SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Mechanical Engineering Department
B.Tech. (Semester IV)

Course Name: **Manufacturing Process - II** **Course Code: BTME13404**
Type of course: **Professional Core Course (PCC)**
Prerequisite: Basic Mechanical workshop (BTGN12110).
Rationale of Course: This course will demonstrate how material removal processes are "Valve Addition Process" to transform a low utility and low value raw material into a high utility and high value finished good, using Machine Tool.

Students will learn about different machine tools and their accessories, as well as the various operations that can be performed on them. Students will also learn the application, advantages, and limitations of various machine tools.

As a result, this course is crucial for people who wish: to work in the manufacturing industry, or to conduct research in the manufacturing sector, or to produce high-quality goods.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Course Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Introduction:** Machining – Purpose, Principle and Definition. Machining requirements. Machine Tool – definition and basic functions. Broad classification of General Purpose Machine Tools.	2	5%
2.	**Mechanics of Machining (Metal Cutting):** Cutting Tools and Types of Cutting Tools. Geometry of Single Point Cutting Tools. Systems of description of Tool Geometry and Tool Signature. Effect of Tool Geometry on Machining Operation. Methods of Machining - Orthogonal and Oblique Cutting. Mechanisms of Chip Formation. Types of Chips formed during Machining. Chip Breakers. Analysis of Orthogonal Cutting, Forces acting on the Cutting Tool and their Measurement - Merchant's Circle Diagram. Workdone for Machining Operation. Shear Forces Induced in Machining, Concept of Specific Cutting Pressure, Shear Strain, Heat Generation/Cutting Temperature: Causes, Effects, Assessment and Control. Tool Failure.	14	30%

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	Modes of Tool Failure. Tool Life. Factors Affecting Tool Life. Concept of Machinability and Cutting Tool Materials.		
3.	**Metal Cutting Lathe:** Purpose and Field of application of Lathe. Classification of Lathes. Kinematic System and Working Principle of Lathes. Machining Operations carried on Centre Lathes. Work and Tool holding devices of lathes. Various Attachments and Accessories available with Lathe.	**5**	**10%**
4.	**Shaper, Planner and Slotters Machines:** Purpose and Field of application of Planners, Shapers and Slotters Machines. Classification of Planners, Shapers and Slotters Machines. Kinematic System & Working Principles of Planners, Shapers and Slotters Machines.	**5**	**10%**
5.	**Drilling and Boaring Machines:** Purpose and Field of application of Drilling Machine. Classification of Drilling Machine. Kinematic System & Working Principle of Drilling Machine. Machining Operations carried on Drilling Machine. Purpose and field of application of Boaring Machine. Working Principle of Boaring Machine. Classification of Boaring Machine.	**5**	**10%**
6.	**Milling Machines:** Purpose and Field of Application of Milling Machines. Classification of Milling Machines. Kinematic System and Working Principle of Milling Machines. Types of Milling Cutter. Machining Operations usually done on Milling Machines. Work and Tool holding devices of Milling Machines. Various Accessories and Attachments in Milling Machines. Indexing - Importance, principles and its types.	**10**	**25%**
7.	**Grinding Machines:** Purpose and field of application of Grinding Machine, Classification of Grinding Machine, Grinding operation, Specification of Grinding Wheel, Tool and cutter grinders, Internal grinders and Center less grinders.	**4**	**10 %**

Percentage Distribution of Marks as per Bloom's Taxonomy (Theory/Practical):

Percentage Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**30**	**15**	**30**	**0**	**5**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Year of publication	Publication Edition
1.	Workshop Technology, Vol. I, II & III	W.A.J Chapman	CBS	2007	4th
2.	Elements of Workshop Technology vol. II	S. K. Hajra Choudhury	Media Publishers & Promoters	2010	1st
3.	Manufacturing Engineering and Technology	Serope Kalpakjian & Steven R. Schmid	Pearson Education	2018	7th
4.	Production Technology	R. K. Jain	Khanna Publishers	2001	17th
5.	Fundamentals of Modern Manufacturing: Materials, Processes, and Systems	Mikell P. Groover	Wiley India Edition	2019	7th

Course Outcomes (CO's):

CO No.	CO Statements After learning this subject, students will be able to	Marks % weightage
CO-1	Explain the various machining processes carried out on different types of Machine tools	30
CO-2	Identify, Analyse critical process parameters and plan the operations on Machine Tool	30
CO-3	Experiment and Examine various Material Removal Processes.	25
CO-4	Transform low utility and low value raw material into a high utility and high value finished good, using Machine Tool	15

Mapping of CO's with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	1	2	1	2	1	1	0	1	2	1	1	3	1	2
CO-2	3	3	2	3	2	1	2	1	2	1	2	3	3	3	3
CO-3	3	2	2	2	2	1	2	1	2	2	2	2	3	2	3
CO-4	3	2	3	2	2	3	3	2	3	2	3	3	3	3	3

Rationale - Mapping of CO's with PO's and CO's with PSO's:

CO-PO's: According to the CO's and PO's mapping, this course will provide a basic understanding of engineering associated with material removal processes using Machine tools like Lathe, Drilling, Shaping, Planning, Milling and Grinding Machines. This course will help students work individually or in groups to transform a low utility and low value raw material into a high utility and high value finished good, using Modern tool usage and Machine Tools, thus benefiting society and the environment.

CO-PSO's: According to the above CO's and PSO's mapping, students will be able to experiment and study conventional material removal processes, as well as conduct their own research to develop value addition processes. They will be able to use their technical skills in creating and developing sustainable products.

List of Practical:

1. Demonstration of Lathe Machine: Working Principle, Kinematic Systems, Various: Mechanism, Operations, Accessories and Attachments.
2. To perform: Facing, Turning, Knurling, Taper Turning, Grooving, Centering, and Thread Cutting operations on the given workpiece using Lathe Machine.
3. Demonstration of Shaper Machine: Working Principle, Kinematic Systems, Various: Mechanism, Operations, Accessories and Attachments.
4. To machine a V-block out of the workpiece using Shaper Machine.
5. Demonstration of Radial Drilling Machine: Working Principle, Kinematic Systems, Various: Mechanism, Operations, Accessories and Attachments.
6. To perform: Drilling, Counter boring and Tapping operations on the given workpiece using Drilling Machine.
7. Demonstration of Milling Machine: Working Principle, Kinematic Systems, Various: Mechanism, Operations, Accessories and Attachments.
8. To perform: End Milling, Face Milling, Indexing and Gear Cutting operations on the given workpiece using Milling Machine.

Major Machine Tools available:

1. Centre Lathe Machines.
2. Radial Drilling Machine.
3. Milling Machine.
4. Shaper Machine.
5. Sawing Machine.
6. Bench Grinder.

List of Open Source/learning website:

1. https://nptel.ac.in/courses/112107219
2. https://nptel.ac.in/courses/112107145