A) COURSE

Course Id:	Course
5695	Mechanic of Materials I

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
5	1	5	11	80 hrs. theory 16 hrs. lab. 96 hrs. total

B) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	III	III	IV	IV	III
Course Type (Required/Elective)	Elective	Elective	Elective	Elective	Elective
Prerequisite Course:	Statics (5694)	Statics (5694)	Statics (5694)	Statics (5694) and Materials for Engineering (5699)	Statics (5694)
CACEI Classification:	CI	CI	CI	CI	CI

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Understand the concepts and develop methods of discipline, to determine the efforts and deformations arising in structural members or components of the machine; and based on the acquired knowledge, establish the fundamentals for inferring causes of failure that will be studied in the course of Mechanics of Materials I.

D) TOPICS (CONTENTS AND METHODOLOGY)

1.- Introduction		7 hours
Specific Objective:	**Objective 1:** That student to know and understand the relationship between the forces applied to an element and the efforts and deformations that occur.	

1.1 Force, stress and deformation.
1.2 Stress definition.
1.3 Stress classification
  1.3.1 Internal stresses: normal and shear.
  1.3.2 Superficial stresses.
1.4 Deformation definition.
1.5 Strain Mechanical Essay.
  1.5.1 Stress deformation graph. Characteristic values.
  1.5.2 Hooke Law.
  1.5.3 Elastic – plastic behaviour of the material.
1.6 Criteria for dimensioning of elements: design factor, admissible stress, admissible deformation.

Readings and other resources	HIBBELER, RUSSELL C.Mecánica de Materiales, Sexta edición. PEARSON, México D.F., 2006. GERE-TIMOSHENKO.Mecánica de Materiales.Ed. Iberoamericana, México D.F., 1986. BEER, JOHNSTON.Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill México, 2007.
Teaching methods	Inductive method: going from general to particular knowledge. Group based learning to cope with basic theoretical knowledge.
Learning activities	Lab practicing to apply concepts taught during class. It is mandatory to present task reports

2.- Strain and compression normal stresses		**10 hours**
Specific Objective:	**Objective 2:** The student to understand and calculate the normal efforts of tension and compression in various elements mainly bars, produced by mechanical loads and temperature variations.	
2.1 Strain and compression normal stresses. 2.2. How to determine stresses on statically equilibrated elements. Sections method of calculation. 2.3 Strain and Compression Deformation. 2.4 Thermical Normal Stresses. 2.5 Estatically non determined stress calculation.		
Readings and other resources	HIBBELER, RUSSELL C.Mecánica de Materiales, Sexta edición. PEARSON, México D.F., 2006. GERE-TIMOSHENKO.Mecánica de Materiales.Ed. Iberoamericana, México D.F., 1986. BEER, JOHNSTON.Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill México, 2007.	
Teaching methods	Inductive method: going from general to particular knowledge. Group based learning to cope with basic theoretical knowledge.	
Learning activities	Lab practicing to apply concepts taught during class. It is mandatory to present task reports	

3.- Shear stresses: pure shear and torsion shear		**15 hours**
Specific Objective:	**Objective 3:** The student to understand and calculate shear, pure and torsion efforts, and to know the importance of latter in mechanical elements.	
3.1 Shear loads. 3.2 Where to find pure shear stresses. 3.3 Torsional moment. Application of torsional moment in Mechanical Engineering. 3.4 Torsional moment equations. 3.4.1 Torsional angular deformation. 3.4.2 Torsional shear stress. 3.5 Relationship between torsional stress and deformation angle. 3.6 Torsional stresses in power transmission. 3.7 Torsional stresses in statically non determined elements.		

Readings and other resources	HIBBELER, RUSSELL C.Mecánica de Materiales, Sexta edición. PEARSON, México D.F., 2006. GERE-TIMOSHENKO.Mecánica de Materiales.Ed. Iberoamericana, México D.F., 1986. BEER, JOHNSTON.Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill México, 2007.
Teaching methods	Inductive method: going from general to particular knowledge. Group based learning to cope with basic theoretical knowledge.
Learning activities	Lab practicing to apply concepts taught during class. It is mandatory to present task reports

4.- Strain flexure	**15 hours**
Specific Objective:	**Objective 4:** The student to learn flexure as a product of mechanical loads, and the calculation of efforts and deformations arising in consequence thereof.
4.1 Model representations. 4.1.1 Beam definition. Different types of beams. 4.1.2 Type of loads that produce flexure on beams. 4.1.3 Mechanical elements behaving as a beam. 4.2 Shear force and flexure moment diagrams. 4.3 Flexure produced stresses. 4.4 Flexure normal stress. Flexure equation or formula. 4.5 Area moments of second order. Flexure resistant moments. Commercial profiles of steel and other materials. 4.6 Flexure shear stress.	
Readings and other resources	HIBBELER, RUSSELL C.Mecánica de Materiales, Sexta edición. PEARSON, México D.F., 2006. GERE-TIMOSHENKO.Mecánica de Materiales.Ed. Iberoamericana, México D.F., 1986. BEER, JOHNSTON.Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill México, 2007.
Teaching methods	Inductive method: going from general to particular knowledge. Group based learning to cope with basic theoretical knowledge.
Learning activities	Lab practicing to apply concepts taught during class. It is mandatory to present task reports

