No.	Information of the subject	
1.	Unit name:	Environmental Biotechnology
2.	Code:	BioT 41023
3.	Classification:	Core subject
4.	Credit value:	3.5
5.	Semester/Year Offered:	1/4
6.	Pre-requisite:	BioT 21021&BioT 22021 BioT 31022&BioT 32022
7.	Mode of delivery:	Presentations, Lectures, Discussions
8.	Assessment system and breakdown of marks:	Assignments, Classwork, Tutorials
	Assignments and Tutorials	30%
	Mid-term exam	35%
	Final exam	35%
9.	Academic staff teaching unit:	Department of Biotechnology
10.	Course outcome of unit: After completion of this course, students will be able to 1. To provide precise and up to date information on the fundamental aspects of Environmental Science 2. To identify and analyse Environmental problems using basic principles of environmental sciences 3. To select and apply appropriate engineering interventions to reduce environmental stresses 4. To solve the environmental impacts using waste minimization and cleaner technology options	
11.	Synopsis of unit: Environment is a complex mixture of many variables including all the physical and biological surroundings and their interactions. Each organism is affected by environmental problems like depletion of ozone layer, global warming, overpopulation, depletion of natural resources, loss of biodiversity, etc. Current environmental problems make us vulnerable to disasters and tragedies, now and in the future. The endangered status of environmental health could be changed only through the understanding of interactions among various living organisms and physical, and chemical phenomena. Environmental biotechnology is concerned with the application of biotechnology as an emerging technology in the context of agriculture, resource conservation, environmental protection, monitoring of contaminated environment, and waste management. It can be considered as a driving force for integrated environmental protection leading to sustainable development. Sustainable development defines progress in human well-being that can be extended or prolonged over many generations rather than just a few years. It requires a framework for integrating environmental policies and development strategies	

	in a global context. Environmental biotechnology may revamp the possibilities for the prevention of pollution, treatments of solid waste and wastewater, manufacturing with less pollution or less raw materials, ensuring the health of the environment through biomonitoring, and genetic engineering. Since environmental biotechnology has a large potential to contribute to the prevention, detection, and remediation of environmental pollution and degradation of waste, it is a sustainable way to develop clean processes and products, less harmful, with reduced environmental impact than their forerunners. It's role is important with reference to clean technology options in the industrial, agroforestry, food, raw material, and mineral sectors.
12.	Topics 1.Components and Subcomponents of Environment 2.Science of Environment 3.Engineering Interventions to Reduce Environmental Stress 4. Waste Minimization and Clean Technology
13.	Main reference: • K. Saravanan, S. Ramachandran, R. Baskar, "Principles of Environmental Science and Technology", 2005, New age international publishers
14.	Additional references: • Gareth M. Evans, Judith C. Furlong, "Environmental Biotechnology- Theory and Applicatiion", 2003, John Wiley &Sons, Ltd • Milton Wainwright, "An Introduction to Environmental Biotechnology", 1999, Kluwer Agademic publishers • Dr. Michael R. Templeton;Prof. David Butler, "Introduction to Wastewater treatment", 2011, bookboon The eBook company.

No.	Information of the subject	
1.	Unit name:	Industrial Biotechnology
2.	Code:	BioT 41024
3.	Classification:	General
4.	Credit value:	3.5
5.	Semester/Year Offered:	1/4
6.	Pre-requisite:	BioT 41024&BioT 42024
7.	Mode of delivery:	Presentations, Lectures
8.	Assessment system and breakdown of marks:	Practical, Classwork
	Practical	15%
	Active participation in Classwork and discussion	15%
	Mid-term exam	35%
	Final exam	35%
9.	Academic staff teaching unit:	Department of Biotechnology
10.	Course outcome of unit: After completion of this course, students will be able to 1. understand the basic knowledge of industrial biotechnology 2. know about the sorts of nutrients in fermentation media 3. understand the microbial growth kinetic in fermentation system 4. understand the fermentation process and system 5. know about the recovery of the fermentation products	
11.	Synopsis of unit: Industrial biotechnology is the application of biotechnology forindustrial purposes, including manufacturing, alternative energy(or "bioenergy"), and biomaterials. It includes the practice of using cells or componentsof cells like enzymes to generate industrially useful products. Industrial biotechnology is still to mature as an industry and there is no doubt that the efficiency gains that can be made from current applications are only the tip of the iceberg, in terms of emission reductions currently achieved but more significantly in terms of transformational potential.	
12.	Topics 1.Introduction 2.Screening for metabolites 3.Microbial nutrition 4.Substrates for industrial fermentation 5.Methods of fermentation	

