Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E. (Mechanical Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
6MERC2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
PRODUCTION ENGINEERING-II	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Course Objective:

The course is designed

1. To provide an understanding of the mechanics of metal cutting and various aspects of machinability and tool wear.
2. To learn about the fundamentals of bulk metal forming processes.
3. To learn about the various unconventional machining processes.
4. To learn about the various methods to evaluate and measure the surface finish and methods to improve the surface finish of engineering components.
5. To learn about the methods to process particulate materials and composites.

Pre requisite(s): A basic course in manufacturing processes and workshop practice.

COURSE CONTENTS

UNIT-I

Theory of Metal Cutting: Introduction, mechanics of metal cutting, oblique and orthogonal cutting, shear angle, rake angle and strain relationships, force and power relationships, heat generation and temperature rise in metal cutting. Machinability: criteria for evaluating machinability, factors affecting machinability, tool life and tool wear, variables influencing tool life, economics of metal cutting.

UNIT-II

Theory of Metal Forming: Introduction, plastic deformation and yield criteria, temperature and friction in metal forming, overview of bulk metal forming processes, mechanics of forming processes: rolling, forging, drawing, bending, extrusion; design consideration for the tooling/dies used in solid forming processes, defects in metal forming, advantages & limitations of hot & cold forming.

UNIT-III

Unconventional Machining Processes: Introduction, need and classification of unconventional machining processes. Principles, process parameters, set-up and applications of the following unconventional machining processes: electric discharge machining (EDM), electrochemical machining (ECM), ultrasonic machining (USM), abrasive jet machining (AJM), laser beam machining (LBM), electron beam machining (EBM) and plasma arc machining (PAM).

UNIT-IV

Surface Finish Measurement and Surface Improvement: Introduction, elements of surface texture, evaluation and representation of surface roughness, effect of surface finish on functional properties of parts. Measurement of surface roughness, surface cleaning and surface treatment, diffusion and ion implantation, Surface coating and deposition processes: surface plating, conversion coating, physical vapour deposition and chemical vapour deposition processes.

UNIT-V

Processing of Particulate Metals, Ceramics-Composites: Introduction, basic P/M processes, powder manufacture, testing and blending, compacting, sintering, hot pressing, other techniques to produce high-density powder metallurgy products, properties of P/M products, advantages and limitations of powder metallurgy; Processing of traditional ceramics, processing of new ceramics and cermets, types and properties of composites and shaping processes for polymer matrix composites.

Course Outcome:

Students earned credits will develop ability to

CO1. Learn the effect of various parameters on the metal cutting process.

CO2. Learn the mechanics of bulk metal forming processes and select the equipment and tooling needed for the various forming operations

CO3. Understand the importance of surface finish of manufactured parts and learn about the various methods to improve it.

CO4.Learn about the powder metallurgy processes and about the processing of ceramics and composites.

BOOKS RECOMMENDED:

[1] Ghosh Amitabh & Mullick Ashok, *Manufacturing science*, East West Press Pvt.Ltd,2ed,2010.
[2] Sharma P. C., *A Text Book of Production Engineering*, S. Chand Publishing,11ed,1982.
[3] HMT(Hindustan Machine Tools), *Production Technology*, McGraw-Hill Education,2017
[4] Mikell P Groover, *Fundamentals of Modern Manufacturing*, Wiley,6ed, 2015
[5] Rao P.N., *Manufacturing Technology,Vol-1,Vol-2*, McGraw-Hill Education,2017.

LIST OF PRACTICAL ASSIGNMENT

1. Measurement of various features of tool geometry of a given single point tool and the tool wear using a tool maker's microscope.
2. Measurement of surface finish of machined components
3. Measurement of a component features using a profile projector.
4. To perform process planning and prepare operations sheet and tool layout for machining a workpart on a capstan/turret lathe.
5. To machine a given workpart according to the prepared process plan and operations sheet.
6. To study the constructional features of EDM machine.
7. To machine a work part as per given drawing on EDM machine.
8. To study of the constructional features of universal cylindrical grinder.
9. To estimate the power requirements and the forces generated theoretically at the chip tool interface during turning, drilling and milling operations.
10. To measure the forces generated at the chip tool interface during machining operations.

Course Objective:

The course is designed

1. To provide an understanding of the mechanics of metal cutting and various aspects of machinability and tool wear.
2. To learn about the fundamentals of bulk metal forming processes.
3. To learn about the various unconventional machining processes.
4. To learn about the various methods to evaluate and measure the surface finish and methods to improve the surface finish of engineering components.
5. To learn about the methods to process particulate materials and composites.

Course Outcome:

Students earned credits will develop ability to

CO.No.	CO	PO
CO1	Learn the effect of various parameters on the metal cutting process.	PO1, PO2, PO4
CO2	Learn the mechanics of bulk metal forming processes and select the equipment and tooling needed for the various forming operations.	PO1, PO3, PO4
CO3	Understand the importance of surface finish of manufactured parts and learn about the various methods to improve it.	PO1, PO3, PO5, PO12
CO4	Learn about the powder metallurgy processes and about the processing of ceramics and composites.	PO1, PO3, PO5, PO12

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3		3								
CO2	3		3	3								
CO3	3		3		3							2
CO4	3		3		3							2
CO5												

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)

1→ relevant and small significance 2 → medium or moderate and 3 →strong