

(Elective – I)

Nanotechnology

B.E. Sem. VII [INFT]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

Objective: Students are expected to learn both some basic science and technology and at the same time, some techniques for understanding the social and cultural significance, role, and possible effects of this emerging science.

SYLLABUS

1. Introduction to Physics of the Solid States

Structure, energy bands, localized particles.

2. Methods of Measuring Properties

Introduction, structures, microscopy, spectroscopy.

3. Properties of Individual Nanoparticles

Introduction, metal nanoclusters, semiconducting nanoparticles, rare gas and molecular clusters, methods of synthesis.

4. Mechanical & Magnetic Properties

Strength of nano crystalline SiC, preparation for strength measurements, mechanical properties, magnetic properties. Super-paramagnetism, material preparation, magnetization of nano particles of magnetite, Mossbauer data of nano particles of magnetite, ESR spectroscopy, small angle neutron scattering.

5. Electrical & Optical Properties

Switching glasses with nanoparticles, Electronic conduction with nano particles. Optical properties, special properties and the coloured glasses.

6. Investigating and Manipulating materials in the Nanoscale

Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction.

7. Optics and Electronics

Light energy, its capture, and photovoltaics, light production, light transmission, light control and manipulation, electronics, carbon nano tubes, soft molecule electronics, memories, gates & switches, architectures.

8. NanoTechnology-Enabled Sensor

Possibilities, relentless integration, advances in processing, diverse nanomaterials, new tools, realities, intensified design problems, the risk of commercialization, diverse applications.

9. Microelectronics

Introduction, nano manufacturing product strategy, considering future impacts, identifying potential synergies, existing technologies, future nano electronic device technologies, photonics.

10. Smarter Computers, Faster Internet, Cheaper Energy

Building a better Digital brain, routing information at the speed of light, nano flying electronics, getting energy and a cleaner environment with nanotech.

11. Nano Medicens

Developing of Nanomedicens, Nanosystems in use, Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.

12. Nanobusiness

Boom, Bust, and nanotechnology:- the next industrial revolution?, nanobusiness today, high tech, bio tech, nanotech.

13. Nanotechnology and You

Nanotechnology:- here and now, the nature of ethics, ethics of individual behavior, nano ethics, converging technologies, practical responses, promise of nanotechnology.

Reference :

1. Introduction to Nanotechnology (*C. P. Poole and F. J. Owens*) Wiley.
2. Nano Materials (*A. K. Bandyopadhyay*) New Age International Publishers.
3. Nano Essentials (*T. Pradeep*) TMH.
4. Nanotechnology : A Gentle Introduction to the Next Big Idea (*M. Ratner and D. Ratner*) Pearson Education.
5. Nanotechnology – Science, Innovation, and Opportunity (*L. E. Foster*) Pearson Education.
6. Nanotechnology – the fun and easy way to explore the science of matter's smallest particles (*Richard Booker and Earl Boysen*) Wiley.
7. Nanotechnology : Content and Context (*Christopher Kelty and Kristen Kulinowski*)

