2018-2019

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	2018-2019	10%	Enclosed

DEPARTMENT OF ZOOLOGY

S.V.U. COLLEGE OF SCIENCES

SRI VENKATESWARA UNIVERSITY: TIRUPATI

RESTRUCTURED CURRICULUM FOR M.Sc. ANIMAL BIOTECHNOLOGY (REGULAR) PROGRAMME TO BE IMPLEMENTED WITH EFFECT FROM THE ACADEMIC YEAR 2018-2019

SYLLABUS

Choice Based Credit System (CBCS)

JUNE 2018

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.

RESTRUCTURED CURRICULUM FORM.Sc. ANIMAL BIOTECHNOLGY PROGRAMME

TO BE IMPLEMENTED WITH EFFECT FROM THE ACADEMICYEAR 2018-2019

SEMESTER-I

S.No	Code	Title of the Course	Credit hours per week	No. of Credits	Core/ Elective	Univ. Exam (Hours)	Int.Ass	Semester end Exam	Total
1	ABT-Core-101	Metabolic Regulation & Cell Function (MRCF)	4	4	Core	3	20	80	100
2	ABT-Core-102	Tools & Techniques (TT)	4	4	Core	3	20	80	100
3	ABT-Core-P-103	MRCF	8	4	Practical	4	-	100	100
4	ABT-Core-P-104	TT	8	4	Practical	4	-	100	100
5	ABT-CF-105	Microbiology and Diseases	4	4	Compulsory (Related to Subject)	3	20	80	100
6	ABT -EF-106	Human Values & Professional Ethics (HVPE)-I	4	4	Elective (Foundation)	3	20	80	100
Total Credits /Marks			**32**	**24**			**80**	**520**	**600**

SEMESTER-II

S.No	Code	Title of the Course	Credit hours per week	No. of Credits	Core/ Elective	Univ. Exam (Hours)	Int. Ass	Semester end Exam	Total
1	ABT-Core-201	Molecular Biology (MB)	4	4	Core	3	20	80	100
2	ABT-Core-202	Animal Cell culture & Stem Cell Biology (ACC-SCB)	4	4	Core	3	20	80	100
3	ABT-Core-P-203	MB & IM	8	4	Practical	4	-	100	100
4	ABT-Core-P-204	ACC-SCB & CB	8	4	Practical	4	-	100	100
5	ABT-CF-205	Cell Biology & Immunology (CB&IM)	4	4	Compulsory (Related to Subject)	3	20	80	100
6	ABT-EF-206	Human Values & Professional Ethics (HVPE)-II	4	4	Elective (Foundation)	3	20	80	100
Total Credits /Marks			**32**	**24**			**80**	**520**	**600**

SEMESTER-III

S.No	Code	Title of the Course	Credit hours per week	No. of Credits	Core/ Elective	Univ. Exam (Hours)	Int. Ass	Semester end Exam	Total
1	ABT-Core-301	Enzymology (ENZ)	4	4	Core	3	20	80	100
2	ABT-Core-302	Animal Reproduction, Breeding & Transgenic Technology (ARBTT)	4	4	Core	3	20	80	100
3	ABT-Core-P-303	ENZ & GE	8	4	Practical	4	-	100	100
4	ABT-Core-P-304	ARBTT & EBT	8	4	Practical	4	-	100	100
5	ABT-GE-305	Generic Electives* (Related to Subject)	4 4	4 4	**GE-305A:** Cancer Biology **GE-305B:** Environmental Biotechnology (EBT) **GE-305C:** Biostatistics & Bioinformatics	3 3	20 20	80 80	100 100
6	ABT - OE-306	Open Electives (For other Dept. students)	4 4	4 4	**OE-306A:** Animal Biotechnology & Industrial Applications **OE-306B:** Genetic Engineering (GE)	3 3	20 20	80 80	100 100
Total Credits /Marks			**32**	**24**			**80**	**520**	**600**

***Among the Generic Elective a student shall choose TWO among THREE**

SEMESTER-IV

S.No	Code	Title of the Course	Credit hours per week	No. of Credits	Core/ Elective	Univ. Exam (Hours)	Int. Ass	Semester end Exam	Total
1	ABT - Core-401	Medical Biotechnology (MBT)	4	4	Core	3	20	80	100
2	ABT - Core-402	Fermentation Technology and Down streaming Process (FTDSP)	4	4	Core	3	20	80	100
3	ABT - Core-P-403&404	Project and Viva- Voce	8	8	Dissertation Preparation and Submission	4	-	200	200
4	ABT - GE-405	Generic Electives* (Related to Subject)	4 4	4 4	**GE-405A:**Biosafety, Bio Ethics & Intellectual Property rights **GE-405B:**Drug design and Development **GE-405C**: Animal Cell Culture Techniques	3 3	20 20	80 80	100 100
5	ABT – OE-406	Open Electives (For other Dept. students)	4 4	4 4	**OE-406A:**Advanced Genomics and Proteomics **OE-406B**: Bio resource Technology (Apiculture, Sericulture , Aquaculture, Vermiculture)	3 3	20 20	80 80	100 100
Total Credits /Marks			**32**	**24**			**80**	**520**	**600**

*Among the Generic Elective a student shall choose TWO among THREE

ABT-Core-101: METABOLIC REGULATION AND CELL FUNCTION

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 and Fructose 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 of Ammonia- 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.

4.2 β- 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

SUGGESTED READING MATERIAL:

1. D. Voet and J.G Voet, Biochemistry, 1. Wiley & Sons.
2. David L. Nelson and Michael M. Cox, Lehninger; Principles of Biochemistry, McMillanLange Medical
3. Robert K.Murrey, D.K. Granner, P.A. Mayes and V.W. Rodwell; Harper's Biochemistry,Worth Publishers.

ABT-Core-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:

4.5 Microscopic techniques: Principles of microscopy Scanning and transmission microscopes.Image processing methods in microscopy.

