Learning Plan
Basic Mechanical Engineering

TI184519 (3 credits)

Last Update : 1 Februari 2019

1. Description

In this Basic Mechanics Engineering course students are given knowledge about the engineering profession, including the roles, ethics, culture and engineering profession responsibilities. Students are introduced to the basics of mechanical engineering, among others: Mechanical Design, Forces in Structures and Machines, Materials and Stresses, Fluids Engineering, Thermal and Energy Systems, Motion and Power Transmission along with illustrations of the branches below. By following this course, students are expected to be able to see and analyze a problem through the Basic Mechanical Engineering scientific approach.

2. The Purpose of Learning Courses

Code	Learning Objectives
LO1	Students are able to see problems with an engineering approach (mechanical engineering / mechanical systems)
LO2	Students have a picture and understanding of the process and stages of problem solving related to the design and mechanical systems
LO3	Students have a basic understanding of Technical Materials, understanding of mechanical properties, and phenomena due to the force (pull / pressure) applied to the material.
LO4	Students have a basic description and understanding of fluids, characteristics, and their applications in the engineering world.
LO5	Students have a basic description and understanding of Energy Conversion and Conservation and its application

3. The relationship between the learning objectives of courses with the learning outcomes of study programs

Course Outcome	ABET Student Outcome										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
LO1	**										
LO2				*			*			*	
LO3			***	*			*				
LO4	***				*						
LO5					**						***

LO6			**								**

Content Rating Legend	
*	General Awareness, and not part of grade
**	15-30 minutes discussion or lecture for the term, and may be included as part of grade
***	More than 30 minutes discussion plus significant exercises and/or assignments, and it is included as part of grade

ABET Student Outcomes

Criteria No	Criteria Description
(a)	an ability to apply knowledge of mathematics, science, and engineering
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d)	an ability to function on multidisciplinary teams
(e)	an ability to identify, formulate, and solve engineering problems
(f)	an understanding of professional and ethical responsibility
(g)	an ability to communicate effectively
(h)	the broad education necessary to understand the impact of engineering solutions in a global economic, environmental, and societal context
(i)	a recognition of the need for, and an ability to engage in life-long learning
(j)	a knowledge of contemporary issues
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

4. Pre-requisite Course

To take this course, students are not required to take other courses as prerequisite courses.

5. References

- J. Wickert, K. Lewis, An Introduction to Mechanical Engineering. Cengage learning , 2013
- John O. Bird, Carl T. F. Ross, Mechanical Engineering Principles, 2nd edition, Routledge, Taylor & Francis, 2012

6. Course Schedule and Strategy

Week	Topics	Learning Method							Learning Facility						
		B1	B2	B3	B4	B5	B6	B7	S1	S2	S3	S4	S5	S6	S7
1	***Intoduction*** - College contract - Introduction / overview of the material - Case study e.g. Development of SpaceX Falcon Heavy and R80 Aircraft Development	√							√	√					
2	***Mechanical Design*** - Design Process: Requirements, Concepts, Details, Realization (Fabrication / Manufacturing) - Fabrication / Manufacturing Process		√						√	√	√				
3	***Mechanical Design*** - Case studies of design concepts - Static: Bridge Structure - Dynamic: Mousetrap-powered vehicles Urban Power Infrastructure		√						√	√	√				
4	***Forces in Structures and Machines*** - Style components (Cartesian and polar) - Style consultant (theoretical and graphic)	√					√		√	√					
5	***Forces in Structures and Machines*** - *Moment of Style* - *Equilibrium of Style and Moment* - *Truss and beam*		√						√	√					
6	**Material Science and Stress** - *Engineering Materials* - *Tension and Compression* - *Material Response*								√	√		√			
7	**Material Science and Stress** - *Shear* - *Safety Factor*	√					√		√	√		√			

