# C. U. SHAH UNIVERSITY
## Wadhwan City

**FACULTY OF**: - Technology and Engineering
**DEPARTMENT OF**: - Mechanical Engineering
**SEMESTER**: -VII
**CODE**: - 4TE07MTD1
**NAME**: – Machine Tool Design

**Teaching and Evaluation Scheme:-**

| Subject Code | Name of the Subject | Teaching Scheme (Hours) | | | | Credits | Evaluation Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Theory | | | | Practical (Marks) | | | Total |
| | | | | | | | Sessional Exam | | University Exam | | Internal | | University | |
| | | Th | Tu | Pr | Total | | Marks | Hrs | Marks | Hrs | Pr/Viva | TW | Pr | |
| 4TE07MTD1 | Machine Tool Design | 3 | 0 | 2 | 5 | 4 | 30 | 1.5 | 70 | 3 | --- | 20 | 30 | **150** |

**Objectives:**

It expected to teach following concepts to the students,
- Selection of suitable drive to run the system.
- Design of machine tools structures, guide-ways.
- Design of Spindle,
- Dynamics of machine tools.
- Special features of machine tool

**Prerequisite:**

- Basic and analytical knowledge of Manufacturing Processes, TOM, Machine Design

**Course Outline:**

| Sr. No. | Course Content | Hours |
|---|---|---|
| **1** | **Introduction:** Classification of machine Tools, Elements of machine tools, Selection of speed and feed, General requirements of machine tool design process as applied to machine tools, layout of machine tool, Various motions introduced in machine tools, Parameters defining limits of motions. | **06** |
| 2 | **Drives:** Design considerations for drives based on continuous and intermittent requirement of power, Types and selection of motor for the drive, Regulation and range of speed based on preferred number series, geometric progression. Design of speed gear box for spindle drive and feed gear box, Step less drives | **06** |
| 3 | **Design of Machine Tool Structure:** Analysis of forces on machine tool structure, static and dynamic stiffness. Design of beds, columns, housings, bases and tables.. | **06** |

| | | |
|---|---|---|
| 4 | **Design of guide ways:** Functions and types of guide-ways, design criteria and calculation for slide-ways, design of hydrodynamic, hydrostatic and aerostatic slide-ways, Stick-Slip motion in slide-ways. | **07** |
| 5 | **Design of Spindle and spindle support:** Design of spindle and spindle support using deflection and rigidity analysis, analysis of antifriction bearings, preloading of antifriction bearing. | **08** |
| 6 | **Dynamics of machine Tools and Control**: Dynamic characteristic of the cutting process, Stability analysis, vibrations of machine tools. Control Systems, Mechanical and Electrical, Adaptive Control System, relays, push button control, electrical brakes, drum control. | **05** |
| 7 | **Automation and special features in machine tool design:** Automation drives for machine tools, Degree of automation, Semi automation, and analysis of collect action. Design considerations for SPM, NC/CNC, and micro machining, Retrofitting, Recent trends in machine tools, Design Layout of machine tool using matrices. | **07** |

**Learning Outcomes:**

After completion of the course student will be able to,

- Design gear box.
- Design different machine tools considering static and dynamic loads.
- Understand effect of vibrations on life of machine tools.
- Understand design considerations for Special features in Machine tools.

**Books Recommended:**


1. Machine Tool Design by **N.K.Mehta** , Tata McGraw Hill, ISBN 0-07-451775-9.
2. Principles of Machine Tool by **Bhattacharya and S. G. Sen**., New central book agency Calcutta, ISBN 81-7381-1555.
3. Design of Machine Tool Design by **D. K Pal, S. K. Basu,** 4th Edition. Oxford IBH 2005, ISBN 81- 204-0968


**Reference Books**


1. Machine Tool design by N**. S. Acherkan,** Vol. I, II, III and IV, MIR publications.
2. Design Principles of Metal Cutting Machine Tool by. **F. Koenigsberger,,** The Macmillan Company New York 1964