Text: *Design of Machinery*, 6th Edition, R.L. Norton, McGraw-Hill, 2020, ISBN13: 9781260113310

Instructor: G.R. Shiflett; OHE 430F; Office hours: MF 2-4pm.

TA: none

Grading: Weekly/bi-weekly homework as appropriate (all of equal weight).

Advice: The reading assignment should be completed before the first class meeting of the week.

Course description

This course is a sequel to your previous studies in the area of dynamics and it has a particular focus on the set of connected rigid bodies known as machines. We approach the motion of machines from two perspectives: 1) what causes machines to move and how they move in reaction to those causes; and 2) how machines move and what are the forces/torques needed to cause such motion (so-called forward and reverse problems although which is forward and with is reverse is rather arbitrary).

Along the way, we will examine: how many actuators are needed to drive a particular machine; how to determine the position of any particle on any component of the machine; how to determine the velocity of any particle on any component of the machine; and how to determine the acceleration of any particle on any component of the machine; how to determine the forces active at any location on any component of the machine; how to determine the forces exerted by the machine on the support framework; and how to balance rotating and/or reciprocating machinery.

Weekly plan

(Subject to change as the semester progresses)

Week	Reading material	Lecture topics	Problem set
1	Text: Ch. 1-2	Introduction; Nomenclature; Mobility analysis	Set #1
2	Text: Ch. 4	Constraint analysis; Solutions to vector equations; Position analysis	
3	Text: Ch. 4	Position analysis (continued); Vector loop equations	Set #2
4	Text: Ch. 6 (§1-2, 6-9)	Introduction to velocity analysis; absolute and relative velocity; rotating frames	
5		Velocity analysis (continued); joints/contact conditions	Set #3
6	Text: Ch. 6 (§3-5)	Instantaneous center of zero velocity; velocity of the IC itself	
7	Bb: Handout	Centers of curvature; Hartmann's construction (a graphical interpretation); Euler-Savary equation	Set #4
8	Text: Ch. 7	Acceleration analysis; absolute and relative acceleration; rotating frames	
9	Text: Ch. 7	Acceleration analysis (continued) joints/contact conditions	Set #5
10	Text: Ch. 10	Static force analysis	

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Week	Reading material	Lecture topics	Problem set
11	Text: Ch. 11 Bb: Rigid body motion handout	Dynamic force analysis	Set #6
12	Text: Ch. 11 Bb: Rigid body motion handout	Dynamic force analysis (continued) 2-D constrained motion	
13	Text: Ch. 12	Balancing; shaking forces/moments;	Set #7
14	Text: Ch. 15	Cam dynamics	Set #8
15		Catch up, review, etc.	
—	Study and final exam period		