



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-5(Diploma)

Subject: Manufacturing Engineering – 2 – DETME15217

Type of course: Professional Core

Prerequisite: Physics

Rationale: A large number of industrial components undergo various machining operations to be transformed into finished products. The appropriate selection and use of machine tools, work-holding devices, cutting tools, and process parameters play a crucial role in achieving high-quality products at an optimal cost. This course introduces students to the fundamentals of cutting mechanics, kinematics, constructional features, and selection criteria for basic machine tools and automation. Additionally, it provides foundational knowledge of conventional work-holding devices, cutting tools, and tool holders used in these machines.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	-	2	4	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

Sr. No	Course content	Hrs	% Weightage
1	Introduction and mechanics of cutting: Need, scope & importance of manufacturing processes in industries. Need of attitude, knowledge & skill required for shop floor supervisor in machine tools-based industries. Differentiate between forming and generating processes. Mechanics of cutting action, orthogonal and oblique Chip formation, types of chips. Forces acting on tool and chip, methods to compute cutting force using dynamometer. Concept and definition of cutting speed, feed and depth of cut. Cutting fluid- basic need, types, properties and its applications. Influence of cutting variables on surface finish, tool life, economy, and mass production. Safety precautions in machine tools.	15	35
2	Basic machine tools-I: Definition and Classification of Basic Machine Tools, Movements of Tool, Job, Slides, and Work Holding Devices During Cutting Operation on Various Machine Tools, Lathe Machine, Types, Working Principle (Using Block Diagram), All Geared Head Stock Centre Lathe, Constructional Features, Kinematics (Drive, Head Stock, Feedbox, Carriage, Cross Slide, Top Slide, Swivel, Apron, Tailstock), Constructional Sketch, Working, and Use, Detailed Specifications, Operations Performed, Work Holding Devices – Constructional Sketch, Working, and Applications (3 Jaw Chuck, 4 Jaw Chuck, Face Plate, Centers), Lead Screw and Feed Rod Mechanisms, Thread Cutting Setting – Concept, Methods, and Simple Numerical, Accessories – Types, Constructional Sketch, Working, and Applications, Metal Removal Rate (MRR) – Concept and Method to Calculate on Lathe, Drilling Machine, Types, Working Principle (Using Block Diagram), Radial Drilling Machine, Constructional Features, Kinematics (Drive, Spindle Speeds, Feed Mechanism, Radial Movement, etc.), Constructional Sketch, Working, and Use, Detailed Specifications, Accessories – Types, Constructional Sketch, Working, and Applications, Tool Holding and Setting Methods, Operations Performed, Work Holding Devices – Constructional Sketch, Working, and Applications, Metal Removal Rate (MRR) – Method to Calculate on Drilling Machine.	12	25



3	Basic machine tools- II: Milling Machine, Types, Working Principle (Using Block Diagram), Plain Horizontal Milling Machining including Constructional Features, Kinematics (Drive, Spindle Speeds, Feed Mechanism, Table Movement, etc.), Constructional Sketch, Working, and Use, Detailed Specifications, Operations Performed, Milling Cutters – Types and Applications, Up Milling and Down Milling – Concept, Advantages, Disadvantages, and Applications, Indexing – Dividing Head – Constructional Sketch, Working, and Use, Simple, Differential, and Compound Indexing Methods with Simple Numerical, Work Holding Devices – Constructional Sketch, Working, and Applications, Metal Removal Rate (MRR) – Concept and Method to Calculate on Milling, Shaping Machine, Types, Working Principle (Using Block Diagram), Constructional Features and Detailed Specifications, Quick Return Mechanisms – Kinematic Sketch, Working, and Advantages, Operations Performed, Work Holding Devices – Constructional Sketch, Working, and Applications, Slotting Machine, Types, Working Principle (Using Block Diagram), Constructional Features and Detailed Specifications, Operations Performed, Work Holding Devices – Constructional Sketch, Working, and Applications, Planing Machine, Types, Working Principle (Using Block Diagram), Constructional Features and Detailed Specifications of Double Column Planner, Operations Performed, Work Holding Devices – Constructional Sketch, Working, and Applications.	9	20
4	Cutting tools and tool holders: Carbide inserts: Designation method for turning, milling and drilling (As per ISO), Need, Benefits. Tool holders for carbide inserts: Designation method for turning, milling and drilling (As per ISO), Need, Benefits. Mounting and replacement methods of carbide insert. Various cutting tools (with tool geometry, nomenclature, tool materials, sketch/drawing of each, ISO/BIS standards) used for various operations on lathe, milling and drilling machines. Single point cutting tool, Plain milling cutter, Side and face milling cutter, Centre drill, Twist drill.	9	20



Continuous Assessment (ALA):

Sr. No	Active Learning Activities	Marks
1	Industrial Component Analysis and Manufacturing Processes Select two industrial components (approved by teacher) and list various machine tools and operations used to produce these components and upload presentation on GMIU portal.	10
2	Catalog Collection: Cutting Tools, Work Holding Devices, and Tool Holders Collect/download at least one catalogue each of cutting tool, work holding device and tool holder and make a report on it and upload on GMIU portal	10
3	Identification of Electric Motors in Workshop Machine Tools Identify type of electric motor used in each type of machine tools in your college workshop and make a report on it and upload on GMIU portal.	10
Total		30

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	30%	30%	10%	10%	-

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand cutting mechanics and effects of machining parameters.
CO2	Explain operations of basic machine tools.
CO3	Identify tool materials, geometries, and ISO designations.
CO4	Select tools, fluids, and devices with safety and troubleshooting.



List of Practical:

Sr. No	Descriptions	Unit No.	Hrs
1	Preparatory Activity:	1	04
2	Lathe Machine Operations: Prepare a Job on Center Lathe as per the Given Drawing.	2	04
3	Milling Machine Operations: Prepare a Simple Job Using Milling Operations Including the Use of an Indexing Head.	3	02
4	Shaping Machine Operations: Prepare a Job Having Plain Surfaces on a Shaping Machine with Minimum Two Holes as per the Given Drawing.	4	04
5	Job Preparation Using Milling Operations: Prepare a simple job using milling operations including use of indexing head	3	04
6	Job Preparation Using Shaping Operations: Prepare a job having plain surfaces on shaping machine with minimum two holes as per given drawing.	4	04
7	Prepare a job on Grinding machine as per the given drawing.	4	04
8	Prepare a single point cutting tool as per given geometry	2	04
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] "Workshop Technology I " by J. A. Schey, Publication: Tata McGraw-Hill Education
- [3] "Workshop Technology I, II, & III " by W. A. J. Chapman, Publication: Viva books
- [4] "Production Technology" by R. K. Jain and S. C. Gupta, Publication: Khanna Publishers
- [5] "All about Machine Tools" by Gerling, Publication: John Wiley & Sons Canada, Limited
- [6] "Production Technology" by HMT, Publication: Tata McGraw-Hill Publishing Co.

