2021-2022

Programme Code	Programme name	Year of Introduction	Status of implementation of CBCS/Elective Course System (ECS)	Year of implementation of CBCS/ECS	Year of revision (ifany)	If revision has been carried out in the syllabus duringthelast 5 years, Percentage of	Link to the relevant documents
			CBCS: Yes/No ECS:Yes/No	CBCS: ECS:	CBCS: ECS:	CBCS: ECS:	CBCS: ECS:
269	Animal Biotechn	2009	CBCS: Yes	2009	2021-2022	15%	Enclosed

DEPARTMENT OF ZOOLOGY

S.V.U. COLLEGE OF SCIENCES

SRI VENKATESWARA UNIVERSITY :TIRUPATI

RESTRUCTURED CURRICULUM FOR

M.Sc. ANIMAL BIOTECHNOLOGY PROGRAMME

TO BE IMPLEMENTED WITH EFFECT FROM THE ACADEMIC YEAR

2021-2022

SYLLABUS

Amended as per NEP-2020

December-2021

Animal Biotechnology:

Vision

1. Provide a sound knowledge in development of biological therapeutic agents through stem cells, recombinant technology and monoclonal antibody production etc.,
2. Provide inexpensive educational services to the weaker sections of society
3. Inculcate respect for nature and concern for ethical values among students through good and scientific educational practices.
4. Recognizing the essential roles of science and biology in the lives of citizens today and tomorrow, we emphasize biological literacy in our teaching and outreach programs.

Mission

1. To promote knowledge about the Animal biotechnology including cell culture, gene transfer technology, use of stem cell in therapies and guidelines to conduct experiment on animals.
2. To impart to the students the contemporary advancements in life sciences.
3. To impart a global perspective and such skills among students that benefit humanity.
4. To develop research aptitude and a scientific advancement.
5. Reinvent ourselves in response to the changing demands of society with high moral values as a good citizen

Choice Based Credit System (CBCS):

The Choice Based Credit System (CBCS) provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it has been found necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions to begin with. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on students' performance in examinations, the UGC has formulated the guidelines to be followed.

Students of this course would be expected to:

1. Be able to play leading role in industry, research and the public services;
2. Understand and appreciate major public concerns and issues associated with Animal Biotechnology;
3. Have an understanding and grasp of international research environment where the frontiers of knowledge in Animal Biotechnology are under research;
4. Be able to adapt and respond positively and flexibly to changing circumstances;
5. Develop the professional skills and personal attributes to deal with complex issues, both systematically and creatively;
6. Have the capacity for individual work and teamwork;
7. Be lifelong learners with intellectual and practical skills.

Animal Biotechnology Course Objectives:

The courseis havingthe following objectives:

1. To create awareness on advanced streams like Stem Cell Biology, Animal Cell Culture, Genomics and Proteomics, Drug Design, Genetic Engineering and Bioinformatics.
2. To expose students to updated curricula and to recent advances in the subject and enable the students to face NET, SET and other competitive examinations successfully.
3. To provide hands on experience related to Animal Cell Culture, Molecular Techniques, Drug Design and Instruments handling so that the students can become familiar with practical works which would help to get bright future in the field of Pharmaceuticals and Biotechnology industries.
4. To prepare students to attract and develop interest in Drug Design, Cancer Biology, Animal breeding techniques, Fermentation technology and Downstream process so that the students can select Animal Biotechnology as their career.
5. The BOS in Animal Biotechnology expects that this new framework of curriculum caters the need of enabling students of subject to accept new challenges of dynamically changing modern era.

Program Educational Objectives:

1. Exposure of students to Animal Biotechnology and to provide them systematic tools of traditional and modern types to acquire this knowledge and skill.
2. To update the syllabus essential for appearing in NET, SET, GATE, ASRB and other competitive exams of UPSC and APPSC.
3. To make aware the students to know the natural resources of country, to utilize by sustainable methods and conservation of living resources.
4. To develop trained and knowledgeable human resource for educational and research institutions and industries; to use this human resource for self reliant India.
5. To develop self-employable ability and to apply knowledge for pharmaceutical and Biotechnology industries; it will also provide employment to other dependents.

The M.Sc. degree in Animal Biotechnology being offered by this University provides its students with a course of study that integrates a range of learning and teaching techniques relevant to their educational development and career ambitions. This Masters programme covers the latest developments in Animal Biotechnology and Drug Design. It provides theoretical knowledge as well as training in the practical and intellectual skills to enable students to better understand and then solve some of the problems in this subject. Graduates in this programme will be induced into critical thinking, and would be able to solve complex problems in Animal Biotechnology. The students would also be inculcated with personal and problem-solving skills that will enhance their employability prospects. Enhanced competence of students has been the key concern in designing and developing this syllabus. Careful thought has gone into selection of topics and setting their scope. Major areas of Animal Biotechnology like Molecular Biology, Animal Cell culture & Stem Cell Biology, Toxicology, Animal Reproduction, Breeding and Transgenic Technology, Genetic Engineering, Animal Biotechnology and Industrial Applications and Cancer Biology have been included in the syllabus only after multiple rounds of thorough discussions and intensive study. Special attention has been paid to subjects like Bioinformatics, Molecular Biology and Genetics to incorporate the latest developments in these fields.

Semester - I

S.No	Components of Study	Title of the Course	Status of Paper	Title of the Paper	Credit Hrs / Week	Number of Credits	IA Marks	Semester End Marks	Total
1	Core*	ABT-101	Mandatory	Metabolic Regulation & Cell Function (MRCF)	6	4	20	80	100
2		ABT-102	Mandatory	Tools & Techniques (TT)	6	4	20	80	100
3	Compulsory Foundation	ABT-103A	Optional - 1	Microbiology and Diseases	6	4	20	80	100
		ABT-103B		Environmental Biology					
4	Elective Foundation	ABT-104A	Optional - 1	Environmental Biotechnology	6	4	20	80	100
		ABT-104B		Human Health and Infectious Diseases					
5	Practical - I	ABT-105P	Paper 1 & 3	Lab-1	6	4		100	100
6	Practical - II	ABT-106P	Paper 2 & 4	Lab-2	6	4		100	100
	Total				36	24	80	520	600
7	Audit Course-I				0	0	100	0	0

***All CORE Papers are Mandatory**

- **Compulsory Foundation - Choose one paper**
- **Elective Foundation - Choose one paper**
- **Audit Course – 100 marks (Internal) – Zero Credits under self study**
- **Interested students may register for MOOC with the approval of the concerned DDC but it will be considered for the award of the grade as open elective only giving extra credits**.

Semester - II

S.No	Components of Study	Title of the Course	Status of Paper	Title of the Paper	Credit Hrs / Week	Number of Credits	IA Marks	Semester End Marks	Total
1	Core*	ABT-201	Mandatory	Molecular Biology (MB)	6	4	20	80	100
2		ABT-202	Mandatory	Animal Cell culture & Stem Cell Biology (ACC-SCB)	6	4	20	80	100
3	Compulsory Foundation	ABT-203A	Optional - 1	Cell Biology & Immunology (CB&IM)	6	4	20	80	100
		ABT-203B		Animal Biotechnology					
4	Elective Foundation	ABT-204A	Optional - 1	Toxicology	6	4	20	80	100
		ABT-204B		Endocrinology					
5	Practical - I	ABT-205P	Paper 1 & 3	Lab-1	6	4		100	100
6	Practical - II	ABT-206P	Paper 2 & 4	Lab-2	6	4		100	100
	Total				36	24	80	520	600
7	Audit Course-II				0	0	100	0	0

***All CORE Papers are Mandatory**

- **Compulsory Foundation - Choose one paper**
- **Elective Foundation - Choose one paper**
- **Audit Course – 100 marks (internal) – Zero Credits under self study**
- **Interested students may register for MOOC with the approval of the concerned DDC but it will be considered for the award of the grade as open elective only giving extra credits.**

Semester - III

S.N	Component	Title	Status of	Title of the	Credi	Numbe	IA	Semeste	Tota

o	s of Study	of the Cours e	Paper	Paper	t Hrs / Week	r of Credits	Mark s	r End Marks	l
1	Core*	ABT-301	Mandator y	Enzymology (ENZ)	6	4	20	80	100
2		ABT-302	Mandator y	Animal Reproduction , Breeding & Transgenic Technology (ARBTT)	6	4	20	80	100
3	Generic Elective	ABT-303A	Optional - 1	Bioinformatics & Biostatistics	6	4	20	80	100
		ABT-303B		Genetic Engineerin g (GE)					
4	Practical - I	ABT-304P	Core & Generic Electives	Lab-I	6	4		100	100
5	Skill Oriented Course	ABT-305	Mandator y (Theory + Practical)	Bio resource Technology (Apiculture, Sericulture, Aquaculture, Vermiculture)	6 (3+3)	4	10	90 (40 + 50)	100
6	Open Elective	ABT-306A	Optional - 1	Animal Biotechnolog y & Industrial Applications	6	4	20	80	100
		ABT-306B		Cancer Biology					
	Total				36	24	90	510	600

***All CORE Papers are Mandatory**

- **Generic Elective - Choose two**
- **Core papers and Generic electives opted paper held Practical-I**
- **Skill Oriented Course is Mandatory. Relevant to Society along with practical (10 marks Internal, 40 final theory & 50 for practical's)**
- **Open Electives are for the Students of other Departments. Minimum One paper should be opted. Extra credits may be earned by opting for more number of open electives depending on the interest of the student through self study.**
- **Interested students may register for MOOC with the approval of the concerned DDC.**

Semester - IV

S.N	Componen	Title	Status of	Title of the Paper	Credi	Numbe	IA	Semest	Tota

o	ts of Study	of the Course	Paper		t Hrs / Week	r of Credits	Marks	er End Marks	l
1	Core*	ABT-401	Mandatory	Medical Biotechnology (MBT)	6	4	20	80	100
2		ABT-402	Mandatory	Fermentation Technology and Downstreaming Process(FTDSP)	6	4	20	80	100
3	Generic Elective	ABT-403A	Optional-1	Drug design and Development	6	4	20	80	100
		ABT-403B		Biosafety, Bio Ethics & Intellectual Property rights					
4	Practical - II (Project)	ABT-404	Mandatory	Project (Dissertation preparation & Submission)	6	4		100	100
5	Project Work	ABT-405	Mandatory	Viva-Voce	6	4	10	100	100
6	Open Elective	ABT-406A	Optional-1	Advanced Genomics and Proteomics	6	4	20	80	100
		ABT-406B		Animal Cell Culture Techniques					
	Total				36	24	120	480	600

***All CORE Papers are Mandatory**

- **Generic Elective - Choose two**
- **Core papers and Generic elective opted paper held Practical-II**
- **Project Work – Collaboration with various firms/companies/societies.**
- **Multi-disciplinary course is Mandatory. Circle formation with other subjects/Dept. of Arts/Commerce**
- **Open Electives are for the Students of other Departments. Minimum One paper should be opted. Extra credits may be earned by opting for more number of open electives depending on the interest of the student through self study.**
- **Interested students may register for MOOC with the approval of the concerned DDC.**

CORE ABT-101:METABOLICREGULATIONAND CELLFUNCTION

Course Objectives:

1. To gain knowledge on chemicals bonds, thermodynamics principles and metabolisms of Glycolysis, TCA Cycle and their biomedical importance.
2. To understand metabolic discords of urea cycle and importance of proteins structure and functions.
3. To learn biosynthesis of purine and pyrimidine nucleotide and Clinical disorders of purine and pyrimidine metabolism
4. To become proficient in Biomedical importance of lipids and over view metabolism of carbohydrate, protein and lipids

UNIT-1.

1.1 Chemical Bonds (Covalent, Ionic and Hydrogen Bonds) and Thermodynamic principles in Biology (Enthalpy, Entropy, Free energy, First law and Second law of thermo-dynamics in relation to Biological system).

1.2 Carbohydrates: Definition and Classification- Structure and function of important Mono, Oligo and Polysaccharides.

1.3 Intermediary Metabolism-I: Glycolysis, TCA Cycle and their Bio-medical importance.

1.4 Intermediary Metabolism-II: Gluconeogenesis, HMP Shunt, Metabolism of Galactose andFructose and their Bio-medical importance.

UNIT-2.

2.1 Proteins: Definition and Classification- Structure (Primary, Secondary and Tertiary structures, Protein folding and denaturation) and function of important Proteins- Haemoglobin, Myosin and Actin.

2.2 Bio-synthesis of nutritionally non-essential amino acids and their Bio-medical importance.

2.3 Catabolism of Proteins and Amino acids-I: Biosynthesis of Urea- Detoxification ofAmmonia-Metabolic disorders of Urea cycle.

2.4 Catabolism of Proteins and Amino acids-II: Phenylalanine, Tryptophan, Biosynthesis and degradation of Polyamines and their Bio-medical importance.

UNIT-3.

3.1 Chemistry of purines, pyrimidines, Nucleosides, Nucleotides, Synthetic derivatives.

3.2 Biosynthesis of purine nucleotides, Catabolism of purines.

3.3 Biosynthesis of pyrimidine nucleotides, Catabolism of Pyrimidines,

3.4 Clinical disorders of purine and pyrimidine metabolism; Hyperurecemia or gout; Hypo-urocemia, Oroticaciduria.

UNIT-4.

4.1 Biomedical importance, Classification of lipids; Saturated and unsaturated fatty acids; Triacylglycerols (tri-glycerides), Phospholipids, Glycolipids, Steroids, Lipid peroxidation.

4.2β- oxidation of fatty acids, Oxidation of unsaturated fatty acids, Ketogenesis.

4.3 Biosynthesis of long chain fatty acids (Palmitic acid), Clinical aspects.

4.4 Overview of Metabolism(Carbohydrate, Protein and Lipid): Integrated metabolism at tissue and organ level(Kidney, Liver, Muscle, Adipose tissue and Small intestine);Metabolic interrelationships among Adipose tissue, Liver and Extra hepatic tissues

Course Output:

1. Thermodynamics principles and metabolisms of Glycolysis, TCA Cycle and their biomedical importance can be leant
2. Students can understand metabolic discords of urea cycle and importance of proteins structure and functions
3. Biosynthesis of purine and pyrimidine nucleotide and Clinical disorders of purine and pyrimidine metabolism; Biomedical importance of lipids and over view metabolism of carbohydrate, protein and lipids can be understood

SUGGESTEDREADINGMATERIAL:

1. D.Voet andJ.G Voet,Biochemistry, 1. Wiley&Sons.
2. DavidL.NelsonandMichaelM.Cox,Lehninger;PrinciplesofBiochemistry,McMillanLan geMedical
3. RobertK.Murrey,D.K.Granner,P.A.MayesandV.W.Rodwell;Harper'sBiochemistry,W orth Publishers.

