GUJARAT TECHNOLOGICAL UNIVERSITY
M.E. Mechanical (Production Engg.)
Semester: I

Subject Name: **Machining Science**
Subject Code: **712802**

Sr. No.	Course Content
1	**Introduction to Machining:** Basic Mechanism involved.
2	**Plastic Deformation:** Tensile test; stress and strain; Mechanism of Plastic Deformation- slip, dislocation.
3	**Chip Formation:** Typical lathe tools; Orthogonal cutting; oblique cutting; Types of chips; Mechanism of built-up-edge formation.
4	**Tool Geometry:** Reference planes; Tools specification in ASA, ORS and NRS; conversation from ASA to ORS; Selection of tools angles; Multi-point cutting tools-geometry of peripheral milling cutters and twist drills.
5	**Mechanics of Metal Cutting:** Merchant's circle diagram- determination of cutting and thrust forces; Coefficient of friction; Stress, strain and strain rate; Measurement of shear angle - direct and indirect methods; Mohr's circle diagram; slip line field method; Thin zone model - Lee and Shaffer's relationship; Thick zone model - Okushima and Hitomi model(analysis) ; Friction in Metal cutting.
6	**Mechanics of Oblique Cutting:** Concept of rake angle measured in different planes; Shear angle; Velocity and force relationship.
7	**Measurement of Cutting Forces:** Cantilever beams, rings; Dynamometer requirement; turning, drilling milling and grinding.
8	**Tool Wear and Tool Life:** Mechanism of wear; Progressive tool wear; Flank wear; Crater wear; Model of diffusion wear; Tool life : Variables affecting tool life-Cutting

	conditions; tool geometry; Tool materials; work materials; Work materials; Cutting fluids; Determination of tool life equation; Mach inability.
9	**Economics of Machining:** Minimum production cost criterion; Maximum production rate criterion; maximum profit rate criterion; Restriction on cutting conditions.
10	**Abrasive Machining Processes:** Introduction; Grinding: Characterstics of a grinding wheel; Specification of grinding wheels; Mechanics of grinding process; Chip length in horizontal surface grinding; External and internal cylindrical grinding; Specific energy in grinding; Wheel wear; Thermal analysis; Selection of grinding wheels; Honning and lapping operations.
11	**Thermal Aspects of Machining:** Regions of heat generation; Distribution of heat generated; Equations of flow due to conduction, transportation, heat absorbed and heat generated; Average shear plane temperature; Average chip-tool interface temperature Experimental determination of cutting temperature - tool-work thermocouple technique, infrared photographic technique
12	**Surface Finish:** Ideal and natural roughness; Surface finish during turning, milling and grinding. Topics of Term Papers.

Reference Books:

1. An introduction to the principles of Metal working - Rowe, Edward Arnold, 1968
2. Manufacturing properties of metals and Alloys - Alexander and Brewar, Van Nostrand.
3. Principle of metal cutting- Dr.A.Bhattacharya
4. Fundamental of machining and machine tools-geoffrey boothroyd-CRC Taylor & Francis
5. Manufacturing Engineering and Technology-serope kalakjian-Addison Wesley longman (Singapore) pvt.ltd.