



## **ME 363: Mechanics of Machinery**

Fall 1432/1433 (32-2)

**ME 363:** 3 Credit Hours: 3-1-1

**Instructor:** Dr. A. Al-Abduljabbar

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**Office Hrs.** 1. Tuesday 8:30-10 AM  
2. By appointment

**Text:** Design of Machinery, Robert Norton, McGraw-Hill.

**Required Material:** Engineering drawing tool set.

### **Lecture Topics**

1. *Geometry of Motion:* Introduction to mechanisms: Definitions and mobility. Type synthesis, inversions, rotatability.
2. *Motion Analysis:* Position and displacement, velocity, acceleration, kinematics of mechanisms. (Graphical approach).
3. *Force Analysis:* Static force analysis, dynamic force analysis, balancing.
4. Instant Center of velocity, Mechanical advantage and Transmission angle.
5. Graphical linkage synthesis.
6. *Cams:* Cam-follower synthesis and Analysis, cam sizing, cam profile layout.
7. *Gears:* Spur gears and involute tooth, force analysis, gear trains.
8. *Selected topics:* Motion analysis using analytic approach; coriolis acceleration.

**Attendance:** Attendance will be checked at the beginning of each lecture. Late coming is strictly not allowed as this disturbs students and instructor. University regulations will be followed for students exceeding the maximum number of unexcused absences.

**Homework and Reports:** All homework problems and reports assigned during a given week are due in class on the following **Tuesday** unless otherwise stated. **LATE** home works **will not be accepted**.

**Quizzes:** Quizzes will be given during the semester. Not necessarily scheduled.

### **GRADING SYSTEM**

30 %	Attendance, Reports, Homework and Quizzes
30%	Major Exams
40 %	Final Exam
100 %	TOTAL



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**Course syllabus**

<b>Duration</b>	<b>Lectures</b>	<b>Tutorials</b>	<b>H.W</b>
(2 weeks)	<ul style="list-style-type: none"> <li>• Introduction : mechanisms terminology and mobility.</li> <li>• Simple mechanisms: type synthesis, inversions, rotatability, input-output characteristics.</li> </ul>	1,2 4-7	3 8-9
	Report I: Inversions of Simple Mechanisms		
(2 weeks)	<ul style="list-style-type: none"> <li>• Graphical position analysis.</li> <li>• Graphical velocity analysis (Vel. Polygon).</li> <li>• Graphical acceleration analysis (Acc. Polygons)</li> </ul>	10,11 (a) 14,15	10(c),,11(c), 12, 13 16
	Report II: Simple Mechanisms Output Motion		
(2 weeks)	<ul style="list-style-type: none"> <li>• Static force analysis.</li> <li>• Dynamic force analysis.</li> <li>• Balancing of Rigid Rotors.</li> </ul>	17,18,19 21,22 24,25,26	20 23 27
	Report III: Linkage Output Function and Path Generators		
	<b>Major Exam I Sunday 2-12-1432 (30 October 2011, 10:00AM).</b>		
(2 weeks)	<ul style="list-style-type: none"> <li>• Instantaneous centers of velocity</li> <li>• Mechanical advantage.</li> <li>• Transmission angle.</li> </ul>	28,29 31-34	30 35,36
	<ul style="list-style-type: none"> <li>• Graphical linkage synthesis.</li> </ul>	37,38	39,40
(1 week)	Report IV: Ackermann Steering Gear, and Hooks Joint.		
(2 weeks)	<ul style="list-style-type: none"> <li>• Cam-Follower motion synthesis</li> <li>• Cam-follower Force Analysis</li> <li>• Cam sizing – analytical approach</li> <li>• Cam profile layout</li> </ul>	41-48, 50-52	49
	Report V: Cam-Follower Mechanisms		
<b>Major Exam II (15%) Sunday 23-1-1433 (18 December 2011, 10:00AM)</b>			
(2 weeks)	<ul style="list-style-type: none"> <li>• Spur Gear and Involute Tooth</li> <li>• Gear Force Analysis.</li> <li>• Ordinary and Planetary Gear Trains.</li> </ul>	53,54 56-60	55
	Report VI: Gears		
(1 week)	<ul style="list-style-type: none"> <li>• Coriolis Acc. Analysis.</li> <li>• Motion of four-bar– analytical approach</li> </ul>	61,62	