

Bot.Sp-16 BIOHAZARDS, BIOSAFETY, BIOETHICS Credit Hours: 3(2+1)
THEORY:

Introduction of the Course

This course will enable students to learn about recognized and unrecognized hazards related to organismic working specimens within laboratory that can cause serious physical harm or even death. Furthermore, it contains recommendations as well as descriptions of mandatory biosafety standards being followed at international and national level. It would also help students to learn about role international and national committees related to bioethics and biosafety.

Course Objectives:

The course is designed:

1. To learn about recognized and unrecognized hazards related to organismic working specimens within laboratory that can cause serious physical harm or even death.
2. To familiarize with the essential basics of biosafety while dealing with biohazardous specimens in the laboratories
3. To give essential insight about bioethics related to biotechnological interventions

Contents:

1. Introduction to Biohazards, Biosafety and Bioethics

- 1.1 Concept of hazard and risk
- 1.2 Definition and concepts of Biohazards
 - 1.2.1 Uses and abuses of genetic information and biohazards
 - 1.2.2 Hazardous group of organisms – Natural and those altered by human
 - 1.2.2.1 Hazardous microbes
 - 1.2.2.2 Hazardous plants
 - 1.2.2.3 Hazardous animals
 - 1.2.3 Possible solutions to various biohazards
- 1.3 Definition and concepts of Biosafety
- 1.4 Definition and concepts of bioethics

2. Genetically modified organisms (GMOs)

- 2.1 Definitions and concepts of GMOs
- 2.2 Risk assessment of GMOs manipulations
 - 2.2.1 Release of genetically modified organisms
- 2.3 Intellectual property rights (IPR) related to GMOs
 - 2.3.1 Patenting of GMOs
 - 2.3.2 Commercializing and benefit sharing

3. Bioethics

- 3.1 Introduction to bioethics
- 3.2 Ethical issues related to GMOs
- 3.3 Concept of euthanasia and its application for humanism purposes
- 3.4 Possible risks associated with reproductive and cloning technologies
- 3.5 Possible risks associated with transplants and eugenics
- 3.6 International bioethics norms
- 3.7 Role of national bioethics committees

4. Biosafety

4.1 Introduction to Occupational Safety and Health Administration (OSHA) Laboratory standard

4.1.1 Concept of PPEs and its significance

4.2 International rules and regulations for biosafety of GMOs

4.3 National rules and regulations for biosafety in Pakistan

4.3.1 Biosafety steering committees and their roles in Academia and R&D Laboratories

4.4 Potential source of human health risks in the laboratory

4.3.1 Radiation – its use in laboratory and human health and safety concerns

4.3.2 Handling and disposal of radioactive materials in the laboratories

4.3.3 Use of effective PPEs for protection of workers and public

PRACTICAL:

1. Acquaintance with OSHA laboratory safety guidelines
2. Identification of hazards commonly found in microbiological laboratories
3. Microbiological procedures to explain potential hazards and biosafety measures
4. Safer disposal / release of biohazardous materials (microbes, plants, animals) from laboratories
5. Handling of pathogenic microbes (bacteria, fungi, viruses)

Teaching Learning Strategies:

1. Lectures
2. Visits to different biotechnology laboratories
3. Laboratory work
4. Assignments / Seminars Workshops

Learning Outcomes:

1. The students will be able to work in the research laboratories while following personal biosafety recommendations.
2. The students will know the biohazard and biosafety signs and will adopt use of PPEs accordingly.
3. During their professional life either at national or international level, the students will know the biosafety standards of laboratories such as, OSHA standards.
4. One of the key learning outcomes will be that it will ensure occupational health and safety both at personal and team level.

Assessment Strategies:

1. Lecture-based quiz (both objective and subjective)
2. Brief and detailed assignments
3. Class tests
4. Group activities

Recommended Readings:

1. Abdin, M.Z., Kiran, U., Ali, A., Kamaluddin. (2017). Plant Biotechnology: Principles and Applications. Springer Nature Singapore, ISBN: 978-981-10-2961-5 (eBook). DOI: 10.1007/978-981-10-2961-5.
2. Bayot, M.L., Limaiem, F. (2021). Biosafety Guidelines. StatPearls Publishing LLC. 8600 Rockville Pike, Bethesda MD, 20894 USA. Bookshelf ID: NBK430685.
3. Laboratory Biosafety Manual, 3rd Ed. (2004). World Health Organization (WHO), Geneva. ISBN: 92-4-154650-6.
4. OSHA Laboratory Safety Guidance (2011). OSHA 3404-11R 2011.
5. Sateesh, M.K. (2020). Bioethics and Biosafety. Distributed by: Willey. Dreamtech Press. ISBN: 978-93-89795-60-8.
