University of Engineering & Management, Kolkata

Syllabus for B.Tech Admission Batch 2021

7th Semester, Department of Biotechnology

Subject Name: Intellectual Property Rights (IPR) &Regulatory **Credit: 2**

Subject Code: HMSCBT701 **Lecture Hours: 24**

COURSE OBJECTIVES:

1. To introduce basic concepts of ethics and safety that are essential for the Biotechnology field.
2. To understand the procedures involved in the protection of Intellectual property in the biotech sector.
3. To give an insight into different treaties signed.
4. To gain knowledge about patent filing.
5. To understand different biosafety regulations.
6. To understand Biohazard safety.

COURSE OUTCOME:

CO1 Define the concept of IPR and its classification by WIPO.

CO2 List various types of IPRs and their implications in the biotech sector.

CO3 Define bioethics & biosafety in the biotech regime.

CO4 Classify the levels of containment and biosafety & rDNA guidelines.

CO5 Describe the biosafety regulations and regulatory bodies in biotechnology.

CO6 Importance of Biohazard disposal and public safety

Module number	Topic	Sub-topics	Mapping with Industryand International Academia	Lecture Hours	Corresponding Lab Assignment
I	**Overview**	Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark and Design Rights, International background of Intellectual Property	***International Academia:*** https://ocw.mit.edu/courses/15-628j-patents-copyrights-and-the-law-of-intellectual-property-spring-2013/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org//sites/default/files/Model_Curriculum/Biotechnology/biotechnology.pdf ***Industry Mapping: NA***	8	There is no corresponding lab
II	**Patents, Trademarks and Licensing**	Patents-Objectives, Rights, Assignments, Defenses in case of In- infringement. Copyright-Objectives, Rights, Transfer of Copyright, work of Employment Infringement, Defenses for infringement. Trademarks-Objectives, Rights, Protection of goodwill, Infringement, Passing off, Defenses. Designs-Objectives, Rights, Assignments, Infringements, Defenses of Design Infringement, Enforcement of Intellectual Property Rights - Civil Remedies, Criminal Remedies, Border Security measures, Practical Aspects of Licensing- Benefits, Determinative factors, important clauses, licensing clauses, FDA	***International Academia:*** https://ocw.mit.edu/courses/15-628j-patents-copyrights-and-the-law-of-intellectual-property-spring-2013/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org//sites/default/files/Model_Curriculum/Biotechnology/biotechnology.pdf ***Industry Mapping: NA***	14	There is no corresponding lab

		approval requirements.			
• III	**IPR Protection**	Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defenses, Patent Protection, Database and Data Protection-Objective, Need for Protection, UK Data Protection Act, 1998, US Safe Harbor Principles, Enforcement. Protection of Semi-conductor Chips-Objectives Justification of protection, Criteria, Subject-matter of Protection, WIPO Treaty, Trips, SCPA. Domain Name Protection-Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, International Perspective	***International Academia:*** https://ocw.mit.edu/courses/15-628j-patents-copyrights-and-the-law-of-intellectual-property-spring-2013/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org//sites/default/files/Model_Curriculum/Biotechnology/biotechnology.pdf ***Industry Mapping: NA***	14	There is no corresponding lab
IV	**IPR and Biotechnology**	Biotechnology and the Law- Objective, Evolution, Basic Structure of Gene Techniques, Applications, Commercial Potential of Biotech Inventions, Rationale for Intellectual Property Protection. Patenting Biotechnology Inventions- Objective, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions. Plant Varieties Protection-Objectives, Justification, International Position, Plant Varieties Protection in India Protection of Geographical Indications Objectives, Justification, International Positions, Multilateral Treaties, National Level, Indian	***International Academia:*** https://ocw.mit.edu/courses/15-628j-patents-copyrights-and-the-law-of-intellectual-property-spring-2013/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org//sites/default/files/Model_Curriculum/Biotechnology/biotechnology.pdf ***Industry Mapping: NA***	12	There is no corresponding lab

