a. Course Code: HCB-805

b. Title: Fundamentals of Healthcare Biotechnology

c. Credit Hours: 3 Hrs

d. Objectives

- To provide education that leads to comprehensive understanding of the principles and practices of health biotechnology.
- To produce responsible biotechnologists that can work within the interdisciplinary framework of biotechnology and related fields.
- To acquaint students with biotechnology in healthcare including diagnostic tools, immunization and therapeutics and also deals with the actions taken against genetic abnormalities and infectious diseases.
- To provide with knowledge pertaining to the scientific, political, legal and ethical issues that drives the advancement, innovations and applications in health biotechnology.
- To provide basic concepts and understanding of how the various drivers of medical biotechnology interact with one another and shape the business and finance of this industry and impact the growth of health biotechnology companies.
- Understanding how the various drivers of health biotechnology interact with one another and shape the business and finance of this industry and impact the growth of health/medical biotechnology companies.

e. **Outcomes**

- To comprehend the basic principles of Health biotechnology.
- To provide education that leads to comprehensive understanding of the principles and practices of health biotechnology.
- To produce responsible biotechnologists that can work within the interdisciplinary framework of biotechnology and related fields.
- To acquaint students with biotechnology in
  - healthcare including diagnostic tools,
  - immunization and therapeutics

a. **Contents with suggested contact hours**: 3hrs per week

- Overview of Health Biotechnology
- Basic concepts and Components of Health Biotechnology

- Applications in Health Biotechnology
- Drivers of Health Biotechnology
- Innovation and Entrepreneurship in Health Biotechnology
- Intellectual Property rights
- Principles of risk management in a Health biotechnology
- Developments in Health and pharmaceutical biotechnology
- key principles of innovation and operational management of health biotechnology
- General business strategies and marketing concepts of Health biotechnology
- Challenges of Biotechnology policy development and implementation

b. Details of lab work, and workshop practice (if applicable). **NA**

h. Recommended Reading (including Textbooks and Reference books with dates).

- Debmalya Barh, "**Biotechnology in Healthcare, Vol. 1: Technologies and Innovations"**, Elsevier Science, 2022
- Provash Chandra Sadhukhan, Sanjay Premi, **Biotechnological Applications in Human Health;** 2020.

Academic Plan

Course Title: Fundamentals of Healthcare Biotechnology (Code: ____) (Core Course- MS Healthcare Biotechnology)

Marks Distribution: Total Marks: 100 (at least 3 Quizzes = 10% + MTE = 30% + Assignments= 10% ETE =50 %)

Lecture. No	Lecture Topic	Weeks
1st Month		
Module 1: Introduction		
1-2	• Introduction • Health Biotechnology in Sustainable Development Goals (SDGs)	Week 1
Module 2: Components of Health Biotechnology		
3-4	• Organism • Application • Progress	Week 2

Module 3: Applications and Drivers of Health Biotechnology		
5-6	• Pharmaceutical • Diagnostic • Medical Devices	Week 3
7-8	• Political and Social Progress • Legal and Ethical Developments • Intellectual Properties: Use and Protection • Business Models and Marketing	Week 4
2nd Month		
Module 4: Innovation and Entrepreneurship in Health Biotechnology		
9-10	• Human Genome Project • Recombinant DNA and CRISPR Technology	Week 1
11-12	• Stem cell therapies • 3D printed organs	Week 2
13-14	• Vaccine development	Week 3
15-16	• Tissue engineering	Week 4
3rd Month		
Module 5: Innovation and Entrepreneurship in Health Biotechnology		
17-18	• Targeted cancer therapies • Artificial Intelligence in Disease management	Week 1
19-20	• Lipopeptides as Therapeutics: Molecular Docking and Drug Design • Precision Medicine	Week 2
Module 6: Principles of Biosafety		
21-22	• Biotechnology: benefits and concerns/risks; Biorisk and Risk Assessment	Week 3
23-24	• Procedures and good laboratory practices (GLPs) • Standard operating procedures for research involving microbes and recombinant DNA • Laboratory Biosafety	Week 4
4th Month		
Module 7: Bioethics and social issues		
25-26	• Theories of bioethics challenges facing modern biotechnology research and application	Week 1

Module 8: The concept of Biosecurity		
27-28	• National guidelines for research with GMOs and microbes • Challenges of Biotechnology policy development and implementation	Week 2
	• ETE	Week 3