

Subject Code: 1ET4020503	Subject Name: Machine Tools Technology
Pre-Requisite:	

RATIONALE:

This course will make students familiar with fundamentals of such conventional & advance processes on various machines like grinding machines, super-finishing machines, broaching machines, jig boring machines, non-conventional machining processes, etc. Large numbers of industrial parts have features like teeth, threads, slots, splines, surfaces etc. Quality of these parts depends on parameters aspects such as accuracy of profile, dimension & surface finish controls. These parameters are specified on the product drawing and require suitable machines & cutting tools for its manufacturing.

COURSE OBJECTIVE:

The course content should be taught and implemented with the aim to develop different type of skills so that students are able to acquire at least following competencies:

Produce the part as per given drawing/specifications by adopting conventional machine tools and/or non-conventional machining processes using optimum process parameters, safe working procedures, suitable work & tool holding devices and appropriate cutting tools.

Plan and supervise manufacturing operations at a shop floor of machine tools-based manufacturing industries.

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous assessment
4	--	4	6	60	40	40	60

Sr. No.	Topic	Total hours	Weightage (%)
1.	Introduction to Machine Tool Technology Explain need scope and importance of machine tool technology in industries, grinding and super-finishing machines, thread production, broaching machines, electro-mechanical systems (MEMS). Non-conventional and advance methods of machining. Define machining parameters, Explain the effect of different machining parameters on quality and cost of product. Definitions of machine tool, cutting speed, feed, depth of cut, metal removal rate, surface finish symbols and values, cutting tools and their geometry.	04	07

2.	Grinding and super finishing processes. Classification, Constructional features including coolant and lubrication systems, motion and power transmission path, working, application and cutting parameters of following grinding machines with “commonly used grinding wheels and work piece materials”: i. Cylindrical (centre less, internal and external) grinding machines. ii. Bench and portable grinder. iii. Tool and cutter grinding machine. iv. Profile grinding machine. Honing, lapping, buffing and other super finishing processes and their applications. Cutting action of grinding wheel. Terms associated with grinding wheel operations including loading, glazing, dressing and truing. Grinding wheels: i. Nomenclature. ii. Types and shapes. iii. Designation system and its interpretation. iv. Selection criteria and applications.	08	15
3.	Non-Conventional Machining Processes Need of nonconventional machining and comparison between conventional & non-conventional machining methods. Classification, working principles, application and working parameters of following non-conventional machining methods: d. Electro chemical machining (ECM). ii. Electro discharge machining (EDM) iii. Ultrasonic machining (USM). iv. Laser beam machining (LBM). v. Abrasive jet machining (AJM). e. Criterion for selection of non- conventional machining methods.	08	15
4.	Locating and clamping devices. Concept, meaning, and definitions of location and clamping. Use locating and clamping principles in day-to-day supervision on the shop floor. Degree of freedom-concept and importance. 3-2-1 principle of location. Locators: Types, Sketches with nomenclature, working. Applications. Fool proofing and ejecting. Clamping devices: i. Types. ii. Sketches with nomenclature. iii. Working. iv. Applications.	08	15

5.	Jigs and fixtures. Concept, meaning, differences, and benefits of jigs and fixtures. Types, sketches with nomenclature, working, and applications of jigs and fixtures. Types, sketches with nomenclature, working, and applications of fixtures. Steps to design jigs and fixtures. For simple components: Select type (Jig or fixture). Develop locating method. Develop clamping method. Design jig and fixture (as applicable). Prepare details and assembly sketches.	12	18
6.	Gear manufacturing and finishing processes. Types of gears, nomenclature of spur and helical gears. Gear generating and forming processes-concept, differences and applications. Classification, constructional features including coolant and lubrication systems, motion and power transmission path, working and application of gear milling, gear hobbing and gear shaping machines. Nomenclature and sketch of gear hob and gear shaping cutter. Gear Cutting parameters for commonly used materials and work-piece. Tool mounting methods on gear milling, gear shaping and gear hobbing machines. Gear finishing processes- shaving & grinding.	08	15
7.	Broaching, Jig Boring and Special Purpose Machine Tools. Types, constructional features including coolant and lubrication systems, motion and power transmission path, working and applications of broaching machines. Different Shapes that can be produced by broaching process. Nomenclature and sketch of a simple broach. Types, constructional features including coolant and lubrication systems, motion and power transmission path, working and application of jig boring machines. Various SPM (Only names) and their areas of application. Parts fit for SPM. Comparison of SPM with other automates.	08	15

Course Outcome:

The students will be able to understand

- i. Working of grinding, super finishing, gear cutting, broaching, threading, non-conventional and advance machining methods with kinematics and coolant/ lubrication systems stating functions of each element.
- ii. Interpret designation system / method of cutting tools and tool holders used on machine tools.
- iii. Set the machine and mount the job, cutting tools and tool holders correctly.
- iv. Select appropriate cutting tools, work holding devices and cutting parameters for the given work piece.
- v. Outline the process and produce the job/product as per given drawing/ specification.

List of Practical/Experiments:

- 1 Demonstrate and prepare a report on various cutting parameters.
- 2 Reshape single point cutting tool by grinding and prepare report on cutting tool angle.
- 3 To manufacture a composite job and cut square thread as per given drawing.
- 4 Demonstrate of different types of jigs and fixtures.
- 5 Calculate and manufacture spur gear on milling machine using indexing head.
- 6 Prepare a report on kinematics and motion transmission system for jig boring machine.
- 7 Prepare a report on kinematics and motion transmission system for broaching machine.
- 8 To study about non-conventional methods of machining.
- 9 Report on presentation.

List of References:

1. Machine tools technology, G.S. Kandasami, Khanna publication
2. Metal cutting technology and experiment, K.G. Chandiramani, TataMcGraw Hill, New Delhi.
3. Production engineering science, Dr. P.C. Pande & C.K. Singh, Standard Publisher Distributer.
4. The art of tool and cutter grinding, S.P. Narang, S. Chand.
5. Advance machining methods, V.K. Jain, Allied Publisher, New Delhi.

List of Software/Learning Websites:

- 1 <http://nptel.ac.in/video.php?subjectId=112105126>
- 2 <http://nptel.ac.in/courses.php?disciplineId=112>
- 3 <http://nptel.ac.in/courses/112104028/>
- 4 <http://nptel.ac.in/courses/112105126/27>
- 5 <http://www.youtube.com/watch?v=bmooEZYivxo>
- 6 <http://www.youtube.com/watch?v=mWy9awGv6so>
- 7 <http://www.youtube.com/watch?v=mKES5Fyz9l0>
- 8 <http://www.youtube.com/watch?v=BgGXQUeYNKw>