		Position			

Subject Name: State-of-art-imaging **Credit: 2+1**

Subject Code: PECBT701 **Lecture Hours: 36**

Relevant Links:

Study Material Coursera NPTEL MITopencourseware

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Microscopy I**	Light optical microscopy, Electron Microscopy (TEM/SEM), Fluorescence microscopy, confocal microscopy, Overview and limitations of traditional imaging methods	**International standard** https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-7-basics-of-mirrors-magnifiers-and-microscopes/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html	**5**	1. LS of Leaf 2. TS of Leaf 3. Fluorescence image of bacteria

2	**Steps of Drug Discovery**	Super-resolution microscopy- The resolution of an optical imaging system, Stimulated emission depletion (STED), Ground state depletion (GSD), Saturated structured illumination microscopy (SSIM). Stochastic optical reconstruction microscopy (STORM), Photoactivatable probes photo activated localization microscopy (PALM) and fluorescence photo-activation localization microscopy (FPALM),	**International standard** https://ocw.mit.edu/courses/15-136j-principles-and-practice-of-drug-development-fall-2013/ ***AICTE prescribed syllabus*** https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-7-basics-of-mirrors-magnifiers-and-microscopes/ ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html	**5**	Image analysis
3	**Microscopy III**	Multi-photon imaging systems, Real time imaging, computerized tomography (CT) imaging, Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), Functional MRI (fMRI)	**International standard** https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-7-basics-of-mirrors-magnifiers-and-microscopes/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html	**8**	Not Applicable
4	**Microscopy IV**	Live cell imaging via PALM/STORM, Tissue imaging through mass spectroscopy, Machine learning and its application in microscopic image analysis	***International Standards:*** https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-7-basics-of-mirrors-magnifiers-and-microscopes/ ***AICTE prescribed syllabus*** ***https://www.aicte-***	**6**	Not Applicable

			india.org/flipbook/p&ap/biotechnology/ ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html		

Subject Name:	**Food and Nutrition Technology**	**Credit: 4**
Subject Code:	**PCCBT701**	**Lecture Hours: 48**

Pre-requisite: Biochemistry and Microbiology

Relevant Links:

https://uemeduin-my.sharepoint.com/:b:/g/personal/sonali_paul_uem_edu_in/EYSxsiL3fZBOu3p0ehxXNm4BsEJgl_nUXT9LBzlKvvWyQw?e=rKZsM2

https://nptel.ac.in/courses/103107088

https://www.linkedin.com/learning/package-design-project-paperboard-food-packaging?trk=learning-serp_learning-search-card_search-card&upsellOrderOrigin=sem-ga_campid.9764329640_asid.102279866120_crid.428931010987_kw.linkedin%2Blearning_d.c_tid.kwd-310582843911_n.g_mt.e_geo.9298520

https://www.coursera.org/learn/food-beverage-management

Course Objective:

1. To understand the basic of food preservation
2. To understand the basic of food processing

Course Outcomes

CO1	To define the idea of food spoilage
CO2	To describe the new and improved food preservation techniques
CO3	To illustrate the production of single cell protein
CO4	To analyse the principles and applications of genetically modified crops
CO5	To evaluate the role of enzymes in food production
CO6	To design the methodologies to analyse food adulterants

Module Number	Topic	Sub Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Preservation Technology	Spoilage of food – Food poisoning – Microbiology of water, milk, meat, vegetables –Preservation of food by canning, dehydration, irradiation, sterilization etc. Role of lactic acid in preservation in sauerkraut.	International academia: https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf Industry mapping: https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0130-8	12	1.
2	Food Production Technology	Fermented and semi-fermented food – Production of single cell protein – Yeast, mushroom – SCP for cattle feed. Genetically modified crop, safety aspects of genetically modified crops	International academia: https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf Industry mapping: https://www.fda.gov/food/ag	12	

			ricultural-biotechnology/gmo-crops-animal-food-and-beyond		
3	Technology for Improved Process	Enzymes in bakery and cereal products, Enzymes in fruit juice production, Enzymes in fat /oil production. Enzymes in cheese making and beverage production, Utilization of food waste.	International academia: https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf https://www.ift.org/policy-and-advocacy/advocacy-toolkits/food-processing	12	1.
4	Analysis of major food ingredients	Analysis of preservative, natural and synthetic-Food colour – Food flavour enhancing agents. Chemical safety measurement – Heavy metal, fungal toxins, bacterial toxins, herbicide, Pesticide. detection, Quality control tests explained in brief.	International academia: https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf Industry mapping: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9818512/	12	1.