4.6 Different fixation and staining techniques for Light microscope and Electron microscope.

4.7 Microtomy and processing of tissues for Light microscope and Electron microscope.Cryopreservation and cryotechniques for microscopy

4.8 Freeze-etch and freeze-fracture methods for EM.

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

SUGGESTED READING MATERIAL:

1. A Biologists Guide to Principles and Techniques of Practical Biochemistry, K. Wilson&K.W. Goulding, ELBS Edn.
2. Animal Cell Culture – A practical approach, Ed.John. R. W.Masters IRL Press.
3. General Zoological Microtechniques - P.M. Weesner.
4. Principles and techniques of Biochemistry and molecular biology by Kein Wilson and JohnWalker, VII volume, Cambridge press Edition.
5. Neuro anatomical Techniques, N.J. Stransfed and T.A. Miller Springer Verlag, New YorkHeidelberg, Berlin.
6. Principles of NeuroPhychopharmacology- Robert S. Feldman, Jerrold S. Meyer and Lind F.Quenzer. Sinauer Associates, Inc. Publishers. Sunderland. Massachusetts.
7. Biophysical chemisty by Upadhyay – Upadhyay - Nath.

ABT-CF-105: MICROBIOLOGY AND DISEASES

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: Introduction to Microbiology

1.1 Discovering the microbial world. Classification of microorganisms up to order level - bacteria, algae, fungi, protozoa.

1.2 Structure of prokaryotic and eukaryotic microorganisms. General and distinctive characteristics 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, Maintenance of culture.

1.4 Outlines of characterization and identification of common bacteria, fungi, algae and protozoa.

UNIT - II: Microbial nutrition, growth and regulation

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-III:Microbial Genetics

3.1 Chemical nature of gene, Concept of gene, operon, mosaic genes/split genes.

3.2 Plasmids incompatibility. Classification: copy number, control and its significance. Structure and functions of insertion elements (IS) - transposable elements. Mechanism of transposition. Catabolic transposons and their significance.

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

3.4 Benzer‟s classical studies on II locus. Cistron complementation - Elucidation of co-linearity between DNA and protein sequence. Genetics of viruses – bacteriophage, lambda, SV 40, retroviral genome (HIV), replication, lytic and lysogenic cascades.

Unit IV: Diseases caused by microorganisms

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 Protozoa diseases (Protista): Malaria, Sleeping sickness, dysentery And Plant Pathogens: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

SUGGESTED READING MATERIAL:

1. Microbiology- M.J. Pelczar, E.C.S. Chan, Noel R. Krieg. Tata McGraw-Hill Edition.
2. Prescott's Microbiology-Christopher J. Woolverton, Linda Sherwood, Joanne Willey. TataMcGraw-Hill Edition.
3. Text book of Microbiology- Ananthanarayan and CJ Paniker, 7th Edition.

ABT-EF-106: HUMAN VALUES AND PROFESSIONAL ETHICS – 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. Definition and Nature of Ethics- Its relation to Religion, Politics, Business, Law, Medicine and Environment. Need and Importance of Professional Ethics- Goals – Ethical Values in various Professions.

II. Nature of Values- Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts- right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders, Character and Conduct.

III. Individual and 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. Bhagavad Gita – (a) Niskama karma. (b) Buddhism – The Four Noble Truths – Aryaastangamarga, (c) Jainism – mahavratas and anuvratas. Values Embedded in Various Religions, Relirious Tolerance, Gandhian Ethics.

V. Crime and Theories of punishment – (a) Reformative, Retributive and Deterrent. (b) Views on 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

SUGGESTED READING MATERIAL:

1. John S Mackenjie: A manual of ethics.
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D. Irwin Inc.
3. “Management Ethics – integrity at work” by Joseph A. Petrick and John F. Quinn,Response Books: New Delhi.
4. “Ethics in Management” by S.A. Sherlekar, Himalaya Publishing House.

5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manu Dharma Sastra or the Institute of Manu: Comprising the Indian System ofDuties: Religious and Civil(ed.) G.C. Haughton.
10. SusrutaSamhita: Tr. KavirajKunjanlal, KunjalalBrishagratha, Chowkamba Sanskrit series, Vol. I, II and III, Varnasi, Vol I OO, 16-20, 21-32 and 74-77 only.
11. CarakaSamhita: Tr. Dr. Ram Karan Sarma and VaidyaBhagavan Dash, ChowkambhaSanskrit Series office, Varanasi I,II,III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues, Barbara Mackinnon, Wadsworth/ThomsonLearning, 2001.

ABT-Core-201: MOLECULAR BIOLOGY

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 mitochondrial genome, mitochondrial and maternal Inheritance

1.3 Structure of gene (Cistron, Muton, Recon, Cis-trans test)

1.4 DNA damage and repair: Biological indication of repair, photo reactivation, Excision repair,Recombination repair, SOS repair, and Mismatch repair.

UNIT-2:

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

2.2 Enzymology of DNA replication: DNA polymerase I, II and III; Replication of Eukaryotic

Chromosomes; Eukaryotic DNA polymerases; Multiple fork; Replication of Chromatin.

2.3 .Discontinuous Replication: Fragments in Replication fork and detection of fragments; Eventsin the Replication fork; De novo initiation and covalent extension.

2.4 Bidirectional replication, Termination of replication.

UNIT-3:

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

3.2 Types of RNA, Processing of mRNA, rRNA and tRNA, Ribozyme.

3.3 Genetic code, Identification of start and stop codon, Universality of genetic code Degeneracy,Wobbles Hypothesis. Codon usage, Genetic code of 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 Temporal response, Induction, Repression, Lac Operon, Galactose Operon.

4.2 Lambda Operon, Tryptophan Operon.

4.3 Gene regulation in Eukaryotes- I: Gene families, Gene alteration (Gene loss, Gene amplification, gene rearrangement), Regulation of synthesis of primary transcripts (gene organization that affects regulation-Activator gene; Transcriptional control by hormones, Methylation).

