

भारतीय सूचना प्रौद्योगिकी अभिकल्पना एवं विनिर्माण  
संस्थान, कर्नूल

**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY  
DESIGN AND MANUFACTURING, KURNOOL**

Jagannathagattu, Dinnedevarepadu, Kurnool - 518007, Andhra Pradesh, India  
(An Institute of National Importance under MoE, Govt. of India)



Syllabus for

*Minor Specialization for B.Tech.*

**(From AY 2021-22)**

**DEPARTMENT OF MECHANICAL ENGINEERING**  
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY,  
DESIGN AND MANUFACTURING, KURNOOL

April, 2021

**Scheme/Structure for  
Minor Specializations for B. Tech  
Department of Mechanical Engineering**

1. Minor Specialization in **Sustainable Manufacturing** (for Mech. Engg students)

<b>Sustainable Manufacturing (for Mechanical Engg students)</b>					
<b>S. No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>I</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>MEM201</b>	Sustainable Design and Manufacturing	<b>4</b>	<b>0</b>	<b>4</b>
<b>2</b>	<b>MEM202</b>	Green Manufacturing Technology	<b>3</b>	<b>2</b>	<b>4</b>
<b>3</b>	<b>MEM203</b>	NPTEL/MOOCs Course (Identified by the Dept.)	<b>3</b>	<b>0</b>	<b>3</b>
<b>4</b>	<b>MEM204</b>	Lean Manufacturing	<b>4</b>	<b>0</b>	<b>4</b>
		<b>Total</b>	<b>14</b>	<b>2</b>	<b>15</b>

## Minor Specialization in Sustainable Manufacturing (for Mech. Engg students)

Course Title	<b>Sustainable Design and Manufacturing</b>	Course Number	MEM201
Department	Mechanical Engineering	Structure (IPC)	4-0-4
Offered to	<b>Minor:</b> Sustainable Manufacturing	Status (Core/ Elective)	NA
Prerequisite	-	Effective from	July 2021
Course Objective	To introduce the structures of sustainable manufacturing, environmental and management practice.		
Course Outcomes	<p>The students will be able to:</p> <ol style="list-style-type: none"> <li>1. Acquire a broad understanding of sustainable manufacturing, green product and process.</li> <li>2. Understand the analytical tools, techniques in green manufacturing.</li> </ol>		
Contents of the course	<p>ADD SUSTAINABLE DESIGN</p> <p>Closed Loop Production Systems: Life Cycle of Production Systems, Machine Tools and Energy Consumption, LCA of Machine Tools, Parameter Optimization, Dry Machining and Minimum Quantity Lubrication, Remanufacturing, Reuse, Approaches for Sustainable Factory Design.</p> <p>Semiconductor Manufacturing : Overview of Semiconductor Fabrication, Micro Fabrication Processes, Facility Systems, Green Manufacturing in the Semiconductor Industry : Concepts and Challenges, Use-Phase Issues with Semiconductors, Example of Analysis of Semiconductor Manufacturing.</p> <p>Environmental Implications of Nano-Manufacturing : Introduction, Nano-manufacturing Technologies, Conventional Environmental Impact of Nano-Manufacturing, Unconventional Environmental Impacts of Nano-Manufacturing, LCA of Nanotechnologies.</p> <p>Green Manufacturing Through Clean Energy Supply.</p> <p>Introduction, Clean Energy Technologies, Application Potential of Clean Energy Supplying Green Manufacturing, Evolution of Manufacturing, Leveraging Manufacturing, Energy of Labour.</p>		
Textbooks	<ol style="list-style-type: none"> <li>1. Dornfeld, D. A. (Ed.). (2012). <i>Green manufacturing: fundamentals and applications</i>. Springer Science &amp; Business Media.</li> <li>2. Singh, M., Ohji, T., &amp; Asthana, R. (Eds.). (2015). <i>Green and sustainable manufacturing of advanced material</i>. Elsevier.</li> </ol>		
References	<ol style="list-style-type: none"> <li>1. Dornfeld, D. A. (2014). Moving towards green and sustainable manufacturing. <i>International Journal of Precision Engineering and Manufacturing-Green Technology</i>, 1(1), 63-66.</li> <li>2. Shankar, K. M., Kannan, D., &amp; Kumar, P. U. (2017). Analyzing sustainable manufacturing practices–A case study in Indian context. <i>Journal of cleaner production</i>, 164, 1332-1343.</li> </ol>		

