AMITY UNIVERSITY
UTTAR PRADESH

Course Title: MACHINE DESIGN – I **Credit Units: 03**

Course Level: UG **Course Code: MAE301**

L	T	P/S	TOTAL CREDIT UNITS
3	0	0	3

Course Objectives: The objective of this course is to help students apply concepts learned in the mechanics, structure, material and manufacturing courses. This course offers working knowledge in the use of proper failure theories under steady and variable loading, design of mechanical elements, such as shaft, coupling, power screws, and detachable, permanent and welded connections.

Pre-requisites: Stress and strain, different types of engineering materials and their properties, friction, joints power drive

Course Contents/Syllabus:

	Weightage (%)
Module I: Variable stresses in Machine Parts	**18%**
Descriptors/Topics 1. Fatigue and Endurance Limit **2.** Factor of Safety for Fatigue Loading. **3.** Stress concentration, Notch sensitivity. **4.** Gerber Method, Goodman Method and Soderberg Method for combination of stresses.	
Module II: Power Screws	**17%**
Descriptors/Topics 1. Types of screw threads, Torque required to raise and lower the load. 2. Efficiency of square threaded screw, overhauling and self locking screw. 3. Stresses in power screw. **4.** Design of screw jack.	
Module III: Cotter and Knuckle Joints	**15%**

Descriptors/Topics 1. Types of cotter joints, design of socket and spigot joint. 2. Design of sleeve and cotter joint. **3.** Design of jib and cotter joint. **4.** Design procedure of Knuckle joint	
Module IV: Riveted and Welded Joint	**20%**
Descriptors/Topics 1. Types of Riveted joint, Lap joint, Butt Joint. 2. Caulking and Fullering, Failure of Riveted joint. 3. Strength of Riveted joint, Efficiency of Riveted joint. 4. Advantages and Disadvantages of welded joint over Riveted joint. 5. Strength of Fillet joint, strength of Butt joints.	
Module V: Keys and Couplings	**20%**
1. Types of Keys, Splines, Strength of Sunk Key. 2. Types of shaft coupling, Sleeve and muff coupling, Flange coupling. 3. Flexible coupling, Oldham coupling. 4. Universal coupling.	
Module VI: Drives	**10%**
1. Types of Belt drives, Flat Belt drives, Velocity ratio, Sleep, Creep of Belt, Length of open Belt, length of cross belt. 2. Power transmission by belt, Maximum tension in the belt. Types of V belt and Pulleys, advantages and disadvantages of V belt over Flat Belt. 3. Ratio of driving tensions for V belt, Rope drives. 4. Chain drives, advantages and disadvantages of Chain drives.	

Student Learning Outcomes:

On completion of the course the student will be able to:

1. Ability to formulate and analyze stresses and strains in machine elements and structures in 3-D subjected to various loads.
2. Ability to do tolerance analysis and specify appropriate tolerances for machine design applications.
3. Able to apply multidimensional static failure criteria in the analysis and design of mechanical components.
4. Apply multidimensional fatigue failure criteria in the analysis and design of mechanical components.
5. Able to analyze and design structural joints.
6. Able to analyze and design power transmission shafts carrying various elements with geometrical features.

Pedagogy for Course Delivery:

The course pedagogy will include lectures, numerical practice, case studies, seminars and presentations. It also includes discussion on real life problems related to design of mechanical components.

Lab/ Practicals details, if applicable: NIL

Weightage of Theory and Lab

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100%	NIL	100%

Assessment/ Examination Scheme:

	Continuous Assessment/Internal Assessment				End Term Examination
Components (Drop down	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text Books:

- Sadhu Singh, Machine Design
- R.S. Khurmi & J.K. Gupta, Machine design
- D.K. Aggarwal & P.C. Sharma, Machine Design

Reference Books:

- J.E. Shigley, Mechanical Engineering Design.

Any other Study Material:

- Lab Manuals of various software
- MACHINE DESIGN DATA handbook