PERIYAR UNIVERSITY SALEM

B.Sc., BIOTECHNOLOGY (CBCS SYLLABUS)

(For candidates admitted from 2008-09 onwards)

		COURSE							
SEMESTER	PART	CODE	COURSE	Hrs		CREDIT	MAR	KS	
				Lecture	T/P	-	CIA	EA	TOTAL
	Ι	U08	Tamil I	6		3	25	75	100
	II	U08	English I	6		3	25	75	100
	III	U08BTC01	Core I	6		5	25	75	100
I		U08BTA01	Allied I	5		4	25	75	100
		U08BTCP01	Core practical I	3		-	-	-	-
		U08BTAP01	Allied practical I	3		-	-	-	-
		U08	Environ.,Science	1		-	-	-	-
	Ι	U08	Tamil II	6		3	25	75	100
	II	U08	English II	6		3	25	75	100
	III	U08BTC02	Core II	5		5	25	75	100
п		U08BTA02	Allied II	4		3	25	75	100
11		U08BTCP01	Core practical I	3		3	40	60	100
		U08BTAP01	Allied practical I	3		3	40	60	100
		U08	Environ.,Science	1		2	25	75	100
		U08BTS01	SBEC I	2		2	25	75	100
	Ι	U08	Tamil III	6		3	25	75	100
	II	U08	English III	6		3	25	75	100
	III	U08BTC03	Core III	4		5	25	75	100
Ш		U08BTA03	Allied III	4		3	25	75	100
111		U08BTCP02	Core practical II	3		-	-	-	-
		U08BTAP02	Allied practical II	3		-	-	-	-
		U08BTS02	SBEC II	2		2	25	75	100
		U08BTN01	NMEC I	2		2	25	75	100
	Ι	U08	Tamil IV	6		3	25	75	100
	II	U08	English IV	6		3	25	75	100
	III	U08BTC04	Core IV	4		5	25	75	100
IV.		U08BTA04	Allied IV	4		4	25	75	100
1 V		U08BTCP02	Core practical II	3		4	40	60	100
		U08BTAP02	Allied practical II	3		3	40	60	100
		U08	Value education	2		2	25	75	100
		U08BTN02	NMEC II	2		2	25	75	100

V	U08BTC05	Core V	5		5	25	75	100
	U08BTC06	Core VI	5		5	25	75	100
	U08BTC07	Core VII	5		5	25	75	100
	U08BTE01	Elective I	5		5	25	75	100
	U08BTS03	SBEC III	2		2	25	75	100
	U08BTS04	SBEC IV	2		2	25	75	100
	U08BTCP03	Core practical III	3		-	-	-	-
	U08BTCP04	Core practical IV	3		-	-	-	-
VI	U08BTC08	Core VIII	5		5	25	75	100
	U08BTC09	Core IX	5		5	25	75	100
	U08BTE02	Elective II	5		5	25	75	100
	U08BTE03	Elective III	5		5	25	75	100
	U08BTS05	SBEC V	2		2	25	75	100
	U08BTS06	SBEC VI	2		2	25	75	100
	U08BTCP03	Core practical III	3		4	40	60	100
	U08BTCP04	Core practical IV	3		4	40	60	100
		Extension activity		-	1	-	-	-
			180		140	1090	2910	4000

LIST OF COURSES

CORE COURSE: 13 (Theory 9+ Practical 4)

CORE COURSE

- 1. Cell Biology
- 2. Genetics
- 3. Fundamentals of Microbiology
- 4. Biophysics
- 5. Molecular Biology
- 6. Animal Biotechnology
- 7. Recombinant DNA Technology
- 8. Microbial Biotechnology
- 9. Plant Biotechnology

PRACTICAL

- 1. Lab in Cell biology & Genetics
- 2. Lab in Microbiology & Biophysics
- 3. Lab in Immunology, rDNA Technology, Bioinformatics & Bioprocess Technology
- 4. Lab in Plant, Animal and Microbial Biotechnology

ALLIED COURSE: 6 (Theory 4+practicals 2)

ALLIED COURSE

- 1. Biochemistry I
- 2. Biochemistry II
- 3. Biostatistics
- 4. Computer Application in Biology

ALLIED PRACTICAL

- 1. Lab in Biochemistry
- 2. Lab in Biostatistics & Computer application in biology

ELECTIVE COURSE: 3

- 1. Immunology and Immunotechnology
- 2. Bioprocess Technology
- 3. Plant Molecular Biology

SKILL BASED ELECTIVE COURSE: 6

- 1. Environmental Biotechnology
- 2. Developmental Biology
- 3. Bioinformatics
- 4. Bio-Instrumentation
- 5. Intellectual property rights & Bioethics
- 6. Nano Biotechnology

ENVIRONMENTAL STUDIES: 1

VALUE EDUCATION: 1

NON MAJOR ELECTIVE: 2

NME - I Concepts of Biotechnology NME - II Applied Biotechnology

EXTENSION ACTIVITY

• Training Report

PERIYAR UNIVERSITY SALEM

B.Sc., BIOTECHNOLOGY (CBCS SYLLABUS)

(For candidates admitted from 2008-09 onwards)

SEMESTER I

Part	Course	No of	Hours /	Credits	То	tal
		courses	week		credit	Hours
Ι	Tamil I	1	6	3		
II	English I	1	6	3		
	Core course I	1	6	5		
	Allied course I	1	5	4	15	30
III	Core Practical I	-	3	-		
	Allied practical	-	3	-		
	Ι					
IV	Environmental	1	1	-		
	science					

CORE COURSE I

CELL BIOLOGY

UNIT I

Cell as a Basic unit; Classification of cell types ;Cell theory; Organization of plant and animals cells; Comparison of Microbial, Plant and Animal cells; Biochemical composition of cells& their Biological Significance.

UNIT II

Ultra structure of cells; Sub cellular Organization; structure and function of cell membranes, Cytosol Endoplasmic reticulum and Chloroplast, vacuoles, Peroxisomes, lyzosome, cell wall.

UNIT III

Chromosomes and cell division: Morphology, Structural Organization, ultra structure of chromosome, Specialized chromosomes; salivary gland and lamp brush chromosomes, Cell division (Eukaryotic and prokaryotic); Mitosis, meiosis and cell cycle.

UNIT IV

Specialized cells: Motile cells (amoeboid, ciliary, flagellar movements), nerve cells and muscle cells.

UNIT V

Introduction about Biotechnology: Definition, History and scope of Biotechnology, Biotechnology in India, Recent trends in Biotechnology, Applications of Biotechnology

REFERENCE BOOKS:

- 1. Cell Biology- DeRoberties, Blaze publishers & Distributors Pvt.Ltd., NewDelhi.
- 2. Cell Biology- Powar.C.B, Himalaya publishing house, New Delhi. Edition 3;1983
- 3. Cell Biology Jack D Bruke, The William Twilkins Company.
- 4. Cell Biology Ambrose & Dorouthy M Easty, ELBS Publications.
- 5. Fundamentals of Cytology Sharp, Mc Graw Hill Company.
- 6. Cytology Wilson & Marrison, reinform Publications.
- Cell Biology & Molecular Biology- EDP Roberties & EMF Roberties, Sauder College.Wavely publication; 8 th Edition ;1995.

