

III B. Tech – I Semester

(20ME5753) GREEN NANOTECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	4

Pre-Requisites: Basics of Nanotechnology, Environmental science

Course Objectives:

The Students will acquire the knowledge:

- To understand the eco-friendly nature of nanotechnology and the Nanomaterials.
- To study nanotechnology and nanodevices which are environmental friendly materials.
- To be familiar with the field of traditional manufacturing to green manufacturing.
- To be familiar with various processing of sustainable green manufacturing techniques.
- To be familiar with different types of waste management and Industrial ecology.

UNIT-I: Green Manufacturing Trends

Green Manufacturing - Fundamentals and Applications Basic definitions Issues surrounding green manufacturing at the process, machine and system , Government motivations for green manufacturing Traditional manufacturing to green manufacturing, Economic issues surrounding green manufacturing- Economic issues surrounding green manufacturing-Internal Semiconductor and medical areas, Supply chain and packaging areas.

UNIT-II: Sustainable Green Manufacturing

Green manufacturing sustainability - processes - requirements, and risk. The sustainable lean and green audit process, International green manufacturing standards and compliance, International green manufacturing standards and compliance, Green rapid prototyping and rapid manufacturing, Green flexible automation, Green collaboration processes, Alternative energy resources, Sustainable green manufacturing system design.

UNIT- III: Waste Management

Sustainability and global conditions, Material and solid waste management, Energy management, Chemical waste management and green chemistry, Climate change, air emissions management, Supply water and waste water management, Environmental business management, Present atmosphere and challenges.

UNIT-IV: Industrial Ecology

Introduction - Material flows in chemical manufacturing - Industrial parks, Material flows in chemical manufacturing - Industrial parks, Assessing opportunities for waste exchanges, Assessing opportunities for by product synergies, Life cycle concepts, Product stewardship and green engineering, Regulatory, social and business environment for green manufacturing, Metrics and analytical tools - Green supply chains, Present state of green manufacturing.

UNIT-V: Nanomaterial's for Green Systems

Green materials, including biomaterials, biopolymers, Green materials, including bioplastics, and composites, Nanotech Materials for truly Sustainable Construction: Windows, Skylights, and Lighting, Nanotech Materials for truly Sustainable Construction: Paints, Roofs, Walls, and Cooling, Multifunctional Gas Sensors and biomimetic Sensor, Multifunctional Optical Interference Sensors, Thermo-light responsive smart materials Nanomaterial's, Stimulus-responsive smart materials Nanomaterial's, Nano composites and LCA – introduction of Nano composites - Biodegradability, life cycle assessment and economics of using natural materials.

Course Outcomes:

After successful completion of the course, the students will be able to:

S. No	Course Outcome	BTL
1.	Illustrate the concepts of green manufacturing trends.	L2
2.	Explain the sustainable green manufacturing.	L2
3.	Summarize the concepts of waste management.	L2
4.	Describe principles of industrial ecology.	L2
5.	Outline the utility of nanomaterials for green systems.	L2

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO2	3	2	3	2	3	3	2	3	2	3	2	3	2	2
CO3	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO4	3	2	3	2	3	3	2	3	2	3	2	3	3	1
CO5	3	2	3	2	3	3	2	3	2	3	2	3	3	2

Text Books

1. David Allen T. and David R. Shonnard, Green engineering, Prentice Hall NJ, 2002.
2. David Dornfeld, Green manufacturing fundamental and applications Prentice hall, 2002.

Reference Books:

1. Sammy Shinga G., Green electronics design and manufacturing, Prince Publications, 2008.
2. James Clark, Green chemistry, Blackwell publishing, 2008.
3. Paulo Davim, Sustainable manufacturing, Wiley publications 2010.
4. Frank Kreith, George Tchobanoglous, Solid waste management, McGraw Hill, 2002.
5. Stevens S., Green plastics, Princeton University press, 2002.
6. Robert Ayres U., A Handbook of Industrial Ecology, Edward Elgar publishing, 2002.