CORE ABT-102:TOOLS&TECHNIQUES

Course Objectives:

1. To acquire skills in chromatography, centrifugation, electrophoresis and blotting techniques
2. To get knowledge on cell and tissue culture, cell types, culture media and overview of stem cell biology
3. To acquire skill on electrganetic spectrum, type of detectors, electophysiological methods and brain activity recording techniques
4. To learn microscopic techniques, different fixation and staining techniques, tissue processing for microtomy, cryotechiques

UNIT-1.

1.1 Chromatography: Molecular sieve chromatography: Principle, Determination of void volume and molecular mass of native molecules. Ion exchange chromatography: Ion exchange materials – Cation and anion exchange materials. Principle and separation of charged molecules.Principle and application of TLC and HPLC.

1.2 Centrifugation.Techniques-Density gradient, ultra centrifugation.

1.3 Electrophoresis: principle, Matrices used in electrophoresis – PAGE for separation of proteins, molecular mass determination. Separation of nucleic acids using agarosegel- electrophoresis. Pulse field electrophoresis and isoelectric focusing.

1.4 Blotting techniques: western, southern and northern blotting techniques.

UNIT-2.

2.1 Introduction to cell and tissue culture: Preparatory techniques – cleaning, sterilization, sterile handling tissue culture laboratory requirements, Design of tissue culture laboratory: Equipments and purpose.

3.1 Cell types (Primary and secondary) and cell lines, Cell proliferation measurements, Cell viability testing: Dye inclusion and dye exclusion tests.

2.2 Culture media: composition, preparation and sterilization, macro and micro nutrients, Importance of serum and limitation with serum media, cell harvesting methods.

2.3 The biology of stem cell: overview; different types of stem cells – embryonic stem cells, fetal tissue stem cells, adult stem cells, stem cell nuclear transfer; somatic cell nuclear transfer, Animal cloning.

UNIT-3.

3.1 Electromagnetic spectrum of light- Simple theories of absorption of light by molecules. Beer-Lambert law.

3.2 Types of detectors: UV-Visible spectrophotometry, Infra-red spectrophotometry, Fluorescent spectroscopy. Flame photometry, AAS.

3.3 Electrophysiological methods: Single neuron recording, patch-clamp recording, ECG

3.4 Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI,CAT.

UNIT-4.

4.1 Microscopictechniques:PrinciplesofmicroscopyScanningandtransmissionmicroscopes.Imageprocessingmethods in microscopy.

4.2 Differentfixationandstainingtechniques forLightmicroscopeandElectronmicroscope.

4.3 MicrotomyandprocessingoftissuesforLightmicroscopeandElectronmicroscope.Cryopreservation and cryotechniques formicroscopy

4.4 Freeze-etchandfreeze-fracturemethodsforEM.

Course Output:

1. Technical skill can be gained on chromatography, centrifugation, and electrophoresis and blotting
2. Cell and tissue culture techniques can be learnt, knowledge on cell types can be gained
3. Skills can be acquired on electrganetic spectrum, type of detectors, electophysiological methods and brain activity recording techniques.
4. Microscopic techniques, different fixation and staining techniques, tissue processing for microtomy, cryotechiques can be understood

SUGGESTEDREADINGMATERIAL:

1. ABiologistsGuide toPrinciplesandTechniquesof PracticalBiochemistry,K.Wilson&K.W. Goulding, ELBSEdn.
2. AnimalCellCulture–Apracticalapproach,Ed.John.R.W.Masters IRLPress.
3. General ZoologicalMicrotechniques -P.M.Weesner.
4. PrinciplesandtechniquesofBiochemistryandmolecularbiologybyKeinWilsonandJohn Walker,VIIvolume, Cambridgepress Edition.
5. NeuroanatomicalTechniques,N.J.StransfedandT.A.MillerSpringerVerlag,NewYorkHeidelberg,Berlin.
6. PrinciplesofNeuroPhychopharmacology-RobertS.Feldman,JerroldS.MeyerandLind F.Quenzer.Sinauer Associates,Inc. Publishers. Sunderland.Massachusetts.

7. Biophysical chemistybyUpadhyay– Upadhyay-Nath.

CF ABT-103A:MICROBIOLOGYANDDISEASES

Course Objectives:

1. To understand microorganisms classification and structure of prokaryotic and eukaryotic micoorganism
2. To get knowledge on Nutritional requirements to microorganisms, growth of microorganism, control of microorganism and microbes of biotechnological importance
3. To become proficient in chemical nature of gene, plasmids incompatibility, horizontal transfer of genome among the microbial community and Benzer's classical studied on II locus
4. To learn diseases caused by micoorganisms

UNIT-1.IntroductiontoMicrobiology

1.1 Discoveringthemicrobialworld.Classificationofmicroorganismsuptoorderlevel-bacteria, algae,fungi, protozoa.

1.2 Structureofprokaryoticandeukaryoticmicroorganisms.Generalanddistinctivecharacteristics of the major groups of microorganism bacteria, mycoplasma, chalmidae,rickettsias,actinomycetes, fungi,algae, protozoa Prions and viruses.

1.3 Isolation, cultivation and enumeration of microorganisms - direct and indirect methods,Maintenanceof culture.

1.4 Outlinesofcharacterizationandidentificationofcommonbacteria,fungi,algaeandprotozoa.

UNIT–2.Microbialnutrition,growthandregulation

2.1 Nutritional requirements to microorganisms - Mode of nutrition - phototrophy, chemotrophy - methylotrophyorganotrophy, mixotrophy, saprophytic, symbiotic and parasitic, Interaction of microbes.

2.2 Growth of microorganism (bacteria) - normal and biphasic growth curve, batch and continuous cultures, chemostats, shift up and shift down. Growth determination, Microbial metabolism - energy yielding and energy requiring processes.

2.3 Control of microorganisms - principles, physical and chemical agents, Assay of antimicrobial action. Batch and continuous sterilization of media and air. Viruses - nature, cultivation and assay methods, structure, physico-chemical properties, classification, pathogenicity, Replication of viruses.

2.4 Microbes of biotechnological importance - examples of bacteria, yeast, algae and viruses.

UNIT-3.

MicrobialGenetics

3.1 Chemicalnatureof gene,Conceptofgene,operon,mosaicgenes/splitgenes.

3.2 Plasmids incompatibility. Classification: copy number, control and its significance.Structureandfunctionsofinsertionelements(IS)-transposableelements.Mechanismoftransposition.Catabolic transposons and theirsignificance.

3.3 Horizontal transfer of genome among the microbial community - transformation,conjugation transduction - generalized transduction, specialized transduction –cotransduction.

3.4 Benzer"sclassicalstudiesonIIlocus.Cistroncomplementation-Elucidationofco-linearity between DNA and protein sequence. Genetics of viruses – bacteriophage,lambda,SV40,retroviralgenome(HIV),replication,lyticandlysogeniccascades.

Unit4.Diseasescausedbymicroorganisms

4.1 Viral diseases: Flu, Dengue fever, Hepatitis,

4.2 Bacterial diseases: Cholera, tuberculosis, anthrax,

4.3 Fungal diseases: Athlets foot, Dutch Elm disease, ergotism

4.4 Protozoadiseases(Protista):Malaria,Sleepingsickness,dysenteryAndPlantPathogens:TMV, Rust

Course Output:

1. Microorganisms classification and structure of prokaryotic and eukaryotic microorganism can be learnt
2. Nutritional requirements to microorganisms, growth of microorganism, control of microorganism and microbes of biotechnological importance can be understood
3. Chemical nature of gene, plasmids incompatibility, horizontal transfer of genome among the microbial community and Benzer's classical studied on II locus can be proficient
4. Diseases caused by microorganisms can be understood

SUGGESTEDREADINGMATERIAL:

1. Microbiology-M.J.Pelczar,E.C.S.Chan,NoelR.Krieg.TataMcGraw-HillEdition.
2. Prescott's Microbiology-Christopher J. Woolverton, Linda Sherwood, Joanne Willey. TataMcGraw-HillEdition.
3. TextbookofMicrobiology- AnanthanarayanandCJPaniker,7th Edition

CF ABT-103B: ENVIRONMENTAL BIOLOGY

Course Objectives:

While studying the **Environmental Biology**, the student shall be able to:

1. The objectives of the course are to develop the ability to solve the problems related to the environment, to make them aware of various eco-friendly techniques and modern techniques to solve various environment-related problems.
2. The objective of this course is to make awareness among the young students about the surrounding environment, the impact of climate change and its mitigation and biodiversity.
3. The aim of the contents of this course is to introduce and explain about various conservation issues of the ecosystem and animals.
4. Man himself is a part of ecosystem. The ecosystems in the world are continuously under the pressure of anthropogenic activities and human mediated ecological changes. Several animal species are under the survival threats. To introduce the students about wildlife and wild habitats, about depleting wild life and human wildlife conflict.
5. Generate an interest in Ethology in order to understand the complexities of both animal and human behavior.
6. To understand the basic theories and Principles of Ecology.
7. To learn about current environmental issues based on Ecological principles.
8. To study Environmental pollution and their management.

UNIT-1.

1.1 A general account on Biomes and their environments.

1.2 Fresh Water: Classification and Characteristics, eutrophication, seasonal changes.

1.3 Marine: Classification and Characteristics.

1.4 Terrestrial: Forests – Grass lands – Tundra – Desert.

UNIT-2.

2.1 Trophic dynamic view of ecosystem and energy flow.

2.2 Ecological Energetics and productivity of ecosystems.

2.3 Impact of environmental factors on Energy flow.

2.4 Bioaccumulation and Biological magnification.

UNIT-3.

3.1 Air Pollution: Criteria and standards in India, health hazards and Toxicology – Green house gases and Green House Effect.

3.2 Water Pollution: Criteria and standards in India, health hazards and toxicology.

3.3 Role of environmental epidemiological studies and health indices in evaluation of environmental health hazards: environmental epidemiological episodes in India and Abroad.

3.4 Environmental Laws; Environmental Laws in India – legislation and Execution.

UNIT-4.

4.1 Biomonitoring

4.2 Bio indicators and environmental monitoring, Environmental impact assessment.

4.3 Bioremediation: Need and scope of bioremediation, Environmental applications of bioremediation. Future outlook of Bioremediation: Phytoremediation, Biotechnological cleaning up of the environment by plants.

4.4 Natural calamities and disaster management.

Course Outcomes:

1. The student will get idea about the ecological process in its surrounding and at National and Global level and the use of student knowledge on Ecology, Behaviour can be applied to Education, Research and Extension programmes in his further career.
2. Students will be understanding the various features and aspects of population ecology, community ecology and ecosystem ecology. They might have the knowledge about environmental biology in details. They will acquire knowledge about various tools and techniques of field ecology.
3. Students will be able to apply the scientific method and quantitative techniques to describe, monitor and understand environmental systems.
4. Students will be able to use interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.
5. Students will be able to be proficient in ecological field methods such as wildlife survey, biodiversity assessment, mathematical modeling and monitoring of ecological systems.
6. Students will be able to use technology, such as geographical information systems and computer programming, to assist in problem solving.
7. This paper will help in creating skilled personnel in the field of environment protection and research.
8. Demonstrated an understanding of Ecological relationships between organisms and their environment.

SUGGESTED READING MATERIAL:

1. Animal Physiology - Adaptation &Environment. 4thEditionKnut Schmidt - Nielsen - Cambridge University Press.
2. Biochemical ecology and water pollution - PR Dugan, plenum press, London, 1972.
3. Biodegradation &Bioremediation - 2nd editon, Martein Alexander - Academic Press, 1999 USA.
4. Chemical and biological methods for water pollution studiesR.K. Trivedy and P.K. Goel, 1984.
5. Current pollution researches in India - RK. Trivedy and P.K. Goel. Karad.
6. Ecology & Environment - P.D. Sharma, 1991.
7. Ecotechnology for pollution control and environmental management, enviromedia, Karad, RK. Trivedi.
8. Encyclopedia of environmental pollution and control, enviromedia, Karad, Vol. 1 &2, R.K Trivedi.
9. Environmental Biology and Toxicology-P.D. Sharma, Rastogi Publications, Meerut (India), 1998.
10. Environmental Physiology of desert organism. Ed.by N.F. Hadley - Dowden Huchinson and Ross, Inc.Penn.USA.
11. Environmental Science Research Volumes: Vol.1. Indicators of environmental quality - W.A. Thomas, 1972. Vol.3. Environmental pollution by pesticides - C.A. Edwards, 1974.
12. Field Biology & Ecology - Allen H Benton & E. Werner, JR, 1980.
13. Health hazards and human environment, World Health Organization (WHO) 1972.
14. Industrial Pollution - VP. Kudesia, 1990.
15. Methods in Environmental Analysis - Water soil and air by P.K. Gupta - Agrobios (India), Jodhpur, 2001
16. Pesticides in the environment - R White Stevenns, MarcelDekker Inc. New York, 1971.
17. Practical methods in Ecology & Environmental Science, RK. Trivedy, Goel, Trisal, 1997.
18. The Ecology of waste water treatment - H.A. Hawkes pergoman press, 1963a. Vol.5 Environmental dynamics of pesticides - R. Hague and V.H. Preed, 1975.
19. Water Treatment and purification technology - W.J. Ryan, Agrobios (India), Jodhpur, 2002.

EF ABT-104A:ENVIRONMENTALBIOTECHNOLOGY

Course Objectives:

1. To gain knowledge on waste and pollutants, hazards from wastes and pollutants and hazards from chemicals in wastes
2. To understand waste treatment, treatment of liquid wastes, treatment of solid waste and contributions of biotechnology to waste treatment
3. To become proficient in aerobic waste water treatment and measurement of pollution levels
4. To learn anaerobic treatment of waste water, biodegradation of xenobiotics compounds, hazards from xenobiotics and bioremediation

UNIT-1.

