



# Birla Institute of Technology & Science, Pilani

Hyderabad Campus

## FIRST SEMESTER 2022-2023

### Course Handout Part II

Date: 29-08-2022

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

<b>Course No.</b>	: ME F314 (L-P-T-U:3-0-1-3)
<b>Course Title</b>	: Design of Machine Elements
<b>Instructor-in-Charge</b>	: Dr. Nitin Kotkunde
<b>Tutorial Instructors</b>	: Mr. Veeraiahgari Vamshi, Mr. Gudlavalleti Deepak Kumar, Mr. Suswanth Poluru,

**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, 9<sup>th</sup> SI (Indian) Edition, New Delhi, 2011.

#### Reference books

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

#### Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-3	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)
4-7	Design of machine	Design for static loading. Static failure criteria for design of machine components made of	CH5 (TB1)



	elements for static failure	both ductile and brittle materials. MSS, DE, DCM, BCM and MM criteria.	
8-11	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-elliptic, for design of machine components. Combined loading. Cumulative fatigue damage and Miner's rule.	CH6 (TB1)
12 -13	Design of shafts	Design of shaft components	CH7 (TB1)
14 -18	Design screw fasteners	Design of power screws. Design of bolted joints in tensile, torsion and bending type joints. Design riveted joints	CH8 (TB1)
19 - 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)
28-32	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)
33-37	Design of gears	Fundamentals of gears. Design of spur gears. Lewis bending equation. Surface endurance model.	CH13-14 (TB1)
38 - 40	Design of brakes & clutches	Design of drum brake and clutch with internally expanding shoes.	CH16 (TB1)
41 - 43	Design of belt drives	Design of flat belts, v-belts	CH17 (TB1)

#### Evaluation Scheme:

Component	Duration	Weightage Marks (%)	Date & Time	Nature of Component
Mid-semester Test	90 min	60 (30%)	31 October 2022 1.30 PM – 3.00 PM	Closed Book
Tutorial	50 min (every week)	40 (20%)	-	Open Book
Classroom Interaction Test (CIT)	20 min	20 (10%)	-	Open Book
Comprehensive Examination	180 min	80 (40%)	19 December 2022 (FN Session)	Partially Open Book



**Chamber Consultation Hour:** Every Tuesday and Thursday (4.00 PM – 5.00 PM)

**Notices:** All notices to be displayed only on CMS.

**Make-up Policy:** Only genuine cases of illness, with prior permission. No makeup for tutorials and class room interaction tests.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE  
(ME F314)**

