### Department of Mechanical and Industrial Engineering ME 405-101 -- MECHANICAL LAB II Fall 2023 Instructor: Dr. S. Rahman E-mail: <u>rahman@njit.edu</u> Office: FENS 205

### Catalog Description: ME 405 (1-2-2)

Laboratory emphasizes the use of fundamental principles and instrumentation systems for the analysis and evaluation of mechanical components within a system.

Prerequisites:	ME 343 – Mechanical Laboratory – I
	ME 312 – Thermodynamics II
	ME 304 – Fluid Mechanics
<b>Co-requisite:</b>	ME 407 – Heat Transfer

Software usage: Microsoft Word, Microsoft Excel

### **Course Objectives:**

- 1. To develop the skills in acquiring and processing experimental data
- 2. To develop skills in analyzing experimental errors and assessing the accuracy of the engineering measurements
- 3. To develop the skills in applying the principles of potential flows for describing and designing mechanical components, including pumps and turbines
- 4. To develop skills in describing transient temperature measurements using analytical and numerical approaches
- 5. To develop skills in analyzing pressure measurements and use such measurements to reconstruct the flow velocity profiles
- 6. To develop skills in preparing written technical reports
- 7. To develop skills in working on an engineering project as a group

### Lab Experiments:

(1) Drag and pressure distribution on a cylinder

- (2) Performance test of a Centrifugal Pump
- (3) Performance test of a Gear Pump
- (4) Performance test of an Impulse Turbine (Pelton Wheel)
- (5) Transient heat conduction in bodies of finite length

# **Course Outcomes:**

### **Objective 1**

Students will develop an ability to process experimental data using theoretical concepts of fluid mechanics, heat transfer, and thermodynamics

# **Objective 2**

Students will develop an ability to quantify and analyze experimental errors, separate between systematic and statistical errors, and determine the reliability of measurements

# **Objective 3**

Students will learn using generic data processing software to process experimental data and describe the measurements using engineering models

### **Objective 4**

Students will learn how to characterize and test mechanical components including pumps and turbines

### **Objective 5**

Students will demonstrate an ability to prepare comprehensive written technical reports

GRADING POLICY	Lab reports & class participation	50 %
	Midterm Tests (2x12.5%)	25 %
	Final Exam (cumulative)	25 %

**Note**: There are two midterm tests and a final exam during the semester. Make-up exams are given only in some special cases approved by the Dean of Students.

ACADEMIC INTEGRITY NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. For more information on the honor code, go to <u>http://www.njit.edu/academics/honorcode.php</u>

# **CLASS HOURS:**

Monday 6:00 PM - 8:50 PM ME 110

### OFFICE HOURS (FENS 205 FACE-TO-FACE OR VIRTUAL)

Monday	10:00 AM - 01:00 PM
Tuesday	10:30 AM – 01:00 PM
Wednesday	
Thursday	10:00  AM - 01:00  PM (by appointment only)
Friday	10:00 AM - 01:00 PM

By appointment contact in advance: (973) 596-6072 or rahman@njit.edu

### **NJIT ONLINE INFORMATION**

The instructor will discuss these requirements on the first day of the course and/or post on their Learning Management System (LMS). Please become familiar

- Webex: <u>http://ist.njit.edu/webex</u>
- Online Proctoring: <u>https://ist.njit.edu/online-course-exam-proctoring</u>

# COURSE ACTIVITY SCHEDULE (Tentative)

Date	Activities
9/11	Introduction
	Theories of lab 1
9/18	Groups A & B – perform lab 1 and Groups C & D – perform lab 2
9/25	Groups D & C – perform lab 1 and Groups B & A – perform lab 2
10/2	Sample calculations – lab 1, due on the same day
	Lab report format discussion
10/9	Theories of labs 2, 3 & 4
	Sample calculations – lab 2, due on the same day
10/16	Review and Midterm I (labs 1 & 2)
10/23	Answers of Midterm I discussion
	Groups A & B – perform lab 3, Group C – perform lab 4
	Lab report 1 due
10/30	Groups C & D – perform lab 3, Groups B & A – perform lab 4
	Lab report 2 due
11/6	Group D – perform lab 4
	Sample calculations – lab 3, due on the same day
11/13	Sample calculations – lab 4, due on the same day
11/20	Perform lab 5
	Theories of Heat Transfer (lab 5)
	Lab report 3 due
11/27	R <u>eview and Midterm II (Labs 3 &amp; 4)</u>
12/4	Answers of Midterm II discussion
	Heat Transfer problems
	Lab report 4 due
12/11	Review
12/18	Final Exam (cumulative)