- 8. Cell and Molecular biology conceptsand experiments- Gerald Karp; 4 th Edition.
- Molecular cell biology- Lodish ,Berk; 5 th Edition.
 Cell biology Organelle Structure and function- David.Sadava; Panima Indian Edition.

ALLIED COURSE I

BIOCHEMISTRY –I

UNIT I

Carbohydrates: Introduction, classification. monosaccharide-structure, stereoisomers, structural isomers, mutarotation, and chemical reactions.Oligosaccharides-Dissaccharides-structure and importance of lactose and maltose. sucrose, Polysaccharides-structure and importance of homopolysaccharides and heteropolysaccharides.

UNIT II

Amino acids : Classification, Essential & Non essential amino acids, structure and properties. **Protein:** Definition, classification and functions – structural levels of organization

UNIT III

Lipids: Classification, physical & Chemical properties, saturated and unsaturated fatty acids, Structure of cell membrane & transport

UNIT IV

Vitamins: Classification, occurrence, deficiency symptoms, and biochemical functions of fat soluble and water soluble Vitamins

UNIT V

Enzymes – Definition, classification with example, active site, lock & key model, induced fit hypothesis. Enzyme units – kinetics- factors affecting enzyme activity.

REFERENCE BOOKS:

- 1. Fundamentals of Biochemistry- J.L. Jain. S.Chand publication:2004.
- 2. Biochemistry by Agarwal. Global publications; 1999.
- 3. Text book of biochemistry-Edward Staunton West, Wilbert. R.Todd, Howard S. Mason, John T. Van Bruggen
- 4. Principles of Biochemistry- David. L. Nelson, Michael M. Cox, Lehninger
- 5. Fundamentals of Biochemistry –**Donald Voet, Judith. G. Voet, Charlotte** W.Pratt
- 6. Biochemistry Lubert stryer
- 7. Biochemistry- U. Sathyanarayana, Chakrapani; Edition 2 ;2007 Books and allied (P) Ltd.,

SEMESTER II

Part	Course	No of	Hours /	Credits	То	tal
		courses	week		credit	Hours
Ι	Tamil II	1	6	3		
II	English II	1	6	3		
	Core course II	1	5	5		
	Allied course II	1	4	3	24	30
III	Core Practical I	1	3	3		
	Allied practical I	1	3	3		
	Environmental	1	1	2		
IV	Studies					
	SBEC-I	1	2	2		
	Environmental					
	Biotechnology					

CORE COURSE II

GENETICS

Unit I

Marks: 75

Genome organization in Bacteria, Plant and Animal: DNA & Plasmid replication, Recombination, DNA repair.

Unit II

Mendel's laws of inheritance; Non-Mendelian inheritance; Chromosomal theory of inheritance.

Unit III

Chromosome structure in Bacteria, Plants and Animals, Chromosome aberrations – Structure. Mutations – Spontaneous and induced: chemical and Physical mutagens:

Unit IV

Fundamentals of Microbial genetics – Conjugation, Transduction, Transformation. Analysis of mutations in biochemical pathways, one gene – one enzyme hypothesis.

Unit V

Genetic diversity, Genetic diseases, Prenatal diagnosis: Genetic counseling: Population genetics.

REFERENCE BOOKS:

- 1. Cell and Molecular Biology **Robertis** *et al*.Waverly publication, edition 8, 1995.
- 2. Genetics Strickberger, M.W.Printice hall, edition 4,1997.
- 3. Genes V & VI Lewin. B.Oxford, 1994, 1997.
- 4. Molecular Biology of the Cell Alberts. Garland publication, edition 4, 2002.
- 5. Text Book of Cell and Molecular Biology Ajoy Paul. Books and allied (p) Ltd, edition 2,2007.
- 6. Biotechnology Satyanarayana. U, (2005):, Books and Allied (p) Ltd
- 7. Principles of Genetics E.J.Gardener, M.J.Simmons and D.P.Snustand, John Wiley & Sons Publications.

SKILL BASED ELECTIVE COURSE - I

ENVIRONMENTAL BIOTECHNOLOGY

Max. Marks: 75

Unit I

Renewable and non-renewable resources of energy. Conventional fuels and their environmental impact. Modern fuels and their environmental impact – methanogenic bacteria, biogas.

Unit II

Bioremediation: Bioremediation of soil, water, contaminated with oil spills, heavy metals and detergents. Degradation of lignin and cellulose using microbes.

Unit III

Phytoremediation: Degradation of pesticides and other toxic chemicals, aromatic and chlorinated HC and petroleum products by MOs.

Unit IV

Treatment of municipal waste and industrial effluents- primary, secondary, tertiary treatment methods.

Unit V

Biosensors. Environmental significance of GM microbes, plants and animals.

REFERENCE BOOKS:

1. Principle of Environmental Science, **William P. Conningham and Mary Ann Conningham** (2003) Tata McGraw-Hill publishing company. tokyo

2. Environmental Biotechnology, Hans – Joachim Jordening, Josefwinter (2005) New Delhi

3. Environmental Biology. P.D.Sharma (1994) Rastogi publications New Delhi

4. Environmental Biotechnology and cleaner bioprocesses, **Eugenia J. Olugin** (2000) Taylor and Francis India

5. Environmental Biotechnology, K. C. Agarwal (2005) Nidhi publishers, New Delhi

6. Biotechnology, Satyanarayana. U, (2005):, Books and Allied (p) Ltd

ALLIED COURSE-II BIOCHEMISTRY –II

UNIT I

Buffers – Definition and determination of pH , Henderson Hasselbalch Equation. Dialysis, Surface tension and Viscosity. Principle and Applications of Colorimetry and Chromatography

UNIT II

CARBOHYDRATE METABOLISM -Glycolysis , Glycogenesis , Glycogenolysis ,Citric acid cycle & HMP shunt.

LIPID METABOLISM- Biosynthesis of Saturated &Unsaturated fattyacids. Beta & omega oxidation of fatty acids and cholesterol Biosynthesis.

UNIT III

PROTEIN METABOLISM -Transamination, oxidative and non-oxidative deamination, decarboxylation- urea cycle. Interrelationship of carbohydrates, proteins and fat metabolism

UNIT IV

BIOENERGETICS –Law of thermodynamics, Redox potential, Respiratory chain ,Oxidative phosphorylation (Theories and Mechanism),High energy compounds . **UNIT V**

HORMONES – Definition, Classification of Hormones, Secondary messengers (Cyclic AMP, IP3 and DAG)Biological function and disorders of Pancreatic Hormones (Insulin& Glucagon), Thyroid hormone (thyroxin and Tri iodo tyronin)

REFERENCE BOOKS

- Principles and techniques of practical Biochemistry, Keith Wilson and John Walker, 1995. Cambridge University Press.
- 2 Biophysical chemistry Principles and Techniques- Avinash Upadhyaye and Nirmalendhe Nath, Himalaya Publishers.
- 3 A Biologist Guide to Principles and Techniques of Biochemistry, Keith Wilson and Kenneth Goulding, Edward Arnold publishers.

