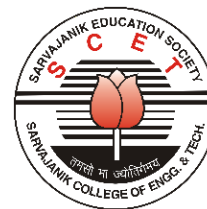




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**Mechanical Engineering Department**  
**Semester III**

**Course Name:** Manufacturing Processes - I **Course Code: BTME13304**  
**Type of course:** Professional Core Course (PCC)  
**Prerequisite:** No prerequisites

**Rationale of Course:** The course is intended to give students an understanding of fundamental manufacturing methods such as metal casting, metal forming, and metal joining. The course's purpose is to educate students on the importance, benefits, and drawbacks of various manufacturing processes so that they may use this knowledge to select a technique for producing a component from a raw material with the right degree of precision and in the required amount of time.

Hence this course will benefit students who want to pursue jobs in manufacturing sector or who want to observe technical advancements in manufacturing processes in order to prosper in their professional lives.

**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	

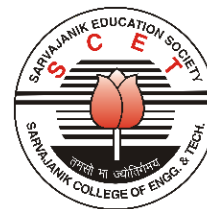
**CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and 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.	<b>Introduction:</b> Manufacturing – need & concept. Manufacturing Processes and Production Management. Broad classification of Engineering Manufacturing Processes.	3	10%
2.	<b>Metal Casting Process:</b> Introduction: Brief History, Advantages, Limitations, and Application of Casting Process. Pattern. Types of Pattern. Pattern materials. Pattern Allowances. Sand Casting Process: Green and dry sand casting process. Types of Molding sand and its properties. Cores: Purpose, Types, Advantages and Limitations of cores. Core prints. Chaplets. Element of Gating systems. Classification of Gating System. Casting Yield. Riser Importance and Chills. Riser design. Casting defects. Causes and remedies of Casting defects. Cleaning of Casting	15	30%



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Sr. No.	Topics	Teaching Hrs.	Module Weightage
3.	<p><b>Metal Joining Process:</b></p> <p>Introduction to joining processes: Welding, Brazing, Soldering and Adhesive bonding. General applications of Welding, Brazing and Soldering Processes.</p> <p>Welding Process - Principle of welding. Classification of welding processes. Gas welding: Principle, Oxyacetylene welding, Oxy-hydrogen Welding and Flame cutting. Arc welding: Manual Metal Arc (MMA) or Shielded Metal Arc (SMA) Welding, Submerged arc welding (SAW), Metal Inert Gas (MIG) or Gas metal arc welding (GMAW), Tungsten Inert Gas (TIG) or Gas Tungsten Arc welding (GTAW). Arc welding power sources, Influence of power sources on welding. Welding variables and parameters: Electrodes and Electrode Coatings. Resistance welding: Principle and Classification. Spot welding, Projection welding and Seam welding. Weldability and its testing. Welding Defects. Introduction: Various Standards for Welding: ISO, ASME, BIS, AWS etc. and Welding Symbols.</p>	15	30%
4.	<p><b>Metal Forming and Shaping Process:</b></p> <p>Bulk Deformation. Concept of strain hardening. Hot and cold working processes.</p> <p><b>Forging Process:</b> Introduction, Operation, Classification, Advantages, Disadvantages, Application and Defects.</p> <p><b>Rolling Process:</b> Introduction, Operation, Rolling-Stand Arrangement, Advantages, Disadvantages and Application.</p> <p><b>Extrusion Process:</b> Introduction, Operation, Classification and Application.</p> <p><b>Wire and Tube drawing:</b> Machines and equipment for the processes.</p> <p><b>Plastic Deformation of Sheet Metal:</b> Stretch Forming, Ironing, Coining, Drawing and Deep drawing, Spinning, Bending and Embossing.</p>	12	30%

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

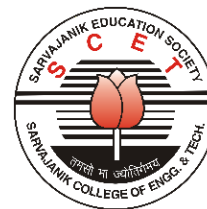
% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	20	20	5	5

**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.



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**Reference Books:**

Sr. no.	Title of book /article	Author(s)	Publisher	Publication year	Publication edition
1.	Manufacturing Engineering and Technology	Serope Kalpakjian & Steven R. Schmid	Pearson Education	2018	7 <sup>th</sup>
2.	Production Technology	R. K. Jain	Khanna publishers	2001	17 <sup>th</sup>
3.	Production Technology	P. C. Sharma	S. Chand & Co Ltd.	2006	1 <sup>st</sup>
4.	Manufacturing Technology Vol. II	P.N. Rao	Tata McGraw Hill	2018	4 <sup>th</sup>
5.	Welding Technology	O. P. Khanna	Dhanpat Rai & Co.	2011	1 <sup>st</sup>

**Course Outcomes (CO's):**

CO No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Observe and Describe the Principles of Manufacturing Processes.	20
CO-2	Select and Explain the best Manufacturing Processes for Producing the Quality Products.	30
CO-3	Identify various process parameters and plan the process in order to eliminate the defects.	30
CO-4	Experiment and Examine the Manufacturing Processes.	20

**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	PS O1	PS O2	PS O3
CO-1	3	1	1	1	1	1	1	0	1	2	1	2	3	1	2
CO-2	3	1	1	1	2	1	2	1	1	2	3	2	3	2	2
CO-3	3	3	1	2	2	1	2	2	2	3	3	3	3	3	3
CO-4	3	3	2	3	3	2	3	2	3	3	3	3	3	3	3

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

**CO-PO's:** As per CO's and PO's mapping, this course will provide a wide understanding of engineering associated to traditional manufacturing processes like Metal Casting, Metal Joining, and Metal Shaping and Forming Processes. This course will help students work individually or in groups to develop problem-solving skills that will allow them to design and develop sustainable solutions for manufacturing processes through investigations, 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 manufacturing processes, as well as conduct their own research in manufacturing sector. They will be able to use their technical skills to create and develop sustainable manufacturing methods.



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**List of Practicals:**

1. To design and prepare a wooden /metal pattern of the selected object.
2. To prepare a Green sand mold and carryout Casting of the selected object.
3. To carryout Fluidity test of two similar or dissimilar metals/alloys used in casting.
4. To prepare a single V butt joint, using Arc welding method.
5. To prepare a Lap joint, using Arc welding method.
6. To prepare a single V butt joint, using Gas welding machine
7. To prepare a Butt joint on Tungsten Inert Gas (TIG) welding machine and to carryout tensile test of the joint.
8. To prepare a Lap joint on Resistance Spot welding machine and check its tensile strength.

**Students Activities:**

1. Visit to Foundry.
2. Visit to Forging Industry.

**Major Machines and its Equipment available:**

1. Small Foundry Shop
2. Welding Machines:
  - Arc welding machine.
  - Gas welding machine.
  - Tungsten Inert Gas (TIG) welding machine.
  - Spot welding machine.

**List of Open learning websites:**

1. <https://nptel.ac.in/courses/112107219>
2. <https://nptel.ac.in/courses/112107144>