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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MECH 312 – ENGINEERING DESIGN

CIP Code: 14.19
For assistance determining CIP Code, please refer to this webpage
or reach out to Sarah Todd at todds@canton.edu

Created by: Cullen Haskins

Updated by:

Canino School of Engineering Technology

Department: MET

Semester/Year: Spring 2022
A. TITLE: Engineering Design

B. COURSE NUMBER: MECH 312

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

# Credit Hours: 3
# Lecture Hours: 3 per week
# Lab Hours: per week
Other: per week

Course Length: 15 Weeks

D. WRITING INTENSIVE COURSE: Yes ☐ No ☒

E. GER CATEGORY: None: ☒ Yes: GER
If course satisfies more than one: GER

F. SEMESTER(S) OFFERED: Fall ☒ Spring ☐ Fall & Spring ☐

G. COURSE DESCRIPTION:

This course reiterates the design process introduced in introduction to engineering and 3D Modeling, the design requirement attributes developed in machine design, the 3D modeling aspects of a CAD class and focuses on the practical application of that process from problem definition through final prototype. Documentation of a systematic design process and the necessity of design iteration is emphasized. Mathematical modeling in Excel or MatLAB, and 3D modeling and stress analysis and/or simulations are utilized. Students use principles they learned from previous classes to design, build, test, and refine a component or sub-assembly of a product. The machine shop and 3D printers may be utilized for project development.

H. PRE-REQUISITES: None ☐ Yes ☒ If yes, list below:

MECH 121 (Manufacturing Processes), MATH 364 (Differential Equations), MECH 112 (3D Modeling) or MECH 212 (Geometric Dimensioning and Tolerancing), MECH 232 (Machine Design) or ENGS 350 (Mechanics of Machine Elements).

CO-REQUISITES: None ☒ Yes ☐ If yes, list below:
### 1. STUDENT LEARNING OUTCOMES: *(see key below)*

By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>Program Student Learning Outcome [PSLO]</th>
<th>GER [If Applicable]</th>
<th>ISLO &amp; SUBSETS</th>
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<tbody>
<tr>
<td>A. Apply and document a logical design process to a unique mechanical engineering technology problem.</td>
<td>ABET: SO # 3, SO # 4</td>
<td>1-Comm Skills 5-Ind, Prof, Disc, Know Skills ISLO</td>
<td>W Subsets Subsets Subsets</td>
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<tr>
<td>B. Create detailed hand sketches and 3D parametric models with sufficient detail for prototyping.</td>
<td>ABET: SO # 1</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>C. Utilize mathematical and/or other models to analyze designs.</td>
<td>ABET: SO # 1</td>
<td>2-Crit Think ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>D. Refine a design through iteration of the design process.</td>
<td>ABET: SO # 2, SO # 4</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>KEY</td>
<td>Institutional Student Learning Outcomes [ISLO 1 – 5]</td>
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<td>ISLO #</td>
<td>ISLO &amp; Subsets</td>
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</table>
| 1 | Communication Skills  
Oral [O], Written [W] |
| 2 | Critical Thinking  
Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS] |
| 3 | Foundational Skills  
Information Management [IM], Quantitative Lit./Reasoning [QTR] |
| 4 | Social Responsibility  
Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T] |
| 5 | Industry, Professional, Discipline Specific Knowledge and Skills |

*Include program objectives if applicable. Please consult with Program Coordinator

J. **APPLIED LEARNING COMPONENT:**  
Yes ☒  
No ☐

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

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service

- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship
  (program, class, project)
K. **TEXTS:**

N/A

L. **REFERENCES:**


M. **EQUIPMENT:** None □ **Needed:** Computer Lab with AutoDesk Inventor, Excel, Matlab, 3D printers, and Machine Shop

N. **GRADING METHOD:** A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

Projects, Homework, Quizzes, and Exams

P. **DETAILED COURSE OUTLINE:**

1. The Engineering Design Process
   A. Problem Definition
   B. Design Criteria/Constraints
   C. Brainstorming Design Alternatives
      i. Research
      ii. Explore the design space
   D. Design Elimination and Selection
   E. Prototype I
      i. Sensitivity Analysis
2. Engineering Design
   A. Problem Definition
      i. Are we solving the right problem?
   B. Design Criteria/Constraints
      i. Do these need revision based on what we have learned?
   C. Brainstorming Design Alternatives
      i. Revisit old ideas and see if you come up with more based on what you've learned
   D. Design Selection and Optimization
      i. Mathematical Modeling
      ii. Simulations
      iii. Finite Element Methods
   E. Prototype II
3. Experimental Testing
   A. Data acquisition
4. Data analysis
5. Iterate the design
6. Application of GD&T for production
7. Inspection of parts
Q. LABORATORY OUTLINE: None ☐ Yes ☐