8	**MID TERM EXAMINATION**					√							√		
9	**Fluid Mechanics** - Fluid Properties - Laminar and Turbulent Flow	√			√				√	√			√	√	
10	**Fluid Mechanics** - - Lift and drag - - Flow in Pipes**Case study** Example: - Airfoil aircraft, Downforce on F1 cars - Fluid Engines (Pumps, Compressors, Turbines)	√			√				√				√	√	
11	***Thermal and Energy Systems*** - Mechanical energy, effort and power - Conservation and Energy Conversion	√			√				√	√			√	√	
12	***Thermal and Energy Systems*** - Heat value, specific heat - heat transfer		√				√		√	√		√			
13	***Thermal and Energy System*** **Case study:** - thermal power plants - Jet engine, 2 stroke engine, 4 stroke engine		√				√		√	√	√				
14	**Motion and Power Transmission** - Translation, Rotation, and Coriolis Motion - Simple mechanism and complex mechanism		√				√		√	√					
15	**Motion and Power Transmission** - Types of power transfer / conductor **Case study** - Gear transmission, chain drive, and CVT - Planetary Gear		√						√	√					
16	**FINAL TERM EXAMINATION**					√							√		

Note : Check the relevant forms and learning facility column

Note:

Learning Method	Learning Facility

B1	Lecture	S1	Book
B2	Discussion/Presentation	S2	Power point
B3	Practicum	S3	Video
B4	Exercises	S4	Prototype
B5	Written Test	S5	Case Study
B6	Individual Task	S6	Journal/Articles etc
B7	Expo (Task)	S7	Exibition Event

*** please add if not listed above*

7. Assessment methods and their relevance to the learning objectives of the course

No.	Evaluation Type	Weight (%)	Evaluated Learning Objectives					
			LO1	LO2	LO3	LO4	LO5	LO6
1	Mid Term Examination	20%	√	√	√			
2	Task 1	15%		√				
3	Task 2	15%				√		
4	Task 2	20%	√		√			
5	Final Term Examination	30%				√	√	√

Note : Mark the relevant learning outcomes which evaluated

8. Matrix of assessment criteria

Assessment criteria for several types of evaluation in general.

Evaluation Type	Fail Less than 50%	Pass 50 – 59%	Credit 60-69%	Distinction 70 – 79%	High Distinction 80 – 100%
Written Task	Not following the steps in the process. The equation / formula used is incorrect, there are no units. Work imitates the work of friends.	Do not write down assumptions and do not describe system or process diagrams. The equation / formula used is incomplete and there is no unit of magnitude.	Do not write down assumptions and do not describe system or process diagrams. The equation / formula used is incomplete.	Follow the steps but not very complete (no system / process diagrams, formulas, assumptions). Calculations and analyzes of 80% are precisely accompanied by units of the existing quantities.	Following the steps in progress (there is a system / process diagram, formulas, assumptions). Calculations and analyzes of more than 80% are precisely accompanied by units of the existing quantities.
Written Examination	Not following the steps in the process. The formula used is incorrect, there are no units.	Do not write down assumptions and do not describe system or process diagrams. The equation / formula used is incomplete and there is no unit of magnitude.	Do not write down assumptions and do not describe system or process diagrams. The equation / formula used is incomplete.	Follow the steps but not very complete (no system / process diagrams, formulas, assumptions). Calculations and analyzes of 80% are precisely accompanied by units of the existing quantities.	Following the steps in progress (there is a system / process diagram, formulas, assumptions). Calculations and analyzes of more than 80% are precisely accompanied by units of the existing quantities.
Presentation	Not doing a presentation, or not showing any activity in a presentation.	Presentations are poor, and tend to be unable to answer questions and submit very weak arguments.	Mediocre presentations, with less strong argumentation skills and tend to fail to understand questions or answer with answers that are less relevant.	Able to present fairly well, but not strong enough in explaining the reasons, theories, and practical conditions of the problem / topic delivered.	Able to present in a concise, concise and clear manner with a high level of self-confidence and be able to explain the reasons, conceptual theories, and conditions related to the problem / topic presented