1.1 Introduction,

1.2 WasteandPollutants:Manufacturing,energyproduction,agricultureanddairy,transport,HouseBuildingand Domesticactivities.

1.3 Hazardsfromwastesandpollutants;biologicalagentspresentinwastes.

1.4 Hazardsfromchemicals inwastes,Hazardsfromphysicalpollutants.

UNIT-2.

2.1 Wastetreatment:Biofilters.

2.2 TreatmentofLiquidwastes

2.3 Treatmentofsolidwaste.

2.4 ContributionsofBiotechnologytowastetreatment.

UNIT-3.

3.1 Aerobicwastewatertreatment

3.2 Measurementsof thelevelof pollution.

3.3 Theprocessofwaste watertreatment.Aerobicreactorsordigesters,Microorganisms.

3.4 Anaerobictreatmentofwastewater:Microorganisms,SludgeTreatment

UNIT-4.

4.1 BiodegradationofXenobioticcompounds:Types ofRecalcitrantXenobioticcompounds.

4.2 HazardsfromXenobiotics,Generalfeaturesof BiodegradationofXenobiotics.

4.3 Biodegradationofhalogenatedcompounds.TheoriginofcapacitytodegradeXenobiotics.

4.4 Bioremediation:MicrobialBioremediation.

Course Output:

1. Knowledge will be gained on waste and pollutants, hazards from wastes and pollutants and hazards from chemicals in wastes
2. Waste treatment, treatment of liquid wastes, treatment of solid waste and contributions of biotechnology to waste treatment can be understood
3. Aerobic waste water treatment and measurement of pollution levels will be proficient
4. Anaerobic treatment of waste water, biodegradation of xenobiotics compounds, hazards from xenobiotics and bioremediation will be learnt

SUGGESTEDREADINGMATERIAL:

1. ATextBook ofBiotechnology, HDKumar (WEPub.)
2. BiodegradationandDetoxificationofEnvironmentalPollutants–Chakrabarthy
3. BiotechnologybyB. D. Singh. Kalyani Publishers, 2007.
4. ConceptsinBiotechnology– Balasubramanian,Bryce,Dharmalingam,GreenandJayaraman.
5. EnvironmentalBiotechnologybyAlanScragg.PearsonEducationLimited,England.
6. Environmentalbiotechnologyby S.N. Jogdand. Himalaya PublishingHouse. Bombay.
7. EnvironmentalchemistrybyA.K.DeWileyEasternLtd. NewDelhi.
8. EnvironmentalMicrobiology–Grant andLong.
9. EnvironmentalMicrobiology–Mitchall.
10. IntroductiontoBiodeteriorationbyD.Allsoppandk.J.Seal,ELBS/EdwardArnold.
11. MicrobialEcology– Fundamentalsand Applications –Atlas andBartha.
12. PrescottandDcenn,S IndustrialMicrobiology– Reed(Ed).

EF ABT-104B: HUMAN HEALTH AND INFECTIOUS DISEASES

Course objectives:

While studying the **Human Health and Infectious Diseases** course, the student shall be able to:

1. To introduce the basic concepts of pathophysiology of infectious diseases
2. To study the major infectious diseases transmission to humans and response of immunity
3. To understand the Pathogenesis, mechanisms of pathogenesis; transmission and epidemiology of various bacterial, viral, fungal and protozoan diseases.
4. To study the Sexually transmitted diseases.
5. To study the prevention and control measures of infectious diseases

Unit-1.

Introduction to Infectious Diseases: Basic concepts in pathophysiology of infectious diseases, Outline of physiological mechanisms leading to diseased state, Infectious disease transmission, Infection and immunity, Acute and Chronic Infections, Major infectious diseases of humans.

Unit-2.

Bacterial Infections: Pathogenesis, mechanisms of pathogenesis; transmission, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major human infections (Tuberculosis, Cholera, Typhoid).

Unit-3.

Viral Diseases: Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and anti-retroviral therapy of Human immunodeficiency virus (HIV/AIDS); Sexually transmitted diseases.

Unit-4.

Fungal and Protozoan Diseases: Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major Fungal human pathogens: (Dermatophytes, Candida, Aspergillus); Protozoal human pathogens (Plasmodia and Trypanosoma).

Course Outcomes:

1. Learn the basic concepts of Infectious diseases and the role of immunity to control infections
2. Provides knowledge on the physiological mechanisms leading to diseased conditions.
3. Students gains knowledge on the pathogenesis and transmission of infectious diseases.

4. This insight allows the students to learn the treatment methods to control the growth and control of microbes.

SUGGESTED READING MATERIAL:

1. A text book of Biotechnology-RC. Dubey.S.Chand& Company Ltd., New Delhi -1996.
2. A text book on Biotechnology-(n Ed.) H.D. Kumar. EWP - Private Ltd., New Delhi -1998.
3. Biotechnology-V.Kumaresan.Saras Publication-1994.
4. Environmental Microbiology, Pepper, I. L., Gerba, C. P. and Gentry, T. J. (2015), 3rd edition, Academia Press, Elsevier
5. Textbook of Environmental Microbiology, Mohapatra, P. K. (2008), I.K. International (P)Ltd.
6. Basic Biotechnology, Ratledge, C. and Kristiansen, B. (2003), 2nd edition, Cambridge University Press
7. Pocket Guide to Bacterial Infections – K. Balamurugan and PrithikaUdayakumar (2019). CRC Press.
8. Infections and Infectious diseases (2001). WHO &International Federation of Red Cross and Red Crescent Societies

ABT 105P : ABT -101 (Core) & ABT -103A or ABT -103B (CF)

ABT 106P : ABT -102 (Core) & ABT -104A or ABT -104B (EF)

AUDIT COURSE

ABT-107:HUMAN VALUESANDPROFESSIONALETHICS–I

Course Objectives:

1. To gain knowledge on nature of ethics its relation to religion. Politics, Business
2. To understand nature of values Good and Bad, end and means, analysis of basic moral concepts, good behavior and respect for elders, character and conduct
3. To become proficient on Bhagavad Githa
4. To learn crime and theories of punishment

I. DefinitionandNatureofEthics-ItsrelationtoReligion,Politics,Business,Law,MedicineandEnvironment.NeedandImportanceofProfessionalEthics-Goals–EthicalValues invariousProfessions.

II. NatureofValues-GoodandBad,EndsandMeans,ActualandpotentialValues,Objective and Subjective Values, Analysis of basic moral concepts- right, ought, duty,obligation, justice, responsibility and freedom, Good behavior and respect for elders,Characterand Conduct.

III. Individualand society:Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya(Non possession) and Aparigraha (Non-stealing).Purusharthas (Cardinal virtues) Dharma (Righteousness), Artha (Wealth), Kama (Fulfillment Bodily Desires), Moksha (Liberation).

IV. BhagavadGita–(a)Niskamakarma.(b)Buddhism–TheFourNobleTruths–Aryaastangamarga,(c)Jainism–mahavratasandanuvratas.ValuesEmbeddedinVariousReligions, Relirious Tolerance, GandhianEthics.

V. Crime and Theories of punishment – (a) Reformative, Retributive and Deterrent. (b)Viewson manu and Yajnavalkya.

Course Output:

1. Knowledge on nature of ethics its relation to religion. Politics, Business will be gained
2. Nature of values Good and Bad, end and means, analysis of basic moral concepts, good behavior and respect for elders, character and conduct can be understood
3. Will be proficient on Bhagavad Githa
4. Crime and theories of punishment can be learnt

SUGGESTEDREADINGMATERIAL:

1. JohnSMackenjie:A manualofethics.
2. “TheEthicsofManagement”byLarueToneHosmer,RichardD.Irwin Inc.
3. “ManagementEthics–integrity atwork”by JosephA.PetrickandJohnF.Quinn,ResponseBooks: New Delhi.
4. “EthicsinManagement”byS.A.Sherlekar,HimalayaPublishingHouse.
5. Harold H. Titus: Ethics forToday
6. Maitra,S.K:HinduEthics
7. WilliamLilly: IntroductiontoEthics
8. Sinha:AManual ofEthics
9. Manu: Manu DharmaSastra ortheInstitute of Manu: Comprisingthe IndianSystemofDuties:Religious and Civil(ed.) G.C. Haughton.
10. SusrutaSamhita:Tr.KavirajKunjanlal,KunjalalBrishagratha,ChowkambaSanskritseries, Vol.I,IIandIII,Varnasi,VolIOO, 16-20, 21-32and 74-77only.
11. CarakaSamhita:Tr.Dr.RamKaranSarmaandVaidyaBhagavanDash,ChowkambhaSanskrit Series office,VaranasiI,II,IIIVolIPP 183-191.
12. Ethics,TheoryandContemporaryIssues,BarbaraMackinnon,Wadsworth/ThomsonLearni ng,2001.

CORE ABT-201:MOLECULARBIOLOGY

Course Objectives:

1. To gain knowledge on DNA structure, genome of Nuclear and mitochondrial and maternal Inheritance
2. To understand replication in prokaryotes, Enzymology of DNA replication, Discontinuous replication and Bidirectional replication
3. To understand synthesis of RNA, Types of RNA, Genetic code and Ribosome structure
4. To learn gene regulation I and II and Operon concepts

UNIT-1.

1.1 Watson and Crick Model: Types of DNA; Properties of DNA(C-value paradox, Cot value)

1.2 Nuclear and mitochondrialgenome, mitochondrialand maternalInheritance

1.3 Structureof gene(Cistron,Muton,Recon,Cis-transtest)

1.4 DNAdamageandrepair:Biologicalindicationofrepair,photoreactivation,Excisionrepair,Recombinationrepair, SOS repair, and Mismatchrepair.

UNIT-2.

2.1 Replication in Prokaryotes: Geometry of DNA replication, semi conservative replication.

2.2 EnzymologyofDNAreplication:DNApolymeraseI,IIandIII;ReplicationofEukaryotic Chromosomes;EukaryoticDNApolymerases;Multiplefork;ReplicationofChromatin.

2.3 .Discontinuous Replication: Fragments in Replication fork anddetection offragments; EventsintheReplication fork; Denovo initiation and covalentextension.

2.4 Bidirectionalreplication, Terminationofreplication.

UNIT-3.

3.1 Synthesis of RNA:- RNA Polymerase, Promoter, Auxiliary Proteins, RNA chain initiation,elongation,termination and Splicingmechanism

3.2 TypesofRNA,ProcessingofmRNA, rRNAandtRNA,Ribozyme.

3.3 Geneticcode,Identificationofstartandstopcodon,UniversalityofgeneticcodeDegeneracy,Wobbles Hypothesis. Codonusage, Geneticcodeof Mitochondria.

3.4 Ribosome structure (Prokaryotic and Eukaryotic), Protein synthesis: Initiation, Elongation and Termination of polypeptide chain, Signal peptide hypothesis, Post translational modification, Polyproteins, Inhibitors of translation.

UNIT-4:

4.1 Temporalresponse,Induction,Repression,LacOperon,GalactoseOperon.

4.2 LambdaOperon, Tryptophan Operon.

4.3 GeneregulationinEukaryotes-I:Genefamilies,Genealteration(Geneloss,Geneamplification, generearrangement), Regulation of synthesis of primary transcripts (geneorganization that affectsregulation-Activatorgene; Transcriptional control by hormones,Methylation).

4.4 GeneregulationinEukaryotes-II:BriefdescriptionoffundamentalsofChromatinremodeling, Enhanceosome, Reporter or Chimeric genes, Role of binding motifs in geneexpression(Helix-Turn-Helixmotif, ZincfingerandLeucine Zipper),miRNA.

Course Output:

1. DNA structure, genome of Nuclear and mitochondrial and maternal Inheritance will be understood
2. Knowledge will be gained on replication in prokaryotes, Enzymology of DNA replication, Discontinuous replication and Bidirectional replication
3. Synthesis of RNA, Types of RNA, Genetic code and Ribosome structure can be understood
4. Gene regulation I and II and Operon concepts can be learnt

SUGGESTEDREADINGMATERIAL:

1. BiochemistrybyA.L.Lehniger
2. CellandMolecularBiology-E.D.P.DeRobertisandE.M.F.
3. ConceptsinMolecularBiology-S.C.Rastogi,VN.SharmaandAnandaTandon(1993)GenesVIIbyBenjaminLewin.
4. Harper'sreview ofBiochemistrybyD.W. Martinet al1990
5. MolecularBiologybyDavid Freifelder, 1993

CORE ABT-202:ANIMALCELLCULTURE&STEMCELLBIOLOGY

Course Objectives:

1. To understand animal cell culture, biology of stemcells and embryonic stem cell
2. To learn propagation of embryonic stem cells, nuclear transfer technology, animal cloning and stem cell differentiation
3. To gain knowledge on stem cell plasticity, stem cell assay and protocols, stem cell separations and stem cell therapies
4. To learn stem cells and tissue engineering, human embryonic stem cells and society, intellectual property results

UNIT-1.

1.1 Introduction to animal cell and tissue culture: Components of cell culture, cell types and cell lines, different substrates, types of culture.

1.2 Animal cell culture: experimental works – Technological uses of Animal cell cultures - Prospects.

1.3 The biology of stem cells: Overview; different types of stem cells- embryonic Stem cells, fetal tissue stem cells, adult stem cells; nuclear transfer of stem cells; human & animal cloning. Animal stem cell protocols & research.

1.4 Embryonic stem cells: the blastocyst and inner cell mass cells primitive endoderm implantation; blastocyst development in vitro.

UNIT-2.

2.1 Isolation and propagation of embryonic stem cells; chimeras; generation of knockout mice.

2.2 Nuclear transfer technology: Transfer of nuclei into eggs; development potential of transplanted nuclei; reprogramming a nucleus.

2.3 Animal cloning: Overview; challenges in human therapeutic cloning; somatic cell nuclear transfer in humans: pronuclear early embryonic development.

2.4 Stem cell differentiation: Overview; adult stem cells; fetal stem cells; human embryonic stem cells; human parthenote stem cells.

UNIT-3.

3.1 Stem cell plasticity: Overview; self-renewal potential; differentiation versus stem cellrenewal; transdifferentiation; cellcycledynamicsofdifferentstem cells.

