BMEE301L	Design of Machine Elements	L	T	P	C
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Pre-requisite	**BMEE202L, BMEE202P**	**Syllabus version**			
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Course Objectives

1. To impart the knowledge on materials selection in design
2. To familiarize the effects of various types of loading on machine parts.
3. To develop the design methodology for mechanical components used in industries.
4. To adopt various standards in the design process.

Course Outcomes

At the end of the course, the student will be able to

1. Evaluate the design of machine components using theories of failure.
2. Analyse machine components subjected to dynamic loads against fatigue failure.
3. Recommend suitable mechanical springs for various applications.
4. Design shafts, keys and couplings as per the international standards.
5. Investigate the design aspects of temporary and permanent joints.
6. Design and develop the engine components.

Module:1	**Introduction to Design**	**8 hours**
Design Process – Factors Considered in Design – Selection of Materials – Use of Standards in Design – Direct, Bending and Torsional Stresses in Machine Elements - Factor of Safety – Design Stress – Theories of Failures.		
Module:2	**Fatigue Strength**	**8 hours**
Stress Concentration – Theoretical Stress Concentration Factor – Size Factor – Surface Finish Factor – Fatigue Stress Concentration Factor – Notch Sensitivity – Variable and Cyclic Loads – Fatigue Strength – S-N Curve – Gerber, Soderberg and Goodman Equations – Combined Cyclic Stresses – Minor's rule – Basquin's equation.		
Module:3	**Design of Mechanical Springs**	**8 hours**
Stresses and Deflections of Helical Springs – Extension Springs – Compression Springs – Springs for Fatigue Loading, Energy Storage Capacity – Leaf Springs – Helical Torsion Springs – Flat Spiral Springs.		
Module:4	**Design of Shafts, Keys and Couplings**	**9 hours**
Design of Solid and Hollow Shafts for Strength and Rigidity – Design of Shafts for Combined Bending, Torsion and Axial Loads – Design of Keys-Stresses in Keys – Design of Rigid and Flexible couplings.		
Module:5	**Design of Permanent Joints and Threaded Fasteners**	**9 hours**
Design of Riveted Joints – Design of Welded Joints – Design of Bolted Assembly – Direct Loading and Eccentric Loading.		
Module:6	**Design of Cotter and Knuckle Joints**	**8 hours**
Introduction to Cotter and Knuckle Joints - Design of Cotter Joints – Spigot and Socket, Sleeve and Cotter, Gib and Cotter – Design of Knuckle Joint.		
Module:7	**Design of Engine Components**	**8 hours**
Introduction to IC engine components – Classification - Design of Flywheel – Design of Connecting Rod – Design of Crankshaft – Design of Piston.		
Module:8	**Contemporary Issues**	**2 hours**
	Total lecture hours:	**60 hours**

Text Book(s)

1. V. B. Bhandari, Design of Machine Elements, 2020, 5th Edition, Tata McGraw Hill.

Reference Books

1. Richard G. Budynas and Keith Nisbett J, Shigley Mechanical Engineering Design, 2020,

	11th Edition (in SI Units), McGraw Hill		
2.	Harsha, A. P., Hornberger, L. E., Shoup, T. E., Spotts, M. F., Design of Machine Elements, 2019, Pearson India Education Services Pvt. Limited.		
3.	Robert L. Norton, Machine Design, 2018, 5th Edition, Pearson.		
4.	Juvinal, R.C and Kurt M.Marshek, Machine Component Design, 2016, Wiley.		
5.	PSG Design Data: Data Book of Engineers, 2020, Kalaikathir Achchagam.		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT			
Recommended by Board of Studies	09-03-2022		
Approved by Academic Council	No. 65	Date	17-03-2022