- 4 Principles of Biochemistry ,Emil I. Smith
- 5 Endocrinology Williams
- 6 Fundamentals Of Biochemistry (1999) by **Donald Voet, Judith G.Voet and** Charlotte W Pratt, John Wiley & Sons, NY
- 7 Outlines of Biochemistry (1987) by Eric E.Conn, P.K. Stumpf, G.Brueins and Ray H.Doi, John Wiley & Sons, NY
- 8 Biochemistry 3rd (1994) by Lubert Stryer, W H freeman and co, Sanfrancisco.
- 9 Text book of biochemistry (1997) 4th edition Thomas M devlin, A John Wiley, In
- 10 Principles of Biochemistry (1994) Garrette & Grisham, Saunders college
- 11 Essentials of Biochemistry **Sathyanarayanan.U**, **Chakrapani**, Books and allied Publishing (p) Ltd, edition 2, 2008

CORE PRACTICAL 1

LAB IN CELL BIOLOGY & GENETICS

Max. Marks: 60 Exams. Duration: 6Hours.

CELL BIOLOGY

1. Microscopes and its parts

- 2. Micrometry Stage and Ocular Micrometer.
- 3. Cell Counting Haemocytometer
- 4. Mounting buccal epithelium and observing living cells using vital staining.
- 5. Mitosis in Onion root tip squash
- 6. Meiosis in grasshopper testis squash
- 7. Chironomous Salivary gland Chromosome squash preparation
- 8. Estimation of chlorophyll content by spectrophotometer.
- 9.staining of macro molecules

GENETICS

1. Karyotype analysis: Man – Normal and Abnormal – Down and Turner's syndromes, kleinfleter

- 2. Mono and dihybrid crosses in Drosophila-Mendel's laws of genetics.
- 3. Replica plate technique.
- 4. Gradient plate technique.
- 5. Rearing morphology of drosophila (mutant eye identification)

6. Paper Chromatography .
7. Chemical Mutagens:

* EMS
* MMS

8. Physical Mutagens: (Demonstration on bacteria)

* UV rays.

ALLIED PRACTICAL -I

BIOCHEMISTRY

1. Qualitative Analysis

- Analysis of carbohydrates- Glucose, Fructose, Ribose, Sucrose, Lactose and Starch.
- ii) Analysis of Amino acids Tyrosine, Tryptophan, Arginine, Methionine, Cystine & Phenylalanine.

2. Preparation

- i) Starch from potato
- ii) Casein from milk
- iii) Phospholipids from Egg yolk.

3. Quantitative Analysis

- i) Estimation of Glycine by formal titration method.
- ii) Estimation of Ascorbic acid by 2,6 dichlorophenol indophenol dye
- iii) Determination of Acid number
- iv) Determination of Saponification value
- v) Estimation of Urea by DAM colorimetric method
- vi) Estimation of Glucose by Ortho- Toludine Method

4. Techniques

- i) Separation of Amino acid & Sugars by Ascending paper chromatography
- ii) Separation of Lipid by TLC

SEMESTER III

Part	Course	No of	Hours /	Credits	То	tal
		courses	week		credit	Hours
Ι	Tamil III	1	6	3		
II	English III	1	6	3		
	Core course III	1	4	5		
	Allied course III	1	4	3	18	30
III	Core Practical II	1	3	0		
	Allied practical II	1	3	0		
	SBEC II	1	2	2		
IV	NMEC I	1	2	2		

CORE COURSE III

FUNDAMENTALS OF MICROBIOLOGY

Marks: 75

Unit I

Definition and scope of Microbiology, History and recent developments, contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Elie Metchinkoff and Fleming. Principles of classification - Bacteria, Algae, Fungi, and viruses.

Unit II

Microscopy- Simple and compound microscopy, Dark field, Phase contrast, Fluorescence and Electron Microscopy. Stain and staining techniques- Simple, differential and special staining (Endospore, capsular and Granular).

Unit III

Cellular structures of prokaryotes and eukaryotes – Ultra structure and functions of prokaryotic cell wall, Plasma membrane, Flagella, Structure and functions of Cyanobacteria.

Unit IV

Sterilization- Physical and chemical. Growth of bacteria – multiplication – nutritional requirements – factors affecting growth - growth curve – Determination of growth. Culture techniques – Pure culture, anaerobic culture- preservation of cultures.

Unit V

Antimicrobial chemotherapy – Antibiotics – mode of actions - antimicrobial resistance - tests for sensitivity to antimicrobial agents.

REFERENCE BOOKS:

- 1. A Text book of Microbiology. **Dubey, RC and Maheswari DK** (2005). S. Chand & Company Ltd., New Delhi.
- 2. College Microbiology. **Sundara Rajan S** (2003).Volume 1 7 2. Revised Edition, Vardhana Publications, Bangalore.
- 3. Microbiology- Pelczar Tr. MJ, Chan ECS & Kreig NR (2006). 5th Edition, Tata McGraw-Hill companies Ltd.
- 4. Microbiology Prescott LM, JP Harley and DA Klein (2005). 6th international Edition, McGraw-Hill companies Ltd.
- 5. General Microbiology -Robert F Boyd (1984). Times Mirror / Mosby college publishers.

SKILL BASED ELECTIVE COURSE - II DEVELOPMENTAL BIOLOGY

Marks: 75

UNIT I

Spermatogenesis and Oogenesis in mammals, Menstrual cycle, Monitoring of estrus cycle, Artificial insemination, IVF, Sperm banking, Embryo transfer.

UNIT II

Activation of sperm and egg– interaction of sperm and egg – Sequence of events in sperm entry – Egg surface changes. Post–fertilization changes:

UNIT III

Cell division and chemical changes during cleavage – pattern of cleavage – Distribution of cytoplasmic substances in the egg –Metamorphosis (Insects and amphibians) - homeotic genes.

UNIT IV

Development of Microsporangium and Megasporgium, Pollination, Double fertilization Endosperm, Embryo, Seed, Experimental embryology.

UNIT V

Organization of shoot and root apical meristem, and development. Phyllotaxy, Floral development in Arabidopsis.

REFERENCE BOOKS

- 1. An Introduction to Embryology, Balinsky, B.I. (1981). W. B. Saunders Co., Philadelphia
- 2 The embryology of angiosperms, Bojani and Bhatnagar: (1978) Vilas publication.
- 3. The embryology of angiosperms , Springer Verlec Jhori B.M: (1982)
- 4 Introduction to the embryology of Angiosperm, Maheswari, P: (1981) McGraw Hill..
- 5 Chordate embryology, Verma , P.S., V.K. Agarwal and Tyagi, 1995. S. Chand & Co., New Delhi.
- 6. Developmental biology **Gilbert, Scott's**. (1985). Sinauer Association, Inc., Publishers.
- 7 Development -Berril, N.T., Karp, G. : 1988. *Tata McGraw Hill* Co., New York
- 8. Patten's Foundation of Embryology, Bruce M Carlson. Tata McGraw Hill Co.,
- 9. Fundamentals of Embryology, Waddington, G.H. : 1949. George Allen and

Unwin.