3.2 Stem cell assays and protocols: Isolation of defined stem cell populations; progenitor cellassays,sourcesofprogenitorcells,cytokineandchemotherapyapproachestomobilization of progenitor cells; flow cytometric techniques; methods of cell selectionusingmonoclonal antibodies.

3.3 Magnetic approaches to cell separation, Dyna beads, nano particle preparations; growthfactors and ex-vivo expansion of hematopoietic stem / progenitor cells bioreactors forexpansion.

3.4 Stemcelltherapies:Clinicalapplicationsofstemcelltherapy;neurodegenerativediseases- Parkinson's disease, Alzheimers, spinal cord injury, other brain syndromes;tissuesystemsfailures-diabetes,cardiomyopathy,kidneyfailure,liverfailurehemophilia,lymphomaand leukemicmalignancies requiringstem celltherapy.

UNIT-4.

4.1 Stem cells & tissue engineering: Role of nanoparticles; organ development; nanoparticles as scaffolds.

4.2 Human Embryonic Stem Cells and Society: The religious, legal, ethical and scientific debate; the future of the debate; the regulatory aspects of therapeutical use of stem cells.

4.3 Bioethical, Environmental and Health issues related to Biotechnology.

4.4 Intellectual property results – patents and protection of ideas – Risk and Reward.

Course Output:

1. Knowledge will be gained animal cell culture, biology of stemcells and embryonic stem cell
2. Propagation of embryonic stem cells, nuclear transfer technology, animal cloning and stem cell differentiation can be learnt
3. Stem cell plasticity, stem cell assay and protocols, stem cell separations and stem cell therapies can be understood
4. Stem cells and tissue engineering, human embryonic stem cells and society, intellectual property results can be proficient

SUGGESTEDREADINGMATERIAL:

1. HandbookofStemCellsVolume1and2EdsRobertLanzaandothersElsevierAcademic Press.
2. AustenC.R.andShort. R.V.Reproductioninanimals.
3. SchattenandSchatten.MolecularBiologyofFertilization.
4. R.G.Edwards.HumanReproduction.
5. S.F.Gillbert.DevelopmentalBiology.SinauerAssociation Inc.,Massachusetts.

CF-ABT-203A:CELLBIOLOGYANDIMMUNOLOGY

Course Objectives:

1. Able to learn organization of prokaryotic and eukaryotic cell, Nucleus structure, Eukaryotic chromosome and polytene and lamp brush chromosomes
2. To learn mechanism of cell division, regulation of eukaryotic cellcycle, chromosomal abnormalities and tumor biology
3. To understand types of immunity, types of cell involved in immune response, structure and function of antibody and complimentarily cascade
4. To gain knowledge on Antigen presentation, hypersensitivity reactions, immune tolerance and immunopathology

UNIT-1.

1.1 Organization of prokaryotic and eukaryotic cell.Structure and function of Plasmamembrane, mitochondria endoplasmic reticulum, Golgi apparatus, lysosomes,peroxisomes.

1.2 Nucleus-structureandfunctionofnuclearmembrane,nucleolus.

1.3 Eukaryoticchromosomeanditshighresolutionorganization.

1.4 Polyteneandlampbrushchromosomes.

UNIT–2.

2.1 Mechanism of cell division - mitiotic apparatus, cytokinesis, chromosome movement - presentconcept.

2.2 Regulation of eukaryotic cell cycle - Over view of cell cycle.Mutation causing cellcyclecontrol.Meiotic process - stages, chromosome pairing, chiasma formationMolecularmechanismsofrecombination,synaptonemalcomplex.Nondysjunction,

2.3 Chromosomalabnormalities-euploidy,haploidy-theirfundamentalandpracticalsignificance.Polypliody-induction -Aneuploidy-typeandgeneticsignificance.

2.4 Tumor biology - cell to cell interaction, cell adhesion, cell transformation mechanism andoncogenesis.

UNIT–3.

3.1 Immunity- innate and acquired, innate immune mechanisms, Immunogens and antigens –Properties, factors governing immunogenicity, haptens, epitopes-size and identification.Adjuvants-properties andmechanism of action.

3.2Cellsinvolvedintheimmuneresponse Tcells,Bcells,CDantigens,neutrophils,eosinophilsandnaturalkiller cells.Macrophages,dendrites,Phagocytosis,Lymphoidtissues.

3.3 Fuctions of antibody in relation to structure. Antigen-antibody interactions- affinity ofantibody,avidity,bonuseffect,classicalprecipitinreaction,antigen-bindingsiteofantibody,forcesinvolvedinantigen-antibodycomplexformation,Generationofantibodies,Theories ofantibodyformation. Monoclonaland polyclonal antibodies.

3.4 Complement-nature,physicochemicalproperties,complementcascadepathway,complementfixation.

UNIT–4.

4.1 AntigenPresentation-pathwaysofantigenprocessingandpresentationofintracellularandextracellularantigens. Cell mediatedimmunity(CMI):Inductionand mechanism

4.2 Hypersensitivityreactions–Classification,TypeI–IVreactions.Immunitytobacterial,fungal,viral andparasiticdiseases. Allergy:classification anddetails.

4.3 Immunetolerance,immunesuppression.TransplantationandG.V.H.reactions.

4.4 Immunopathology-Autoimmunediseases;immunecomplexdiseases;immunodeficiencydiseases;immunityto infection.

Course Output:

1. Organization of prokaryotic and eukaryotic cell, Nucleus structure, Eukaryotic chromosome and polytene and lamp brush chromosomes will be understood
2. Mechanism of cell division, regulation of eukaryotic cellcycle, chromosomal abnormalities and tumor biology can be learnt
3. Types of immunity, types of cell involved in immune response, structure and function of antibody and complimentarily cascade will be proficient
4. Knowledge will be gained on Antigen presentation, hypersensitivity reactions, immune tolerance and immunopathology

SUGGESTEDREADINGMATERIAL:

1. CellandMolecularbiologybyEDRDeRobertisandEMRDeRobertisJr,Indianedition, 3.1 B.I.Publications,Pvt. Ltd.
2. TheCell (A Molecular Approach)byGeoffreyM.Cooper,7thEdition.
3. Kuby,J.Immunology,7th edition,W.H.Freeman andCompany, NewYork.
4. Janeway‟sImmunobiology,9thedition,GarlandScience.

CF ABT-203B ANIMAL BIOTECHNOLOGY

Course objectives:

While studying the **Animal Biotechnology** course, the student shall be able to:

1. To introduce a detailed achievements of Biotechnology, Genetic Engineering and r-DNA technology principles.
2. To gain knowledge on cloning vectors and their uses in gene cloning technologies.
3. Principles of Cloning strategies and screening analysis of Re-combinations.
4. To apply principles of Biotechnology concepts in veterinary sciences i.e. production of Transgenic animals, Artificial insemination, Invitro fertilization, Embryo transfer technology.
5. Application of Biotechnological principles in Medicine and Gene transfer techniques.
6. To understand the uses of Fresh and marine pearl culture technology, IPR, Patents and Copyrights.

UNIT-1.

1.1 General IntroductionandAchievementsofBiotechnology

1.2 Enzymesusedingenecloning-Restrictionendonucleases,DNAligases,Kinase,Phosphatase,Nucleases, Polymerases, Reversetransciptase

1.3 Cloningvectors(Plasmids,Phages,cosmids,yeastsShuttlevectors),viralvectors(SV40,Adenovirus andBaculovirus) usedin Genecloning.

1.4 Cloningandselectionstrategiesofrecombinants(antibioticselection,bluewhitescreening,colonyhybridization,Fluorescencein-SituHybridization(FISH)andimmunologicaltest.

UNIT-2.

2.1 Preparationof celllines,typesofcelllines. TypesofStemCells,StemCellTherapy

2.2 ApplicationsofcellcultureinVeterinary–Diseasediagnosis,virusvaccines,hormones

2.3 Application of Biotechnology in Medicine- Production of monoclonal antibodies(Hybridomatechnology),ProductionofvaccinesandProductionofGrowthHormone

2.4 Genetherapy:Introduction,principleofgenetransferandexamples(Adenosinedeaminasedeficiencydisease,DuchenneMusculardystrophydiseaseandCysticfibrosis)

UNIT-3.

3.1

Livestockimprovement:Manipulationofreproductioninanimals(Artificialinsemination,multiple ovulations, *invitro*fertilization,Embryotransfertechnology)

3.2 Methodsofgenetransfer–Microinjection,electroporation,lipofectionandviralmediated genetransfer techniques

3.3 Generation of chimeric, transgenic and knockout mice and other animals and theircharacterization. Gene editing- Gene silencing-CRISPR-associated protein-9 nuclease(Cas9)technology

3.4 Potential application of transgenic animals: models for various diseases/disorders,productionofpeptidesandproteinsofbiopharmaceuticalinterest(molecularfarming)

UNIT-4.

4.1 Growth hormone transgenics and sf.Sex reversal in fishes and their applications, Production of monosex populations.Aquaculture and fishseed production: Hypophysiation,hCG injections

4.2 Marinebio/fishresourcesanditsapplicationsinpharmaceuticalandNutraceuticalIndustries

4.3 Freshwaterandmarine(oyster)pearlculturetechnology,pearlculturein India,usesofpearlculture

4.4 Intellectual Property Rights: Introduction; Types of IP; Patents and its types,Trademark Copyright&RelatedRights,ProtectionofGMOs;ethicalandlegalissuesin biotechnology.

Course Outcomes:

1. Imparts the knowledge to cells lines and stem cells in culture media.
2. It gives insight into various cell/ tissues culture techniques and their applications
3. Understanding of in vitro culturing of organisms and production of transgenic animals.
4. Understanding of cloning of mammals, large scale culture and production from recombinant microorganisms and cloning vectors.
5. This insight allows students to take into consideration about ethical issues involved in production of transgenic animals and BT products.
6. Use in gene transfer technology, genetic manipulations and in a variety of Industrial processes and prominence of IVF, Artificial insemination and embryo transfer techniques.
7. Gives knowledge to culture of animal cells and its culture medium.
8. Learn basic concepts and principles of recombinant DNA technology, Gene manipulation for transgenic animal production and therapeutics/ vaccine production.
9. Provides knowledge on Livestock, improvement aquaculture and pearl culture

10. Provides knowledge on Intellectual property rights and genetically modified organisms

SUGGESTED READING MATERIAL:

1. A text book of Biotechnology-RC. Dubey.S.Chand& Company Ltd., New Delhi -1996.
2. A text book on Biotechnology-(n Ed.) H.D. Kumar. EWP - Private Ltd., New Delhi -1998.
3. Animal Biotechnology-M.M. Ranga, Agrobios (India), 2000.
4. Biotechnology-Fundamentals & Applications-S.S .Purohit& S.K. Mathur, Agro Botonics-1999.
5. Biotechnology-V. Kumaresan. Saras Publication-1994.

EF ABT-204A: TOXICOLOGY

Course objectives:

While studying the **Toxicology** course, the student shall be able to:

1. Provides broad theoretical knowledge within toxicology and development of a general working knowledge of the principles and practice of clinical toxicology.
2. Basic toxicology concepts including: mechanisms of toxicology, absorption, distribution and excretion of toxicants, xenobiotic metabolism, toxicokinetics, chemical carcinogenesis, hepatotoxicology. Based on student interest some of the following areas may be included: genetic toxicology, developmental toxicology, renal toxicology, toxic effects of pesticides, toxic effects of metals, toxic effects of radiation, venoms and animal poisons, air pollution, ecotoxicology, food toxicology, forensic toxicology, occupational toxicology, regulatory toxicology, other.
3. This course includes the study of Pesticides that are agrochemicals and used for preventing, repelling, mitigating or destroying any pests. It includes insecticides, fungicides, rodenticides and herbicides etc. These insecticides are of chemical or biological origin that control the insect. The course indicates the mechanism of Pest control that may result in the form of killing the insects or otherwise preventing it from its destructive behaviors. Insecticides are either natural or man-made synthesized and are applied to target pests in a myriad of formulations (EC, WP, SP, FP, G etc.) and delivery systems (sprays, baits, slow-release diffusion, dust, etc.). In recent years, the bacterial genes coding for insecticidal proteins have been incorporated into various crops that deal with the mortality of the pests feeding on them.
4. The course highlights various categories of insecticides and their relative efficacy in relation to other control methods in a particular ecosystem. Use of bio-pesticides and other plant derived pesticides form an important part of IPM (Integrated Pest Management).
5. The course indicates the biodiversity of insects in different ecosystems and the impact of global climatic changes on insects diversity and their behaviour. Insects are important for the survival of different biota on the earth. Effect of various anthropogenic activities and pollutants on insects is correlated with maintenance of different ecosystems.
6. To apprise the students about the toxicants along with their application and their effects on biosphere as well as human health.

Unit-1.

1.1 Introduction and scope of toxicology and classification of xenobiotics.

1.2 Principles of toxicology- Dose response relationship- Toxicity tests {acute ($LD_{50,}$ $LC_{50,}$ ED_{50}) and chronic toxicity tests on aquatic and terrestrial animals}, Variations in toxic response.

1.3 Mechanism of toxic action of pesticides (Receptor concept, nature of receptors, Theory of toxicants-receptors interactions and mechanism of action of some pesticides)

1.4. Toxicokinetics-

i) Classic toxicokinetics

ii) Physiologic toxicokinetics

Unit-2.

2.1 Translocation of toxicants; Absorption of Toxicants, Distribution of Toxicants, Excretion of Toxicants

2.2 Biotransformation of Xenobiotics; Biotransformation sites, Biotransformation enzymes, Biotransformation reaction and bioactivation

2.3 Bioaccumulation of Xenobiotics; Bioconcentration, Bioaccumulation and Biomagnification; Biomagnification of lipophilic and recalcitrant substances

2.4 Toxic effect of metals - Mercury, Lead, Cadmium and Arsenic

Unit-3.

3.1 Toxic Response of Blood: Toxicology of erythron, leukon, platelets and homeostasis

3.2 Toxic Response of Liver; Mechanism and types of toxin – induced liver injury; critical factors in toxicant induced liver injury; detoxification mechanisms by liver.

3.3 Toxic Response of Kidney; Susceptibility of the kidney to toxic injury; Biochemical mechanisms / mediators of renal cell injury.

