

STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK



MASTER SYLLABUS

MECH 322 – ADVANCED 3D PRINTING

CIP Code: 14.1901

*For assistance determining CIP Code, please refer to this webpage
<https://nces.ed.gov/ipeds/cipcode/browse.aspx?v=55>
or reach out to Sarah Todd at todds@canton.edu*

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Updated by:

**CANINO SCHOOL OF ENGINEERING TECHNOLOGY
MECHANICAL ENGINEERING TECHNOLOGY
SPRING 2022**

A. TITLE: ADVANCED 3D PRINTING

B. COURSE NUMBER: MECH 322

C. CREDIT HOURS (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity):

Credit Hours: 2

Lecture Hours 0 per Week

Lab Hours 15 Weeks – 2, 2-hour labs per week

Other per Week

Course Length (# of Weeks): 15

D. WRITING INTENSIVE COURSE: No

E. GER CATEGORY: None

F. SEMESTER(S) OFFERED: Fall

G. COURSE DESCRIPTION:

This course builds on the topics of Introduction to 3D Printing. Topics include print material selection, mechanical properties of printed parts, dual extrusion printing, volume optimization, large-scale prints, accuracy, sizing and tolerances, resin printers, functional prototypes & production, emerging technology, limitations of 3D printing and health risks. Weekly labs examine new topics and offer opportunities for introducing, practicing, and refining 3D printing skills with an emphasis on creating functional prototypes.

H. PRE-REQUISITES: MECH 122

CO-REQUISITES: None

I. STUDENT LEARNING OUTCOMES:

<u>Course Student Learning Outcome [SLO]</u>	<u>PSLO</u>	<u>GER</u>	<u>ISLO</u>
a. Communicate an understanding of the benefits and limitations of 3D printing technologies.			5-Ind, Prof, Disc, Know Skills
b. Demonstrate proficiency in importing, slicing, and printing parts with multiple software and printer types.	ABET SO#1 Performance Indicator e – Select and apply knowledge of engineering and technology		5-Ind, Prof, Disc, Know Skills

c. Demonstrate appreciation for and implementation of proper safety procedures for Fused Deposition Modeling (FDM) and resin printing processes.			5-Ind, Prof, Disc, Know Skills
d. Produce multi-part prints that assemble to serve a functional purpose.	ABET SO#1 Performance Indicator f – Identify, analyze, and solve problems		5-Ind, Prof, Disc, Know Skills

KEY	<u>Institutional Student Learning Outcomes</u> <u>[ISLO 1 – 5]</u>
ISLO #	ISLO & Subsets
1	Communication Skills Oral [O], Written [W]
2	Critical Thinking <i>Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS]</i>
3	Foundational Skills <i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>
4	Social Responsibility <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
5	Industry, Professional, Discipline Specific Knowledge and Skills

J. APPLIED LEARNING COMPONENT: Yes X No _____

If Yes, select one or more of the following categories:

Classroom/Lab X

Internship _____

Clinical Practicum _____

Practicum _____

Service Learning _____

Community Service _____

Civic Engagement _____

Creative Works/Senior Project _____

Research _____

Entrepreneurship _____

(program, class, project)

K. TEXTS: None

L. REFERENCES:

The 3D Printing Handbook, Technologies, Design and Applications by Ben Redwood, Filemon Schöffner, and Brian Garret, Amsterdam, The Netherlands, ISBN 978-90-87485-0-5
3D Printing Failures: How to Diagnose & Repair All Desktop 3D Printing Issues by Sean Aranda, Self-Published

M. EQUIPMENT:

Computer Lab, single & dual extruder FDM printers, photocuring resin printers, and wash and cure station(s)

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Homework, Quizzes, Labs, & Exams

P. DETAILED COURSE OUTLINE:

See Lab Outline Below

Q. LABORATORY OUTLINE:

Lab 1. Emerging Technologies and Limitations

Lab 2. Student Presentations of 3D printing technology

Lab 3. Environmental and Health Risks

Lab 4. Student presentations of environmental and health risks

Lab 5. Alternate Printing Materials - Hips, ABS, TPU...?

Lab 6. Mechanical Strength of Printed Parts

Lab 7. Mechanical Properties of 3D Printed Parts - Orientation

Lab 8. Mechanical Properties of 3D Printed Parts - Shell Thickness

Lab 9. Overhangs & Print Temperature

Lab 10. Supports & Print Temperature

Lab 11. Dual Extrusion Printing - Multi-Color

Lab 12. Dual Extrusion Printing - Multi-Material

Lab 13-14. Large-Scale Prints

Lab 15. Resin Printer Basics and Safety

Lab 16 - 18. Resin Printing

Lab 17. Resin Printing

Lab 19-20. Accuracy of 3D Prints

Lab 21-22. Print Sizing and Tolerances

Lab 23-24. Printing Interfacing Parts

Lab 25-28. Functional Prototypes

Final Exam