B.Sc. V Sem
Nanotechnology DSE
Nanotechnology in Healthcare
Credits: 4 (60hrs. Theory)

[Marks: 100(60+40)] **Passing Marks: 35**

The objectives of the course are:

	Course Objectives	Cognitive Level
CO -I	To study about the basics of immunology	U,R
CO -II	To study about the role of nanotechnology in immune system	Ap,An
CO -III	To know the basics of Bio nanotechnology and biosensors	Ap,An
CO -IV	To study about the role of nanomaterials in drug delivery and discovery.	Ap,C
CO -V	To study about the Nano medicine and nano toxicology	C,E

Course Learning Outcome (CLO)

Course outcome: On completion of the course, the students will be able to:

CLO No.	Course Outcomes	PSOs Addressed	Cognitive Level*
CLO -I	The students will be able to understand immune system and immune response	1,2	U,R
CLO -II	The students will be able to know role of nanoparticles in vaccine development and disease control.	2,3,4,5	Ap,An
CLO -III	The students will be able to understand how to use nanomaterial's in drug delivery and disease control	3,5,7	Ap,An
CLO -IV	The students will be able to understand the role of nano materials in pharmacology	2,5,9	Ap,C
CLO -V	Students will be able to understand about basics of nanotoxicology.	1,9	C,E

CO- Course Objective; CLO – Course Learning Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

Unit I: Introduction to Immunology **(12 L)**.

Basic concepts in immunology: Cells and organs of the immune system, Principles of innate and adaptive immunity, The effector mechanisms of immunity, The complement system and innate immunity. The induced responses of innate immunity; Pattern recognition by cells of the innate immune system, Induced innate responses to infection.

Unit II: Nanotechnlogy and Immune System **(12 L)**.

Modulating the immune system through nanotechnology: Nanoparticles and the immune system, Nanoscale immune activation, Nanotechnology in vaccination, Nanoparticle-based vaccine carriers, Nanotechnology and immunosuppression, Nanoparticles as vehicles for immunosuppressant.

Unit III: Bio-Nanotechnology **(12 L)**.

Fundamental Characterization for Nanotechnology, Introduction to Bio-nanotechnology Role of nanotechnology in the area of infectious & noninfectious disease, Nano-pharmaceuticals, Diagnosis, Sensors and Biosensors

Unit IV: Biomedical Applications **(12 L)**.

Delivery vehicles, biomedical applications of nanomaterials. Targeted drug delivery, Nano-medicines for various disease conditions: infectious diseases, neurological diseases: (challenges of blood brain barrier), pulmonary disorders, cardiovascular diseases, cancer: nano-chemotherapy,

Unit V: Nanotoxicology **(12 L)**.

Nanotoxicology: basics of cellular and organ level toxicity, effect of nanosize, shape, surface properties and composition on toxicity of nanomedicines, Case studies: Ag, ZnO, TiO_2, Quantum dots, carbon-based nanomaterials, polymeric, protein and lipid nanoparticles. Clinical Translation and Commercialization of Nano medicine.

Text/References

1) Nanotechnology in Health, Sajee K Sahu, Pan Stanford Publishing Pvt.Ltd.
2) Nanotechnology and Human Health Current Research and Future Trends A Volume In Nanotechnology in Biomedicine, Mukesh Kumar Yadav , Punuri Jayasekhar Babu, Arun S Kharat
3) Biosensors and Nanotechnology: Applications in Health Care Diagnostics, Zeynep Altintas (Editor)

4) Current Advancesin the Medical Application of Nanotechnology, editor(s) : Mark Slevin

5) Exploring Nanotechnology in Healthcare , N Udupa, Manipal University Press