Text Books/References:

1. Potter,Norman.M.FoodScience,5thEd.SpringerUS
2. Manay,S.;ShadaksharaSwamy,M.,(2004).Foods:FactsandPrinciples,4thEd. New AgePublishers.
3. B.Srilakshmi.,(2002)FoodScience,NewAgePublishers.
4. Meyer,(2004).FoodChemistry.NewAge
5. DemanJM.(1990)PrinciplesofFoodChemistry.2ndEd.VanNostrandReinhold,NY
6. RamaswamyHandMarcottM.FoodProcessingPrinciplesandApplications.CRCPress

Subject Name: Nano-Biotechnology **Credit: 2**

Subject Code: PECBT702 **Lecture Hours: 36**

Study Material Coursera NPTEL MITopencourseware

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Basics of Quantum Mechanics and Atomic Structure**	Duality of light, de Broglie waves, electrons in potential well, structure of hydrogen atom, classic atomic bonding, LCAO theory, band theory, energy bands for metals, semi-conductors	**International standard** https://www.coursera.org/learn/nanotechnology ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**4**	Not Applicable
2	**Surface Science of Nanomate**	crystal structure, close packed structures – FCC, HCP and BCC, surface structure for close-packed surfaces, surface reconfiguration (surface relaxation &	**International standard https://www.coursera.org/learn/nanotechnology** ***AICTE prescribed syllabus***	**5**	Not Applicable

		surface reconstruction) adsorption, wetting, surface area in nanomaterials.	https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-7-basics-of-mirrors-magnifiers-and-microscopes/ ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html		
3	**Introduction to Nanostructure**	Carbon nanotubes (CNT), fullerene ('C60'), quantum dots and semiconductor nanoparticles, metal-based nanostructures, nanowires, polymer-based nanostructures, gold nanostructures	**International standard** https://www.coursera.org/learn/nanotechnology ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html	**8**	Not Applicable
4	**Nanomaterial Characterization**	X-ray diffraction, electron microscopy, interaction between electron beam and solids, TEM, SEM, SPM (STM & AFM), AES, XPS, SIMS	***International Standards:*** https://www.coursera.org/learn/nanotechnology ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**6**	Not Applicable
5	**Nano biomaterials**	Biomimetic nanotechnology, protein-based nanostructures, Nano motors, bacterial (E. coli) and mammalian (Myosin family), DNA nanotechnology, nanostructures in cells study, microarray platforms, Nano printing	***International Standards:*** https://www.coursera.org/learn/nanotechnology ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnolog***	**2**	Not Applicable

		of DNA, RNA, and proteins biochips applications in nano scale detection, lab-on-a-chip devices (LOC), tissue engineering	***y/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html		
6	**Nanotechnology in Biomedical Appl**	micro- and Nano electromechanical devices in drug delivery, other applications in drug delivery, photodynamic therapy in targeted drug administration, Nano biosensors, applications of quantum dots in biotechnology, DNA based nanomaterials as biosensors	***International Standards:*** https://www.coursera.org/learn/nanotechnology ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**2**	Not Applicable
7	**Health and Environmental Impacts of Nanotechnology**	Engineered nanomaterial of relevance to human health, routes of entry into the body, toxic effects on health, plants and microbes are nanofactories	***International Standards:*** https://www.coursera.org/learn/nanotechnology ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**2**	Not Applicable

Subject Name: **Bioterrorism and National security** **Credit: 3**

Subject Code: **OECBT702** **Lecture Hours: 24**

Prerequisite: Basic Knowledge of chemistry, biochemistry, genetics, cell and molecular biology,

