

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (ADVANCE MANUFACTURING SYSTEM) (50) SUSTAINABLE DESIGN AND MANUFACTURING SUBJECT CODE: 2745002 M.E. 4<sup>TH</sup> SEMESTER

**Type of course:** Engineering Science

**Prerequisite:** Zeal to learn.

**Rationale:** This course is designed to introduce the fundamental concepts of sustainable manufacturing and to make students understand the three pillars of sustainability and how they are manifested in sustainable manufacturing. It will also help students to understand the strategy to achieve sustainability, supply chain management and sustainable operations.

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
				ESE (E)	PA (M)	ESE (V)		PA (I)		
					ESE	OEP	PA	RP		
3	2#	0	4	70	30	30	0	10	10	150

### Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Environmental Valuation: <ul style="list-style-type: none"> <li>Introduction to the environmental issues pertaining to the manufacturing sector - pressure to reduce costs - processes that minimize negative environmental impacts - environmental legislation and energy costs - acceptable practice in society - adoption of low carbon technologies - need to reduce the carbon footprint of manufacturing operations.</li> <li>Techniques for non-market valuation: cost and income based approaches, demand estimation methods- expressed and revealed preference, choice modeling- Environmental accounting at sector and national levels.</li> </ul>	9	20%
2	Evaluating Sustainability: <ul style="list-style-type: none"> <li>Sustainability performance evaluators- Frameworks and techniques - environmental management systems - life cycle assessment - strategic and environmental impact assessments - carbon and water foot-printing.</li> </ul>	6	15%
3	Manufacturing Strategy For Sustainability: <ul style="list-style-type: none"> <li>Concepts of Competitive Strategy and Manufacturing Strategies and development of a strategic improvement programme - Manufacturing strategy in business success - Sustainable manufacturing system design options -Approaches to strategy formulation - Realization of new strategies/system designs.</li> </ul>	9	20%
4	Supply Chain Management:	9	20%

	<ul style="list-style-type: none"> <li>Challenges in logistics and supply chain - developing the right supply chain strategy for the products - need to align the supply network around the strategy - Tools that can be used systematically to identify areas for improvement in supply chains - Specific challenges and new thinking in the plan, source and delivering of sub-processes.</li> </ul>		
5	<p>Sustainable Operations:</p> <ul style="list-style-type: none"> <li>Principles of sustainable operations - Life cycle assessment Manufacturing and service activities -Influence of product design on operations - Process analysis - Capacity management – Quality management -Inventory management - Just-In-Time systems - Resource efficient design - Consumerism and sustainable well-being - Sustainable manufacturing and practices.</li> </ul>	9	25%

### Reference Books:

- Seliger, G ,”Sustainable Manufacturing: Shaping Global Value Creation”, Springer, 2012.
- Seliger, G.,”Sustainability in Manufacturing: Recovery of Resources in Product and Material Cycles”, 2007.
- Jovane, F., Emper, W.E. and Williams, D. J., “The ManuFuture Road: Towards Competitive and Sustainable High-Adding-Value Manufacturing”, Springer, 2009.
- Kutz, M.,” Environmentally Conscious Mechanical Design”, John Wiley & Sons, 2007.
- Davim, J.P., “Sustainable Manufacturing”, John Wiley & Sons, 2010

### Course Outcome:

It is desired that at the end of the course, the student will be equipped with the basic knowledge of sustainable manufacturing and Design of sustainable products and operations.

### List of Tutorials:

Students should be given the tutorials based on design of sustainable supply chain, measures of sustainable manufacturing and index development

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.