

Spring 2021

## **ME 231-002: Kinematics of Machinery**

Zhiming Ji

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## ME-231 Section 002, Kinematics of Machinery Spring 2021

Instructor: Dr. Zhiming Ji	Mode: Synchronous Online	Email: <a href="mailto:ji@njit.edu">ji@njit.edu</a>
Class Room: Webex Room	Class Time: TR4:00-5:20pm	Office Hours: T5:30-6:00pm, W4:30-6:00pm

**Course Description:** Design, selection, and evaluation of mechanisms for various applications. Topics include displacement, velocity, and acceleration analysis of planar linkages, synthesis of function generators and motion generators, design of cams, gears and analysis of gear trains. **Prerequisites:** CIS 101, MECH 234.

**Course Learning Outcomes** -- Students are expected to:

1. Calculate the degree of freedom and identify the mobility of a mechanism
2. Calculate the displacements of a planar mechanism
3. Calculate the extremes of the transmission angle in a crank-and-rocker mechanism
4. Synthesize a planar four-bar mechanism motion generator for two or three positions of a moving body
5. Calculate the velocities and accelerations of planar mechanism
6. Design a cam for a specified follower motion
7. Design a gear train for a desired speed ratio
8. Calculate the speed ratio of a planetary gear train

**Required Textbook:** Robert L. Norton, Design of Machinery, McGraw-Hill, 6th ed., ISBN 978-1-260-11331-0 or 978-1-260-43130-8.

**Grading Policy:** Grades will be determined by performance on assignments, project and exams in terms of total points. The points are distributed as: homework assignments 20%, two midterms 25% each, and the final exam 30%.

**Make-Up Exams:** If you have a reason for missing an exam, you must contact the office of the Dean of Students. A make-up exam will be arranged after receiving a notice from the Dean of Students office.

**Academic Integrity** is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic of integrity code at: <https://www5.njit.edu/doss/policies/index.php>

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the Academic Integrity Code, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu).

### COURSE OUTLINE:

Week (date)	Topic	Reading Assignment
1 (1/19, 1/21)	Introduction, Links, Joints, DOF	Chaps. 1 & 2
2 (1/26, 1/28)	Grashof's Condition, 4-Bar Linkage Classification	Chap. 2
3 (2/2, 2/4)	Displacement Analysis	Chap. 4
4 (2/9, 2/11)	Displacement Analysis	Chap. 4
5 (2/16, 2/18)	Linkage Synthesis	Chap. 5
6 (2/23, 2/25)	Midterm 1, Linkage Synthesis	Chap. 5
7 (3/2, 3/4)	Velocity Analysis	Chap. 6
8 (3/9, 3/10)	Acceleration Analysis	Chap. 7
9 (3/23, 3/25)	Cam Design	Chap. 8
10 (3/30, 4/1)	Cam Design, Midterm 2	Chap. 8
11 (4/6, 4/8)	Cam Design	Chap. 8
12 (4/13, 4/15)	Spur Gears	Chap. 9
13 (4/20, 4/22)	Spur Gears, Gear Trains	Chap. 9
14 (4/27, 4/29)	Gear Trains, Review	Chap. 9
15 (5/?)	Final Exam	

Note: May 4, Tuesday, last day of classes, following Friday schedule