3.4 Toxic Response of Reproductive system; Endocrine disruption (including screening and puberty) in humans and mammals. Testicular and ovarian dysfunction.Deterioration in fertility by toxicants.

Unit-4.

4.1 Xenobiotic effect on basic metabolism (Carbohydrates, Proteins, Lipids)

4.2 Teratogens and Teratology (Relationships between maternal and developmental toxicity)

4.3 Antidotal therapy; Types of antidotes and antidotal procedures.

4.4 Risk assessment – Hazard identification; Risk characterization and Safety evaluation of Chemicals.

Course outcomes:

1. The awareness about toxic agents, their effects and knowledge about mode of transformation of toxicants will help in creating skilled personnel in the field of environment protection and research.
2. It is a discipline overlapping with biology, chemistry, medicine that involves the study of toxicants, their mechanism of action.
3. It involves the study of the adverse effects of chemical substances on living organisms.
4. Skill development in environmental and occupational Toxicology.
5. It provides opportunities for students research projects, internships in assessing the effects of toxic pollutants on the environment and in the food chain.
6. Identification of different routes of exposure of environmental toxins.
7. Understanding of the physiological and genotoxic effects of drugs and environmental toxins.
8. Knowledge of various techniques for Toxicity evaluation.
9. The students having this course will study various types of insecticides and understand their mode of action to kill/control the insects. Also, the students will learn about novel categories of insecticides that may be compatible with other control strategies.
10. The students will learn handling of the pesticides in crop protection and understand the therapy and antidotes at the time of poisoning.
11. Further, Insects being the important component of various food chains/ food webs, the students will be understand their crucial role in homeostatic maintenance of ecosystems and their biota.
12. The students will learn about the impact of anthropogenic pollutants and climatic changes on the survival and propagation of insects, and may appreciate the insects as bio-indicators of ecological changes/disturbances.

SUGGESTED READING MATERIAL

1. Casarett&Doul's- Toxicology- The basic science of poisons- C.D. Klassen, Mary, O.D & John Doull.
2. Concepts of Toxicology Dr. Omkar, Vishal Publishing C.2003.
3. Environmental toxicology of pesticides- F. Mastimura, G.M.Boush and T.Misato.
4. Introduction of Biochemical Toxicology- E.Hodgson&F.E.Gutherie.
5. Pesticides action and metabolism- O'Brrien.
6. Pesticides and Human Welfare- D.L. Gunn and J.G.R.Stevens. Oxford University Press-1978.
7. The Encyclopedia of Americana- Vol.15

EF ABT: 204B ENDOCRINOLOGY

Course Objectives :

1. To study the concepts of Classification of Hormones, Structural features of Endocrine Glands
2. Compare the structure, functions and regulation of the endocrine organs of vertebrates
3. Identification of Endocrines glands of the body and their secretions
4. To study the Steroid and Peptide hormones and their role
5. To study the evolution of Pancreatic and Adrenal gland hormones
6. To study the evolution of Thyroid and Parathyroid hormones and their role in the regulation of metabolism
7. To study the role of hormones in the growth, development and reproduction.
8. to study the aspects concerning Hormones – Human health

Unit-1.

1.1 Classification of hormones. Brief account of structural features of endocrine glands. Hormonal effects and regulation – basic concepts and methods

1.2 Biosynthesis and secretion of pituitary. Factors influencing secretion. Endocrine disorders - brief description

1.3 Biosynthesis and secretion of pancreas, adrenal, and thyroid hormones. Factors influencing secretion.

1.4 Biosynthesis and secretion of sex steroid hormones. Factors influencing secretion.

Unit-2.

2.1 Peptide hormones, Steroid hormones. Hormones as messengers.Cell surface receptors. Cascade of reaction linked to signal transduction.

2.2 Evolution of pituitary gland; Physiological actions of pituitary hormones. Urophysis and action of its hormone(s).Pancreatic hormones and glucose homeostasis.

2.3 Evolution of discrete adrenal gland; Synthesis of corticosteroid, structural diversity of glucocorticoids among vertebrates.

2.4 Sex steroids. Cytoplasmic and nuclear receptors.Mechanism of action of steroid hormones.Prostaglandins.Calcium-magnesium-protein Kinase.Hormones and eukaryotic metabolic regulation.

Unit-3.

3.1 Evolution of thyroid gland.

3.2 Thyroid hormone synthesis and its regulation, paradigms of thyroid hormone action in poikilotherms and homeotherms.

3.3 A comparative account of parathyroid gland and ultimobranchial body/C cells, synthesis of parathyroid hormone, calcitonin and of vitamin D3;

3.4 Hormonal regulation of calcium and phosphate homeostasis.

Unit-4.

4.1 Hormones, growth and development and reproduction

4.2 Hormones regulating reproduction

4.3 Hormones and human health

4.4 Production of hormones as Pharmaceuticals-Insulin, GH and Prolactin.

Course Outcomes :

1.Understand the structure, function and regulation of endocrine & neuroendocrine glands,

2. Develop a deep knowledge of the role of endocrine secretion in regulation of reproductive Cycle

3.Understand the pathways associated with Biosynthesis and secretion of Endocrine hormones and their role in the control of metabolism

4.Acquring the knowledge of signal transduction mechanisms

5.Through understanding of several endocrines including Peptide hormones, Steroid hormones, Pituitary hormones, Sex hormones, Thyroid hormones etc in the control of metabolic pathways

6.Understanding the influence of hormones on Growth, Development and Reproduction and their regulatory pattern

SUGGESTED READING MATERIAL:

1. Barrington. EJ.W. General and comparative Endocrinology Cambridge Press, Oxford.
2. Bentley, PJ. Comparative Vertebrate Endocrinology, Cambridge Press, Oxford.
3. Martin, C.R. Endocrine Physiology. Oxford Univ. Press, Oxford.
4. Prakash S. Lohar. Endocrionology-Hormones and human health-2005.MJP Publishers-Chennai.
5. Williams, R.H. Text Book of Endocrinology, W.B. Saunders Co., Philadelphia.

ABT 205P : ABT -201 (Core) & ABT -203A or ABT -203B (CF)

ABT 206P : ABT -202 (Core) & ABT -204A or ABT -204B (EF)

AUDIT COURSE

ABT-207:HUMAN VALUESANDPROFESSIONALETHICS–II

Course Objectives:

1. To get knowledge on value education
2. To learn medical ethics
3. To become proficient on business ethics
4. To understand environmental ethics and social ethics

I. Value Education- Definition – relevance to present day -Concept of HumanValues –Selfintrospection–Self-esteem.Familyvalues-Components,structureandresponsibilitiesoffamilyNeutralizationofanger–Adjustability–Threatsoffamilylife
– Status of women in family and society – Caring for needy and elderly – Time allotmentforsharingideas andconcerns.

II. Medical ethics- Views of Charaka, Sushruta and Hippocratus on moral responsibility ofmedicalpractitioners.Codeofethicsformedicalandhealthcareprofessionals.Euthanasia,Ethicalobligationtoanimals,Ethicalissuesinrelationtohealthcareprofessionals and patients. Social justice in health care, human cloning, problems ofabortion.EthicalissuesingeneticengineeringandEthicalissuesraisedbynewbiologicaltechnologyorknowledge.

III. Business ethics- Ethical standards of business-Immoral and illegal practices and theirsolutions. Characterics of ethical problems in management, ethical theories, causes ofunethicalbehavior,ethical abuses andwork ethics.

IV. Environmental ethics- Ethical theory, man and nature – Ecological crisis, Pest control,Pollution and waste, Climate change, Energy and population, Justice and environmentalhealth.

V. Socialethics-Organtrade,Humantrafficking,Humanrightsviolationandsocialdisparities Feminist

ethics,surrogacy/pregnancy.Ethicsofmedia-

ImpactofNewspapers,TelevisionMovies andInternet.

Course Output:

1. Value education can be understood
2. Medical ethics can be learnt
3. Knowledge will be gained on business ethics
4. Environmental ethics and social ethics can be learnt

SUGGESTEDREADINGMATERIAL:

1. JohnSMackenjie:A manualofethics.
2. "TheEthicsofManagement"byLarueToneHosmer,RichardD.IrwinInc.
3. "ManagementEthics– integrityatwork"byJosephA.PetrickandJohnF.Quinn,ResponseBooks: New Delhi.
4. "Ethicsinmanagement"byS.A.Sherlekar,HimalayaPublishingHouse.
5. Harold H. Titus: Ethics forToday
6. Maitra,S.K:HinduEthics
7. WilliamLilly: IntroductiontoEthics
8. Sinha:AManual ofEthics
9. Manu:ManuDharmaSastraortheInstituteofManu:ComprisingtheIndiansystem ofDuties:Religious and Civil(ed.) G.C. Haughton.
10. SusrutaSamhita:Tr.KavirajKunjanlal,KunjalalBrishagratha,ChowkambaSanskritse ries,Vol.I,IIandIII,Varnasi,VolIOO, 16-20, 21-32and 74-77only.
11. CarakaSamhita:Tr.Dr.RamKraranSarmaandVaidyaBhagavanDash,ChowkambhaS anskritSeries office,VaranasiI,II,IIIVolIPP 183-191.
12. Ethics,TheoryandContemporaryIssues,BarbaraMackinnon,Wadsworth/ThomsonL earning,2001.

CORE ABT-301:ENZYMOLOGY

Course Objectives:

1. To understand enzyme specificity, enzyme catalysis and isolation and purification of enzymes
2. To gain knowledge on theories of enzymes kinetics, enzyme kinetics and its importance, effect of reactant concentrations and effect of temperature of pH and enzyme concentration reaction rate
3. To learn inhibition of enzyme activity, kinetics of allosteric enzymes, regulation of enzyme activity and mechanism of enzyme action
4. To become proficient on clinical aspects of enzymology, immobilized enzymes, isoenzymes and enzyme enginnering

UNIT-1.

1.1 Historical Background, overview and specific examples, nomenclature and classification of enzymes–IUB system, chemical nature and properties of enzymes.

1.2 Enzyme specificity (Absolute specificity, Group specificity, Broad specificity).

1.3 Enzyme catalysis, Quantitative measurement of enzyme activity, Assay of enzyme activity-units of enzyme activity.

1.4 Isolation and purification of enzymes, intracellular distribution of enzymes.

UNIT-2.

2.1 Theoriesof enzymekinetics -kinetictheoryandcollisiontheory.

2.2 Enzymekineticsanditsimportance,derivationofMichaelis-Mentonequation,MethodsofVmaxand Km determination,construction ofLine weaver burk plots.

2.3 Effectofreactantconcentrations(Rateconstant,Firstorder,SecondorderandZeroorderkineticreactions, Ramachandran plot, determination ofslope).

2.4 EffectofTemperature,pHandenzymeconcentrationonreactionrate.

UNIT-3.

3.1 Inhibitionofenzymeactivity(competitive,non-competitive,uncompetitiveandmixedinhibition).

3.2 Kineticsofallostericenzymes.

3.3 Regulationofenzymeactivity(Metabolicregulation),Catalyticefficiencyofenzymes(feedbackinhibition, covalent modification).

3.4 Mechanismofenzymeaction(LockandKey,Inducedfitmodel),catalyticsite,roleofmetalions.

UNIT-4.

4.1 ClinicalAspectsofenzymology,MedicalandTherapeuticapplicationsofenzymes;Enzymes-Clinicaldiagnosis.

4.2 Immobilizedenzymes,variousmethodsofimmobilization-ionicbonding,absorption,covalentbonding(basedon R groups of amino acids).

4.3 Iso enzymesandmultipleformsofenzymes.

4.4 Enzymeengineering–economicimportanceofenzymeproduction.Enzymesinindustries-food,biotechnologyandotherindustries.

Course Output:

1. Enzyme specificity, enzyme catalysis and isolation and purification of enzymes can be understood
2. Knowledge will be gained on theories of enzymes kinetics, enzyme kinetics and its importance, effect of reactant concentrations and effect of temperature of pH and enzyme concentration reaction rate
3. Inhibition of enzyme activity, kinetics of allosteric enzymes, regulation of enzyme activity and mechanism of enzyme action will be learnt
4. Clinical aspects of enzymology, immobilized enzymes, isoenzymes and enzyme enginnering will be proficient

SUGGESTEDREADINGMATERIAL:

1. Biochemicalcalculations.I.H.Segel, 2nd Ed.,JohnWiley&Sons.
2. Biochemistry.D.Voet&J.G.Voet,J.Wiley&Sons.
3. EnzymeKinetics.I.W.Segil.
4. EnzymeKinetics.D.V.Roberties,CambridgeUniversityPress.
5. Harper‟sBiochemistry.RobertK.Murrey,PeterA.Mayer,D.K.Granner,V.W.Rodwell,LangeMedical.

CORE ABT-302:ANIMALREPRODUCTION,BREEDINGANDTRANSGENICTECHNOLOGY

Course Objectives:

1. To become proficient on structure and function of male and female reproductive system; reproductive cycles and contraception in male and females
2. To gain skill on sex determination, selection for qualitative inherited characters, parental determination and verification and progeny testing
3. To understand artificial insemination techniques, in vitro fertilization, embryo transfer technology, microinjection and macroinjection
4. To learn transgenic technology development, generation of chimeric, transgenic and knockout mice

UNIT-1.

1.1 Structureandfunctionofmalereproductivesystem-hormonalregulationofspermatogenesisandspermeiogenesis;inhibinandandrogenbindingproteins;capacitationofspermatozoa.

1.2 Structureandfunctionoffemalereproductivesystem-influenceofhormonesondevelopmentof ovarian follicles andoogenesis;

1.3 Reproductive cycles: estrous and menstrual cycle; ovulation, atresia and corpus luteumformation;pregnancyand lactation; implantation and placentation.

1.4 Contraceptioninmalesandfemales:Hormonalandchemical;recentadvancesincontraceptionresearch.

UNIT-2.

2.1 Introduction - Sex determination; principles of animal breeding; structure of the livestockbreedingindustry: dairycattle, beef cattle, swine, sheep and poultry

2.2 Selectionforqualitatively inheritedcharacters-genefrequency andselectingagainstrecessive genes; detectingheterozygotesforrecessives.

2.3 Parental determination and verification; the use of markers and/or molecular probes,selectioncriteria: multiplerecords,pedigreeselection, familyselection.