- 10. The Elements of Experimental Embryology, Huxley De Beer: 1934. Cambridge Univ.Press, Cambridge, Hafher Publishing Co.
 11. An Outline of Developmental Physiology, Rover, C.P.: (1968). Pergamon Press.
- 12 Fertilization, Austin, C.R. (1966). Prentice Hall.

SEMESTER IV

Part	Course	No of	Hours /	Credits	То	tal
		courses	week		credit	Hours
Ι	Tamil IV	1	6	3		
II	English IV	1	6	3		
	Core course IV	1	4	5		
	Allied course IV	1	4	4	26	30
III	Core Practical II	1	3	4		
	Allied practical II	1	3	3		
	Value education	1	2	2		
IV	NMEC II	1	2	2		

CORE COURSE IV

BIOPHYSICS

UNIT I

Marks: 75

Energetic of living body-Heat dissipation & conservation. Laws of thermodynamics. Nature of chemical bonds, Intra & Intermolecular Interactions in Biological Systems.

UNIT II

Spectroscopy-Beer's Law, Lamberts Law. Visible, UV, IR, Raman, Atomic Absorption spectroscopy. (single & double beam spectrophotometer), colorimeter.

UNIT III

Physical methods of imaging intact biological structure – X-ray, CAT scan, ECG, EEG, NMR. Sedimentation, Diffusion, Osmosis.

UNIT IV

Chramotography-Paper, TLC, GLC, HPLC, Gel filtration.Centrifugation – Differential, Density Gradient.

UNIT V

Electrophoresis – AGE, SDS-PAGE, 2-D Gel.X-ray crystallography, GM-Counter.

REFERENCE BOOKS:

- Physical Biochemistry, applications to Biochemistry and Molecular Biology D, Freifelder.W.H.Freeman and company, edition 2, 1982.
- 2. General Biophysics, vol. I & II H.V. Volkones.
- 3. Molecular Biophysics B. Pullmann & M. Voino.
- 4. Biophysical chemistry Upadhyay, Himalaya Publication, edition 3, 2005.
- 5. Biophysics S. Mahesh (2003), New Age International (P), Ltd.

ALLIED COURSE IV

COMPUTER APPLICATIONS IN BIOLOGY

UNIT I

Introduction to Computers: Introduction – Types of Computers – Characteristics of Computers. Generations of Computers - Classification of Computers – Programming Languages : Machine Language – Assembly Language – High level languages. Input Devices- Keyboard – Mouse - Types of mice – Connections – Mouse Pad - Trackball – Joystick -Out put Devices – Dot Matrix Printer – Inkjet – Laser Printer – LCD & LED Printers– Line Printer Auxiliary Storage Devices : Hard Disk – CD –DVD – primary memory

Unit – II

Overview of C: History of C – Importance of C – Basic structure of C programs. Constants, variables and data types: Character set – Keywords and identifiers – Constants – Variables – Declaration of storage classes. Operators and expression – Evaluation of expressions – Type conversions in expressions – Operator precedence and associatively – Mathematical functions. Managing input and output operations: Reading and writing a character – Formatted input and output.

Unit – III

Decision making and branching: Simple IF, IF-ELSE, Nesting of IF-ELSE, ELSE-IF ladder, Switch statements – GOTO statements. Decision making and looping: WHILE statement – DO statement – FOR statement – Jumps in loops. Arrays: Definition & Declaration – One dimensional – Two dimensional – Multi dimensional arrays - Dynamic arrays.

Unit – IV

Character arrays and strings: Introduction – Declaring and initializing string variables – User – Defined functions: – Definition of functions – Return values and their types – Function calls – Function declaration – All category of functions – Nesting of functions Structures and Unions: Introduction – Accessing structure members – Structure initialization - Arrays of structures – Arrays within structures - Unions

Unit – V

Scope of bio informatics-internet basic-biological data analysis and applicationssequences of data bases – application of bio informatics

TEXT BOOK

- 1. Fundamentals of computers science and Communication Engineering. Alexis Leon & Mathews Leon, Vikas Publishing House Pvt. Ltd., New Delhi (Unit-I)
- 2. Programming in ANSI C, E. Balgurusamy Tata McGraw Hall, New Delhi, 4th edition. (Unit-II,III,IV)
- Introduction to Bioinformatics by V.Kothekar, 2004 Dhruv publications, Delhi -95. (Unit-V)

Note :

This paper has to be taught and exam Paper to be valued by only Computer Science Board.

CORE PRACTICAL - II LAB IN MICROBIOLOGY & BIOPHYSICS

Max. Marks: 60 Exams. Duration: 6Hours.

MICROBIOLOGY

- 1. Sterilization Techniques & sterilization of Media, Glass ware, Air
- 2. Media Preparation (solid & liquid)
- 3. Isolation & Enumeration of Micro-organism from water, Air, soil
- 4. Types of culture method-streak plate, pourplate, Stab & slope method.
- 5. Measurement of Growth rate of bacteria;
- 6. Staining Techniques Grain's staining, Negative staining, flagella staining, spore staining, Acid fast, Lactophend cotton blue staining.
- Characterization of micro organisms motility, carbohydrate utilization, MR;VP, citrate utilization, Catalase, Oxidase, H₂S production test.
- 8. Microscopic slide preparation fungi & Bacteria.
- 9. Sterility Test
- 10. Antibiotic sensitivity Test.

BIOPHYSICS

- 1. Determination of P^H using P^H meter.
- 2. Sedimentation of Emulsion of oil
- 3. Chromatographic methods for macromolecule separation.
- 4. Agarose Gel Electrophoresis & SDS-PAGE.
- 5. Isolation & Purification of protein (Dialysis)
- 6. Estimation of protein Lowry's Method, Bradford Method. (Spectrophotometer)
- 7. Colorimetric Estimation of Creatinine by JAFF'S method.
- 8. ECG and EEG (Demo)

ALLIED PRACTICAL – II LAB IN BIOSTATISTICS AND COMPUTER APPLICATIONS IN BIOLOGY

Programming List:

- 1. Finding Mean, Standard deviation and Mean deviation for a given problems
- 2. Calculating the correlation coefficients.
- 3. Finding Regression coefficients and Regression lines.
- 4. Calculating student 't' test for a given problem(statistics to biological problems/data)
- 5. Calculating chi-sequence test for a given problem
- 6. Sorting
- 7. Indexing
- 8. Write a program to find the factorial of a given number & to count the positive, negative & zero numbers.
- 9. Write a program to find the occurrences of each character in the string & to concatenate two strings without using string library function.