	6. Product Recovery 7. Organic feedstock produced by fermentation
13.	Main reference: • WulfCruger and AnnelieseCrueger, Biotechnology: A Textbook of Industrial Biotechnology, Panima Publishing Corporation. (1984)
14.	Additional references: • Presscott, Dunn, Industrial Microbiology, Agrobios (India).2006 • Murrey Moo & Young, Comprehensive Biotechnology, Pergamon.2007 • Ratledge& Kristiansen, Basic Biotechnology, IInd edition,; CambridgeUniversity press. 2004. • WulfCruger and AnnelieseCrueger, Biotechnology: A Textbook of Industrial Microbiology, Panima Publishing Corporation. (2003)

No.	Information of the subject	
1.	Unit name:	Medical Biotechnology
2.	Code:	BioT 41053
3.	Classification:	General subject
4.	Credit value:	3.5
5.	Semester/Year Offered:	1/4
6.	Pre-requisite:	BioT 31052&BioT 31052 BioT 21022&BioT 22022
7.	Mode of delivery:	Presentations, Lectures
8.	Assessment system and breakdown of marks:	MCQs, Fill in the blank, Short Q, Long Q, Classwork
	Active participation in Classwork and discussion	30%
	Mid-term exam	35%
	Final exam	35%
9.	Academic staff teaching unit:	Department of Biotechnology
10.	Course outcome of unit: After completion of this course, students will be able to 1.Recognize and Reproduce medical terms applied in medical Biotechnology 2.Acquire broad knowledge of the principles and concepts of cell molecular biology associated with medical science. 3.Acquire knowledge to pharmaceutical and diagnostic products using the cell and cell materials that help treat and prevent human disease 4.Apply tools and technique used in medical Biotechnology 5.Identify various types of medically important pathogenic microorganism and related diseases and various types of parasitic diseases (life-long learning)	
11.	Synopsis of unit: Medical Biotechnology covers the Pathogenic Microorganism, Classification and Identification of Pathogenic microbes, medically important bacteria, fungi, viruses ,parasites, zoonoses and zoonotic microbes.Knowledge to morphology , physiology, pathology, epidemiology of pathogenic microbes and their infectious diseases. Medical biotechnology is the use of living cells and cell materials to research and diagnostic products that help treat and prevent human diseases.	
12.	Topics 1. Pathogenic Microorganisms 2.Bacterial Pathogens and Related Diseases	

	3. Parasitic Diseases 4.Pathogenic Viruses 5. Fungal Pathogens and Mycoses 6. Zoonosis and Zoonotic Microbes
13.	Main reference: • BioT 04012, Medical Biotechnology I&II
14.	Additional references: • FridosAlam Khan Biotechnology in Medical Science • Text Book of Biotechnology • Chapter 10 Medical Microbiology Editor H.K.Das (4^{th} Edition) • McGill Laboratory Biosafety Manual • Classification of Pathogens(3.1 Conventional Pathogens, 3.2 Unconventional link.com >Microbiology> Pathogens.htm

No.	Course Information	
1.	Unit name:	Plant Biotechnology
2.	Code:	BioT 41062
3.	Classification:	Core subject
4.	Credit value:	3.5
5.	Semester/Year Offered:	1/4
6.	Pre-requisite:	BioT 21061& BioT 22061
7.	Mode of delivery:	Presentations, Lectures
8.	Assessment system and breakdown of marks:	Practical
	Tutorial	20%
	Mid-term exam	40%
	Final exam	40%
9.	Academic staff teaching unit:	Department of Biotechnology
10.	Course outcome of unit: After completion of this course, students will be able to 1. Understand the basic knowledge of plant biotechnology 2. Examine the relationship between science and biotechnology 3. to select the nutrition and media used in plant tissue culture 4. to define the tissue culture and plant tissue culture 5. to know about the protoplast culture 6. to understand the transgenic plants 7. to apply the plant tissue culture	
11.	Synopsis of unit: The plant biotechnology is the application of biotechnology for rapid multiplication, to mass production, (true-to-type) plant of uniform, for genetic improvement, to shorten the bearing maturity period. In grow-out culture system, plant sample and media preparation are very important. Plant biotechnology is used to produce the commercial products to the plant breeder.	
12.	Topics 1. Requirements for tissue culture facility 2. Nutrition, Media and Characteristics of Plant Cell and tissue cultures 3. Production of Isogenenic lines; Basic technical Aspects of Andogenesis	
13.	Main reference: • Plant Biotechnology; **Gamborg. O. L,** Nutrition, media and characteristics of plant cell and tissue culture	
14.	Additional references: • Plant Biotechnology; **Street, H.E.** (ed), In “Plant Tissue and Cell Culture”, Blackwell Scientific Publ., London(1973)	

