment resources
      - 11.4.1. Online marketplaces
      - 11.4.2. Social media
      - 11.4.3. Networking
12. Application of Sustainable Principles in the Context of Laser Etching and 3D Printing
    - 12.1. Definition
    - 12.2. Impact of industry on environment
    - 12.3. Zero waste

APPROPRIATE READINGS

Reading assignments may include, but are not limited to, subject matter textbooks, workbooks, instructor written handouts, industry-related publications, online help pages, articles posted on the internet, information from web sites, online libraries, resource manuals, videos and tutorials. Topics will be related to laser and 3D printing technology in the cut and sew industry.

WRITING ASSIGNMENTS

Appropriate writing assignments may include, but are not limited to:

1. Maintain a portfolio of class notes, technique samples and completed learning project actualizations.
2. Written plan of laser etched, or 3D printed project, where the student explains their chosen project theme and visual inspiration, and the production process is listed.
3. A brief case of a project calculating the cost and analyzing the production process.
4. Write a report on current and emerging laser and 3D technology.

OUTSIDE ASSIGNMENTS

Outside assignments may include, but are not limited to:

1. Independent, further exploration of a class topic.
2. Independent research on laser and 3D printing developments and new trends in the cut and sew textile industry.
3. Practical application of laser and 3D printing skills on textile products outside of class assignments.
4. Practical application of sustainable best practices learned in class.

APPROPRIATE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING

Assignments that demonstrate critical thinking may include, but are not limited to:

1. Student self-evaluation of the completed laser and 3D printed learning projects using a designated rubric.
2. Prepare modeling and image files according to the specifications of the chosen printing technique and application.
3. Calculate the cost of the finished projects.

EVALUATION

A student’s grade will be based on multiple measures of performance related to the course objectives. The assessment will measure development of independent critical thinking skills

and the student's ability to perform basic laser etching/cutting and 3D printing skills. Evaluation of the student's ability will be based on, but not limited to, the following criteria:

1. Completion of course design, etching, cutting and printing projects.
2. Completion of resource portfolios demonstrating skills and sourcing information.
3. Completion of class attendance and participation requirements.

Upon successful completion of all courses included in the program, a Certificate of Program Completion will be issued.

METHOD OF INSTRUCTION

Methods of instruction may include, but are not limited to:

1. Classroom and streamed lectures
2. Demonstrations
3. Journaling
4. Laboratory
5. Classroom, virtual, or online discussions
6. Web-based resources
7. Work based learning opportunities
8. Job shadowing
9. Field trips
10. Guest speakers
11. Audio-Visual resources
12. Video resources
13. Collaborative learning
14. Individual/small group instruction

This course, or sections of this course, may be offered through distance education.

TEXTS AND SUPPLIES

1. *Laser Cutting for Fashion and Textiles,* Laura Berens Baker, Orion Publishing Group, The Limited, 2016
2. *3D Printing Failures: How to Diagnose and Repair ALL Desktop 3D Printing Issues*, Sean Aranda, independently published (November 23,2019), 2020 Edition
3. *Additive Knowledge: Everything you need to know about 3D Printing, 3D Scanning and 3D Modeling*, Adam Rehak, Kindle Edition (June 20,2021)
4. *3D Printing and Additive Manufacturing: Principles and Applications*, Chee Kai Chua, Kah Fai Leong, WSPC; 5th Edition (November 30,2016)

Supplies:
The student will provide the required materials for laser use as instructed in the course syllabus. Students must have at least a 32 GB USB flash drive for all classes and lab work and have access to a computer or laptop outside of the campus classroom and lab to complete assignments.

PREPARED BY: Shirley Pierson MFA DATE November 2023

REVISED BY: _____ DATE _____

Instructors must meet all requirements stated in Policy 5500 (Student Rights, Responsibilities and Administrative Due Process), and the Attendance Policy set forth in the Continuing Education Catalog.

REFERENCES:

San Diego Community College District Policy 5500
California Community Colleges, Title 5, Section 55002
Continuing Education Catalog