SAN DIEGO COMMUNITY COLLEGE DISTRICT
COLLEGE OF CONTINUING EDUCATION
COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER

CLTX 601

COURSE TITLE

ESSENTIAL 2D DIGITAL MANUFACTURING TOOLS

TYPE COURSE

NON- FEE   VOCATIONAL

CATALOG COURSE DESCRIPTION

This course teaches basic digital drafting skills for *two-dimensional* (2D) computer-aided machines, including Computer Numerical Control (CNC) lasers and routers, plotters and cutters, sublimation and direct to product printing, machine embroidery and other emerging digital technologies. Using project and work-based learning through digital drafting software and additive-subtractive manufacturing, students develop an understanding of industry standards, the entrepreneurial mindset, and sustainable principles for employment in the 21st Century workplace. (FT)

LECTURE/ LABORATORY HOURS

70 - 77

ADVISORIES

NONE

RECOMMENDED SKILL LEVEL

12th Grade Reading and Math Skills
Computer Literacy

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 2D digital manufacturing industry.
2. Gain experience with the standard tools, software, and practices of 2D digital manufacturing.
3. Apply course skills acquired to 2D digital manufacturing projects.
4. Explore the history of 2D digital manufacturing.
5. Gain an understanding of key terminology used throughout digital manufacturing.
6. Explore sustainable principles and current applications within digital manufacturing.
7. Gain an awareness of the relationship of the industry to current economic, political, environmental, and socio-cultural factors, locally, nationally, and globally.
8. Introduction to entrepreneurship and its applicability and relevance to digital manufacturing.
9. Explore the various career options and diverse job opportunities that exist in digital manufacturing, with an overview of skills, knowledge, education, and training expected for success or advancement.
10. Explore emerging technologies and techniques in digital manufacturing.
11. Gain an understanding of employability skills and soft skills and their importance in the workplace.

COURSE OBJECTIVES

Upon successful completion of the course the student will be able to:

1. Navigate a 2D drafting and printing software user interface for the digital manufacturing industry.
2. Operate the tools within the 2D digital manufacturing industry.
3. Analyze and properly address digital manufacturing problems using design thinking.
4. Conceptualize and develop a 2D object using a variety of digital manufacturing techniques.
5. Recognize and use key 2D digital manufacturing terminology.
6. Describe and demonstrate proper safety principles and practices in digital manufacturing.
7. Describe sustainable principles and practices in digital manufacturing.
8. Discuss the relationship between socio-cultural, economic, environmental, and political factors that affect industry locally, nationally, and globally.

9. Interpret intellectual property policies in the industry.
10. Report on new techniques and technologies in digital manufacturing.
11. Define essential entrepreneurial and soft skills and illustrate their importance for success in the workplace.
12. Identify and describe career options and job opportunities and the associated skills, education, and training necessary for success.

SECTION II

COURSE CONTENT AND SCOPE

1. Introduction to Essential 2D Digital Manufacturing Tools
    1.1. Clothing and Textiles (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

2. Digital Manufacturing
    2.1. Evolution of manufacturing
    2.2. Current jobs and careers in digital manufacturing
    2.3. Entrepreneurial opportunities in the industry

3. Computer Aided Design and Drafting (CADD) Software
    3.1. Software for 2D applications
    3.2. Application specific software

4. Using CAD Software
    4.1. Vector versus (vs.) raster
    4.2. Basic tools
    4.3. Creating 2D raster images
    4.4. Creating 2D vector images
    4.5. Saving vs. exporting files
    4.6. Preparing files for production
    4.7. Preparing files for outsourcing

5. Machine Interfacing Programs
    5.1. Definition of computer assisted machining
    5.2. Manufacturer-specific software
    5.3. CADD plug-in software
    5.4. 2D post-processing (gcode)

6. From Object to Digital File
    6.1. Process of collecting measurements from an object

6.2. Digitizing
6.3. General mathematics of 2D objects

7. From Digital File to Object
7.1. Process of manufacturing from digital files
7.2. Systems for digital manufacturing

8. Additive Technologies
8.1. Types of additive technologies
8.2. Uses of additive technologies

9. Subtractive Technologies
9.1. Types of subtractive techniques
9.2. Uses of subtractive technologies

10. The Case for Digital Fabrication
10.1. Business study of digital vs. conventional manufacturing
10.2. Near future workforce training
10.3. Reshoring of industry

11. Design Thinking
11.1. Digital technology workflow integration
11.2. Project troubleshooting and alteration
11.3. Research process

12. Safety and Sustainability
12.1. Personal safety and hazards
12.2. Machine safety and preventative maintenance
12.3. Material hazards and waste management
12.4. Material sourcing ethics and sustainability

13. Intellectual Property Policy
13.1. Intellectual property
13.2. Forms of property registration

14. Soft and Entrepreneurial Skills
14.1. Definition
14.2. Acquisition
14.3. Application

APPROPRIATE READINGS

Appropriate readings may include, but are not limited to, textbooks, workbooks, instructor-written handouts, trade publications, internet articles, resource manuals, videos, and tutorials related to 2D Digital Manufacturing.

WRITING ASSIGNMENTS

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

1. Maintaining a portfolio of class notes, technique samples, and assignments
2. Create an order of operation sheet to complete a 2D object project correctly and efficiently.
3. Analyze and write a report on industry case studies.

OUTSIDE ASSIGNMENTS

Outside assignments may include, but are not limited to:

1. Internet research, watching audio-visual materials, reading articles, and referenced resources in further exploration of a class topic.
2. Independent research and observation on developments and latest trends in the digital manufacturing industry.
3. Practical application of essential digital skills in software outside of class meetings.
4. Practical application of sustainable best practices learned in class.

APPROPRIATE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING

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

1. Practicing a disciplined, systematic approach to problem solving through 2D digital applications.
2. Learning how to analyze a problem and develop design solutions through research, analysis, and evaluation.

EVALUATION

A student's competency will be based on multiple measures of performance. Assessment will measure the development of independent critical thinking and 2D digitally aided manufacturing skills. Evaluation of the student's ability will be based on, but not limited to, the following criteria:

1. Perform in a variety of activities and assignments.
2. Complete written and practical examinations and projects.
3. Contribute to class and group discussions.
4. Maintain attendance and punctuality per current policy.
5. Demonstrate ability to work independently and as a team member.

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

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

<u>TEXTS AND SUPPLIES</u>

The Art of Digital Fabrication: STEAM Projects for the Makerspace and Art Studio, Erin E. Riley, Constructing Modern Knowledge Press, current edition
The Laser Cutting Process: Analysis and Applications, Bekir Sami Yilbas, Elsevier, current edition
Additive Knowledge: Everything you need to know about 3D Printing, 3D Scanning and 3D Modeling, Adam Rehak, Kindle Direct Publishing, current edition
3D Printing and Additive Manufacturing: Principles and Applications, Chee Kai Chua, Kah Fai Leong, WSPC, current edition

Supplies:
Supplies as listed on the syllabus and time outside of instructional hours are needed to complete projects and portfolios. At least a 32GB USB flash drive is required. It is highly recommended to have a computer or laptop available for use outside of the campus classroom and lab.

PREPARED BY: <u>Shirley Pierson MFA</u>   DATE: <u>January 2024</u>

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.

<u>REFERENCES</u>:

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