4.4 Gene regulation in Eukaryotes-II: Brief description of fundamentals of Chromatin remodeling, Enhanceosome, Reporter or Chimeric genes, Role of binding motifs in gene expression (Helix-Turn-Helix motif, Zinc finger and Leucine 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

SUGGESTED READING MATERIAL:

1. Biochemistry by A.L. Lehniger
2. Cell and Molecular Biology-E.D.P. De Robertis and E.M.F.
3. Concepts in Molecular Biology-S.C. Rastogi, VN. Sharma and AnandaTandon (1993)Genes VII by Benjamin Lewin.
4. Harper's review of Biochemistry by D.W. Martin et al1990
5. Molecular Biology by David Freifelder, 1993

ABT-Core-202: ANIMAL CELL CULTURE & STEM CELL BIOLOGY

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- I:

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- II:

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

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

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

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

UNIT- III:

3.1 Stem cell plasticity: Overview; self-renewal potential; differentiation versus stem cell renewal; trans differentiation; cell cycle dynamics of different stem cells.

3.2 Stem cell assays and protocols: Isolation of defined stem cell populations; progenitor cell assays, sources of progenitor cells, cytokine and chemotherapy approaches to mobilization of progenitor cells; flow cytometric techniques; methods of cell selection using monoclonal antibodies.

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

3.4 Stem cell therapies: Clinical applications of stem cell therapy; neurodegenerative diseases- Parkinson's disease, Alzheimers, spinal cord injury, other brain syndromes;

tissue systems failures- diabetes, cardiomyopathy, kidney failure, liver failure hemophilia, lymphoma and leukemic malignancies requiring stem cell therapy.

UNIT- IV:

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

SUGGESTED READING MATERIAL:

1. Handbook of Stem Cells Volume 1 and 2 Eds Robert Lanza and others ElsevierAcademic Press.
2. Austen C.R. and Short. R.V. Reproduction in animals.
3. Schatten and Schatten. Molecular Biology of Fertilization.
4. R.G. Edwards. Human Reproduction.
5. S.F. Gillbert. Developmental Biology. Sinauer Association Inc., Massachusetts.

ABT-CF- 205: CELL BIOLOGY AND IMMUNOLOGY

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 Plasma membrane, mitochondria endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes.

1.2 Nucleus - structure and function of nuclear membrane, nucleolus.

1.3 Eukaryotic chromosome and its high resolution organization.

1.4 Polytene and lamp brush chromosomes.

UNIT - II:

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

2.2 Regulation of eukaryotic cell cycle - Over view of cell cycle. Mutation causing cell cycle control. Meiotic process - stages, chromosome pairing, chiasma formation Molecular mechanisms of recombination, synaptonemal complex. Nondysjunction,

2.3 Chromosomal abnormalities - euploidy, haploidy - their fundamental and practical significance. Polypliody - induction - Aneuploidy - type and genetic significance.

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

UNIT - III:

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

3.2 Cells involved in the immune response- T cells, B cells, CD antigens, neutrophils, eosinophils and natural killer cells. Macrophages, dendrites, Phagocytosis, Lymphoid tissues.

3.3 Functions of antibody in relation to structure. Antigen-antibody interactions- affinity of antibody, avidity, bonus effect, classical precipitin reaction, antigen-binding site of antibody, forces involved in antigen-antibody complex formation, Generation of antibodies, Theories of antibody formation. Monoclonal and polyclonal antibodies.

3.4 Complement - nature, physicochemical properties, complement cascade pathway, complement fixation.

UNIT - IV:

4.1 Antigen Presentation- pathways of antigen processing and presentation of intracellular andextracellular antigens. Cell mediated immunity (CMI): Induction and mechanism

4.2 Hypersensitivity reactions – Classification, Type I – IV reactions. Immunity to bacterial,fungal, viral and parasitic diseases. Allergy: classification and details.

4.3 Immune tolerance, immune suppression. Transplantation and G.V.H. reactions.

4.4 Immunopathology-Autoimmune diseases; immune complex diseases; immunodeficiencydiseases; immunity to 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

SUGGESTED READING MATERIAL:

1. Cell and Molecular biology by EDR De Robertis and EMR De RobertisJr, Indian edition,

   3.1 B.I. Publications, Pvt. Ltd.
2. The Cell (A Molecular Approach) by Geoffrey M. Cooper, 7th Edition.
3. Kuby, J. Immunology, 7th edition, W.H. Freeman and Company, NewYork.
4. Janeway‟sImmunobiology, 9th edition, Garland Science.

ABT-EF-206: HUMAN VALUES AND PROFESSIONAL ETHICS – 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 Human Values – Self introspection – Self-esteem. Family values - Components, structure and responsibilities of family Neutralization of anger – Adjustability – Threats of family life
– Status of women in family and society – Caring for needy and elderly – Time allotmentfor sharing ideas and concerns.

II. Medical ethics- Views of Charaka, Sushruta and Hippocratus on moral responsibility of medical practitioners. Code of ethics for medical and healthcare professionals. Euthanasia, Ethical obligation to animals, Ethical issues in relation to health care professionals and patients. Social justice in health care, human cloning, problems of abortion. Ethical issues in genetic engineering and Ethical issues raised by new biological technology or knowledge.

III. Business ethics- Ethical standards of business-Immoral and illegal practices and their solutions. Characterics of ethical problems in management, ethical theories, causes of unethical behavior, ethical abuses and work ethics.

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

V. Social ethics- Organ trade, Human trafficking, Human rights violation and social disparities Feminist ethics, surrogacy/pregnancy. Ethics of media-Impact of Newspapers, Television Movies and Internet.

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

SUGGESTED READING MATERIAL:

1. John S Mackenjie: A manual of ethics.
2. "The Ethics of Management" by Larue Tone Hosmer, Richard D. Irwin Inc.
3. "Management Ethics – integrity at work" by Joseph A. Petrick and John F. Quinn,Response Books: New Delhi.
4. "Ethics in management" by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manu Dharma Sastra or the Institute of Manu: Comprising the Indian system ofDuties: Religious and Civil(ed.) G.C. Haughton.
10. SusrutaSamhita: Tr. KavirajKunjanlal, KunjalalBrishagratha, Chowkamba Sanskritseries, Vol. I, II and III, Varnasi, Vol I OO, 16-20, 21-32 and 74-77 only.
11. CarakaSamhita: Tr. Dr. Ram KraranSarma and VaidyaBhagavan Dash, ChowkambhaSanskrit Series office, Varanasi I,II,III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues, Barbara Mackinnon, Wadsworth/ThomsonLearning, 2001.

