COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MECH 412 – VIBRATION AND NOISE CONTROL

Created by: Dr. Lucas Craig

Updated by:

Department: MET

Semester/Year: Spring 2021

A. **TITLE**: Vibrations and noise control

B. **COURSE NUMBER:** MECH 412

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:**
***If course satisfies more than one*:**

F. **SEMESTER(S) OFFERED: Fall Spring Fall & Spring**

G. **COURSE DESCRIPTION:**

The objective of this course is to provide students with relevant skills to model and analyze vibrating mechanical systems and equipment. Instruction includes methods for solving free, harmonic, and general forced responses and the design of suppression systems. Students gain experience with accelerometers and varies other tools needed to measure vibration and how to mitigate noise due to vibration.

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

MATH 364 and MECH 301, or permission of instructor

CO-REQUISITES: None Yes If yes, list below:

I. **STUDENT LEARNING OUTCOMES: (*see key below*)**

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

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Develop an understanding of vibrational terminology: degrees of freedom, free and forced excitation, damped and undamped, natural frequency, amplitude, and period	6		ISLO # 2	CT
Derive governing equations from momentum and energy principles	1,6		ISLO # 2	CT
Model vibrational systems responses from various excitations	6		ISLO # 2	CT
Solve multiple-degrees of freedom using matrix algebra	6		ISLO # 2	CT
Design vibration suppression systems	1,2,6		ISLO # 2, ISLO # 5	CT
Perform varies measurements to determine vibrational analysis in mechanical equipment and to reduce vibrational noise	1,2,6		ISLO # 2, ISLO # 5	CT

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**

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:

Inman, Daniel. Engineering Vibration, 4th edition. New Jersey: Pearson Education, Inc., 2014.

L. REFERENCES:

N/A

M. EQUIPMENT: None Needed:

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Homework	**25%**
Exams (3)	**60%**
Final Exam / Project	**15%**

P. DETAILED COURSE OUTLINE:

A. Introduction to vibration
A. Harmonic motion
B. Viscous damping
C. Modeling and energy methods
D. Stiffness
E. Measurement and design considerations
F. Stability
G. Numerical simulation of the time response

B. Response to harmonic excitation
A. Harmonic excitation of undamped systems
B. Harmonic excitation of damped systems
C. Base excitation
D. Rotating unbalance

E. Measurement devices
F. Numerical simulation and design
G. Nonlinear response properties

C. General forced response
A. Impulse response function
B. Response to arbitrary input
C. Transform methods
D. Numerical simulation of the response
E. Nonlinear response properties

F. Multiple-degree-of-freedom systems
A. Two-degree-of-freedom model
B. Eigenvalues and natural frequencies

G. Design for vibration suppression
A. Acceptable levels of vibration
B. Vibration isolation
C. Vibration absorbers

Q. LABORATORY OUTLINE: None Yes