SEMESTER V

Part	Course	No of	Hours /	Credits	То	otal
		courses	week		credit	Hours
III	Core course V	1	5	5		
	Core course VI	1	5	5		
	Core course VII	1	5	5		
	Elective course I	1	5	5	24	30
	Core practical III	1	3	-		
	Core practical IV	1	3	-		
IV	SBEC III	1	2	2		
	SBEC IV	1	2	2		

CORE COURSE V

MOLECULAR BIOLOGY

UNIT I

Central dogma of molecular Biology.DNA Replication. Prokaryotic and Eukaryotic DNA replication, Mechanism of DNA replication,Enzymes and accessory proteins involved in DNA replication.DNA Repair – light and dark mechanisms . Regulation of gene expression-lac and trp operons.

UNIT II

Transcription- Prokaryotic Transcription, Eukaryotic Transcription, RNA polymerase. Transcriptional and post-transcriptional gene silencing.Modifications in RNA.5' cap formation, 3'-end processing and polyadenylation, splicing, Editing, Nuclear export of mRNA.

UNIT III

Translation-Prokaryotic and eukaryotic translation, the translation machinery, Mechanisms of initiation, elongation and termination, co-and post-translational modifications of proteins. Import into nucleus, mitochondria and chloroplast. Receptor mediated endocytosis.

UNIT IV

Oncogenes and Tumor Suppressor Genes-Viral and cellular oncogenes,tumor suppressor genes from humans,Structure ,function and mechanisms p53 tumor suppressor proteins. Homologous Recombination-Holliday junction.

UNIT V

Molecular Mapping of Genome-Genetic and physical maps. Southern and fluorescence in situ hybridization in genome analysis.

REFERENCE BOOKS

- Molecular cloning: A Laboratory Manual, J.Sambrook, E.F.Rritsch and I.Maniatis, Cold Spring Hratbor Laboratory Press, New York, 2000.
- Introduction to Practical Molecular Biology, P.D.Dabre, John Wiley and Son Ltd. New York, 1988.
- Molecular Biology, Labfax, T.A.Brown, Bioscientific publishers ltd, Oxford, 1991.
- Molecular Biology of gene(4th Edition), J.D.Watson, N.H.Hopkins, J.W.Roberts, J.A.Steitz and A.M.Weiner. The Benjamin/Cummings publications C Inc.California, 1987.
- Molecular Cell Biology(2nd Edition, J.Darnell, H.Lodish and D.Baltimore, Scientific American Book, USA, 1994.
- Molecular Biology of the Cell (2nd Editiion) B.Aberts, D.Bray, J.Lewis, M.Raff, K.Roberts and J.D.Watson, Garland Publishing, Inc.New York, 1994.
- 7. Gene VII Benjamin Lewin. Oxford University Press. U.K.
- Molecular Biology and Biotechnology. A comprehnsive dies reference.
 R.A.Meyers (Edition). VCH Publishers, Inc., New York, 1995.
- 9. Genomes, T.S.Brown.
- 10. Molecular Biology and Biotechnology. J.M.Walker and R.Rapley. 2005.
- 11. Molecular Biotechnology, S.B.Primrose.2005.

CORE COURSE VI ANIMAL BIOTECHNOLOGY

Marks: 75

Unit I

Historical Perspectives, early experiments & Scope of Animal Tissue culture. Requirements for Animal cell culture. Media-Natural, Semi synthetic & Synthetic. Role of ingredients in Animal culture Media. Design & layout of ATC Laboratory.

Unit II

Basic Techniques of mammalian cell culture; Disagregation of animal tissue. Primary culture, Evolution of cell line,Organ culture, Stem cell culture, Embryo culture,Embryonic Stem cells and their application. Maintenance of cell culture Embryo culture.

Unit III

Sericulture, Commercial production of silk, Baculoviruses as animal viral vector. Silkworm as a bioreactor. Aquaculture, Biotechnology of aquaculture

Unit IV

Embryo Technology& Animal Breeding. Invitro fertilization, Embryo transfer, ICSI, Embryo splitting, Fertility control & regulation, test tube babies. Cell cloning, Transgenic animals-sheep, goat, Mice, fish.

Unit V

Hybridoma Technology, Production of vacciine, Interferons, Hormones in ATC. Gene therapy. Ethical values in animal biotechnology.

REFERENCE BOOKS:

- 1. Culture of animal cells R. Ian Freshney, John wiley & sons Puhler.
- 2. Invitro cultivation of Animal cells **Bulterworth & Heincmann**, tunwich University Press.
- 3. Genetic Engineering of Animal A. Publer, VCH Publishers.
- 4. Animal Biotechnology M. Ranga. Studam publishers, 2006.
- 5. Animal Biotechnology Dr. Ramadoss.
- 6. Animal Biotechnology-R.Sasidhara, MJP Publishers, 2006.
- 7. Medical biotechnology- S.N Jogdand, Himalaya publishing house ,2004.
- 8. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd

CORE COURSE VII RECOMBINANT DNA TECHNOLOGY

Marks: 75

Unit I

History and recent developments in rDNA Technology - Enzymes in rDNA Technology – Restriction Endonuclease – Ligases – Alkaline phospotase – Polynucleotide kinase - Terminal deoxynucleotidyl transferase - S1 nuclease - DNA polymerase - Rnases – Ribonuclease – Reverse transcriptase - Taq polymerase .

Unit II

Vectors- Plasmids - Size - Copy Number - Amplification- Types – Plasmid pBR322 - origin – advantage –pUC - Col E1 plasmid – Ti plasmid - F plasmid – R plasmid . Lamda phage vectors, cosmids and phagemid as vectors.

Unit III

Animal and Plant Viruses and their use as vectors, Shuttle vectors, Expression vectors. Screening and selection of recombinant clones.

Unit IV

Gene transfer techniques. Molecular mechanism of antisence technology. PCR, RAPD, RFLP, Safety regulations in recombinant DNA.

Unit V

Construction of genomic and cDNA libraries, screening of libraries, Site directed mutagenesis, Ethical issue involving in rDNA Technology. rDNA Technology in solving human problems.

REFERENCE BOOKS

 From Genes to Clones Introduction to Gene Technology - Winnacker, E.L. 1987., Panima Educational Book Agency, New Delhi.

- 2. Gene VII -Benjamin Lewin, 2000. Oxford University Press, UK.
- Principles of Gene Manipulation and Genomics Primrose, S.B. and Twyman, R.M. 2006. 7th Edition. Blackwell Publishing Company.
- Recombinant DNA Second Edition James D. Watson, Micheal Gilman, Mark Zoller, 2001. W.H. Freeman and Company, New York.
- 5. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd.

ELECTIVE COURSE I

IMMUNOLOGY AND IMMUNO TECHNOLOGY

Marks: 75

UNIT I

Historical perspectives and overview of immune system, innate and acquired immunity. Immune system- Organs and Cells, Haematopoiesis.

UNIT II

Antigen – Properties, Classes. Haptens, Adjuvants . Cell mediated immunity – receptors and T cell activation. Humoral response – B cell activation and proliferation. Hypersensitive reactions.

