YADAVA COLLEGE

(Autonomous, Co- Educational Institution)
Affliated to Madurai Kamaraj University
Re - Accredited with "A" Grade by NAAC
Govindarajan Campus, Thiruppalai,
Madurai-625014

DEPARTMENT OF MICROBIOLOGY
(SELF – FINANCE COURSE)

C.B.C.S. - SYLLABUS
w.e.f. 2015-2016

SYLLABUS UNDER CBCS PATTERN (2015-2016)
B.Sc., MICROBIOLOGY - PROGRAMME STRUCTURE

Sem	Subject Code	Title of the Papers	Teaching Hours	Credit	Duration Of Examination	Internal	External	Total
First		Tamil	5	3	3	25	75	100
		English	5	3	3	25	75	100
	Core subject	General Microbiology	4	4	3	25	75	100
	Core subject	Practical(Microbial techniques)	2	-	-	-	-	-
	Allied 1	General Chemistry	5	5	3	25	75	100
	Allied2	General Biology	5	5	3	25	75	100
		Environmental Studies	2	2	3	25	75	100
		Skill Based Elective (Communicative English)	2	2	3	25	75	100
		NSS/NCC/Physical Education	-	-	-	-	-	-

Second		Tamil	5	3	3	25	75	100
		English	5	3	3	25	75	100
	Core	Microbial Pysiology and Metabolism	4	4	3	25	75	100
		Practical(Microbial Techniques)	2	1	3	40	60	100
	Allied 1	Organic Chemistry	3	3	3	25	75	100
		Practical-I Qualitative analysis of Organic compounds	2	1	3	40	60	100
	Allied 2	Cell Biology	3	3	3	25	75	100
		Biology Practical I(General and Cell Biology)	2	1	3	40	60	100
		Value Education	2	2	3	25	75	100
		Skilled Based Elective (Communicative English)	2	2	3	25	75	100
		NCC/NSS/Physical Education	-	-	-	-	-	-

Third		Tamil	5	3	3	25	75	100
		English	5	3	3	25	75	100
	Core	Molecular Biology and Microbial Genetics	4	4	3	25	75	100
	Core	Practical II(Lab in Molecular Biology and Microbial Genetics)	2	1	3	40	60	100
	Allied 1	Industrial Chemistry	5	5	3	25	75	100
	Allied 2	Genetics	5	4	3	25	75	100
		Non Major Elective (Mushroom Cultivation)	2	2	3	25	75	100
	R4ECE3	Skill Based Elective (Communicative English)	2	2	3	25	75	100
		NSS/NCC/Physical Education	-	-	-	-	-	-
		Self study papers-Plant tissue Culture		3		25	75	100

Fourth		Tamil	5	3	3	25	75	100
		English	5	3	3	25	75	100
	Core	Industrial Microbiology I	4	4	3	25	75	100
	Core	Lab in Industrial Microbiology	2	1	3	40	60	100
	Allied 1	Biophysical Chemistry	3	3	3	25	75	100
	Allied 1	Chemistry Practical-II	2	1	3	40	60	100
	Allied 2	Biostatistics and Research methodology	3	3	3	25	75	100
	Allied 2	Genetics and Biostatics (Biology practical - 2)	2	1	3	40	60	100
		Non Major Elective (Catering and Food Processing Technology)	2	2	3	25	75	100
		Skill Based Elective (Communicative English-4)	2	2	3	25	75	100
		NSS/NCC/Physical Education	-	-	-	-	-	
		Self study paper-Proteomics and Genetic Engineering		3		25	75	100

Fifth	Core subject	Medical Microbiology	5	3	3	25	75	100
	Core subject	Basic to Bioinformatics	5	4	3	25	75	100
	Core subject	Principles of Immunology	5	4	3	25	75	100 .
	Core subject	Biochemistry	5	4	3	25	75	100
	Core subject	Lab-IV Lab in Medical Microbiology and Immunology	4	2	3	40	60	100
	Core subject	Lab-V Lab in Biochemistry and Bioinformatics	4	2	3	40	60	100
		Skill Based Elective (Communicative English)	2	2	3	25	75	100
		NCC/NSS/Physical education	-	-	-	-	-	-
		Self study paper-Genetic Engineering		3		25	75	100