ABT-Core-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 Theories of enzyme kinetics - kinetic theory and collision theory.

2.2 Enzyme kinetics and its importance, derivation of Michaelis-Menton equation, Methods ofVmax and Km determination, construction of Line weaver burk plots.

2.3 Effect of reactant concentrations (Rate constant, First order, Second order and Zero orderkinetic reactions, Ramachandran plot, determination of slope).

2.4 Effect of Temperature, pH and enzyme concentration on reaction rate.

UNIT-3:

3.1 Inhibition of enzyme activity (competitive, non-competitive, uncompetitive and mixed inhibition).

3.2 Kinetics of allosteric enzymes.

3.3 Regulation of enzyme activity (Metabolic regulation), Catalytic efficiency of enzymes (feedback inhibition, covalent modification).

3.4 Mechanism of enzyme action (Lock and Key, Induced fit model), catalytic site, role of metalions.

UNIT-4:

4.1 Clinical Aspects of enzymology, Medical and Therapeutic applications of enzymes;Enzymes-Clinical diagnosis.

4.2 Immobilized enzymes, various methods of immobilization-ionic bonding, absorption,covalent bonding (based on R groups of amino acids).

4.3 Iso enzymes and multiple forms of enzymes.

4.4 Enzyme engineering–economic importance of enzyme production. Enzymes in industries-food, biotechnology and other industries.

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

SUGGESTED READING MATERIAL:

1. Biochemical calculations. I.H. Segel, 2nd Ed., John Wiley & Sons.
2. Biochemistry. D. Voet& J.G. Voet, J.Wiley& Sons.
3. Enzyme Kinetics. I.W. Segil.
4. Enzyme Kinetics. D.V. Roberties, Cambridge University Press.
5. Harper‟s Biochemistry. Robert K. Murrey, Peter A. Mayer, D.K. Granner, V.W. Rodwell,Lange Medical.

ABT-Core-302: ANIMAL REPRODUCTION, BREEDING AND TRANSGENIC TECHNOLOGY

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- I:

1.1 Structure and function of male reproductive system- hormonal regulation of spermatogenesis and spermeiogenesis; inhibin and androgen binding proteins; capacitation of spermatozoa.

1.2 Structure and function of female reproductive system- influence of hormones on development of ovarian follicles and oogenesis;

1.3 Reproductive cycles: estrous and menstrual cycle; ovulation, atresia and corpus luteum formation; pregnancy and lactation; implantation and placentation.

1.4 Contraception in males and females: Hormonal and chemical; recent advances in contraception research.

UNIT- II:

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

2.2 Selection for qualitatively inherited characters -gene frequency and selecting against recessive genes; detecting heterozygotes for recessives.

2.3 Parental determination and verification; the use of markers and/or molecular probes, selection criteria: multiple records, pedigree selection, family selection.

2.4 Progeny testing: breeding value, transmitting ability and heritability; correlated characters; selection for maternal ability; factors affecting selection response; genotype-environment interactions

UNIT- III:

3.1 Artificial insemination (AI) techniques and their development: estrus synchronization; semen collection, evaluation, storage.

3.2 I*n vitro* fertilization, ICSI and preservation of endangered species.

3.3 Embryo transfer technology, Super ovulation, cryo preservation of embryos, Hormones involved in embryo transfer technology.

3.4 Microinjection and Macroinjection – introduction – procedure – applications advantages and limitations.

UNIT- IV:

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

SUGGESTED READING MATERIAL:

1. Comparative Reproductive Biology. Edited by H. Schatten and G.M. Constanitinescu.Blackwell Publishers, UK.
2. Comparative Endocrinology and Reproduction. Edited by K. P. Joy, A. Krishna, C.Haldar, Narosa Publishers, Delhi.
3. Daltons Introduction to Practical Animal Breeding. Edited by Malcolm B. Willis,Blackwell Science, UK..
4. Williams Text Book of Endocrinology, Edited by J. D. Wilson and others, Saunders,USA.
5. Animal Transgenisis and Cloning. Edited by L. M. Houdebine, Wiley, USA.

ABT-GE-305A: CANCER BIOLOGY

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-I:

1.1 Introduction:Cancer types, Characteristics of cancer cells.

1.2 Carcinogenesis: cancer initiation, promotion and progression, termination.

1.3 Factors responsible for carcinogenesis: Physical, chemical and biological.

1.4 Tumor Development:Models, Tumor angiogenesis. Overview of invasion and metastasis. Cell-cell interactions in cancer. Invasion and the extracellular matrix. Specific cases of Prostate, Breast, Intestinal cancers.

UNIT-II:

2.1 Oncogenes and their role in Cancer:Introduction to oncogenes.

2.2 Mechanisms of oncogene activation (gene amplification.

2.3 Mechanisms of oncogene activation (chromosomal translocations).

2.4 Chromosomal translocations with dominant negative effects. Introduction to tumor suppressor genes.

UNIT-III:

3.1 Cell-Cycle Regulation and Cancer:Mutations affecting mitogenic signal transduction pathways. Cell Cycle Regulation - Mutations affecting the cell cycle. Loss of checkpoint control and genetic instability. Replicative senescence

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

3.3 Carcinogenesis: Chemical and physical agents.

3.4 Carcinogenesis: Repair mechanisms. Aberrant repair and genetic instability. Genetic predisposition to cancer.

UNIT-IV:

4.1 Tumor Immunology:Tumor immunology [tumor antigens, cytokines,

4.2 Vaccine development, Immunotherapy and its limitations.

4.3 Tumor cell evasion of immune defenses.

4.4 Principles of chemotherapy and chemoprevention. Drug screens: High throughput Screening (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

SUGGESTED READING MATERIAL:

1. Oxidative Stress and Inflammatory Mechanisms in Obesity, Diabetes, and the Metabolic Syndrome, Edited by Lester Packer and Helmut Sies, CRC Press LLC (2007).
2. Oxidative stress and neurodegenerative disorders. G. Ali Qureshi and S. HasanParvez,Elsevier, St. Louis, MO 63146 USA (2007).
3. Oxidative Stress Disease and Cancer. Edited by Singh, World Scientific Publishing (2006).
4. Fatty Acids and Oxidative Stress in Neuropsychiatric Disorders. Edited by Ravinder, M.D. Reddy and Jeffrey K. Yao, Nova Science Pub Inc (2007).
5. Oxidative Stress, Inflammation, and Health. Edited by Young-JoonSurh and LesterPacker, CRC Press LLC (2005).
6. Critical Reviews of Oxidative Stress & Aging. Edited by Cutler, World Scientific Publishing (2002).
7. Free Radicals, Oxidative Stress, and Antioxidants: Pathological and Physiological Significance" Edited by byTomrisÖzbenm, Springer (1998).