UNIT III

Immunoglobulins – Structure and function. Antigen – Antibody interaction, Monoclonal anti bodies.Organization and expression of immunoglobulin genes.

UNIT IV

Cytokines: Types and function, Complements, Major Histocompatability Complex.

UNIT V

Immune regulation and suppression, Autoimmunity, Vaccines and immune response to infections diseases, Immune deficiency diseases (AIDS), Transplantation.

REFERENCE BOOKS:

- 1 Immunology by L.M. Roitt, J. Brestoff and D.K. Males (1996)
- 2 Immunology by **J.Kubey** (1993) Freeman and company
- 3 Immuno-biology by Janeway CA and Paul Travers 1994.
- 4 Immunological techniques by **D.M. Weir** (1992)
- Monoclonal Antibodies: Principles and Practice by J.W. Goding (1983)
 Academic Press.

- 6 Hybridoma Technology in the Biosciences and medicine by **T.A. Springer** (1985) Plenum Press NY.
- 7 Vaccines, New Approaches to immunization by F.Brown, R.M. Chanock, KA Lerner (1986) cold spring Harborolab.
- 8 Immunology and Immunotechnology ;**Rajasekara pandian M and Senthil kumar B** (2007), Panima publishing corporation , New delhi.

SKILL BASED ELECTIVE COURSE – III BIOINFORMATICS, INTELLECTUAL PROPERTY RIGHTS AND BIOSAFETY

UNIT I

Bioinformatics –definition, introduction, history and scope. Databanks – Gen Bank, PDB. Literature Databanks - Pubmed, Med line. Human Genome Project.

UNIT II

Biological database including both proteins and nucleic acids – Sequence – EMBL, DDBJ. Structural database - CATH, SCOP. Specialized database – Genome data base, EST.

UNIT III

Sequence Alignment based on Matrices (BLOSUM and PAM), Algorithm (Needleman Wunsch & Smith Waterman). Tools for sequence alignment – BLAST, FASTA.

UNIT IV

IPR & IPP – Patents, copy rights, trade secrets, trade marks. Plant breeders right patenting of biological materials. Patents of biotechnology in India. WIPO, GATT, and TRIP.

UNIT V

Biosafety – Risk for human health, environment and agriculture. Biosafety guidelines, regulation and operation.

REFERENCE BOOKS

- 1. Introduction to Bioinformatics **T.K.Attwood**, **D.J.Parry-smith** (2004) Pearson Education
- 2. Bioinformatics for the beginners K.Mani & N.Vijayaraj
- 3. Proteomics- Pennigton & Dunn (2002) Viva books publishers, New Delhi
- 4. Bioinformatics- A practical guide to the analysis of genes & protein 2nd ED Andreas, Baxevanis and Francis Ouellette.
- 6. Bioinformatics. David H Mount. 2005. Second Edn. CBS Publishers, New Delhi.
- 7. Biosafety board of trustees, **Trayror**, **P.C Frederic, R and Koch, M** 2002. Muchigan State university, USA.
- 8. Concepts, Theories and Practice of Human Rights, **Vadakar Praveen**, 2000. Rajat publications.
- 9. Biosafety and Bioethics, Rajmohan joshi 2006

- 10. Text book of Biotechnology, R.C Dubey 2004
- 11. Plants, genes and agriculture, Chrispeels 2002
- 12. Hand book of Indian Patent Law and Practice;1998. Viswanathan, S Published and printer, chepter, Chennai.

SKILL BASED ELECTIVE COURSE - IV BIO- INSTRUMENTATION

Marks: 75

UNIT I

Origin of Bioelectric potentials. Action potentials, Electrodes for Bioelectric potential – Micro Electrode, Skin Surface Electrode, Needle Electrode.

UNIT II

Care & Maintenance of laboratory equipments – Balance, Hot plate & Magnetic stirrer, Incubator, Water bath, Photometers, Nephelometers, Manometer, Autoclave.

UNIT III

Care & maintenance of laboratory Equipment. P^H meter, distillation Plant, De-ionizers. Automatic dispensers & Diluters, Acid-base analyser, Osmometers.

UNIT IV

Principles and applications of Microscope, Centrifuge, Electrophoresis Apparatus.

UNIT V

Biological containment system. Air sanitation procedure. Potential Hazards of Laboratory techniques.

REFERENCE BOOKS:

- 1. Biochemistry, Vote, D. & Vote, J.G. (1995), Second edn. John wiely & sons
- 2. Bioinstrumentation, John Webster, (2004). John weily & Sons.
- 3. Bioinstrumentation, Veerakumari (2006). First edn. MJP Publisher

- Molecular Biology of the Gene, James, D. Watson Hopkins N.H. Robert, J.W.
 & Steitz, J.A.
- 5. Biochemistry, Zubay, G.L. edition 4., WmC, Brown Pulshers
- Analytical Biochemistry and separation techniques, Palanivelu, P (2008). Tulsi Books centere Madurai.
- Principles of Biochemistry, Lehninger, Nelson, D. & Cox, M.(2000). Edition 4
 W,H. Feeman and Company, New York.
- 8. Biophysics, Arora. (2004). Edition 1, Himalaya publishers, New Delhi.
- Practical Biochemistry, Wilson, K.& Walker, J. 2003.edition 5, Cambridge University

SEMESTER VI

Part	Course	No of	Hours /	Credits	То	tal
		courses	week		credit	Hours
III	Core course VIII	1	5	5		
	Core course IX	1	5	5		
	Elective course II	1	5	5		
	Elective course III	1	5	5	33	30
	Core practical III	1	3	4		
	Core practical IV	1	3	4		
IV	SBEC V	1	2	2		
	SBEC VI	1	2	2		
	Extension activity	1		1		

CORE COURSE VIII

MICROBES IN BIOTECHNOLOGY Marks: 75

UNIT I

Microbial Biotechnology: Scope, Techniques, Chronological Development, Microbial diversity and its use. Native and Recombinant protein production.

UNIT II

Microbial Enzymes - amylase, protease, Polysaccharide – Xantham, Solvents – Ethanol, Organic acid – Citric acids production and their applications.

UNIT III

Metabolites from microbes: Amino acids, their production. Antibiotics and other secondary metabolites like Streptomycin, Penicillin, Cephalosporins

UNIT IV

Microorganism in production of Biomass: Single cell protein, Mushroom culvation. Biofertilizers, Biopesticides.

UNIT V

Environmental Biotechnology and Microbes in Bioleaching, Microbial degradation of Xenobiotics, Sewage biodegradation.

