# New Jersey Institute of Technology
## Department of Engineering Technology
## MET 314 Dynamics of Machinery

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| **COURSE NUMBER** | MET 314 |
| **COURSE NAME** | Dynamics of Machinery |
| **COURSE STRUCTURE** | 2-2-3 (lecture hr/wk - lab hr/wk – course credits) |
| **COURSE COORDINATOR/ INSTRUCTOR** | Dr. J. Sodhi/ Dr. Sahidur Rahman |
| **COURSE DESCRIPTION** | Acquaints students with motion and forces in machines. Topics include velocity and accelerations in linkages, gears, cam and gear trains, static and dynamic forces, and torques in linkages. |
| **PREREQUISITE(S)** | MET 236 or MECH 236, and MATH 238 or MATH 112, and MET 105 or FED 101 |
| **COREQUISITE(S)** | None |
| **REQUIRED, ELECTIVE OR SELECTED ELECTIVE** | Required |
| **REQUIRED MATERIALS** | **Design of Machinery, 6th Ed.** by Robert Norton, McGraw Hill, 2019, ISBN 9781260113310 |
| **COMPUTER USAGE** | Microsoft Office; Instructor Specified |
| **COURSE OUTCOMES (CO)** | By the end of the course students should be able to: 1. Analyze motion of points on a four-bar linkage, and forces due to inertial loading. 2. Determine contact ratio and interference on spur gears. 3. Determine drive train ratios. 4. Measure speed of rotating machinery components. |
| **CLASS TOPICS** | Introduction, Mechanisms and Machines, Motion in Machinery, Velocity Analysis -Analytical and Graphical methods, Acceleration Analysis, Static Forces on Mechanism, Spur Gears-Contact Ratio and Interference, Drive Trains.  Project: Designing a successful moving mechanism. |
| **STUDENT OUTCOMES** | The Course Outcomes support the achievement of the following MET Student Outcome. **Student outcome (1)** an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline; |

**Related CO – 1,2,3**

**Student Outcome (3)** - an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature
**Related CO – 4**

**Student outcome (4)** - an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;
**Related CO – 4**

**Student outcome (5)** - an ability to function effectively as a member as well as a leader on technical teams.
**Related CO – 4**

| GRADING POLICY | | |
|---|---|---|
| | Homework | 15 % |
| | Tests   (2 @ 15% ea.) | 30 % |
| | Laboratory | 10% |
| | Project / Project Presentation | 15% |
| | Final Exam | 30% |

**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 https://www.njit.edu/dos/university-code-academic-integrity

**GENERATIVE AI**
Student use of artificial intelligence (AI) is permitted in this course for certain assignments and activities. It is not permitted to be used in the assignments noted by the instructor, as doing so would undermine student learning and achievement of course learning outcomes. Additionally, if and when students use AI in this course, the AI must be cited as is shown within the NJIT

[Library AI citation page](#) for AI. If you have any questions or concerns about AI technology use in this class, please reach out to your instructor prior to submitting any assignments.

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| **STUDENT BEHAVIOR** | • No eating or drinking is allowed at the lectures, recitations, workshops, and laboratories.<br>• Cellular phones must be turned off during the class hours – if you are expecting an emergency call, leave it on vibrate.<br>• No headphones can be worn in class.<br>• Unless the professor allows the use during lecture, laptops should be closed during lecture. |
| **MODIFICATION TO COURSE** | The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline. |
| **PREPARED BY** | Dr. Sahidur Rahman/ Dr. J. Sodhi |
| **COURSE COORDINATED BY** | Dr. J. Sodhi |

## CLASS HOURS

| Monday | 6:00 PM – 7:55 PM | CKB 207 |
|---|---|---|
| Monday | 8:05 PM – 10:00 PM | ME 214 |

## OFFICE HOURS:

By appointment E-mail: [sahidur.rahman@njit.edu](mailto:sahidur.rahman@njit.edu).

## GRADING LEGEND

| GRADE | NUMERIC RANGE |
|---|---|
| A | 90 to 100 |
| B+ | 85 to 89 |
| B | 80 to 84 |
| C+ | 75 to 79 |
| C | 70 to 74 |
| D | 60 to 69 |
| F | 0 to 59 |

**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

- Canvas: https://canvas.njit.edu/
- Zoom: https://njit-edu.zoom.us/
- Online Proctoring: https://ist.njit.edu/online-course-exam-proctoring

# COURSE OUTLINE

| Week | Date | Topics | Reading Assignment | Homework Assignment |
|------|------|--------|--------------------|---------------------|
| 1 | 1/27 | Introduction (1.0-1.4, 1.10)<br>Kinematics Fundamentals (2.0-2.7, 2.12-2.13, 2.18) | pp. 3-7, 17-20<br>pp. 30-46<br>pp 53-62<br>pp. 69-73 | Special Problems |
| 2 | 2/3 | Graphical Linkage Synthesis (3.0-3.6, 3.8) | pp. 98-133<br>pp.141-148 | Special Problems |
| 3 | 2/10 | Positional Analysis (4.0-4.5) | pp. 178-195 | Special Problems |
| 4 | 2/17 | Positional Analysis (4.6-4.13)<br>**Homework Package #1 Due** | pp. 196-213 | Special Problems |
| 5 | 2/24 | Velocity Analysis (6.0-6.4)<br>**Lab. # 1** Oscilloscope | pp. 291-313 | Special Problems |
| 6 | 3/3 | Velocity Analysis (6.7 & 6.9)<br><br>**Midterm #1** | pp. 321-330<br>pp. 331-333 | Special Problems |
| 7 | 3/10 | Acceleration Analysis (7.0-7.2)<br>**Homework Package #2 Due**<br>**Lab #1 Due** | pp.357-365 | Special Problems |
| 8 | 3/24 | Acceleration Analysis (7.3 & 7.5) | pp.365-379<br>pp. 380-382 | Special Problems |
| 9 | 3/31 | Dynamic Force Analysis (11.0-11.4) | pp.589-605 | Special Problems |
| 10 | 4/7 | CAM Design (8.0-8.3)<br><br>**Midterm #2** | pp. 409-442 | Special Problems |
| 11 | 4/14 | CAM Design (8.6-8.7)<br><br>**Lab. # 2** Speed Measurements | pp.460-478 | Special Problems |
| 12 | 4/21 | Gear Trains (9.0-9.8) | pp. 490-520 | Special Problems |
| 13 | 4/28 | Gear Trains (9.9-9.10)<br>**Lab #2 Due**<br>**Homework Package #3 Due** | pp. 520-532 | Special Problems |
| 14 | 5/5 | Balancing (12.0-12.2)<br><br>Review<br>**(Project Due)** | pp. 642-650 | |
| 15 | TBD | **FINAL EXAM** | | |