A) COURSE

Course Id:	Course
5522	Kinematics of Machines

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
5	0	5	10	80 hrs Theory 0 hrs. Lab 80 hrs Total.

B) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	N.A	IV	V	VII	V
Course Type (Required/Elective)		Required	Required	Required	Required
Prerequisite Course:		(5691)	(5691)	It requires that have approved 270 credits	(5691)
CACEI Classification:		AE	AE	AE	AE

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
To sit the bases to realize the design of mechanisms in more advanced studies and to carry out calculations of the principal variables of cinematic order in the elements of the coplanar mechanisms.

D) TOPICS (CONTENTS AND METHODOLOGY)

1. BASICS.		**3 Hours**
Specific Objective:	**Objective 1.** To familiarize students with the terminology used.	
1.1 role of the kinematics in the machine design 1.2 what is a machine? What is a mechanism? 1.3 structure of a generic machine and its components 1.4 role of the engineer in the field of machinery		
Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.	
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.	
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.	

2. TOPOLOGICAL ANALYSIS OF MECHANISMS.	**7 Hours**
Specific Objective:	**Objective 2.** To analyze the basic components of a mechanism.
2.1 basics topological piece link and classification. 2.2 concepts of kinematic pair. Classification pairs 2.3 powertrain 2.4 mechanisms, simplified diagrams and classification mechanisms 2.5 mobility or degrees of freedom of a plane mechanism. Criteria kutzbach 2.6 inversion kinematics	
Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

3. ARTICULATED LINK MECHANISMS.	**9 Hours**
Specific Objective:	**Objective 3.** To identify the main features of the mechanisms articulated planes.
3.1 four-bar linkage mechanism 3.1.1 act grashof 3.1.2 mechanical advantage 3.1.3 analysis position 3.1.4 coupler curves 3.2 mechanisms straight 3.3 mechanisms of quick return 3.4 intermittent motion mechanisms	
Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

4. NSTANT CENTERS.	**4 Hours**
Specific Objective:	**Objective 4.** To study the links of the coplanar motion machines, using instant centers.
4.1 Define instantaneous center. 4.2 Locations of instant centers. 4.3 Kennedy theorem.	
Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

5. SPEED AND ACCELERATION IN COPLANAR MOTION. CORIOLIS VECTOR.	**22 Hours**
Specific Objective:	**Objective 5.** Determination of velocities and accelerations in the links of a mechanism by graphical methods.

5.1 speeds instant centers.
5.2 methods:
a) swivel-link (linear velocity).
b) direct (linear velocity).
c) by resolution (linear velocity).
d) angular speed.
5.3 methods for imaging and linear speed acceleration.
5.4 analytical method for velocity and acceleration
5.5 vector, coriolis

Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

6. SLIDER, CRANK MECHANISMS.	**5 Hours**
Specific Objective:	**Objective 6.** To conduct a specific study on the main characteristics of this mechanism has a very wide use.

6.1 general.
6.2 initial inversion.
6.3 piston speed. Graphic method.
6.4 acceleration of the piston. Graphical construction of klein.
6.5 method of analysis. Velocity and acceleration of the piston.

Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

7. CAM.	**10 Hours**
Specific Objective:	**Objective 7.** Students will learn the methodology for the design of cam elements widely used in the machinery.

7.1 types of cams.
7.2 design of the profile.
A) moving with constant velocity.
B) motion with constant acceleration-deceleration.
C) simple harmonic motion.
D) cycloidal.
7.3 construction of the profile of the cam.
7.4 flat cam or disc.
7.5 rod slice.
7.6 rod with convex face.
7.7 rod with flat face.
7.8 primary and secondary rods.

Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

8. Contacts with pure bearing.	**4 Hours**
Specific Objective:	**Objective 8.** To analyze the special conditions that is generated between bodies where there is relative motion in the contact points.

8.1 conditions for pure rolling contacts.
8.2 transmissions frictional.
8.3 construction of the profile.
8.4 ratio of cones that roll speed.

Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

9. Gears.	**9 Hours**

Specific Objective:	**Objective 9.** To identify the nomenclature of gears, their applications for power transmission and some considerations for its design.
9.1 classification of gears. 9.2 terminology of gears, step. 9.3 gear basic law. 9.4 tooth profiles. Cycloidal and involute teeth. 9.5 teeth standardized	
Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

10. Gear trains.	**7 Hours**
Specific Objective:	**Objective 10.** Identify the different configurations of gear trains and main applications.
10.1 value of the train. 10.2 simple gear train 10.3 compound gear train 10.4 epicyclic gear train or planetarium.	
Readings and other resources	Course notes, complementary bibliography, internet pages, videos, product catalogues and power point presentations.
Teaching Methodologies	Presentation and explanation of topics in class, PPT presentations, student interactions.
Learning Activities	Taking notes during class, problem solving, homework realization, and project development.

E) TEACHING AND LEARNING METHODOLOGIES

a) Presentation and explanation of topics in class.
b) Power Point presentations (PPT)
c) Analysis and synthesis of concepts.
d) Problem solving.
e) Homework and discussion.
f) Team work.
g) Course project.

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Suggested Form of Evaluation	Topics

		and weighting	
1st partial evaluation.	Session 20	**20 % Total Evaluation** Partial evaluation: Exam 90% , Assignments 10%	1, 2, 3
2nd partial evaluation.	Session 40	**20 % Total Evaluation** Partial evaluation: Exam 90% , Assignments 10%	4, 5
3rd partial evaluation.	Session 60	**20 % Total Evaluation** Partial evaluation: Exam 90% , Assignments 10%	6, 7
4th partial evaluation.	Session 80	**20 % Total Evaluation** Partial evaluation: Exam 90% , Assignments 10%	8, 9, 10
5th partial evaluation.	Session 100	**20 % Total Evaluation** Partial evaluation: Exam 90% , Assignments 10%	
Ordinary final evaluation		**100%** (Average value of the partial evaluations)	
Others activities:			
Second chance final exam	Week 17 of the semester in progress	100% Exam	100% topics
Third chance final exam	According to Secretary school setting	100% Exam	100% topics
Regularization Exam	According to Secretary school setting	100% Exam	100% topics

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

Main bibliography

MABIE, H.H. Y REINHOLTZ F.CH. (2001). MECHANISMS AND DYNAMICS OF MACHINERY. 2ED. LIMUSA. MEXICO.
NORTON, ROBERT L. (2000). MACHINE DESIGN, MCGRAW-HILL. MEXICO.
ERDMAN, A.G. Y SANDOR, G.N. (1998). MECHANISM DESIGN: ANALYSIS AND SYNTHESIS. 3A.ED. PRENTICEHALL. MEXICO.
SHIGLEY J.E. Y UICKER J.J. (1994). THEORY OF MACHINES AND MECHANISMS. MCGRAW-HILL. MEXICO.
MABIE, H.H. (1993). MECHANISMS AND DYNAMICS OF MACHINERY. LIMUSA. MEXICO.

Complementary bibliography

CASTILLO, A. (2005). KINEMATICS OF MACHINES. NOTES. FACULTY OF ENGINEERING, UASLP.