

|                       |                                                |
|-----------------------|------------------------------------------------|
| <b>Branch Name:</b>   | Mechanical Engineering (Production Technology) |
| <b>Semester/Year:</b> | Semester I / First Year                        |
| <b>Subject Title:</b> | Advanced Machine Tool Design                   |
| <b>Subject Code:</b>  | 1ET2090104                                     |
| <b>Pre-requisite:</b> | Zeal to learn the subject                      |

**Course Objective:** To provide the knowledge and practice regarding different machine Tool Drive Mechanisms, hands on practice regarding Mechanisms, regulation and Design of Machine Tool Drives & components; knowledge about the regulations of speed and feed rates of machine tool drives, Insight about the Design of Multi Speed Gear Box, Machine Tool Structure and all major Elements along with their procedure of assessing dynamic stability.

| Teaching Scheme<br>(Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|-------------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                      | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                     |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| 02                                  | 02              | 00               | 04     | 60                        | 40                       | 30                       | 20                       | 150              |

| Subject Contents |                                                                                                                                                                                                                                                                                         |                |               |  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------|--|
| Sr.<br>No.       | Topic                                                                                                                                                                                                                                                                                   | Total<br>Hours | Weight<br>(%) |  |
| 01               | <b>Machine Tool Drive:</b> Working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.                                                                         | 02             | 10            |  |
| 02               | <b>Regulation of Speed and Feed Rates:</b> Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, regulation of speed and feed rates.                                                                    | 04             | 15            |  |
| 03               | <b>Design of Machine Tool Structure:</b> Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure. | 06             | 20            |  |
| 04               | <b>Design of Guide-ways and power Screws:</b> Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws. Design of antifriction recirculating ball type lead screw, linear motion.                                               | 06             | 20            |  |
| 05               | <b>Design of Spindles and Spindle Supports:</b> Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.                                                                                                                                                    | 04             | 15            |  |
| 06               | <b>Dynamics of Machines Tools:</b> General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting Process, Stability analysis.                                                                                     | 02             | 10            |  |
| 07               | <b>Machine tool Testing:</b> General criteria and procedure of testing of Lathe, Milling, Shaper, Grinding, Saw etc.                                                                                                                                                                    | 02             | 10            |  |
|                  |                                                                                                                                                                                                                                                                                         | <b>26</b>      | <b>100</b>    |  |

**Review Presentation:** The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (e.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same. Recommended sites for journal papers are (1) [asmedigitalcollection.asme.org](http://asmedigitalcollection.asme.org) (2) [springer.com](http://springer.com) (3) [sciencedirect.com](http://sciencedirect.com) (5) [ieeexplore.ieee.org](http://ieeexplore.ieee.org) (6) [scholar.google.co.in](http://scholar.google.co.in) or others of similar repute.

**Course Outcome:**

**The students shall be able to**

1. Machine Tool Drive.
2. Regulation of Speed and Feed Rates.
3. Design of Machine Tool Structure.
4. Design of Guide-ways and power Screws.
5. Design of Spindles and Spindle Supports.
6. Dynamics of Machines Tools.

**List of Tutorials:**

1. Machine Tool Drive.
2. Regulation of Speed and Feed Rates.
3. Design of Machine Tool Structure.
4. Design of Guide-ways and power Screws.
5. Design of Spindles and Spindle Supports.
6. Dynamics of Machines Tools.

**List of References:**

1. HMT, Mechatronics, Tata McGraw Hill, 1998.
2. N.K. Mehta, Machine Tool Design, Tata McGraw Hill, 1996.
3. S.K. Basu, D.K Pal., Design of Machine Tools, Oxford & IBH publishing Co.1983.
4. G.C. Sen, A.Bhattacharya, Principles of Machine Tools, New Central Book Agencies, 1971.
5. G. Boothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 1985.
6. Acherkan, "Machine Tool Design", Vol 2 & 3, MIR Pub, 1973.