ABT–GE-305B: ENVIRONMENTAL BIOTECHNOLOGY

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-I:

1.1 Introduction,

1.5 Waste and Pollutants: Manufacturing, energy production, agriculture and dairy, transport, House Building and Domestic activities.

1.6 Hazards from wastes and pollutants; biological agents present in wastes.

1.7 Hazards from chemicals in wastes, Hazards from physical pollutants.

UNIT-II:

2.1 Waste treatment: Biofilters.

2.2 Treatment of Liquid wastes

2.3 Treatment of solid waste.

2.4 Contributions of Biotechnology to waste treatment.

UNIT-III:

3.1 Aerobic waste water treatment

3.2 Measurements of the level of pollution.

3.3 The process of waste water treatment. Aerobic reactors or digesters, Microorganisms.

3.4 Anaerobic treatment of waste water: Microorganisms, Sludge Treatment.

UNIT-IV:

4.1 Biodegradation of Xenobiotic compounds: Types of Recalcitrant Xenobiotic compounds.

4.2 Hazards from Xenobiotics, General features of Biodegradation of Xenobiotics.

4.3 Biodegradation of halogenated compounds. The origin of capacity to degrade Xenobiotics.

4.4 Bioremediation: Microbial Bioremediation.

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

Anaerobic treatment of waste water, biodegradation of xenobiotics compounds, hazards from xenobiotics and bioremediation will be learnt

SUGGESTED READING MATERIAL:

1. A Text Book of Biotechnology, HD Kumar (WE Pub.)
2. Biodegradation and Detoxification of Environmental Pollutants – Chakrabarthy
3. Biotechnology by B. D. Singh. Kalyani Publishers, 2007.
4. Concepts in Biotechnology – Balasubramanian, Bryce, Dharmalingam, Green andJayaraman.
5. Environmental Biotechnology by Alan Scragg. Pearson Education Limited, England.
6. Environmental biotechnology by S.N. Jogdand. Himalaya Publishing House. Bombay.
7. Environmental chemistry by A.K. De Wiley Eastern Ltd. NewDelhi.
8. Environmental Microbiology – Grant and Long.
9. Environmental Microbiology – Mitchall.
10. Introduction to Biodeterioration by D. Allsopp and k.J. Seal, ELBS/Edward Arnold.
11. Microbial Ecology – Fundamentals and Applications – Atlas and Bartha.
12. Prescott and Dcenn, S Industrial Microbiology – Reed (Ed).

ABT-GE-305C: BIOINFORMATICS AND BIO STATISTICS

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-I:

1.1 Scope, importance and status of Bioinformatics.

1.2 Internet basics, Tools for web search, Data retrieval tools.

1.3 Sources of websites.

1.4 Data base types-primary, secondary and specific annotation databases.

UNIT-II:

2.1 Database types, Prediction of protein structure and protein folding, Proteinsequencedatabases.

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-III:

3.1 Definition of statistics: Biostatistics, classification, variables and attributes, Diagramatic distribution of biological data.

3.2 Measures of location and dispersion: Arithmetic mean, median and mode. Mean deviation, quartile deviation, Standard deviation and co-efficient of variation.

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

3.4 Correlation and regression: Scatter diagram, types of relationship. Positive and negative correlation, computation of correlation coefficient, Interpretation of correlation coefficient. Simple regression lines and its interpretation.

UNIT-IV:

4.1 Normal probability distribution & its applications.

4.2 Tests of significance: level of significance, null and alternative hypothesis, power of test andp-value of a test.

4.3 Student t- test for one a sample and two samples means-paired t-tests.

4.4 F-test, chi square test and their application, concept of ANOVA.

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

SUGGESTED READING MATERIAL:

1. Basic Bioinformatics by S. Ignacimuthu, s. j. Narosa publications, 2005.
2. Bioinformatics by Andreas D. Baxevanis and B.P. Francis Ouellette, 2nd Ed., 2002.
3. Bioinformatics, Methods and Applications, Genomics proteomics and drug discovery, S.C.Rastogi, N. Mendiratla and P. Rastogi, prentice-Hall ofIndia, 2004.
4. Microsoft Office, by Setultz, 1997.
5. Bio-Statistics- An introductory text-Goldstein, A The Macmillan Co., New York, 1971.
6. Biostatistics by Lewis Alvin (1971) Affiliated East West Press pvt., Ltd., New Delhi.
7. Bio-Statistics- By Lewis Alvin E. Affiliated East-West press (P) Ltd., 1971.
8. Interpretation and uses of Medical Statistics – G.J. Bourke &J.Mc.Gilvaray, BlovkwellScience Publication,London, 1969.
9. Introduction to Biostatistics – By Sokal – Rohlf (2nd Edn) Freeman International Editor(1973).
10. Introduction to Biostatistics by Holdan Bancroft (1962) PualB.Hoebar Inc., New York.
11. Introduction to Instrumental analysis, Ronert Braun. McGraw Hill Intemational edition.

ABT-OE-306A: ANIMAL BIOTECHNOLOGY AND INDUSTRIAL 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-I:

1.1 Preservation animal engineered bacteria/ yeast/ cell lines – reversal strategies – optimizes of expression of restriction primer – mechanism of restriction, isolation digestion.

1.2 Metabolic engineering: enzymatic cultivation of domestic and agricultural wastes – saccharification – large scale purification of cellulases – and their use in conservation of agriculture waste in to sugars.

