1. **MEE320 – Mechanism Design and Analysis**

   Fall 2018

   Course (catalog) description

   Kinematic and dynamic analysis of mechanisms; mechanism design philosophy; and mechanism synthesis. Theory and design are supplemented by computer techniques. Mechanisms include cams, gears, and linkages.[1]

   Course objectives On completing this course, the student will be able to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. Specifically, the student will be able to:

   - Develop a design strategy based on project and client needs and constraint
   - Think holistically: sees the whole as well as the parts
   - Support design procedure considering design options and iterations with documentation and references
   - Consider all the relevant technical, nontechnical or external factors and design tradeoffs
   - Coordinate activities so that parts integrate into a working whole, within time constraints of the project
   - Create an atmosphere in which members feel comfortable contributing, and value team success over personal success

2. **Prerequisites:** MEE 211

3. **Credit and contact hours:** 3 Cr. hrs. Contact hours is one 160 minutes lectures/week

   Meeting times
   Tue, Thu 11:00a–12:15p EB 101

4. **Instructor:** Sachit Butail

   EB 148
   Office hours: Tue, Thu 12:30p–2:00p or by appointment
   sbutail@niu.edu
   (815) 753-9987

5. **Teaching assistants:** Katherine Chwistek (KC) Anandan Ganapathy (AG)

   EB 259 (KC), EB 141 (AG)
   Office hours: Mon, We 2:00–4:00p (KC), Thu, Fri 2:00–3:30 (AG)
   Z1736144@students.niu.edu (KC), Z1817132@students.niu.edu (AG)

[1] Top image: Thinking chair by Arthur Ganson, `https://www.flickr.com/photos/brendanadkins/2309594412`

6. **Textbook(s) and/or other required materials:**

   Design of Machinery (5th Edition)
   Robert L. Norton
   Publisher: McGraw Hill

7. **Specific Course Information:**

   i. **Homeworks:**

   Homeworks will be assigned at the end of almost every week and will be due at the beginning of class (Tuesday or Thursday depending on the difficulty) in the following week. You may collaborate on these, however, the work you submit should be entirely your own. **Late submissions will not be accepted.**

   ii. **Quiz/Exams:**

   In-class quiz will be given almost every week, which will be reviewed shortly thereafter. The quiz will be closed book, closed notes. Three exams including the final exam will be given during the course of the semester. The exams will be cumulative focusing on all the material covered until the week before the exam.

   iii. **Project:**

   Two design projects will be assigned during the course of the semester. These will be announced shortly.

   iv. **Grading:**

   - Homework Assignments: 10%
   - Quiz: 10%
   - Exams (3): 45%
   - Projects (2): 35%

   v. **Note:**

   - It is your responsibility to check your scores on Blackboard periodically. Scores will only be updated for the most recent homework/quiz/project/exam.

8. **Topics covered:** We will try to interleave topics as that has been shown to aid in long-term retention and learning[2]. The topics that will be covered with corresponding chapter in book for reading reference:

   1) Mechanism and machines; design process
   2) Types of motion, links, joints; degrees of freedom
   4) Position analysis: coordinate systems; types of motion; algebraic position analysis; four-bar linkages; simulation
   6) Velocity analysis: analytical solutions; four-bar linkages; simulations
   7) Acceleration analysis: analytical solutions; four-bar linkages
   3) Linkage synthesis
   8) Cam design: SVAJ diagrams
   9) Gear trains; contact ratio; gear types

[2]Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). Make it stick. Harvard University Press.

Tentative Schedule

Wk	Tue	Thu	Topic	Recommended Reading
1	28-Aug	30-Aug	The design process: human factors and case study	1.0-1.5, 1.6, 1.8, 1.11
2	4-Sep	6-Sep	Kinematics: links, joints, degrees of freedom, mechanism and structures, Vectors and vector addition, Grashof condition	1.11, 2.1, 2.2, 2.3
3	11-Sep	13-Sep	Linkage Synthesis, four bar	3.0, 3.1, 3.2
4	18-Sep	20-Sep	Fourbar design and analysis in CAD	
5	25-Sep	**27-Sep**	Cams and Gears	8.0, 8.1, 9.0, 9.6
6	2-Oct	4-Oct	Vector loop representation of linkages	4.5
7	9-Oct	11-Oct	Position analysis of a fourbar linkage	4.6
8	16-Oct	18-Oct	Position analysis of a fourbar linkage	
9	23-Oct	25-Oct	Velocity analysis	6.3, 6.7
10	30-Oct	1-Nov	Linkage Synthesis revisited	3.4
11	6-Nov	**8-Nov**	Cam design	8.1
12	13-Nov	15-Nov	Cam design	8.2
13	20-Nov		Gear trains	9.1, 9.2, 9.5
14	27-Nov	29-Nov	Open	
15	4-Dec	6-Dec	Open	
		11-Dec		

Legend

Exam on this day

Accessibility Statement

If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu. Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

Academic Integrity

Please carefully go through `http://www.niu.edu/ai/students/`. Please discuss with me if you have doubts about what constitutes dishonesty, plagiarism, and cheating. You are responsible for your work!