

SYLLABUS

Date / Revision : 04 September 2017/ 03
Faculty : Engineering
Study Program : MEE

SUBJECT: Advance Machine Elements

1 Basic Information

1.01	Subject Name	Advance Machine Elements
1.02	Semester	4
1.03	Level	3
1.04	SKS	4
1.05	Mandatory / Curriculum	Mandatory / D-07
1.06	Subject Code	MELM
1.07	Subject Code	MEE-D-MELM-4107
1.08	Year	2017 (7)
1.09	Quality Control	Final Test, OFSE, see evaluation
1.10	Limitations	Min 12, Max 32 students in a class
1.11	Combined with	--
1.12	Perquisite	Statics and Mechanics of Material, Machine Element
1.13	Responsible	Dipl.-Ing. Wahjoe Goertino, M.Si
1.14	Revision	04 September 2017

2 Description of Subject

This course is intended for students in Mechanical Engineering of the Engineering faculty. The course is the continuation of Machine Element1, which is delivered in previous semester.

The course covers the calculation and design of gears, shafts, bearings, gear housing, clutch, chain and belt. Welding parts is also discussed and calculated.

Besides the theoretical consideration, students have the chance to see how the element part is made by doing the excursion to the industry.

Finally the students have to design, to construct based on the calculation and present them in form of design-drawing using CAD.

3 Objectives

- Introduces the design and calculation of machine elements
- Introduce how the element is function is a system
- Introduce the concept of design of machine element
- Introduce the safety factor for designing.

4 Competency

After finished the course, students are expected to:

- Be able to calculate the machine element builds in the system
- Select the proper material and standard part based on calculation
- Be able to analyze the system
- Have understanding of the function of mechanism of the system
- Be able to design the simple mechanism system
- Be able to determine the proper design
- Be able to analyze the mechanical design

5 Learning Approach / Methodology

- Approach : Combination of Expository - inquiry and colaborative
- Method : Discussion, question answer, sample problem, group work
- Student Task : Presentation, homework
- Media : LCD projector, film.

6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	05 Points
5.3	Homework / Classwork	05 Points
5.4	Presentation /Simulation	10 Points
5.5	Daily Quiz	20 Points
5.6	Final Examination	60 Points
	Total	100 Points

7 Text Book and Reference

1	<p>Main Text Book:</p> <ul style="list-style-type: none"> Fundamental of Machine Elements, Hamrock, Schmid, Jacobson, 2nd edition, Mc. Graw Hill
2	<p>Supplementary Text books:</p> <ul style="list-style-type: none"> Mechanical Design of Machine Elements and Machines, Jack A. Collins, Henry Busby, George Staab, 2nd edition, Wiley, 2010 Roloff/ Matek, Maschinenelemente, Normung, Berechnung, Gestaltung, Dieter Muhs, Herbert Wittel, Dieter Jannasch, Joachim Vossiek, Viewegs Fachbuecher der Technik

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1	<p>Gear and Gear-box:</p> <ul style="list-style-type: none"> General introduction, Geometry of gear, nomenclature, types of gear, ratio, how gear is made, involute, evolvent, module, power, torque, RPM, Gear material, pressure angle. 	Hamrock Ch 14-15	
2	<p>Gear and Gear-box: Calculation of spur gear:</p> <ul style="list-style-type: none"> Pitch diameter, addendum, foot diameter, determine of module, dimension tolerance of gear, positive correction, negative correction, Forces and load in gear, width of gear, foot strength of gear, Lewis factor 	Hamrock Ch 14-15	
3	<p>Gear and Gear-box:</p> <ul style="list-style-type: none"> Calculation of Helical, Bevel and Worm gears. Helical gear: Helical gear relationship, Pitches of helical gear, Pressure angle, equation. Bevel gear: Types of bevel gear, Geometry, Forces and torque, equation. 	Hamrock Ch 14-15	
4	<p>Shaft and Axle:</p> <ul style="list-style-type: none"> General introduction, geometry of shaft, material for shaft and axle, how shaft and axle are made, Torque, Bending, Tolerance of shaft, Testing and Hardness, Maximum stress, Notch 	Hamrock Ch 11	Quiz 1
5	<p>Shaft and Axle:</p> <ul style="list-style-type: none"> Calculation of shaft and axle, Load: Axial, Torsion, Bending and combine load. Determination of Torque and Bending. Determination of shaft diameter: DET, Distortion Energy Theory (Von Mises), MSST, Maximum Shear Stress Theory (Tresca). Critical speed of rotating shaft, 	Hamrock Ch 11	

6	<p>Bearing:</p> <ul style="list-style-type: none"> General introduction, Bearing type, ball bearing, roller bearing, Geometry of bearing, How bearings are made, Application of bearings, axial load bearing, radial load bearing, Fit and tolerance for bearing and shaft, Assembly disassembly of bearing. 	Hamrock Ch 13	Quiz2
7	<p>Bearing:</p> <ul style="list-style-type: none"> Calculation and selection of bearing. Static load rating, Equivalent static load, Dynamic load rating, Equivalent dynamic load, working factor, Fatigue life, Life adjustment factor. Taper roller bearing, O mounting, X mounting. 	Hamrock Ch 13	
8	MIDTERM SEMESTER BREAK		
9	<p>Fastener and Power Screw:</p> <ul style="list-style-type: none"> General Introduction, Thread terminology, Classification and Designation, Material for bolt and nut. How bolt and nut is made. Bolt and Nut: Bolt types, Nut types, Standard dimension of bolt and 	Hamrock Ch 16	
10	<p>Fastener and Power Screw:</p> <ul style="list-style-type: none"> Power Screw: Forces and Torque, Power efficiency, Self-locking screw. Threaded Fastener: Load analysis of Bolt and Nut, Stiffness parameters, Strength, Static loading, Dynamic loading, and Gasket joints. 	Hamrock Ch 16	
11	<p>Clutch:</p> <ul style="list-style-type: none"> General introduction, Calculation and selection of clutch: Torque, acceleration, Moment of Inertia, Clutch moment, Operational behavior. Not switchable clutch: Rigid clutch, Spline clutch Switchable clutch: Switching clutch, Centrifugal clutch, Fly wheel clutch, and Induction clutch. 	Hamrock Ch 18	Quiz3
12	<p>Belt :</p> <ul style="list-style-type: none"> General introduction. Flat Belt: Belt length, Forces and Slip V-Belt: Input power rating, Drive size, Arc correction factor, Design power rating and center distance. 	Hamrock Ch 19	
13	<p>Chain:</p> <ul style="list-style-type: none"> General introduction. Chain types, Application and execution. Mechanics of chain: Velocity, Number of tooth, Forces and Torques. Calculation: Selection of chain, number of member, Shafts distance. 	Hamrock Ch 19	Quiz4
14	<p>Welding Connection:</p> <ul style="list-style-type: none"> General introduction. Welding process, Weldability of material, weld types, Calculation of Weld strength 	Roloff Matek Ch6	

15	<p>Project:</p> <ul style="list-style-type: none"> • Student elaborate a complete design of a system includes all necessary calculations. Student has to present in form of design drawing using CAD. 		
16	Final Examination		