2.4 Progenytesting:breedingvalue,transmittingabilityandheritability;correlatedcharacters; selection for maternal ability; factors affecting selection response; genotype-environmentinteractions

UNIT-3.

3.1 Artificialinsemination(AI)techniquesandtheirdevelopment:estrussynchronization;semencollection, evaluation, storage.

3.2 I*nvitro*fertilization, ICSIandpreservationofendangeredspecies.

3.3 Embryotransfertechnology,Superovulation,cryopreservationofembryos,Hormonesinvolvedin embryo transfer technology.

3.4 MicroinjectionandMacroinjection–introduction–procedure–applicationsadvantagesand limitations.

UNIT-4.

4.1 An overview of transgenic technology Development of transgenic mice and other animal models: by injection of foreign DNA/gene into zygote; optimization of construct for in vivo expression

4.2 Generation of chimeric, transgenic and knockout mice and other animals and their characterization.

4.3 Transgenic fishes, transgenic poultry and transgenic insects as bioreactors.

4.4 Potential application of transgenic animals: models for various diseases/disorders, production of peptides and proteins of biopharmaceutical interest (molecular farming).

Course Output:

1. Knowledge will be gained on structure and function of male and female reproductive system; reproductive cycles and contraception in male and females
2. Sex determination, selection for qualitative inherited characters, parental determination and verification and progeny testing will be understood
3. Artificial insemination techniques, in vitro fertilization, embryo transfer technology, microinjection and macroinjection can be learnt
4. Transgenic technology development, generation of chimeric, transgenic and knockout mice will be learnt

SUGGESTEDREADINGMATERIAL:

1. ComparativeReproductiveBiology.EditedbyH.SchattenandG.M.Constanitinescu.BlackwellPublishers, UK.
2. ComparativeEndocrinologyandReproduction.EditedbyK.P.Joy,A.Krishna,C.Haldar,NarosaPublishers,Delhi.
3. DaltonsIntroductiontoPracticalAnimalBreeding.EditedbyMalcolmB.Willis,BlackwellScience,UK..
4. WilliamsTextBookofEndocrinology,EditedbyJ.D.Wilsonandothers,Saunders,USA.

5. AnimalTransgenisisand Cloning.EditedbyL.M.Houdebine,Wiley,USA.

GE ABT-303A:BIOINFORMATICSANDBIOSTATISTICS

Course Objectives:

1. To know the importance of bioinformatics, internet basics, sources of websites and data base types
2. To understand prediction of protein structure and protein sequence database, prediction of gene structure, submission of sequence to database, phylogenetic analysis
3. To learn biostatistics, measures of location and dispersion, curve fitting and correlation and regression
4. To understand probability distribution, tests of significance, student t-test and F-test, chi square test and their application

UNIT-1.

1.1 Scope, importance and status of Bioinformatics.

1.2 Internetbasics,Toolsfor websearch,Dataretrievaltools.

1.3 Sourcesofwebsites.

1.4 Databasetypes-primary,secondaryandspecific annotationdatabases.

UNIT-2.

2.1 Database types, Prediction of protein structure and protein folding, Protein sequence databases.

2.2 Prediction of gene structure, Functional genomics, Genomic databases**.**

2.3 Submission of sequence to the database, Homology, BLAST- Types of BLAST

2.4 Phylogenetic analysis, Human genome project.

UNIT-3.

3.1 Definitionofstatistics:Biostatistics,classification,variablesandattributes,Diagramaticdistributionofbiological data.

3.2 Measures of location and dispersion: Arithmetic mean, median and mode.Mean deviation,quartiledeviation, Standard deviation andco-efficient ofvariation.

3.3 Curve fitting: Fitting strait line, parabola exponential curve and geometric curve to the data.Fittingof straight line usingMs-Excel.

3.4 Correlation andregression: Scatter diagram, types of relationship. Positive and negativecorrelation, computation of correlation coefficient, Interpretation of correlation coefficient.Simpleregression lines and its interpretation.

UNIT-4.

4.1 Normalprobabilitydistribution&itsapplications.

4.2 Testsofsignificance:levelofsignificance,nullandalternativehypothesis,poweroftestandp-valueof atest.

4.3 Studentt-testforoneasampleand two samplesmeans-paired t-tests.

4.4 F-test,chisquaretestandtheirapplication,conceptofANOVA.

Course Output:

1. Importance of bioinformatics, internet basics, sources of websites and data base types can be understood
2. Prediction of protein structure and protein sequence database, prediction of gene structure, submission of sequence to database, phylogenetic analysis can be learnt
3. Knowledge will be gained biostatistics, measures of location and dispersion, curve fitting and correlation and regression
4. Probability distribution, tests of significance, student t-test and F-test, chi square test and their application can be understood

SUGGESTEDREADINGMATERIAL:

1. BasicBioinformaticsbyS. Ignacimuthu,s.j.Narosapublications,2005.
2. BioinformaticsbyAndreas D. Baxevanisand B.P.Francis Ouellette, 2nd Ed., 2002.
3. Bioinformatics,MethodsandApplications,Genomicsproteomicsanddrugdiscovery,S. C.Rastogi,N. Mendiratlaand P. Rastogi,prentice-Hall ofIndia, 2004.
4. Microsoft Office, bySetultz, 1997.
5. Bio-Statistics-Anintroductorytext-Goldstein,ATheMacmillan Co.,New York,1971.
6. BiostatisticsbyLewisAlvin(1971)AffiliatedEastWestPresspvt.,Ltd.,NewDelhi.
7. Bio-Statistics-ByLewisAlvinE.AffiliatedEast-Westpress(P)Ltd.,1971.
8. InterpretationandusesofMedicalStatistics– G.J.Bourke&J.Mc.Gilvaray,BlovkwellSciencePublication,London, 1969.
9. IntroductiontoBiostatistics–BySokal– Rohlf(2ndEdn)FreemanInternationalEditor(1973).
10. IntroductiontoBiostatisticsbyHoldanBancroft(1962)PualB.HoebarInc.,NewYork.
11. Introductionto Instrumentalanalysis,RonertBraun.McGrawHill Intemationaledition.

GE ABT-303B:GENETIC ENGINEERING

Course Objectives:

1. To understand use of enzymes in DNA and RNA synthesis, restriction enzymes and ligation and modification o DNA
2. To learn vectors for constructions of genomic libraries, expression vectors, promoters and vectors used for cloning
3. To gain knowledge on DNA fragments, cDNA synthesis, PCR
4. To become proficient on ligation between cohesive and blunt end DNA fragments, introduction of cloned genes into host and expression of cloned genes

UNIT-1.

1.1 Enzymes used for the synthesis of DNA: DNA Polymerase I, Klenow fragment, Sequenase, Taq Polymerase, Reverse transcriptase, Terminal Transferase

1.2 Enzymes used for the synthesis of RNA: T3 and T7 RNA polymerases, SP6 RNA polymerase

1.3 Restriction enzymes - Outlines of bacterial restriction and modification systems – Classification of restriction enzymes - Type II restriction enzyme: Nomenclature, Production of DNA fragments with 3‟ protruding ends and blunt ends and their significance in molecular cloning - RFLP and its significance.

1.4 Enzymes used for ligation and modification of DNA: DNA ligase, Methylases, Kinase, Phosphatase.

UNIT-2.

2.1 Vectors for construction of genomic libraries - cosmids, bacterial artificial chromosomes(BACs),yeastartificialchromosomes(YACs)-vectorsforconstructionofcDNAlibraries-lamda ZAP. Multipurposevectors -pUC 18/19,Blue script vectors

2.2 Expression vectors – structure - promoters used in expression vectors - lac, tac, λpL, T7promotersand theirsignificancein constructingexpression vectors.

2.3 Promoter-probe vectors – Structure promoter probe vector - Reporter genes (lacZ, gfp,gus,luciferase) and strategies used toassaypromoteractivity.

2.4 Vectorsusedforcloninginto mammaliancells-SV40Vectors.

UNIT-3.

3.1 Isolationofgene/DNAfragments.Mechanicalshearing,restrictiondigestion,cDNAsynthesis,PCR amplification and chemicalsynthesis of gene.

3.2 cDNA synthesis - Mechanism of cDNA synthesis, Strategies used to obtain full lengthcDNA.5‟and 3‟RACE.

3.3 PCR - Concept and technology- Properties of primers - Inverse, multiplex PCR, RAPDandits significance. Real timePCR.

3.4 Chemical synthesis - Designing gene from amino acid sequence, solid phase synthesis ofoligonulceotides -In vitro synthesis of gene

UNIT-4.

4.1 Ligation between cohesive and blunt end DNA fragments - T4 DNA ligase - Conversionof blunt end DNA fragment into cohesive ended DNA - linkers, adapters, homopolymertailing.

4.2 Introductionofclonedgenesintohost-Transformation,conjugation,transduction,electroporation,particlebombardment,microinjection,liposomemediatedDNAdelivery.

4.3 Identificationandcharacterizationofclonedgenes-Screeningofgenomic/cDNAlibraries-genetic,molecularhybridization-immunochemical techniques

4.4 Expression of cloned genes – detection of expressed proteins – biological and molecularmethods.

Course Output:

1. Use of enzymes in DNA and RNA synthesis, restriction enzymes and ligation and modification o DNA can be understood
2. Vectors for constructions of genomic libraries, expression vectors, promoters and vectors used for cloning can be learnt
3. Knowledge will be gained on DNA fragments, cDNA synthesis, PCR
4. Will become proficient on ligation between cohesive and blunt end DNA fragments, introduction of cloned genes into host and expression of cloned genes

SUGGESTEDREADINGMATERIAL:

1. Biotech‟sDictionaryofGeneticEngineeringbyDineshArora.
2. D.Green;PhilipHilterRichardM.Myers Sue. Klapholz;HaroldRiethman JaneRoskams.
3. DNAcloning:Mammaliansystems - APracticalApproachbyD.M.Glover,B.D.Hames.
4. FromGenes to clonesIntroduction to GenetechnologybyErnst-L-Winnacker.
5. Geneticdisorders ofManbyM.R. Goodman.
6. GeneticEngineeringandits ApplicationsbyP.Joshi
7. Genetics-MonrveW.Strickberger.3rdEd.,May,2000.

SKILL ORIENTED COURSE ABT-305: BIO RESOURCE TECHNOLOGY (APICULTURE,SERICULTURE,AQUACULTURE,VERMICULTURE)

Course Objectives:

1. To understand Types of honey bees, life history of honey bees, management of apiculture and by products of honey bees and economic importance disease and their control
2. To learn historical back ground of sericulture, economic importance of silk
3. To become proficient on fresh water fin fish culture, shell fish (prawn and Pearls) culture
4. To understand historical background of vermicompost, methods of vermiculture and problems involved in vermicompost

UNIT-1. APICULTURE

1.1 Typesof Honeybees.

1.2 LifeHistoryof Honeybees.

1.3 ManagementofApiculture.

1.4 Byproducts of honeybees andeconomic importanceDiseaseandtheircontrol.

UNIT-2.SERICULTURE

2.1 Historicalback groundofSericulture

2.2 TypesofSilkworms.Lifehistoryofmulberrysilkworm.

2.3 EconomicimportanceofSilk.

2.4 DiseasesofSilkworms.

UNIT-3.AQUACULTURE

3.1 Freshwaterfinfishculture.

3.2 Shellfish(Prawn&Pearls)culture.

3.3 Fishbreeding(Bund&induced breeding).

3.4 IntegratedfishfarmingandEconomicimportanceofAquaculture.

UNIT-4.VERMICULTURE

4.1 HistoricalbackgroundofVermicompost.

4.2 DifferentmethodsofVermiculture.

4.3 Advantages andeconomicimportanceof VermicultureVermicompost.

4.4 ProblemsinvolvedinVermicompost.

Course Output:

1. Types of honey bees, life history of honey bees, management of apiculture and by products of honey bees and economic importance disease and their control can be understood
2. Historical back ground of sericulture, economic importance of silk can be learnt
3. Fresh water fin fish culture, shell fish (prawn and Pearls) culture can be proficeint
4. Knowledge can be gained on historical background of vermicompost, methods of vermiculture and problems involved in vermicompost

SUGGESTEDREADINGMATERIAL:

1. ManualoffreshwaterAquaculture.R.Santhanan.Oxford,IBHPublicatons-1987.
2. Aquacultureprinciples.T.V.R.Pillay. Backwell scientificpublications-1993.
3. BiologyCultureandProductionofIndianMajorCarps,"Chakaraburthy",N.M.Narendr apublishinghouse, NewDelhi-1999.
4. Silkwormrearing,Oxford&IBHPublishingCo.Pvt.Ltd.NewDelhi-1997.
5. SilkDying andFinishing,Oxford&IBHPublishingCo.Pvt.Ltd.NewDelhi-1997.
6. EconomicZoology, G.S.Shukla&V.B.Upadyay.Rastoogipublications,1994.

OE ABT-306A:ANIMALBIOTECHNOLOGYANDINDUSTRIAL APPLICATIONS

Course Objectives:

1. To gain knowledge on preservation animals engineered bacteria/yeast/ cell lines, metabolic engineering, fermentative production and glycolytic pathway
2. To understand monoclonal antibodies, DNA biotechnology and genetically engineered products
3. To learn transgenic, poultry, piggery, diary sciences and aquaculture applications
4. To know the DBT guidelines, Global scenario of transgenic micro organisms and ethical issues related to biotechnology products.

UNIT-1.

1.1 Preservation animal engineered bacteria/ yeast/ cell lines – reversal strategies – optimizesofexpression ofrestrictionprimer– mechanismof restriction, isolationdigestion.

1.2 Metabolicengineering:enzymaticcultivationofdomesticandagriculturalwastes–saccharification – large scale purification of cellulases – and their use in conservation ofagriculturewaste in to sugars.

1.3 FermentativeproductionofbioEthanol,PropanolandButanol.

1.4 Glycolyticpathway,manipulatingincreasedflux towardsalcohols.

UNIT-2.

2.1 Products from animal and plant cells, monoclonal antibodies, hormones etc. Geneticallyengineeredproducts,DNAbiotechnology,Modernmethodsforthedetectionofpathogens.

