



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Master of Technology
Environmental Engineering



M. Tech II Semester III

Subject Name: Nano Technology **Subject Code:** MTEN14303
Type of course: Program Elective
Prerequisite: Basic concepts of physics, chemistry and environment
Rationale: This course introduces students to a vibrant area of research and a growing industry. It covers core scientific principles and applications of this interdisciplinary field combining knowledge from the fields of material science, environmental engineering, biology, chemistry, and physics bringing together chemists, physicists, materials scientists, and engineers to meet the potential future challenges for sustainable development through new technologies and preparation of advanced materials with sustainable environmental protection.

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

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage (%)
1	Introduction to Nanotechnology: Introduction, nanotechnology timeline, Core concepts of nanotechnology, global scenario and research trends, impact of nanotechnology	6	20%
2	Different Classes/ types of Nanomaterials Classification based on dimensionality-Quantum Dots,Wells and Wires- Carbon- based nano materials (buckyballs, nanotubes, graphene)-Metalbased nano materials (nanogold, nanosilver and metal oxides) -Nanocomposites- Nanopolymers -Nanoglasses - Nano ceramics -Biological nanomaterials.	12	20%

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3	Preparation of Nanomaterials and its characterization Classification of synthesis: Physical, Chemical, mechanical methods, Top down and bottom up nanofabrication. Chemical Methods: Metal Nanocrystals by Reduction – Solvothermal Synthesis- Photochemical Synthesis – Sonochemical Routes-Chemical Vapor Deposition (CVD) -Metal Oxide – Chemical Vapor Deposition (MOCVD).Physical Methods:Ball Milling - Electrodeposition – Spray Pyrolysis – Flame Pyrolysis -DC/RF Magnetron Sputtering – Molecular Beam Epitaxy (MBE)	12	30%
4	Application of Nanotechnology : Nanomedicines, nanoelectronics, nanosensing, nanomagnetism, Nanotechnology in Energy Conversion and Storage, nanotechnology application in Environmental Engineering and soil remediation	12	30%

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	25	10	10	5

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom’s Taxonomy**)

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Textbook of Nanoscience and Nanotechnology	Pradeep T.	Tata McGraw Hill Education Pvt. Ltd. 1259007324	2012	First
2.	NANO: The Essentials: Understanding Nanoscience and Nanotechnology	Pradeep T.	Tata McGraw Hill Education Pvt. Ltd. 9780071548298	2017	Third
3.	Nanotechnology: Technology revolution of 21 st Century	Er. Rakesh Rathi	S. Chand 81-219-3082-0	2009	First
4.	Nanotechnology in Environmental Science	Chaudhery Mustansar Hussain, Ajay Kumar Mishra	Wiley-VCH Verlag GmbH & Co 9783527342945	2018	First

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5.	Environmental Nanotechnology	M. H. Fulekar, Bhawana Pathak	CRC Press ISBN 9781498726238	2017	-
6.	Advances in Nanotechnology and the Environment	Juyoung Kim	Jenny Stanford Publishing 9789814241557	2012	-
7.	Nanotechnology and Environment	Mousumi Sen	Amity University 978-1-78985-671-2	2020	-
8.	Environmental Nanotechnology: Applications and Impacts of Nanomaterials	Mark R. Wiesner, Jean-Yves Bottero	The McGraw-Hill Companies	2007	-

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Demonstrate a basics of nanoscience/nanotechnology and its importance as an interdisciplinary aspect (R,U – Cognitive level)	15
CO-2	To understand about the different types of nanomaterials (U,A, N – Cognitive level)	25
CO-3	To understand synthesis and characterisation of nanomaterials (U,A, N – Cognitive level)	20
CO-4	To understand application of nanomaterials in varied fields (E,C – Cognitive level)	25
CO-5	To understand application of nanomaterials in environmental engineering (N,E,C– Cognitive level)	15

List of Practicals:

1. Report on use of nano technology for environmental engineering.
2. Classification of nano materials
3. Preparation of nano materials
4. Characterization of nano materials
5. Literature review and summary on nano technology
6. Presentation

List of Open Source/learning website:

Introduction to nanotechnology

https://www.youtube.com/watch?v=ebO38bbq0_4

<https://www.youtube.com/watch?v=k61wjab7iUs>

History of nanotechnology

<https://nptel.ac.in/courses/113/106/113106093/>

PE V: Program Elective



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Nanocomposites

<https://nptel.ac.in/courses/118/102/118102003/#>

Carbon nanotubes <https://nptel.ac.in/courses/113/106/113106093/>

Fabrication of nanomaterials

<https://www.youtube.com/watch?v=k61wjab7iUs>

Nanotechnology for environmental remediation

<https://nptel.ac.in/courses/118/107/118107015/>