1.3 Fermentative production of bio Ethanol, Propanol and Butanol.

1.4 Glycolytic pathway, manipulating increased flux towards alcohols.

UNIT-II:

2.1 Products from animal and plant cells, monoclonal antibodies, hormones etc. Genetically engineered products, DNA biotechnology, Modern methods for the detection of pathogens.

2.2 Bioinformatics and Biotechnology, Disease Processes, Extremophiles and the search for new biocatalysts.

2.3 Transgenics: Transgenic animal: production and application; transgenic animals as models for human diseases.

2.4 Transgenic animals in live-stock improvement; expression of the bovine growth hormone; transgenics in industry; chimera production; Ethical issues in animal biotechnology.

UNIT-III:

3.1 Poultry.

3.2 Piggery.

3.3 Diary Sciences.

3.4 Aquaculture applications.

UNIT- IV:

4.1 Safety in the contained use and release of transgenic animals-Mechanism of implementation of biosafety guidelines-at Institutional, national and International level.

4.2 DBT Guidelines- Actus and treaties related to biosafety of GMM and GMP‟s-Publicawareness perception and acceptance of products of biotechnology.

4.3 Global scenario of transgenic micro organisms and plants-Intellectual property rights-Patent laws at national and international level.

4.4 Ethical issues related to biotechnology products-Ecological risks of engineered microorganisms remedies.

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

SUGGESTED READING MATERIAL:

1. Tzotzos, G.T. 1995. Genetically modified organisms-A guide to biosafety, CABInternational, Walling ford, U.K. 213p.
2. DBT 1998 Back ground document for workshop on biosafety issues emanating from use of genetically modified organisms (GMOs). Bangalore. September 1998. 289p.
3. Subbaram, N.R. 1998. Hand book of Indian patent law and practice. S.Viswanathan(Printers & Publishers) Pvt. Ltd. Chennai 628p.

ABT-OE-306B: 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-I:

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-II:

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

2.2 Expression vectors – structure - promoters used in expression vectors - lac, tac, λpL, T7 promoters and their significance in constructing expression vectors.

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

2.4 Vectors used for cloning in to mammalian cells - SV40 Vectors.

UNIT-III:

3.1 Isolation of gene/DNA fragments. Mechanical shearing, restriction digestion, cDNA synthesis, PCR amplification and chemical synthesis of gene.

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

3.3 PCR - Concept and technology- Properties of primers - Inverse, multiplex PCR, RAPD and its significance. Real time PCR.

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

UNIT-IV:

4.1 Ligation between cohesive and blunt end DNA fragments - T4 DNA ligase - Conversion of blunt end DNA fragment into cohesive ended DNA - linkers, adapters, homopolymer tailing.

4.2 Introduction of cloned genes into host - Transformation, conjugation, transduction, electroporation, particle bombardment, microinjection, liposome mediated DNA delivery.

4.3 Identification and characterization of cloned genes - Screening of genomic/cDNA libraries - genetic, molecular hybridization - immunochemical techniques

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

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

SUGGESTED READING MATERIAL:

1. Biotech‟s Dictionary of Genetic Engineering by DineshArora.
2. D. Green; Philip Hilter Richard M. Myers Sue. Klapholz; Harold Riethman Jane Roskams.
3. DNA cloning: Mammalian systems - A Practical Approach by D.M. Glover, B. D. Hames.
4. From Genes to clones Introduction to Gene technology by Ernst-L- Winnacker.
5. Genetic disorders of Man by M.R. Goodman.
6. Genetic Engineering and its Applications by P. Joshi
7. Genetics - Monrve W. Strickberger. 3rd Ed., May, 2000.

ABT-Core-401: MEDICAL BIOTECHNOLOGY

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-I:

1.1 Introduction, Disease prevention (Vaccines), An ideal vaccines.

1.5 Disease diagnosis: Probes.

1.6 Monoclonal antibodies.

1.7 Detection of Genetic Disease.

UNIT-II:

2.1 Disease treatment.

2.2 Interferons.

2.3 Growth factor.

2.4 Antisense nucleotide as therapeutic agent.

UNIT-III:

3.1 Gene Therapy.

3.2 Types of gene therapy.

3.3 Augmentation therapy.

3.4 Targeted transfer.

UNIT-IV:

4.1 Forensic medicine.

4.2 Preparation of the DNA Sample.

4.3 Approaches for DNA Analysis.

4.4 Applications of Forensic 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

SUGGESTED READING MATERIAL:

1. Biotechnology by B. D. Singh. Kalyani Publishers, 2007.
2. Text Book of Biotechnology By H.K. Das (Wiley Publications).
3. Strategies in Transgenic Animal Sciences - By Glemn M.M. and James M. Robl ASM.2000.
4. Essentials of Biotechnology for Students By Satya N. Das. 2001.
5. Gene series By Benjamin Lewin, Oxford University Press
6. Molecular Biology of Cell By Bruce Alberts
7. Molecular Biology David Freifelder, Narosa Publishing House
8. E. coli and Salmonella typhimurium- Cellular and Molecular Biology By Neidhardt,American Society for Microbiology, USA.
9. Molecular Biology of the Gene by Watson.

ABT-Core-402: FERMENTATION TECHNOLOGY AND DOWNSTREAMING, 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-I:

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-II:

2.1 Bioreactor designs; Types of fermentation and fermenters; Concepts of basic modes of fermentation - Batch, fed batch and continuous; Conventional fermentation v/s biotransformation; Solid substrate, surface and submerged fermentation.

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

2.3 Upstream processing: Media formulation; Sterilization; Aeration and agitation in bioprocess; Measurement and control of bioprocess parameters; Scale up and scale down process.

2.4 Membrane-based separations(micro and ultrafiltration theory, design and configuration of membrane separation equipment, applications, precipitation methods(with salts, organic solvents, and polymers, extactive separations, aqueous two phase extraction, supercritical extraction) insitu product removal, integrated bioprocessing.

UNIT-III:

3.1 Role and Importance of downstream processing in biotechnological processes.

3.2 Problems and requirements of bioproduct purification.

3.3 Economics of downstream processing in Biotechnology, cost -cutting strategies.

3.4 Characteristics of biological mixtures, process design criteria for various classes of bioproducts(high volume, low value products and low volume, high value products), physico-chemical basis of bioseparation processes.