2.2 Bioinformatics and Biotechnology, Disease Processes, Extremophiles and the search fornewbiocatalysts.

2.3 Transgenics:Transgenicanimal:productionandapplication;transgenicanimalsasmodelsforhuman diseases.

2.4 Transgenicanimalsinlive-stockimprovement;expressionofthebovinegrowthhormone;transgenicsinindustry;chimeraproduction;Ethicalissuesinanimalbiotechnology.

UNIT-3.

3.1 Poultry.

3.2 Piggery.

3.3 DiarySciences.

3.4 Aquacultureapplications.

UNIT-4.

4.1 Safetyinthecontaineduseandreleaseoftransgenicanimals-Mechanismofimplementationofbiosafetyguidelines-atInstitutional,nationaland Internationallevel.

4.2 DBTGuidelines-ActusandtreatiesrelatedtobiosafetyofGMMandGMP"s-Publicawarenessperception and acceptanceof productsofbiotechnology.

4.3 Globalscenariooftransgenicmicroorganismsandplants-Intellectualpropertyrights-Patentlaws at national and international level.

4.4 Ethicalissuesrelatedtobiotechnologyproducts-Ecologicalrisksofengineeredmicroorganismsremedies.

Course Output:

1. Knowledge will be gained on preservation animals engineered bacteria/yeast/ cell lines, metabolic engineering, fermentative production and glycolytic pathway
2. Monoclonal antibodies, DNA biotechnology and genetically engineered products can be understood
3. Transgenic, poultry, piggery, diary sciences and aquaculture applications can be undertood
4. DBT guidelines, Global scenario of transgenic micro organisms and ethical issues related to biotechnology products can be learnt

SUGGESTEDREADINGMATERIAL:

1. Tzotzos,G.T.1995.Geneticallymodifiedorganisms-Aguidetobiosafety,CABInternational,Wallingford, U.K. 213p.
2. DBT1998Backgrounddocumentforworkshoponbiosafetyissuesemanatingfromuseofgenetically modified organisms(GMOs).Bangalore. September1998.289p.
3. Subbaram,N.R.1998.HandbookofIndianpatentlawandpractice.S.Viswanathan(Printers &Publishers) Pvt.Ltd. Chennai 628p.

OE ABT-306B:CANCERBIOLOGY

Course Objectives:

1. To gain knowledge on cancer types and tumor development
2. To learn oncogenes, mechanisms of onogene activation and chromosomal translocation
3. To understand cell cycle regulation and cancer, DNA Damage and repair
4. To learn tumor immunology, Vaccine development, tumor cell evasion of immune defenses

UNIT-1.

1.1 Introduction:Cancertypes,Characteristicsofcancercells.

1.2 Carcinogenesis:cancerinitiation, promotionandprogression,termination.

1.3 Factorsresponsibleforcarcinogenesis:Physical, chemicalandbiological.

1.4 TumorDevelopment:Models,Tumorangiogenesis.Overviewofinvasionandmetastasis.Cell-cell interactions in cancer.Invasion and the extracellular matrix.Specific cases ofProstate,Breast,Intestinal cancers.

UNIT-2.

2.1 Oncogenes andtheirroleinCancer:Introductiontooncogenes.

2.2 Mechanismsofoncogeneactivation(geneamplification.

2.3 Mechanismsofoncogene activation(chromosomaltranslocations).

2.4 Chromosomaltranslocationswithdominantnegativeeffects.Introductiontotumorsuppressor genes.

UNIT-3.

3.1 Cell-CycleRegulationandCancer:Mutationsaffectingmitogenicsignaltransductionpathways. Cell Cycle Regulation - Mutations affecting the cell cycle. Loss of checkpointcontrolandgeneticinstability. Replicativesenescence

3.2 DNA Damage, Repair failure and Carcinogen Mechanisms:Carcinogens, DNA damageandrepair.

3.3 Carcinogenesis:Chemicalandphysicalagents.

3.4 Carcinogenesis:Repairmechanisms.Aberrantrepairandgeneticinstability.Geneticpredispositionto cancer.

UNIT-4.

4.1 TumorImmunology:Tumorimmunology[tumorantigens, cytokines,

4.2 Vaccinedevelopment,Immunotherapyanditslimitations.

4.3 Tumorcellevasionofimmunedefenses.

4.4 Principles of chemotherapy and chemoprevention. Drug screens: High throughputScreening(HTS) approaches.

Course Output:

1. Cancer types and tumor development can be understood
2. Oncogenes, mechanisms of onogene activation and chromosomal translocation can be learnt
3. Cell cycle regulation and cancer, DNA Damage and repair can be understood
4. Tumor immunology, Vaccine development, tumor cell evasion of immune defenses can be leant

SUGGESTEDREADINGMATERIAL:

1. OxidativeStressandInflammatoryMechanismsinObesity,Diabetes,andtheMetabolic Syndrome,EditedbyLesterPacker andHelmut Sies,CRC PressLLC(2007).
2. Oxidativestressandneurodegenerativedisorders.G.AliQureshiandS.HasanParvez,El sevier,St.Louis, MO63146 USA(2007).
3. OxidativeStressDiseaseandCancer.EditedbySingh,WorldScientificPublishing(2006).
4. FattyAcidsandOxidativeStressinNeuropsychiatricDisorders.EditedbyRavinder,M.D.Reddy andJeffreyK.Yao,NovaSciencePubInc(2007).
5. OxidativeStress,Inflammation,andHealth.EditedbyYoung-JoonSurhandLesterPacker,CRC PressLLC(2005).
6. CriticalReviewsofOxidativeStress&Aging.EditedbyCutler,WorldScientificPublish ing(2002).
7. FreeRadicals,OxidativeStress,andAntioxidants:PathologicalandPhysiologicalSigni ficance"Edited bybyTomrisÖzbenm,Springer(1998).

ABT 304 P : ABT-301 (Core), ABT-302 (Core) & ABT-303 A& B (GE)

ABT Lab 2: ABT-305 (Skill Oriented course)

CORE ABT-401:MEDICALBIOTECHNOLOGY

Course Objectives:

1. To understand disease diagnosis, monoclonal antibodies and detection of genetic disease
2. To learn Disease treatment, interferons, growth factor, and antisense nucleotide as therapeutic agent
3. To gain knowledge on gene therapy, types of gene therapy, augmentation therapy and targeted transfer
4. To become proficient on forensic medicine, preparation of DNA sample. Approaches for DNA analysis and applications of forensic medicine

UNIT-1.

1.1 Introduction,Diseaseprevention(Vaccines),Anidealvaccines.

1.2 Diseasediagnosis:Probes.

1.3 Monoclonalantibodies.

1.4 DetectionofGeneticDisease.

UNIT-2.

2.1 Diseasetreatment.

2.2 Interferons.

2.3 Growthfactor.

2.4 Antisensenucleotideastherapeuticagent.

UNIT-3.

3.1 GeneTherapy.

3.2 Typesofgenetherapy.

3.3 Augmentationtherapy.

3.4 Targetedtransfer.

UNIT-4.

4.1 Forensicmedicine.

4.2 Preparationofthe DNASample.

4.3 ApproachesforDNAAnalysis.

4.4 ApplicationsofForensic medicine.

Course Output:

1. Disease diagnosis, monoclonal antibodies and detection of genetic disease can be understood
2. Disease treatment, interferons, growth factor, and antisense nucleotide as therapeutic agent can be learnt
3. Knowledge will be gained on gene therapy, types of gene therapy, augmentation therapy and targeted transfer
4. Forensic medicine, preparation of DNA sample. Approaches for DNA analysis and applications of forensic medicine will be proficient

SUGGESTEDREADINGMATERIAL:

1. BiotechnologybyB. D. Singh. Kalyani Publishers, 2007.
2. TextBook ofBiotechnologyByH.K. Das (WileyPublications).
3. Strategies in Transgenic Animal Sciences - By Glemn M.M. and James M. Robl ASM.2000.
4. Essentialsof Biotechnologyfor StudentsBySatyaN. Das.2001.
5. GeneseriesByBenjaminLewin,OxfordUniversityPress
6. Molecular Biologyof Cell ByBruceAlberts
7. MolecularBiologyDavidFreifelder,NarosaPublishingHouse
8. E.coliandSalmonellatyphimurium-CellularandMolecularBiologyByNeidhardt,AmericanSocietyforMicrobiology,USA.
9. Molecular Biologyof theGenebyWatson.

CORE ABT-402:FERMENTATIONTECHNOLOGYANDDOWNSTREAMING,PROCESS

Course Objectives:

1. To understand cell distribution methods, separation techniques, purification by chromatographic techniques and isolation and screening and maintenance of industrially importance microbs
2. To learn bioreactor design, fermentation economics, upstream processing, membrane based separations
3. To gain knowledge on importance of downstream processing economics of downstream processing
4. To become proficient in adsorptive chromatographic separations, electrophoretic process, hybrid separations technologies and gel permeation chromatography dialysis and crystallization

UNIT-1.

1.1 Cell distribution methods: Sonicatron – frush press – freeze than methods. Cell distribution for intracellular products, removal of insolubles, biomass (and particulate debris).

1.2 Separation techniques, flocculation and sedimentation, centrifugation and filtration methods.

1.3 Purification by chromatographic techniques; Reverse osmosis and ultra-filtration; Drying; Crystallization; Storage and packaging; Treatment of effluent and its disposal.

1.4 Isolation, screening and maintenance of industrially important microbes; Microbial growth and death kinetics (an example from each group, particularly with reference to industrially useful microorganisms).

UNIT-2.

2.1 Bioreactor designs; Types of fermentation and fermenters; Concepts of basic modes offermentation-Batch,fedbatchandcontinuous;Conventionalfermentationv/sbiotransformation;Solid substrate,surfaceand submergedfermentation.

2.2 Fermentation economics; Fermentation media; Fermenter design-mechanically agitated;Pneumatic and hydrodynamic fermenters;Large scale animal and plant cell cultivationandair sterilization.

2.3 Upstreamprocessing:Mediaformulation;Sterilization;Aerationandagitationinbioprocess; Measurement and control of bioprocess parameters; Scale up and scale downprocess.

2.4 Membrane-based separations(micro and ultrafiltration theory, design and configuration ofmembrane separation equipment, applications, precipitation methods(with salts, organicsolvents, and polymers, extactive separations, aqueous two phase extraction, supercriticalextraction)insitu product removal, integratedbioprocessing.

UNIT-3.

3.1 RoleandImportanceofdownstreamprocessinginbiotechnologicalprocesses.

3.2 Problemsandrequirementsofbioproductpurification.

3.3 EconomicsofdownstreamprocessinginBiotechnology,cost-cuttingstrategies.

3.4 Characteristicsofbiologicalmixtures,processdesigncriteriaforvariousclassesofbioproducts(high volume, low value products and low volume, high value products),physico-chemicalbasis of bioseparation processes.

UNIT-4.

4.1 Adsorptivechromatographicseparationsprocesses.

4.2 Electrophoreticprocesses (allelectrophoresistechniquesincludingcapillaryelectrophoresis)

4.3 Hybridseparationtechnologies(membranechromatography,electrochromatographyetc).

4.4 GelPermeationChromatography, dialysis,Crystallisation.

Course Output:

1. Cell distribution methods, separation techniques, purification by chromatographic techniques and isolation and screening and maintenance of industrially importance microbs can be understood
2. Bioreactor design, fermentation economics, upstream processing, membrane based separations can be learnt
3. Knowledge will be gainedon importance of downstream processing economics of downstream processing
4. Adsorptive chromatographic separations, electrophoretic process, hybrid separations technologies and gel permeation chromatography dialysis and crystallization will be proficient

SUGGESTEDREADINGMATERIAL:

1. WankatP.C,“RateControlledSeparations",Elsevier,1990.
2. BelterPAandCusslerE, “Bioseparations",Wiley, 1985.
3. “ProductRecoveryinBioprocessTechnology",BIOTOLSeries,VCH,1990.
4. AsenjoJ.M,“SeparationprocessesinBiotechnology",1993,MarcelDekkerInc.

GE ABT-403A:DRUGDESIGNANDDEVELOPMENT

Course Objectives:

1. To learn drug design, analog approach of drug designing
2. To understand SAR Vs QSAR, Partition coefficient, Hammets substituent constant and Tafts steric constant, Free Wilson mode, 3D-QSAR approach like COMFA and COMIA
3. To gain knowledge on pharmacological screening and assays, pharmacological screening models for therapeutic areas, cell based assay, biochemical assay, radiological binding assay, small molecule manufacturing
4. To learn Drug Laws, FDA, OECD, ICH, Schedule Y, drug registration, Regulations of human pharmaceuticals and biological products, and clinical trial design

UNIT-1.

1.1 Historyofdrugdesign,Current approachesandchallengesin drugdesign.

1.2 ConventionalMethods:Lead,Discoveryoflead,Leadoptimisation,Objectiveofleadoptimization.

1.3 Analogapproachofdrugdesigning:Bioisostericreplacement,rigidanalogs.

1.4 Alteration ofchain branching,changes in ring size, ring position isomers, design ofstereo isomers and geometric isomers, fragments of a lead molecule, variation in interatomicdistance.

UNIT-2.

2.1 SARversusQSAR, Historyand developmentofQSAR, ObjectivesofQSAR.

2.2 Types of physicochemical parameters, experimental and theoretical approaches for thedeterminationofphysicochemicalparameterssuchasPartitioncoefficient,Hammetssubstituentconstant and Tafts stericconstant.

2.3 Hansch approach, Free-Wilson model, statistical methods, Non-computer-assisted searchoperationslikeToplissdecisiontree,Simplexmethod,Fibonaccisearchtechnique.

2.4 3D-QSARapproacheslikeCOMFAandCOMSIA.

UNIT-3.

3.1 PharmacologicalScreeningandAssays:Generalprinciplesofscreening,correlationsbetweenvarious animalmodels and human situations.

3.2 Pharmacologicalscreening modelsfor therapeutic areas.Correlationbetweenin-vitroandin-vivoscreens.

3.3 Special emphasis on cell-based assay, biochemical assay, radiological binding assay, highthroughputscreening, specificuseofreferencedrugsandinterpretation of results.

3.4 Manufacturing&processdevelopment;smallmoleculemanufacturing;developmentofproteintherapeutics andvaccines.

UNIT-4.

4.1 Drug Laws, FDA, OECD, ICH, Schedule Y, Design non clinical toxicity studies andclinicaldevelopment, clinical risk/benefit analysis.

