Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2023-2024

Course Handout Part II

Date: 10-08-2023

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **ME F314 (L-P-T-U:3-0-1-3)**
Course Title : **Design of Machine Elements**
Instructor-in-Charge : **Prof. Srinivasa Prakash Regalla**
Tutorial Instructors : ***S1: Suswanth Poluru, S2: Mr. Veeraiahgari Vamshi, S3: Himanshu shukla, S4: Vicky Lad***

Scope and Objective of the Course: Design methodology, fundamental principles, materials, design for static failure, design for fatigue failure, design and selection of machine elements such as shafts, screw fasteners, welded joints, springs, belt drive, brakes & clutches, bearings & gears.

Textbooks:

1. Budynas R. G. and Nisbett J. K., "Shigley's Mechanical Engineering Design" Tata–McGraw Hill, 11th SI (Indian) Edition, New Delhi, 2020.

Reference books

1. Spotts M. F., Shoup T.E., Hornberger L.E., "Design of Machine Elements", 8th Edition, Pearson Education, New Delhi, 2008.
2. Juvinall R.C., Marshek K.M., "Fundamentals of Machine Component Design", 6th Edition, John Wiley & Sons, Hoboken, NJ, 2017.
3. Schmid S.R., Hamrock B.J., Jacobson B.O., "Fundamentals of Machine Elements", 3rd Edition, SI Version, CRC Press, Boca Raton, FL, 2014.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-2	Design methodology, fundamental principles, materials	Introduction to mechanical engineering design, stress and strength, factor of safety, material strength and stiffness, materials selection, equilibrium and free-body diagram, shear force, bending moment, stress and Cartesian stress components, Mohr's circle, beam deflections and strain energy.	CH1 to CH4 (TB1)
3-6	Design of machine elements for static failure	Design for static loading. Static failure criteria for design of machine components made of both ductile and brittle materials. MSS, DE, DCM, BCM and MM criteria.	CH5 (TB1)

7-10	Design of machine elements for fatigue failure	Design for fatigue loading. S-N curve and its mathematical model. Fatigue failure criteria, including Soderberg, Modified Goodman, Gerber and ASME-ellpitic, for design of machine components. Combined loading. Cumulative fatigue damage and Miner's rule.	CH6 (TB1)
11 -13	Design of shafts	Design of shaft components	CH7 (TB1)
14 -17	Design screw fasteners	Design of power screws. Design of bolted joints in tensile, torsion and bending type joints. Design riveted joints	CH8 (TB1)
18 - 21	Design of welded joints	Standard welding symbols. Design of welded joints in butt, lap, direct shear, torsional, bending and combined loading cases.	CH9 (TB1)
22 - 27	Design of mechanical springs	Fundamentals of helical springs. Design of compression, tension and torsional springs.	CH10 (TB1)
28 - 31	Design of belt drives	Design of flat belts, v-belts	CH17 (TB1)
32 - 35	Design of brakes & clutches	Design of drum brake and clutch with internally expanding shoes.	CH16 (TB1)
36-39	Selection of rolling element bearings and design of journal bearings	Selection of ball and roller bearings with load-life- reliability trade-off models. Design of journal bearings.	CH11 & CH12 (TB1)
40-43	Design of gears	Fundamentals of gears. Design of spur gears. Lewis bending equation. Surface endurance model.	CH13-14 (TB1)

Evaluation Scheme:

Component	Duration (min)	Weightage (%)	Date & Time	Nature of Component
Mid-semester Examination	90	25%=50M	14/10 - 9.30 - 11.00AM	Closed Book
Design Project (Hand-written report) (Batch work)	-	10%=20M		Open Book
Tutorials	Weekly	20%=40M		Open Book
Surprise Quiz	10 min each on selected Fridays	5%=10M	In Lecture Classes	Open Book
Comprehensive Examination	180	40%=80M	20/12 FN	Closed Book

Chamber Consultation Hour: To be announced in the first lecture class.

Notices: CMS

Make-up Policy: Only for Mid-semester and Comprehensive examinations and only in genuine cases of illness with prior intimation with medical documents enclosed. No makeup for tutorials as the best (N-2) assignments will be taken into account for grading.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester. Any form of academic dishonesty would lead to serious actions.

INSTRUCTOR-IN-CHARGE