5033 - TOOL ENGINEERING (CUTTING TOOLS) – I								
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
Lectures	Practical	Credits			Theory		Practical Ex.	Total
3	2	5	25	25	3 Hrs.	100	25	175

Pre-requisite	Source
2004/4068	PRD

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	50	175

RATIONALE:- Tool is the most critical element in any metal removal process. It is the tool, which directly comes in contact with the work-piece and removes the excess material in order to impart desired shape to the work-piece. Hence surface finish and dimensional accuracy of work-piece highly depend on the proper selection and use of cutting tool. Thus, a production engineer, whose principal workplace is shop floor, should necessarily possess some basic knowledge about cutting along with other related things like cutting fluids

COURSE CONTENTS	Hrs	Mks
1. MECHANICS OF METAL CUTTING 1. Methods of metal cutting.: Orthogonal cutting, Oblique cutting, Chip formation 2. Process of chip formation: Types of chips, Continuous chips, Segmental/ discontinuous chips, Continuous chip with built up edge Relation between chip formation and surface finish, Force & velocity relationships (only for orthogonal cutting). 3. Shear plane, Cutting ratio/chip thickness ratio, Shear angle, Merchant's theory, Force relation, Velocity relations, Coefficient of friction & friction angle, Cutting power required at tool	12	25
2. MACHINABILITY OF METALS 1 Definition of machinability , 2 Criteria for machinability, Criteria based on tool life, Criteria based on cutting forces, Criteria based on surface finish 3 Relative importance of various criteria 4 Influence of different various on machinability: 1 Machine variables,. 2. Tool variables,. 3 Tool material- Tool geometry, Tool rigidity, Nature of engagement of tool with the work-piece, Cutting conditions,. Cutting speed and feed, Dimensions of cut, Cutting fluids, Work material variables 5 Tool wear: 1 Types of tool wear- Attrition wear, Diffusion wear, Abrasive, Electro-chemical wear, Chemical wear, 2 Geometry of tool wear- Flank wear, Crater wear 6. Tool life: 1 Concepts of tool failure, 2 Definition of tool life, 3 Factor influencing tool life, 4 Taylor's tool life equation, 5 Tool life equation considering the effect of feed and depth of cut. 7. Machining economics: 1 Tool life for maximum production, 2 Tool life for minimum cost per part.	15	30
3. CUTTING TOOLS 1. Single point cutting tools: 1 Geometry of single point cutting tool, Basic tool, angles & their significance, Nose radius & its significance, Tools signature, Turning & boring tools, Drawing, Nomenclature, Influence of tool geometry on chip, cutting forces & surface finish, Various types of form tools. 2. Multiple point cutting tools, 1 Nomenclature & design features of – Twist drills, Spot facers, Reamers, Milling cutters, Taps, Broaches, Gear hobes.	7	15
4. CUTTING TOOL MATERIALS 1. History & development of cutting tool materials, 2. Desirable properties of cutting tool materials, 3. Composition, properties, applications and limitations of following tool materials –	7	15

1. Carbon tool steels, 2 High sped steels (HSS), 3. Cemented carbides, 4 Coated carbides, 5 Ceramic tools, 6 Diamond tools, 7 UCON, 8 Cubic boron nitride
4 Manufacturing of cemented carbides.
5 Guidelines for selection of tool materials.

5. CUTTING FLUIDS 7 15

1 Functions of cutting fluids,
2 Lubricating and cooling action
3 Desirable properties of cutting fluids,
4 Classification of cutting fluids
5 Properties, applications and limitations of common types: 1 Soluble oil or water emulsion, 2 Synthetic coolants, .3 Gaseous fluids
6 Selection of cutting fluids
7 Preparation, handling and monitoring of cutting fluids: 1 Preparation of soluble emulsion,. 2 Bacterial control, 3 Storage, 4 Disposal of used cutting fluids, 5 Human compatibility and skin irritation.

Total	48	100

PRACTICAL:-

1. Drawing single point and multiple point cutting tools, giving
2. Their nomenclatures. (Five tools)
3. Experiments on Tool Dynamometers.
4. Design of cams for automats (two)
5. Tool layout for capstan and turret lathers.

REFERENCE BOOKS:-

1. Production Technology - HMT.
2. Production Engineering science. - Pandey & Singh
3. Production Technology - Jain & Agarwal
4. Tool Design - Donaldson.
5. Fundamentals of tool Design - ASTME.