4.2 Drugregistration:Regulatoryaffairs,WTO,Patentregime,Accreditationandharmonizationprocess.

4.3 Regulations of human pharmaceuticals and biological products. Clinical Trials: Mainfeatures of clinical trials, including methodological and organizational considerations andtheprinciples oftrial conduct and reporting.

4.4 Keydesigns surrounding design, samplesize,deliveryand assessment of clinicaltrials.

Course Output:

1. Drug design, analog approach of drug designing can be understood
2. SAR Vs QSAR, Partition coefficient, Hammets substituent constant and Tafts steric constant, Free Wilson mode, 3D-QSAR approach like COMFA and COMIA can be learnt
3. Knowledge will be gained on pharmacological screening and assays, pharmacological screening models for therapeutic areas, cell based assay, biochemical assay, radiological binding assay, small molecule manufacturing
4. Drug Laws, FDA, OECD, ICH, Schedule Y, drug registration, Regulations of human pharmaceuticals and biological products, and clinical trial design can be learnt

SUGGESTEDREADINGMATERIAL:

1. ComprehensiveMedicinalChemistry,Vol.IV,QuantitativeDrugDesign,C.Hansch,Ed.
2. Burger"sMedicinalChemistryandDrugDiscovery,Vol.I,Vedition,M.E.Wolff.Ed.

3. QuantitativeDrugDesign,ACriticalIntroduction,Y.C.Martin,MarcellDekker.
4. TheoreticalDrugDesignMethods,Vol. 7,R.Franke,Elsevier,1988.
5. TheOrganicChemistryof DrugDesignandAction, R.B. Silverman,AcademicPress.
6. TheOrganicChemistryofDrugDesignandDrugAction, byR.B. Silverman.
7. An Introduction toMedicinal ChemistrybyG. L.Patrick.
8. MartinYC.“QuantitativeDrugDesign”Dekker,NewYork.
9. LienEJ.SAR“SideeffectsandDrugDesign”Dekker,NewYork.
10. WilliamH,MalickJB“DrugDiscoveryandDevelopment”HumanaPressClifton.
11. FoyeWO“PrinciplesofMedicinalchemistry,,Lea&Febiger.
12. KorolkovasA,BurckhalterJH.“EssentialsofMedicinalChemistry”WileyInterscience.

GE ABT-403B:BIOSAFETY,BIOETHICS&INTELLECTUALPROPERTYRIGHTS

Course Objectives:

1. To understand socio-economic and legal impact of biotechnology, use of genetically modified organisms, moral and ethical issues in biotechnology and safety issues with GMO
2. To learn intellectual property right, evaluation of patenting, application of GATT and IPR and WTO Act and global and Indian biodiversity
3. To gain knowledge on Indian Patent Act 1970, role of country patent office, U.S. Patent trademark office and U.S. Paten system Vs Indian Patent system
4. To gain knowledge on Ethics and genetic engineering, patent of genes, human cloning, stem cel, regulatory requirements for drugs and biologics, GLP and GMP

UNIT-1.

1.1 Socio–economicandlegalimpactsofbiotechnology,rDNA guidelines,nationalandinternationalguidelines,experimentalprotocols approval,levelsof containment.

1.2 Useofgeneticallymodifiedorganisms, their releasein theenvironment.

1.3 Moralandethicalissuesinbiotechnology.

1.4 Safetyissues with GMO.

UNIT-2.

2.1 IntellectualpropertyRights:Definitionof IPR,Typesof IPR,PatentstoTradesecrets,copyrights,trademarks– legalImplications.
2.2 Evaluationofpatenting,IPrelevanceto Biotechnologyandfewcasestudies.
2.3 ApplicationGATT &IPR,WTOAct.

2.4 Global&Indian biodiversityact.

UNIT-3.

3.1 Indian Patent Act 1970, Recent Amendments filing of a patent application – Precautionsbeforepatenting-disclosure/non-disclosure.

3.2 Role ofacountrypatent office.

3.3 U.S.PatentTrademark Office.

3.4 U.S.PatentsystemVsIndianPatentSystem.

UNIT-4.

4.1 EthicsandGeneticEngineering,PatentofGenes.

4.2 Humancloning,Stemcells,

4.3 Regulatoryrequirements fordrugs andbiologics.

4.4 GLP,GMP.

Course Output:

1. Socio-economic and legal impact of biotechnology, use of genetically modified organisms, moral and ethical issues in biotechnology and safety issues with GMO can be understood
2. Intellectual property right, evaluation of patenting, application of GATT and IPR and WTO Act and global and Indian biodiversity can be leant
3. Knowledge will be gained on Indian Patent Act 1970, role of country patent office, U.S. Patent trademark office and U.S. Patent system Vs Indian Patent system
4. Ethics and genetic engineering, patent of genes, human cloning, stem cell, regulatory requirements for drugs and biologics, GLP and GMP can be proficient

SUGGESTEDREADINGMATERIAL:

1. SassonA,BiotechnologiesandDevelopment,UNESCOPublications,1988
2. SassonA,Biotechnologiesindevelopingcountriespresentandfuture,UNESC Opublishers,1993.
3. SinghK.IntellectualPropertyRightsonBiotechnology,BCIL,NewDelhi.
4. Understandingbiotechnology,aluizioborem,fabricior.Santos.Davide. Bowen.

OE ABT-406A:ADVANCEDGENOMICSANDPROTEOMICS

Course Objectives:

1. To learn structure of Prokaryotic and Eukaryotic genomes, Isolation and purification of genomic DNA, Construction of Physical maps and Whole genome sequence alignment
2. To understand genome annotation, methods for gene identification, functional genomics, transcript profiling
3. To learn protein structure, sample preparation and separation 2D-analysis, Multidimensional liquid chromatography, protein-protein interactions analysis
4. To gain knowledge on DNA /protein sequence homologies, Gene duplication and divergence, and evolution of novel genes and proteins, DNA quantities and non-coding sequences (transposons) in genome evolution

UNIT-1.

1.1 ThestructureofProkaryoticand Eukaryoticgenomes

1.2 Isolationand purificationofgenomicDNA.GenerationofBACandYAClibraries.

1.3 ConstructionofPhysicalmaps–Restrictionmaps,FISHandSTSmaps.Maxim&Gilbert,Sangerand Next generation DNAsequencingmethods.

1.4 Wholegenomesequencealignment;ClonebycloneandShotgumsequencing.Finishedsequencesand DNAsequencedata bases.

UNIT-2.

2.1 Genome annotation, methods for gene identification (location)

2.2 Assigning gene function by experimental analysis: gene inactivation by homologous recombination, RNA interference (RNAi) and gene knockout.

2.3 Functional genomics: Array fabrication, types, method and application of DNA Micro arrays.

2.4 Transcript profiling: Serial analysis of gene expression (SAGE) and Massively parallel signature sequencing (MPSS)

UNIT-3.

3.1 Proteinstructure:secondarystructures,domains,motifandfolds

3.2 Samplepreparationandseparation–2D-analysis,Multidimensionalliquidchromatography.

3.3 CharacterizationofproteinsbyMassspectrometryandproteinsequencing.Proteinmicroarrays.

3.4 Protein-proteininteractionanalysis;yeasthybridsystems,phagedisplayandproteincomplexes.

UNIT-4.

4.1 DNA/proteinsequencehomologies–Analogy, OrthologyandParalogy.

4.2 Geneduplicationanddivergence,andevolutionofnovelgenes andproteins

4.3 DNAquantities and non-codingsequences(transposons)in genomeevolution.

4.4 Molecularclocks,MolecularPhylogenetics andconstructionofphylogenetictrees.Applicationsofgenomicsinmedicine,agriculture and industry.

Course Output:

1. Structure of Prokaryotic and Eukaryotic genomes, Isolation and purification of genomic DNA, Construction of Physical maps and Whole genome sequence alignment can be learnt
2. Genome annotation, methods for gene identification, functional genomics, transcript profiling can be understood
3. Protein structure, sample preparation and separation 2D-analysis, Multidimensional liquid chromatography, protein-protein interactions analysis can be proficient.
4. Knowledge will be gained on DNA /protein sequence homologies, Gene duplication and divergence, and evolution of novel genes and proteins, DNA quantities and non-coding sequences (transposons) in genome evolution

SUGGESTEDREADINGMATERIAL:

1. Griffiths,A.J.F.,Miller,J.H.,Suzuki,D.T.,Lewontin,R.C.,andGalbert,W.M.2000.A nintroduction toGenetic Analysis, W.H.Freeman Publishers, NewYork.
2. DouglasJ.Futuyma,1998.EvolutionaryBiology(3rd.Ed).SinauerAssociates,Inc.Pub lishers.
3. Brown,T.A. 1999. Genomes 3.JohnWiley&Sons, NewYork,USA.
4. Primrose,S.B.&Twyman,R.M.2003.PrinciplesofGenomicAnalysisandGenomics. (7th Ed.). Blackwell Science.
5. Brown,T.A.2001.GenecloningandDNAAnalysis- Anintroduction(5thEd.),BlackwellScientificPublications, Oxford, U.K.
6. RobertF.Weaver.2008. MolecularBiology(4th Ed.).McGrawHillHigherEducation.
7. Gustafson,J.P.2000.Genomes,KluwerAcademicplenumpublishers,NewYork,US A.
8. Jolls,O.andJornvall,H.(eds.)2000.ProteomicsinFunctionalGenomics.BirkhauserV erlag,Basel,Switzerland.
9. BiochemistrybyLubertStryer(5th Ed.) (Freeman-Toppan).

OE ABT-406B: ANIMALCELL CULTURETECHNIQUES

Course Objectives:

1. To understand Animal cell culture, culture medium, characteristics of cell in culture
2. To learn primary culture, established cell line culture, Measurement of viability and cytotoxicity , cell types and apoptosis
3. To gain knowledge in scaling up of animal cell culture, cell transformation, tissue engineering, transgenic animals, animal cloning
4. To become proficient in improvement of biomass, pharming products, plasminogen activator and ethical issues related to biotechnology products

UNIT-1.

1.1 AnimalCellCulture:Equipmentandmaterialsfor animalcellculture technology.Varioussystemsoftissue culture,theirdistinguishingfeatures,advantages andlimitations.

1.2 Culturemedium:naturalmedia,syntheticmedia,sera.Introductiontobalancedsaltsolutionsandsimple growth medium.

1.3 Briefaccountonthechemical,physicalandmetabolicfunctionsofdifferentconstituentsofculturemedium, roleof carbondi oxide, serumand supplements.

1.4 Characteristicsofcellsinculture:Contactinhibition,anchoragedependence,cell-cellcommunicationetc.;Cell senescence;cell andtissue responseto trophic factors.

UNIT-2.

2.1 PrimaryCulture:Behaviourofcells,properties,utility.Explantculture;suspensionculture.

2.2 Established cell line cultures: Definition of cell lines, maintenance and management; celladaptation.

2.3 Measurement of viability and cytotoxicity: Cell cloning, cell synchronization and cellmanipulation.

2.4 Cell types and Apoptosis: Various methods of separation of cell types, advantages andlimitations; flow cytometry.Measurement of cell death, Apoptosis (death domain, role ofcytochromeC)

UNIT-3.

3.1 Stem cells:Scaling up of animal cell culture. Cell transformation. Scope, embryonic andadultstemcells,properties,identification,stemcellsculture,techniquesandtheirapplicationsin modern clinical sciences.

3.2 TissueEngineering:biomaterialsusedintissueengineering,threedimensionalcultureandtransplantation ofengineeredcells.-Skin, boneand neuronaltissues.

3.3 TransgenicAnimals:Methodsinvolvedintheproductionoftransgenicanimals,importance and applications of transgenic animals. Gene knock out and mice models fortacklinghuman diseases.

3.4 Animal cloning: methods of cloning and their importance with reference to domesticanimals.IVF-technologyforlivestock and humans.

UNIT-4.

4.1 Improvementofbiomass,diseaseresistant,recombinantvaccines forpoultry,livestock.

4.2 Pharmingproducts. Pharmaceutical products producedbymammalian cells.

4.3 Plasminogenactivator,erythropoietin,bloodclottingfactors,Glycoproteinhormones,interleukins,interferons,Cell culturebased vaccines.

4.4 Ethicalissuesrelatedtobiotechnologyproducts-Ecologicalrisksofengineeredmicroorganismsremedies.

Course Output:

1. Animal cell culture, culture medium, characteristics of cell in culture can be understood
2. Primary culture, established cell line culture, Measurement of viability and cytotoxicity , cell types and apoptosis can be learnt
3. Knowledge will be gained in scaling up of animal cell culture, cell transformation, tissue engineering, transgenic animals, animal cloning
4. Improvement of biomass, pharming products, plasminogen activator and ethical issues related to biotechnology products will be proficeint

SUGGESTEDREADINGMATERIAL:

1. BallinicC.A.,PhilipsJ.Pand MooYoungM.AnimalBiotechnology. Pergamonpress,NewYork. 1989.
2. BergerS.L.andA.R. Kimmel.Methodsinenzymologyguidetomolecular cloningtechniques(Vol 152).AcademicPressInc. San Diego.1996.
3. JanFreshney.R.Culture ofAnimalCells:AManual ofBasicTechniqueandSpecialized Applications (6thEd.)Wiley&Sons. 2010.
4. John Davis., Animal Cell Culture: Essential Methods (1st Ed.) Wiley-Blackwell andSons publisher. 2011.
5. Ernst-LWinnacker, FromGenestoClones:IntroductiontoGeneTechnology. WILEY-VCH Verlag GmbH,Weinheim, Germany Reprinted by PanimaPublishingCorporation,New Delhi. 2003.
6. AnimalcellBiotechnology, R.E.SpierandJ.BGriffiths.AcademicPress.(1998).
7. LivingresourcesforBiotechnology,Animalcells;a.Doyle,R.HayandB.E.Kirsop(1990) ,Cambridge UniversityPress, Cambridge.
8. Genetherapy– FromLaboratorytotheClinic,Hui,K.M.WorldScientificPublishingCo.Pvt.Ltd. Singapore, 1994.

ABT 404 : Project and Viva-Voce (Dissertation preparation and Submission).

ABT Lab 2: ABT-405 (Project Work)