GENERIC ELECTIVE: PRACTICES IN BIOSAFETY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
PRACTICES IN BIOSAFETY	4	3	-	1	XII Passed	Basic knowledge of biology

Learning objectives

• Recent advances in the field of Biomedical Research have brought into focus the need for certain practices and strategies to prevent exposure to pathogens and toxins.

• The inventions in the field of Genetic Engineering have significantly influenced agriculture,
medicine and food processing industry. Thus implementation of biosafety enables number of procedures and rules that will be helpful in protecting humans and environment from disease causing microorganisms, pests, additives, contaminants and residues etc.

• Topics such as responsible use of biotechnology, biosafety levels, genetically modified (GM)
food, biosafety regulations, impact of biotech processes on environment are of major significance in present scenario.

Learning outcomes

• In this students would understand application of biotechnology in different fields like agriculture, environment, industrial manufacturing, food processes, health and medicine etc. It will enable them to recognize implication of recombinant biomolecules and organisms on our society.

- This would enable students to know about various hazardous biological substances one can come across while working in the laboratory or day today life, and the steps taken to minimize the risk. The students would understand different regulations for handling biohazard and radioactive material.
- The course should kindle the inquisitiveness in students about genetically modified and living modified organisms (GMO & LMO) and their impact on the environment.

SYLLABUS

Unit I: Introduction to biosafety (04 hrs)

Historical background of Biosafety, definition of biosafety, application of biosafety and need for biosafety.

Unit II: Social responsibility of biotechnology and biomedical research (08 hrs)

Legal and socio-economic impacts of biotechnology. Social responsibility towards safety measures.Social and ethical implications of biological weapons (Bioterrorism).Implication of recombinant biomolecules and organisms. Implication of gain of function research. Importance of biotechnology: benefits and limitations of transgenic to human health, society and the environment.

Unit III: Biosafety and importance of containment facility (08 hrs)

Components of biosafety (biohazard and biosecurity), measures of biosafety, containment (good laboratory practices and techniques, safety equipment, design facility), types of containment (physical and biological). Biosafety levels (BSL 1, 2, 3, 4), barriers (physical and secondary).

Unit-IV: Genetically modified organism: concerns and challenges (10 hrs)

Government of India definition of genetically modified organisms (GMOs) and living modified organisms (LMOs), roles of institutional biosafety committee, review committee on genetic manipulation (RCGM), genetic engineering approval committee (GEAC) for GMO applications in food and agriculture, environmental release of GMO in rDNA biosafety guidelines of India. Biosafety assessment procedures for biotech foods and related products, including transgenic food crops, case studies of relevance. Biosafety assessment of pharmaceutical products such as drugs/vaccines etc.

Unit-V: Handling and transportation of GM, infectious and radioactive materials (09 hrs)

Classification of infectious organisms, transportation of genetically modified/infectious organisms, General preparation of shipments for transport: Basic triple packaging system, marking of packages, labelling, precautions, monitoring strategies and methods for detecting transgenic; radiation safety and non-radio -isotopic procedures.

Unit VI: Biosafety guidelines and regulations (06 hrs)

Aim of biosafety guidelines, biosafety and risk assessment issues; regulatory framework; national biosafety policies and law, the cartagena protocol on biosafety, WTO and other international agreements related to biosafety.

Practical (30 hrs)

(Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs)

1. Protocol for development of recombinant / engineered proteins as therapeutics
2. Preparation of comparative account on BSL 1, 2,3,4. (poster, oral presentation, video)
3. Categorization of list of provided hazardous materials and its handling & disposal
4. To study GEAC guidelines on genetically modified crops (Bt-cotton/Bt-brinjal)
5. To develop an understanding of the role and composition of an ethical committee for research by a presentation mode.
6. To study and develop a flowchart to demonstrate spread and containment of any two infectious diseases (typhoid, SARS, Ebola, Dengue, Tuberculosis and Covid).
7. Preparation of chart explaining significance of various symbols used in chemistry and biology laboratories/ reagent bottles and equipment.

Essential Readings:

- Hunt, E. F. and Colander, D. C. (2019). 17th edition. Social science: An introduction to the study of society. Boston, USA: Pearson/Allyn and Bacon. ISBN 9781138592537.
- Helga, K. and Peter, S. (2016). 3rdedition. A companion to bioethics. New Jersey, USA: John Wiley and Sons. ISBN 9781118941508.
- Beauchamp, T.L and Childress, J.F. (2013). 8th edition. Principles of biomedical ethics.

Oxford, UK: Oxford University Press. ISBN 9780190640873.

- Peter, A. S. and Viens, A. M. (2008). 1st edition. The Cambridge textbook of bioethics. Cambridge, UK: Cambridge University Press.ISBN 9780521872843.
- Sateesh, M.K. (2008). 1st edition. Bioethics and Biosafety. New Delhi, India: I K International Pvt Ltd. ISBN 978-8190675703.

Suggestive readings:

- Rebecca, G.; James, F. H.; Karim, M. M.; Cholani,W. (2011). 1st edition. Environmental safety of genetically engineered crops. Michigan, USA: Michigan State University Press. ISBN 978-1611860085.
- Sreekrishna, V. (2007). 1st edition. Bioethics and biosafety in biotechnology. New Delhi, India: New Age International (P) Ltd. ISBN 978-8122420852.
- Rajmohan, J. (2006). 1st edition. Biosafety and bioethics. New Delhi, India: Isha Books. ISBN 13: 9788182053779.
- Tomme, Y. (2004). 1st edition. Genetically modified organisms and biosafety. Gland, Switzerland: World Conservation Union publications. ISBN 2831707986