UNIT-IV:

4.1 Adsorptive chromatographic separations processes.

4.2 Electrophoretic processes (all electrophoresis techniques including capillary electrophoresis)

4.3 Hybrid separation technologies (membrane chromatography, electrochromatographyetc).

4.4 Gel Permeation Chromatography, 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

SUGGESTED READING MATERIAL:

1. Wankat P.C, “Rate Controlled Separations ", Elsevier, 1990.
2. Belter PA and Cussler E, “Bioseparations ", Wiley, 1985.
3. “Product Recovery in Bioprocess Technology ", BIOTOL Series, VCH, 1990.
4. Asenjo J.M, “Separation processes in Biotechnology", 1993, Marcel Dekker Inc.

ABT-GE-405A: BIOSAFETY, BIO ETHICS & INTELLECTUAL PROPERTY RIGHTS

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-I:

1.1 Socio – economic and legal impacts of biotechnology, r DNA guidelines, national and international guidelines, experimental protocols approval, levels of containment.

1.2 Use of genetically modified organisms, their release in the environment.

1.3 Moral and ethical issues in biotechnology.

1.4 Safety issues with GMO.

UNIT-II:

2.1 Intellectual property Rights: Definition of IPR, Types of IPR, Patents to Trade secrets, copyrights, trademarks – legal Implications.

2.2 Evaluation of patenting, IP relevance to Biotechnology and few case studies.

2.3 Application GATT & IPR, WTO Act.

2.4 Global& Indian biodiversity act.

UNIT-III:

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

3.2 Role of a country patent office.

3.3 U.S. Patent Trademark Office.

3.4 U.S. Patent system Vs Indian Patent System.

UNIT-IV:

4.1 Ethics and Genetic Engineering, Patent of Genes.

4.2 Human cloning, Stem cells,

4.3 Regulatory requirements for drugs and biologics.

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

SUGGESTED READING MATERIAL:

1. Sasson A, Biotechnologies and Development, UNESCO Publications, 1988
2. Sasson A, Biotechnologies in developing countries present and future, UNESCOpublishers, 1993.
3. Singh K. Intellectual Property Rights on Biotechnology, BCIL, New Delhi.
4. Understanding biotechnology, aluizioborem, fabricio r. Santos. David e. Bowen.

ABT-GE-405B: DRUG DESIGN AND DEVELOPMENT

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-I:

1.1 History of drug design, Current approaches and challenges in drug design.

1.2 Conventional Methods: Lead, Discovery of lead, Lead optimisation, Objective of lead optimization.

1.3 Analog approach of drug designing: Bioisosteric replacement, rigid analogs.

1.4 Alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance.

UNIT-II:

2.1 SAR versus QSAR, History and development of QSAR, Objectives of QSAR.

2.2 Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammets substituent constant and Tafts steric constant.

2.3 Hansch approach, Free-Wilson model, statistical methods, Non-computer-assisted search operations like Topliss decision tree, Simplex method, Fibonacci search technique.

2.4 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III:

3.1 Pharmacological Screening and Assays : General principles of screening, correlations between various animal models and human situations.

3.2 Pharmacological screening models for therapeutic areas. Correlation between in-vitro and in-vivo screens.

3.3 Special emphasis on cell-based assay, biochemical assay, radiological binding assay, high through put screening, specific use of reference drugs and interpretation of results.

3.4 Manufacturing & process development; small molecule manufacturing; development of protein therapeutics and vaccines.

UNIT-IV:

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

4.2 Drug registration: Regulatory affairs, WTO, Patent regime, Accreditation and harmonization process.

4.3 Regulations of human pharmaceuticals and biological products. Clinical Trials: Main features of clinical trials, including methodological and organizational considerations and the principles of trial conduct and reporting.

4.4 Key designs surrounding design, sample size, delivery and assessment of clinical trials.

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

SUGGESTED READING MATERIAL:

1. Comprehensive Medicinal Chemistry, Vol. IV, Quantitative Drug Design, C.Hansch, Ed.
2. Burger‟s Medicinal Chemistry and Drug Discovery, Vol. I, V edition, M.E. Wolff. Ed.
3. Quantitative Drug Design, A Critical Introduction, Y. C. Martin, Marcell Dekker.
4. Theoretical Drug Design Methods, Vol. 7, R. Franke, Elsevier, 1988.
5. The Organic Chemistry of Drug Design and Action, R. B. Silverman, Academic Press.
6. The Organic Chemistry of Drug Design and Drug Action, by R. B. Silverman.
7. An Introduction to Medicinal Chemistry by G. L. Patrick.
8. Martin YC. “Quantitative Drug Design” Dekker, New York.
9. Lien EJ. SAR “Side effects and Drug Design” Dekker, New York.
10. William H, Malick JB “Drug Discovery and Development” Humana Press Clifton.
11. Foye WO “Principles of Medicinal chemistry „Lea &Febiger.
12. Korolkovas A, Burckhalter JH. “Essentials of Medicinal Chemistry” Wiley Interscience.

ABT-GE-405C: ANIMAL CELL CULTURE TECHNIQUES

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-I:

1.1 Animal Cell Culture: Equipment and materials for animal cell culture technology. Various systems of tissue culture, their distinguishing features, advantages and limitations.

1.2 Culture medium: natural media, synthetic media, sera. Introduction to balanced salt solutions and simple growth medium.

1.3 Brief account on the chemical, physical and metabolic functions of different constituentsof culture medium, role of carbon di oxide, serum and supplements.

1.4 Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cellcommunication etc.; Cell senescence; cell and tissue response to trophic factors.

UNIT-II:

2.1 Primary Culture: Behaviour of cells, properties, utility. Explant culture; suspension culture.

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

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

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

UNIT-III:

3.1 Stem cells:Scaling up of animal cell culture. Cell transformation. Scope, embryonic and adult stem cells, properties,identification, stem cells culture, techniques and their applications in modern clinical sciences.

