MEC3104: DESIGN OF MACHINE ELEMENTS

Hours per semester				Weighted total mark	Weighted exam mark	Weighted continuous assessment mark	Credit unit
LH	PH	TH	CH				CU
60	00	60	60	100	60	40	4

Course description

One of the driving forces in development is that of creativity and perfection. In this course module, students will learn the fundamental aspects which are required in the world of entrepreneurship. This course is central to developing students ability to analyze, design and/or select machine elements and therefore involves economic, societal, safety and manufacturing aspects. In addition to technological considerations, the team projects help develop ability to work in teams, address open-ended engineering problems and written communication via reporting the results.

Course objectives

- To introduce students to the design and theory of common machine elements and to give students experience in solving design problems involving machine elements.
- To synergize forces, moments, torques, stress and strength information to develop ability to analyze, design and/or select machine elements - with attention to safety, reliability, and societal and fiscal aspects.
- To require the student to prepare professional quality solutions and presentations to effectively communicate the results of analysis and design.

Learning Outcomes

On completing this course the student should be able to:

- The course builds on the students' previous fundamentals in mathematics, science and engineering to help develop mechanical design methodology independently.
- The creativity developed during the course equips the student to become good entrepreneurs.

Course Content

Fundamentals of machine design (4 Hours)

Design philosophy

Processes, and 5th Ed. Pearson Manufacturing.

Engineering Materials

Brief overview of design and manufacturing

Stresses in machine elements

Simple stresses

Compound stresses in machine parts Strain analysis

Design for Strength

Design for static loading

Stress Concentration Design for dynamic loading

Low and high cycle fatigue

Fasteners

- Types of fasteners: Pins and keys
- Cotter and knuckle joint
- Threaded Fasteners
- Design of bolted joints

Power Screws

- Power Screw drives and their efficiency
- Design of power screws

Design of Springs

- Introduction to Design of Helical Springs
- Design of Helical Springs for Variable Load

Module:8 Design of Shaft

- Shaft and its design based on strength
- Design of shaft for variable load and based on stiffness

Design of Permanent Joints

- Riveted Joints : Types and Uses
- Design of Riveted Joints

- Welded Joints: Types and Uses
- Design of Welded Joints
- Design of Adhesive Joints

Design of Joints for Special Loading

(4 Hours)

(5 Hours)

(5 Hours)

(4 Hours)

(4 Hours)

(4Hours)

(5 Hours)

(3 Hours)

- Design of Eccentrically Loaded Bolted/Riveted Joints

Design of Eccentrically Loaded Welded Joints
Design of Joints with Variable Loading

Belt drives

(4 Hours)

Introduction to Belt drives Design of Flat Belt drives Design of V- Belt drives

Gearing

Bearings Project Work

Students carry out group projects and produce a report

Delivery Methods:

The course will be taught by using lectures and tutorials and project work.

Assessment Methods:

(4 Hours)

(4 Hours) (16 Hours)

Course work (assignments and tests) and final examination and their relative contributions to final grade are shown as follows:

Requirement

Course work Final examination

Total

Percentage contribution 40% 60% **100%**

Reference Books

1 Joseph Edward Shigley, Charles R Mischke,1989, *Mechanical Engineering Design,* 5th Edition, MacGraw Hill International edition, Mechanical engineering series, ISBN 0-07100607-9.

3

2 R. C. Juvinall and K. M. Marshek, *Fundamentals of Machine Component Design,* 2nd Ed., Wiley, 1991

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M.F Spotts, *Design of Machine Elements,* Prentice Hall India Pvt. Limited, 6 Edition, 1991.