No.	Information of the subject	
1.	Unit name:	Aquaculture Biotechnology
2.	Code:	BioT 41063
3.	Classification:	Core subject
4.	Credit value:	3.5
5.	Semester/Year Offered:	1/4
6.	Pre-requisite:	NA
7.	Mode of delivery:	Presentations, Lectures
8.	Assessment system and breakdown of marks:	Classwork, Practical
	Practical	30%
	Mid-term exam	35%
	Final exam	35%
9.	Academic staff teaching unit:	Department of Biotechnology
10.	Course outcome of unit: After completion of this course, students will be able to 1. Identify the role of aquaculture biotechnology in society 2. Identify seawater and freshwater animals and plants 3. Examine the relationship between science and biotechnology 4. Apply scientific knowledge of aquaculture biotechnology 5. Apply scientific knowledge of aquaculture biotechnology to industry	
11.	Synopsis of unit: The giant freshwater prawn, Macrobrachium rosenbergii is commercially important for its value as a food source. They are distributed throughout the tropical and subtropical zones of the world. The black tiger shrimp, Penaeus monodon is distributed throughout the Myanmar waters from Maung Daw township in the North (Rakhine state) to Kawthaung in the South (Thaninthayi division). The success of shrimp or prawn hatchery depends on: the choice of a suitable site; the choice of a right species; the effectiveness of a hatchery design; the efficiency of the hatchery design; Hatchery technology and experience of hatchery technicians and efficiency of operational management. In growout culture system, pond construction and pond preparation are very important. The production yield in pond culture can be increased by applying modern farming technologies, namely, intensification of culture operation through regularization of pond size, increase stocking density, employment of aeration, application of formulated pellet feeds, etc. Some economically important freshwater finfishes are grass carp, silver carp, bighead carp, common carp, catla, Rohu and mrigal. Some economically important	

	seawater finfishes are grouper and seabass (the giant perch).
12.	Topics 1. Freshwater prawn 2. Seawater shrimp 3. Hatchery operation and post larval technology 4.Growout culture system 5. Economically important some freshwater and seawater finfishes
13.	Main reference: • Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms; John E. Bardach, John H. Ryther, and William O. McLarney
14.	Additional references: • Aquaculture Biotechnology: Garth.L.Fletcher and Matthew. L. Rise., Wiley-Blackwell

No.	Information of the subject	
1.	Unit name:	Animal Biotechnology
2.	Code:	BioT 41064
3.	Classification:	General
4.	Credit value:	3.5
5.	Semester/Year Offered:	1/4
6.	Pre-requisite:	-
7.	Mode of delivery:	Presentations, Lectures
8.	Assessment system and breakdown of marks:	Practical,
	Practical	15%
	Active participation in Classwork and discussion	15%
	Mid-term exam	35%
	Final exam	35%
9.	Academic staff teaching unit:	Department of Biotechnology
10.	Course outcome of unit: After completion of this course, students will be able to 1. understand the basic knowledge of animal biotechnology 2. know about the selection of production of milk and beef 3. understand the reproductive structure of animal 4. understand the influence of the nutrient, the hormone on the body structure and the reproduction rates 5. know about the artificial insemination	
11.	Synopsis of unit: Animal biotechnology is the application of biotechnology for improvement of milk and beef production purposes, including selection of female and male. It includes the semen handling, semen storage and manipulation of insemination tools to produce useful products. Animal biotechnology is used to produce the commercial products in the diary industry. Animal biotechnology produce not only improve genetic but also cost effective. It produce milk products and many beef products.	
12.	Topics 1. Introduction 2. Keeping and breeding of farm animals 3. Reproduction and breeding 4. Artificial Insemination	

13.	Main reference: • Animal Biotechnology, M.M. Ranga, P.G Department of Zoology Government College, Ajmer Agrobios(India)
14.	Additional references: • www.selectsires.com