REFERENCE BOOKS

- Microbial Biotechnology (Fundamental of applied Microbiology) Alexandar N. Glazer & Hiroshi Nikaido
- Fermentation Microbiology and Biotechnology. El mans, E.M.T., and Bryce, C.F.A. 2002. Taylor & Francis group.
- Fundamentals of Biotechnology, Prave, P. Faust, V. Sitting, W. and Sukatseh, D.A. (eds). 1987. WCH Weinhein.
- Principles of Fermentation Technology. Stanbury P.F. and Whitaker, A. 1984. Pergamon Press.
- Comprehensive Biotechnology Volume 2,3, and 4. Moo young, M. (ed). 1985. Pergamon Press.
- 6. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd

CORE COURSE IX PLANT BIOTECHNOLOGY

Marks: 75

UNIT I

Introductory history - Laboratory organization - sterilization techniques - nutrition for plant cells, types of media – MS – Nitsch & Nitsch media, Gamborg's media, White's Media. Structure and function of Growth regulators – Auxins, Cytokininis and Gibberellins. Establishment and maintenance of callus and suspension cultures. Somatic embryogenesis, cytology of callus. Green house effect.

UNIT II

Haploid production, Anther and microspore culture. Gynogenesis, embryo culture and rescue in agricultural and horticultural crops. Invitro pollination and fertilization.

UNIT III

Protoplast isolation, Culture regeneration, fusion. Somatic hybrids, cybrids, cryopreservation, Synthetic seeds – Terminator seed concept. Gene transfer techniques in plants. Applications of transgenic plants.

UNIT IV

Plant micro propagation – micro grafting – *invitro* clonal multiplication – clonal orchards – meristem culture and virus elimination shoot tip culture. Edible vaccines from plants – Banana, Watermelon.

UNIT V

Somaclonal and Gamatoclonal variation in vitro cultures, Secondary metabolites in plants - production –screening - applications. Role of tissue culture in agriculture, forestry. Biodiversity and conservation.

REFERENCE BOOKS

- 1. Biotechnology applications of Plant Tissue & Cell culture. Ravishankar G.A and VenkataramanL.V, 1997.Oxford&IBH Publishing co., Pvt Ltd.
- 2. Tissue culture, Bhan, 1998, Mittal Publications, New Delhi.
- 3. Plant tissue culture, Islan A.C ,1996, Oxford& IBH Publishing Co., Pvt.,
- 4. Plant biotechnology by Ramawath ,2003, S. Chan Dana co, edition 2, 2003.
- Plants from Test tubes- An introduction to Micropropagation, Lydiane Kyte& John Kleyn, edition 3, 1996, Timber Press, Partland.
- Plants, Genes and Agriculture, Chrispeel M.J ,Sadava D.E,1994, Jones and Barlett Publication, Boston.
- 7. Biotechnology, Satyanarayana. U, 2008, Books and Allied (p) Ltd.
- 8. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture, **Reinert J and Bajajy.P.S**,1997, Narosa Publishing House.

ELECTIVE COURSE II

BIOPROCESS TECHNOLOGY

Max. Marks: 75

UNIT I

Introduction to Bioprocess Engineering. Isolation & screening of industrially important Micro Organism. Strain Improvement. Preservation of Microorganism. Inoculum Development for various fermentation process.

UNIT II

Media formulation. Sterilization – Batch & continuous systems. Fermentation types- Solid state & Submerged fermentation. Stoichiometry of cell growth & Kinetics. Immobilization of cells & Enzymes.

UNIT III

Design of Bioreactor, Parts & their function. Types of Bioreactors – CSTR, Air lift, Bubble column, Packed bed & Tower Bioreactors.

UNIT IV

Monitoring and Control of variables such as temperature, agitation, pressure, P^H, Dissolved oxygen. Computational control of fermentation Process.

UNIT V

Down streaming Process – Removal of Particulates, Centrifugation. Product extraction, purification - Chromatography. Final product Formulation, Drying, Lyophilization.

REFERENCE BOOKS

 Bioprocess Engineering – Shuler, M.L. and Kargi, F.2002. Basic concepts. Prentice Hall of India.

- Biochemical Engineering, Fundamental, Bailey and Ollis. 1986. McGraw ill (2nd Ed)
- Principles of Fermentation technology Stanbury, Aditya Publishers, edition:2, 1997.
- 4. Industrial Microbiology A.H. Patel, MacMillan Publishers, 2005.
- 5. Industrial Microbiology Casida, New age publishers, 2006.
- 6. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd

ELECTIVE COURSE III

PLANT MOLECULAR BIOLOGY

Max. Marks: 75

UNIT I

Genome organization. Nucleus, plastid and mitochondrial genome organization. Transposons in plants, transposable elements and transgenesis.

UNIT II

Regulation of gene expression in plants – Nuclear genes, Organellar genes(plastid and mitochondrial genes), Signaling mechanism in gene regulation.

UNIT III

Molecular biology of N_2 fixation, nif gene rearrangement and N_2 fixation in cyanophytes, Agrobacterium and crown gall tumor formation, agroinfection.

UNIT IV

Plant gene expression cassettes – selectable markers, reporter genes and promoters in plant vectors. Direct transformation of plant – physical methods.

UNIT V

Genetic engineering in plants – Bt cotton, herbicide tolerance, Stress tolerance, virus resistance, delay fruit ripening, production of antibodies, viral antigens,Interferons and cytoplasmic male sterility.

REFERENCE BOOKS

- 1. Microbial biotechnology (fundamental of applied microbiology)Alexander N. & Hiroshi Nikaido;
- 2. Plant biochemistry and Molecular biology, Lea, P.J & Leegood; 1993 John wiley & sons.
- 3. Plant virology Mathew, R.E, 1991, Edition 3, Academic press.
- 4. Molecular genetics of Photosynthesis, Anderson, B Salter, H, 1996., IRL press, Oxford.
- 5. Plants, Genes and Agriculture, **Chrispeel M.J, Sadava D.E,** 1994, Jones and Barlett Publication, Boston.
- 6. Biotechnology, Satyanarayana. U, 2008, Books and Allied (p) Ltd.

SKILL BASED ELECTIVE COURSE V

PHARMACEUTICAL BIOTECHNOLGY

Marks: 75

Unit I

History & Principle of pharmacology. Drug names & Classification systems. General Principles of Drug action Pharmaco kinetics, Pharmaco dynamics, measurement of drug action.

Unit II

Chemo therapeutic drugs- Protein synthesis inhibitors, Anti mycobacterial, anti fungal, anti protozoal, antiviral, Antihelmithic, anticancer, anti inflammatory drugs.

Unit III

Techniques of r-DNA technology for production of Biologicals: Human Insulin, HGH, GRF, Erythropoietins, IFN, INF, Lymphotoxin, Interleukins.

Unit IV

Production of Ergot alkaloids, Primary Metabolites of Pharmaceutical uses. Biotransformation & Steroid production.

Unit V

Biochips, Biofilms, Biosurfactants. Protein Engineering, Tissue Engineering.

Reference Books:

- 1. Pharmaceutical Biotechnology S.S. Purohit, Kaknani, Saleja
- Pharmacology Mary J. Myuk, Richard A.Hoarey, Pamala Lippinwitt Williams edition.
- 3. Pharmacology H.P. Rang, M.M. Pale, J.M. Moore, Churchill Livingston.
- Integrated pharmacology Page, Curtis, Sulter, Walker, Halfman. Mosby Publishing co.