5.- Flexure deformation on beams	**15 hours**
Specific Objective:	**Objective 5:** The student to understand and calculate the deformations on a straight axle beam, caused by a bending load.
5.1. How to deduct deformation. Elastic equation. 5.2. Double integrative method. 5.3. Area of flexure moment method.	
Readings and other resources	HIBBELER, RUSSELL C.Mecánica de Materiales, Sexta edición. PEARSON, México D.F., 2006. GERE-TIMOSHENKO.Mecánica de Materiales.Ed. Iberoamericana, México D.F., 1986. BEER, JOHNSTON.Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill México, 2007.

Teaching methods	Inductive method: going from general to particular knowledge. Group based learning to cope with basic theoretical knowledge.
Learning activities	Lab practicing to apply concepts taught during class. It is mandatory to present task reports

6.- Statically non determined beams		**18 hours**
Specific Objective:	**Objective 6:** The student to learn how to establish equations that allow to solve indeterminate beams	
6.1. Double integrative method 6.2 Area of flexure moment method 6.3 Castigliano Theorem of deformation energy 6.4 Statically non determined beams 6.5 Continuous beam. 6.5.1 Three moment's equation. 6.5.2 Support reactions and resistive moments. 6.5.3 Shear force diagrams. 6.5.4 Flexure by three moments equation.		
Readings and other resources	HIBBELER, RUSSELL C.Mecánica de Materiales, Sexta edición. PEARSON, México D.F., 2006. GERE-TIMOSHENKO.Mecánica de Materiales.Ed. Iberoamericana, México D.F., 1986. BEER, JOHNSTON.Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill México, 2007.	
Teaching methods	Inductive method: going from general to particular knowledge. Group based learning to cope with basic theoretical knowledge.	
Learning activities	Lab practicing to apply concepts taught during class. It is mandatory to present task reports	

E) TEACHING AND LEARNING METHODOLOGIES

a) Professor Lecture.
b) Paper Readings.
c) Use of software to prove mathematics modeling.
d) Homework to investigate important matters.
e) Case study strategy..

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Suggested Form of Evaluation and weighing	Topics
1er. Partial Evaluation	20 Session	**25 % Ponderability** Partial Evaluation: Exam 80%, Extra work during class hour 10%, Participating in class hour 10%.	1 y 2
2da. Partial Evaluation	40 Session	**25 % Ponderability** Partial Evaluation:	3

		Exam 80%, Extra work during class hour 10%, Participating in class hour 10%.	
3er. Partial Evaluation	60 Session	**25 % Ponderability** Partial Evaluation: Exam 80%, Extra work during class hour 10%, Participating in class hour 10%.	4 y 5
4ta. Partial Evaluation	80 Session	**25 % Ponderability** Partial Evaluation: Exam 80%, Extra work during class hour 10%, Participating in class hour 10%.	5 y 6
Evaluación Final Ordinario		100% (Promedio de las Evaluaciones Parciales)	
Extra Activity:	Mechanic of Materials Laboratory. Specific activities shown at the correspondent lab practicing manual.		
Ordinary Final Evaluation		Partial Evaluation Average	
Extraordinary Exam	17th week of the semester	100% Exam	100% Themes

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

BASIC TEXT BOOK

HIBBELER, RUSSELL C.
Mecánica de Materiales, Sexta edición.
PEARSON, México D.F., 2006.

GERE-TIMOSHENKO.
Mecánica de Materiales.
Ed. Iberoamericana, México D.F., 1986.

BEER, JOHNSTON.
Mecánica de Materiales. Cuarta Edición. Editorial McGraw Hill, México, 2007.

GERE, GOODNO.
Mecánica de Materiales.
Ed. Cengage, México D.F., 2009.

PYTEL/SINGER.
Resistencia de Materiales, Cuarta edición. Ed. Harla, México D.F., 1982.

Complementary

Craig, Roy R. Jr.
Mecánica de Materiales, Segunda edición. CECSA,
México, 2002.

RILEY/STURGES/MORRIS.
Mecánica de Materiales.
MDSolids V1.7 con problemas modelo. Timothy
A. Philpot, Segunda edición.

Mechanics of Materials.
Interactive Mechanics of Materials Tutorial. Beer,
Johnston, Dewolf, Third edition.
McGraw-Hill.

DUBBEL.
HANDBOOK OF MECHANICAL ENGINEERING.
Edited by W. Beitz & Küttner.
Editorial Springer Verlag, London, 1994.

Internet Sites:
Moodle Platform
Sociedad Americana de Ingenieros Mecánicos: ASME
https://www.asme.org

Data Bases:
About materials properties.
http://www.matweb.com

Fundamental knowledge on Mechanic Engineering materials, unit conversion factors, mechanical design, equations and formulae, fabricating processes, solid mechanics, fluids and mathematics.
http://www.efunda.com/home.cfm

Simulators:
Simulate Software:
MD Solid Simulator