Course Title	<b>Green Manufacturing Technology</b>	Course Number	MEM202
Department	Mechanical Engineering	Structure (IPC)	3-2-4
Offered to	<b>Minor</b> : Sustainable Manufacturing	Status (Core/ Elective)	NA
Prerequisite	-	Effective from	July 2021
Course Objective	To introduce the structures of sustainable manufacturing, environmental and management practice.		
Course Outcomes	<p>The students will be able to:</p> <p>3. Acquire a broad understanding of sustainable manufacturing, green product and process.</p> <p>4. Understand the analytical tools, techniques in green manufacturing.</p>		
Contents of the course	<p>Introduction to Green Manufacturing : Why Green Manufacturing, Motivations and Barriers to Green Manufacturing, Environmental Impact of Manufacturing, Strategies for Green Manufacturing.</p> <p>The Social, Business and Policy Environment for Green Manufacturing, Present Atmosphere and Challenges for Green Manufacturing.</p> <p>Metrics of Green Manufacturing: Introduction, Overview of Currently used Metrics, Overview of LCA Methodologies, Metrics Development Methodologies, Outlook and Research Needs.</p> <p>Green Supply Chain: Motivation and Introduction, Definition, Issues in Green Supply Chains (GSC), Techniques Methods for Green Supply Chain, Future of Green Supply Chain.</p> <p>Principles of Green Manufacturing: Introduction, Background and Technology Wedges, Principles, Mapping Five Principles to Other Methods and Solutions.</p> <p>Need for solid waste management-Sources of solid waste – Quantities and composition-Storage and collection-Materials recovery-Hand sorting-inclined tables – Shaking tables – Optical sorting-Sorting by differential melting temperature Reuse and recycling-Composting – Road making</p> <p>Cutting Fluids; Cryogenic Material properties; Eco-friendly green cutting fluids</p>		
Textbooks	<p>3. Dornfeld, D. A. (Ed.). (2012). <i>Green manufacturing: fundamentals and applications</i>. Springer Science &amp; Business Media.</p> <p>4. Singh, M., Ohji, T., &amp; Asthana, R. (Eds.). (2015). <i>Green and sustainable manufacturing of advanced material</i>. Elsevier.</p>		
References	<p>3. Dornfeld, D. A. (2014). Moving towards green and sustainable manufacturing. <i>International Journal of Precision Engineering and Manufacturing-Green Technology</i>, 1(1), 63-66.</p> <p>4. Shankar, K. M., Kannan, D., &amp; Kumar, P. U. (2017). Analyzing sustainable manufacturing practices–A case study in Indian context. <i>Journal of cleaner production</i>, 164, 1332-1343.</p>		

Course Title	<b>Lean Manufacturing</b>	Course Number	MEM204
Department	Mechanical Engineering	Structure (IPC)	4-0-4
Offered to	<b>Minor:</b> Sustainable Manufacturing	Status (Core/ Elective)	NA
Prerequisite		Effective from	July 2021
Course Objective	<p>To study the various tools for lean manufacturing (LM).  To apply the above tools to implement LM system in an organization  To introduce the concepts of storage, collection and safe disposal of solid wastes</p>		
Course Outcomes	<p>The students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the importance of lean manufacturing</li> <li>2. Understand and apply various cell manufacturing techniques</li> <li>3. Understand the need for waste management</li> <li>4. Develop systems for storage, collection and safe disposal of solid wastes</li> <li>5. Evaluate various material recovery techniques</li> </ol>		
Contents of the course	<p>Introduction To Lean Manufacturing-Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools  Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM  Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles</p>		
Textbooks			
References	<ol style="list-style-type: none"> <li>1. Ronald G. Askin &amp; Jeffrey B. Goldberg, Design and Analysis of Lean Production Systems, John Wiley &amp; Sons, 2003</li> <li>2. Mikell P. Groover, ‘Automation, Production Systems and CIM, 2002.</li> <li>3. Rother M. and Shook J, 1999 ‘Learning to See: Value Stream Mapping to Add Value and Eliminate Muda’ , Lean Enterprise Institute, Brookline, MA.</li> <li>4. Ramesha Chandrappa, Diganta Bhusan Das, Solid Waste Management Principles and Practice, Springer, 2012</li> </ol>		