SKILL BASED ELECTIVE COURSE VI

NANO BIOTECHNOLOGY

UNIT I

Nanobiology-concepts, definitions, prospects & challenges. Biological Nano objects – Topology of DNA, protein, lipid assembly- Biological networks. Nanoparticles, Nano composites.

UNIT II

Methods of Nanobiotechnology - Analysis of bimolecular Nanostructures by Atomic Force Microscopy, Scanning Probe Electron Microcopy, NMR, X-ray Crystallography, Immuno PCR and Lithography.

UNIT III

Biosensors – Types: Potential, Electrochemical & Biomembrane based sensors. Biochips, DNA microarrays, Imaging techniques-digital & molecular.

UNIT IV

Drug delivery systems –polymer therapeutics - polymer drug conjugates; liposome. Determination of mechanical properties - Mechanical testing, Elasticity, Toughness.

UNIT V

Application of Nanobiotechnology in medicine, Drug designing and Cancer treatment. Medical, Social and Economic status of Nanobiotechnology.

REFERENCE BOOKS

- Biomaterials Sciences: An Introduction to Materials in Medicine 2nd Edition, Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons.
- 2. Lehninger's Principles of Biochemistry, 4th Edition, David L. Nelson and Michael M. Cox, 2006
- 3. Nanobiotechnology: Concepts, applications and perspectives, Christof M. Niemayer, Chad A. Mirkin, Wiley VCH publishers 2004.
- 4. Bionanotechnology: Lessons from Nature, David. S. Goodsell, Jhonwiley 2006.
- 5. Naobiotechnology: Molecular Diagnosis, K.K. Jain, Tailor L. Francis Group.

CORE PRACTICAL III

LAB IN IMMUNOLOGY, rDNA TECHNOLOGY, BIOINFORMATICS AND

BIOPROCESS TECHNOLOGY

Max. Marks: 60

- 1. Agglutination- Haem agglutination-ABO blood grouping, Bacterial agglutination WIDAL test, Latex Agglutination- ASO test, Pregnancy test.
- 2. Precipitation- Raising of Antisera, Radial Immunodiffusion, Double Immunodiffusion, Immuno electrophoresis, Counter Current Immuno electrophoresis.
- 3. ELISA
- 4. Isolation and visualization of plasmid DNA.
- 5. Restriction Digestion of Lamda DNA.
- 6. Ligation of DNA Fragments.
- 7. Isolation of Antibiotic Resistant Mutants.
- 8. Bacterial Transformation.
- 9. Sequence retrieval from any Databanks.
- 10. Sequence alignment by BLAST.
- 11. Process Control of Fermenter Demonstration (pH, Temp, Foam, Dissolved O2.

CORE PRACTICAL IV

LAB IN MICROBES, PLANTS AND ANIMALS IN BIOTECHNOLOGY

Max. Marks: 60

1. Isolation of industrially important enzymes (amylase and antibiotics) from soil microbes

- 2. Estimation of biomass dry weight and wet weight method.
- 3. Production of wine
- 4. Estimation of alcohol
- 5. Immobilization of yeast cells
- 6. Immobilization beads used for alcohol production
- 7. Preparation of SCP
- 8. Mushroom cultivation
- 9. Plant Tissue culture media preparation MS Media

Nitsch's media White's media

- 10. Callus induction
- 11. Micro propagation
- 12. Protoplast isolation
- 13. Green house visit and maintenance
- 14. Preparation of Animal cell culture media
- 15. Culture of chick embryo fibroblast
- 16. Inoculation virus and observation
- 18. Cytopathic effect in cell lines
- 19. Chick embryo demonstration

NON MAJOR ELECTIVE I

CONCEPTS OF BIOTECHNOLOGY

Marks: 75

Unit I

Scope of Biotechnology. History of Biotechnology: Conventional and Modern Biotechnology – Biotech industries. Biotechnology Tree – Roots and Branches. Strategies of gene cloning.

Unit II

Tools used in gene cloning – Restriction endonucleases – Types – Features. Ligases – Linkers, adaptors and homopolymer tails. Modifying enzymes – Nucleotide kinase, Alkaline physhatase. Gene amplification by PCR.

Unit III

Vectors – Properties of a good Vector .Constructed plasmids- pBR322. Cosmid vectors, Animal vectors- SV40. Plant vectors- Ti derivatives.

Unit IV

Introduction of genes – Vector mode – transformation and transfection. Vector less mode –Biolistics, Electroporation, Microinjection.

Unit V

Properties of *E.coli* & Yeast as good hosts. Selection of recombinants – Reporter genes, Colony hybridization.

REFERENCE BOOKS

- 1. Principles of Gene Manipulation Old & Primrose, (1989), 3rd edition
- 2. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd
- 3. Biotechnology and Genomics, Gupta P.K: (2004) Rastogi publication.
- 4. Gene cloning and DNA analysis **Brown, T.A** (1996), Blackwell science, Osney Mead, Oxford.
- 5. A text book of Biotechnology, **Dubey**, **R. C.** (2007), S.Chand & Company Ltd. New Delhi.
- 6. Biotechnology, Singh, B. D (2004). Kalyani Publishers, New Delhi

Note:

This paper has to be taught and exam Paper to be valued by only Biotechnology

Board.

NON MAJOR ELECTIVE- II APPLIED BIOTECHNOLOGY

Marks: 75

UNIT I

Plant biotechnology-Role of tissue culture in agriculture, horticulture and forestry, Edible Vaccines from plants – Banana, Watermelon.

UNIT II

Animal biotechnology-Production of Vaccines in animal Cells, Transgenic Animals – cloning, Applications of Transgenic mice and sheep.

UNIT III

Medical biotechnology-Gene therapy, Production and Applications of monoclonal antibodies, Somatic and Germline Engineering, molecular diagnosis.

UNIT IV

Industrial biotechnology-Production of Microbial products- Alcoholic Beverage – Beer, Antibiotic – Penicillin Industrial uses of enzymes – Detergents, Leather, food and Pharmaceutical

UNIT V

Environmental biotechnology-Microorganisms as Bio indicators, Genetic engineered microorganisms to degrade xenobiotics, Biological weapons and bioterrorism,

REFERENCE BOOKS

1. Principles of gene manipulation, Old & Primrose, (1989),

- 2. Animal Biotechnology, M.M. Ranga, (2000), Agrobios (India),
- 3. Culture of Animal Cells, R. Ian Freshney, 2000(4th Edition),, Wiley-Liss.

4. Introduction to Plant Biotechnology Hawla, (2003) (2nd edi) oxford and IBH publishere

5. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd.

6. Industrial Microbiology – A.H. Patel, MacMillan Publishers, 2005

7. Biotechnology and Genomics, Gupta P.K, (2004) Rastogi publication.

8. A text book of Biotechnology, **R. C. Dubey**, (2001), Rajendra Printer. New Delhi.

9.. Gene cloning and DNA analysis, **T.A Brown** (1996), Blackwell science, Osney Mead, Oxford.

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