

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



MASTER SYLLABUS

ENGS 450-Advanced Machine Design

For available course numbers, contact the Registrar's Office at registrar@canton.edu

CIP Code: 14.1901

For assistance determining CIP Code, please refer to this webpage

<https://nces.ed.gov/ipeds/cipcode/browse.aspx?y=55>

or reach out to Sarah Todd at todds@canton.edu

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Updated by:

School: CANINO SCHOOL OF ENGINEERING TECHNOLOGY

Department: MECHANICAL ENGINEERING TECHNOLOGY

Implementation Semester/Year: SPRING 2027

A. TITLE: Advanced Machine Design

B. COURSE NUMBER: ENGS 450

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

# Credit Hours per Week	3
# Lecture Hours per Week	3
# Lab Hours per Week	
Other per Week	

D. WRITING INTENSIVE COURSE:

Yes	
No	X

E. GER CATEGORY:

Does course satisfy a GER category(ies)? If so, please select all that apply.

[1-2] Communication	
[3] Diversity: Equity, Inclusion & Social Justice	
[4] Mathematics & Quantitative Reasoning	
[5] Natural Science & Scientific Reasoning	
[6] Humanities	
[7] Social Sciences	
[8] Arts	
[9] US History & Civic Engagement	
[10] World History & Global Awareness	
[11] World Languages	

F. SEMESTER(S) OFFERED:

Fall	
Spring	X
Fall and Spring	

G. COURSE DESCRIPTION:

Students in this course will develop advance level of mechanics of machine design skills. Students apply their knowledge of machine design and learn tolerance and fits, tapered roller bearings, plain surface bearings, linear motion elements, machine bolted connections, motor control, clutches and brakes and do design projects.

H. PRE-REQUISITES:
 ENGS 350, Junior/Senior
 CO-REQUISITES: None

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	Program Student Learning Outcome [PSLO]	GER	ISLO & Subsets	
a. Determine and apply tolerance and fits to machine element parts	SO 1, 2		2-Crit Think ISLO ISLO	PS Subsets Subsets
b. Identify and analyze tapered roller bearings and plain surface bearings on machine elements	SO 1, 2		2-Crit Think ISLO ISLO	PS Subsets Subsets
c. Evaluate linear motion elements on machine elements	SO 1, 2		2-Crit Think ISLO ISLO	PS Subsets Subsets
d. Articulate bolted connections on machine elements	SO 1, 2		2-Crit Think ISLO ISLO	PS Subsets Subsets
e. Illustrate and design clutches and brakes for motor control	SO 1, 2		2-Crit Think ISLO ISLO	PS Subsets Subsets

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 [X] one or more of the following categories:

Classroom / Lab	X	Community Service	
Internship		Civic Engagement	
Clinical Practicum		Creative Works/Senior Project	
Practicum		Research	
Service Learning		Entrepreneurship [program, class, project]	

K. TEXTS: Machine Elements in Mechanical Design, by Robert. Mott, Edward M. Vavret and Jyhwen Wang, 6th Edition, Pearson.

L. REFERENCES:

M. EQUIPMENT: N/A

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Quizzes

Homework/Assignment

Exams

Project

P. DETAILED COURSE OUTLINE:

I. Tolerances and Fits

1. Factors Affecting Tolerances and Fits

2. Tolerances, Production Processes, and Cost

3. Preferred Basic Sizes

4. Clearance Fits

- 5. Interference Fits
- 6. Transition Fits
- 7. Stresses for Force Fits 555
- 8. General Tolerancing Methods 557
- II. Rolling Contact Bearings
 - 1. Tapered Roller Bearings
 - 2. Considerations in the Application of Bearings
- III. Plain Surface Bearings
 - 1. The Bearing Design Task
 - 2. Bearing Parameter
 - 3. Bearing Materials
 - 4. Design of Boundary-Lubricated Bearings
 - 5. Full-Film Hydrodynamic Bearings
 - 6. Design of Full-Film Hydrodynamically
 - 7. Lubricated Bearings
 - 8. Practical Considerations for Plain Surface Bearings
 - 9. Hydrostatic Bearings
- IV. Linear Motion Elements
 - 1. Power Screws
 - 2. Ball Screws
 - 3. Application Considerations for Power Screws and Ball Screws
- V. Motion Control: Clutches and Brakes
 - 1. Types of Friction Clutches and Brakes
 - 2. Performance Parameters
 - 3. Time Required to Accelerate or Decelerate a Load
 - 4. Inertia of a System Referred to the Clutch Shaft Speed
 - 5. Effective Inertia for Bodies Moving Linearly
 - 6. Energy Absorption: Heat-Dissipation Requirements
 - 7. Response Time
 - 8. Friction Materials and Coefficient of Friction
 - 9. Plate-Type Clutch or Brake
- VI. Design Projects-Design project system assembly involving various machine elements

Q. LABORATORY OUTLINE: None