

| Course Type | Course Code | Name of Course | L | T | P | Credit |
|-------------|-------------|----------------|---|---|---|--------|
| DP | NMEC506 | Machining Lab | 0 | 0 | 3 | 1.5 |

Course Objective

To provide practical knowledge on Machining Processes and their capabilities.

Learning Outcomes

Upon successful completion of this course, students will:

- Understand the working principle of various machining processes and corresponding machines and cutters.
- Be acquainted with the force, temperature, and vibration assessment methodology in machining.
- Be able to assess machinability for different workpiece materials under different environments.

| Unit No. | Topics | Practical hours | Learning Outcome |
|--------------|---|-----------------|--|
| 1 | Dissemination of the lab-specific information and visit to all lab spaces | 3 | General lab-specific information |
| 2 | Re-manufacturing of HSS uncoated cutting tool having specified geometry using grinding | 3 | Hands-on-experience in tool grinding |
| 3 | Real time force, temp, & vibration measurement & analysis in turning | 3 | Hands-on-experience on force, temp, & vibration in machining |
| 4 | ML-driven force, temp, & vibration analysis in milling, drilling, and grinding | 3 | Hands-on-experience on ML application in machining |
| 5 | Microstructure-level lamellar analysis of turning, milling, & drilling chips for different work samples | 3 | Hands-on-experience in polished chip observation |
| 6 | Profilometry-based external surface texture analysis in turning, milling, & grinding based on ISO 25178 | 3 | Hands-on-experience in surface 2D and 3D topography analysis |
| 7 | Spur and helical gear cutting in milling machine through simple and differential indexing | 3 | Hands-on-experience in indexing mechanism and gear cutting |
| 8 | Gear manufacturing through fast and productive processes: Gear Hobbing and Gear Shaping | 3 | Hands-on-experience in faster gear production processes |
| 9 | Knurling-based micro-texturing on cylindrical and flat surfaces | 3 | Hands-on-experience in micro-texturing method and its analysis |
| 10 | Sustainability assessment of dry, flood, and MQL lubrication in terms of force, temperature & quality | 3 | Hands-on-experience on sustainable lubricant supply |
| 11 | Image processing-based tool wear inspection and development of data-driven tool life equation | 3 | Hands-on-experience on tool wear measurement |
| 12 | Machinability and surface quality analysis in drilling of composite material | 3 | Hands-on-experience in machining of composites |
| 13 | Compensation and/or re-experiment | 3 | Reserved date for compensation and re-experimentation |
| 14 | Practice and review | 3 | Final evaluation |
| Total | | 42 | |

Text book:

1. Machining and Machine Tools by A. B. Chattopadhyay, Wiley
2. Metal Cutting: Theory and Practice by A. Bhattacharya, New Central Book Agency

Reference:

2. Manufacturing Engineering and Technology by S. Kalpakjian and Schmid, Pearson Education
3. Metal Cutting Theory and Practice by D. A. Stephenson and J. S. Agapiou, CRC Press