Relevant Links:

Study material:

https://uemeduin-my.sharepoint.com/:w:/g/personal/pratik_talukder_uem_edu_in/EfFNf-9Q5xtLnXd7K7Jql28BoT9_tGczLXOvZ42vXzP15A?e=eJcP75

https://www.coursera.org/learn/terrorism

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1200679/

https://onlinecourses.swayam2.ac.in/nou23_bt02/preview

https://www.linkedin.com/pulse/bio-terrorism-imperialism-hemorrhagic-fever-ebola-virus-olawunmi-/

https://www.linkedin.com/pulse/terrorists-chemical-biological-radiological-nuclear-endro-sunarso/

Course Objective

1. To make students aware about role of biology in production of bioweapons and bioterrorism
2. Also students will learn about the vast scope of the subject and will acquaint with applications of it.

Course Outcomes

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

1 To be able to define the concept of terrorism.

2 To be able to understand the concept of bioterrorism.

3 To be able to apply the knowledge on the significance of microbes and immune system.

4 To be able to analyse the role of bi- weapons and techniques used in bioterrorism.

5 To be able to evaluate the role of different preventive methods and techniques for terrorism prevention

6 To be able to design the concept and method of bioterrorism management.

Module Number	Topic	Sub Topics	Mapping with Industry and International Academia	Lecture Hours
1	**Terrorism and Bioterrorism**	Definition-Traditional Terrorists-New Terrorists-Nuclear, chemical, and radiological weapons-The psychology of Bioterrorism-Historical perspective.	***International academia***: **https://www.coursera.org/learn/terrorism** ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/***	6

			Industry Mapping: **https://www.linkedin.com/pulse/bio-terrorism-imperialism-hemorrhagic-fever-ebola-virus-olawunmi-/**	
2	**Microbes and Immune System**	Primary classes of Microbes-bacteria, virus, and other Agents-Immune system- Interaction between microbes and the immune system.	***International academia***: ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: **https://www.linkedin.com/pulse/bio-terrorism-imperialism-hemorrhagic-fever-ebola-virus-olawunmi-/**	6
3	**Bioterrorism Weapons and Techniques**	Characteristics of microbes and the reasons for their Use-Symptoms-Pathogenicity-Epidemiology-natural and targeted release-The biological, techniques of dispersal, and case studies	***International academia***: **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1200679/**	6

		of Anthrax, Plague-Botulism, Smallpox, and Tularemia and VHF.	***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: **https://www.linkedin.com/pulse/terrorists-chemical-biological-radiological-nuclear-endro-sunarso/**	
4	**Prevention and Control of Bioterrorism**	Surveillance and detection- Detection equipment and sensors – Diagnosis-Treatment-Vaccinations-Supplies-Effectiveness-Liability-Public Resistance-Response-First Responders-Infectious Control-Hospital-Prevention- Protection-Decontamination-Notification-Role of Law Enforcement-Economic impact.	***International academia***: **https://onlinecourses.swayam2.ac.in/nou23_bt02/preview** ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry mapping***: **https://www.linkedin.com/pulse/terrorists-chemical-biological-radiological-nuclear-endro-sunarso/**	6

5.	**Bioterrorism Management Ethical issues**	Personal, national, the need to inform the public without creating fear, cost-benefit Rations-Information Management-Government control and industry Support-Microbial forensics.	***International academia***: **https://onlinecourses.swayam2.ac.in/nou23_bt02/preview** ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry mapping***: **https://www.linkedin.com/pulse/terrorists-chemical-biological-radiological-nuclear-endro-sunarso/**	

Text Books:

1. The Demon in the Freezer: A True Story, Preston, Richard, Fawcett Books, 2003.
2. The Anthrax Letters: A Medical Detective Story, Cole, Leonard A., Joseph Henry Press, 2003.

Reference Book:

Biotechnology research in an age of terrorism: confronting the dual use dilemma, National Academies of Science, 2003.

Submitted by