3.2 Tissue Engineering: biomaterials used in tissue engineering, three dimensional culture and transplantation of engineered cells. - Skin, bone and neuronal tissues.

3.3 Transgenic Animals:Methods involved in the production of transgenic animals, importance and applications of transgenic animals. Gene knock out and mice models for tackling human diseases.

3.4 Animal cloning: methods of cloning and their importance with reference to domestic animals.IVF- technology for livestock and humans.

UNIT-IV:

4.1 Improvement of biomass, disease resistant, recombinant vaccines for poultry, livestock.

4.2 Pharming products. Pharmaceutical products produced by mammalian cells.

4.3 Plasminogen activator, erythropoietin, blood clotting factors, Glycoprotein hormones, interleukins, interferons, Cell culture based vaccines.

4.4 Ethical issues related to biotechnology products-Ecological risks of engineered microorganisms remedies.

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

SUGGESTED READING MATERIAL:

1. Ballinic C.A., Philips J.P and Moo Young M.Animal Biotechnology. Pergamon press,New York. 1989.
2. Berger S. L. and A.R. Kimmel.Methods in enzymology guide to molecular cloning techniques (Vol 152). Academic Press Inc. San Diego.1996.
3. Jan Freshney. R .Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications (6th Ed.)Wiley & Sons. 2010.
4. John Davis., Animal Cell Culture: Essential Methods (1st Ed.) Wiley-Blackwell andSons publisher. 2011.
5. Ernst-L Winnacker, From Genes to Clones: Introduction to Gene Technology. WILEY-VCH Verlag GmbH,Weinheim, Germany Reprinted by PanimaPublishingCorporation, New Delhi. 2003.
6. Animal cell Biotechnology, R.E. Spier and J.B Griffiths. Academic Press. (1998).
7. Living resources for Biotechnology, Animal cells; a.Doyle, R.Hay and B.E. Kirsop(1990),Cambridge University Press, Cambridge.
8. Gene therapy – From Laboratory to the Clinic,Hui, K.M. World Scientific PublishingCo.Pvt. Ltd. Singapore, 1994.

ABT-OE-406A: ADVANCED GENOMICS AND PROTEOMICS

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-I:

1.1 The structure of Prokaryotic and Eukaryotic genomes

1.2 Isolation and purification of genomic DNA.Generation of BAC and YAC libraries.

1.3 Construction of Physical maps – Restriction maps, FISH and STS maps. Maxim & Gilbert,Sanger and Next generation DNA sequencing methods.

1.4 Whole genome sequence alignment; Clone by clone and Shot gum sequencing. Finishedsequences and DNA sequence data bases.

UNIT-II:

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-III:

3.1 Protein structure:secondary structures, domains, motif and folds

3.2 Samplepreparation and separation – 2D-analysis, Multidimensional liquidchromatography.

3.3 Characterization of proteins by Mass spectrometry and protein sequencing.Protein micro arrays.

3.4 Protein- protein interaction analysis; yeast hybrid systems, phage display and protein complexes.

UNIT-IV:

4.1 DNA /protein sequence homologies – Analogy, Orthology and Paralogy.

4.2 Gene duplication and divergence, and evolution of novel genes and proteins,

4.3 DNA quantities and non-coding sequences (transposons) in genome evolution.

4.4 Molecular clocks, MolecularPhylogenetics and construction of phylogenetic trees. Applications ofgenomics in medicine, 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

SUGGESTED READING MATERIAL:

1. Griffiths, A.J.F., Miller, J.H., Suzuki, D. T., Lewontin, R.C., and Galbert, W.M.2000. An introduction to Genetic Analysis, W.H. Freeman Publishers, New York.
2. Douglas J. Futuyma, 1998. Evolutionary Biology (3rd. Ed). Sinauer Associates, Inc.Publishers.
3. Brown, T. A. 1999. Genomes 3. John Wiley & Sons, New York, USA.
4. Primrose, S.B. &Twyman, R. M. 2003.Principles of Genomic Analysis and Genomics.(7th Ed.). Blackwell Science.
5. Brown, T.A.2001.Gene cloning and DNA Analysis- An introduction (5th Ed.),Blackwell Scientific Publications, Oxford, U.K.
6. Robert F. Weaver.2008. Molecular Biology(4th Ed.). McGraw Hill Higher Education.
7. Gustafson, J. P. 2000. Genomes, Kluwer Academic plenum publishers, New York,USA.
8. Jolls, O. and Jornvall, H. (eds.) 2000. Proteomics in Functional Genomics.BirkhauserVerlag, Basel, Switzerland.
9. Biochemistry by LubertStryer (5th Ed.) (Freeman-Toppan).

ABT- OE-406B: 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-I: APICULTURE

1.1 Types of Honey bees.

1.2 Life History of Honey bees.

1.3 Management of Apiculture.

1.4 By products of honey bees and economic importance Disease and their control.

UNIT-II:SERICULTURE

2.1 Historical back ground of Sericulture

2.2 Types of Silkworms. Life history of mulberry silkworm.

2.3 Economic importance of Silk.

2.4 Diseases of Silkworms.

UNIT-III:AQUACULTURE

3.1 Fresh water fin fish culture.

3.2 Shell fish (Prawn & Pearls) culture.

3.3 Fish breeding (Bund & induced breeding).

3.4 Integrated fish farming and Economic importance of Aquaculture.

UNIT-IV:VERMICULTURE

4.1 Historical background of Vermicompost.

4.2 Different methods of Vermiculture.

4.3 Advantages and economic importance of Vermiculture Vermicompost.

4.4 Problems involved in Vermicompost.

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

SUGGESTED READING MATERIAL:

1. Manual of fresh water Aquaculture. R. Santhanan. Oxford, IBH Publicatons-1987.
2. Aquaculture principles. T.V.R. Pillay. Backwell scientific publications-1993.
3. Biology Culture and Production of Indian Major Carps, “Chakaraburthy”, N.M. Narendrapublishing house, New Delhi-1999.
4. Silkworm rearing, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi-1997.
5. Silk Dying and Finishing, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi-1997.
6. Economic Zoology, G.S. Shukla& V.B. Upadyay. Rastoogi publications, 1994.