	Subject code	Title of the paper	Teaching hours	Credit	Duration of Examination	Internal	External	Total
Sixth	Core subject	Microbial Biotechnology	5	4	3	25	75	100
	Core subject	Environmental and Agricultural Microbiology	4	4	3	25	75	100
	Core subject	Food and dairy Microbiology	4	4	3	25	75	100
	Core subject	Industrial Microbiology II	4	4	3	25	75	100
	Core subject	Medical Lab Techniques	5	4	3	25	75	100
	Core subject	Lab in food and dairy, agricultural &environmental microbiology	3	1	3	40	60	100
	Core subject	Lab In Medical Lab Techniques, Microbial Biotechnology &Industrial Microbiology	3	1	3	40	60	100
		Skill Based Elective (Communicative English)	2	2	3	25	75	100
		NSS/NCC/Physical Education	-	1	-	-	-	-
		Self study paper- Aquaculture		3		25	75	100
		TOTAL	**180**	**140**				

Paper-1

GENERAL MICROBIOLOGY

Semester: I

Hours/Week-4

Sub. Code: **Credit-4**

OBJECTIVES

- To acquire knowledge about microbial world
- To obtain knowledge on the contribution of Scientists to Microbial world
- To acquire fundamental knowledge on the classification of microbes.
- To achieve knowledge on the structure of microorganisms
- To acquire knowledge on the factors that influence growth of microorganisms

Unit I

Definition and scope of Microbiology History and recent development – spontaneous generation – Biogenesis- Contribution of Louis Pasteur, Leewen hoek, Lazaro spallanzani, John Tyndall, Joseph Hister, Robert Koch, Edward Jenner & Alexander Fleming, Microcopy – simple – compound light & dark microscopy – phase contrast – fluorescence and Electron Microscopy

Unit II:

Characteristic features of Prokaryotes and Eukaryotes: Prokaryotes - structure and function of cell wall, plasma membrane, flagella, slime, layer, capsule, pili, Cytoplasmic inclusion, sporulation. Eukaryotes – structure & function of cell wall. Cilia, nucleus, mitochondria chloroplast, lysosome Endoplasmic reticulum Golgi complex and plasma membrane- Fluid mosaic model.

Unit III:

Sterilization – Principle – dry heat moist heat, filtration, radiation disinfection techniques, antimicrobial agents, Types of media, Micro and macro nutrients – preservation of culture aerobic and anaerobic culture technique – Bacterial Reproduction and Types – Logrithamic representation of Bacterial population ,Calculation of Generation time and Growth rate Growth curve – Factors affecting Growth curve.

Unit IV:

Microbial taxonomy Bionomical nomenclature – species concept Hackel's Whittaker kingdom – Principles of Classification – Morphological – Physiological, biochemical, numerical, and molecular taxonomy. Classification of bacteria accordring to Bergey's manual.

Unit V:

Modern development in microbiology: principles of bacterial communication systems - quorum sensing and its importance in bacterial virulence, Prebiotics and probiotics, Microbial fuel cells, Single cell protein.

References :

1. Tortora, Funke, Case. 2004, Microbiology - An Introduction, Eighth Edition, Published by Pearson Education. Inc. 2004.
2. John L. Ingraham, Catherine A. Ingraham, 2000, Introduction To Microbiology – Second Edition.Published by Brooks/Cole.
3. Prescott, Harley, Klein, 2003, Microbiology- International Edition, fifth Edition, Published by McGraw-Hill Education.

4.. Nester EW Roberts CV and Nester N4T 1995 - Microbiology A Human Perspectives Iowa USA.

5. Stainer R Y. Ingraham JL Wheels ML. Painter PR 1999 - General Microbiology MacMillan Educational Ltd, London.
6. Pelczer J. Chen ECS., Krieg NR 1986 - Microbiology, MC Grow Hill Company.
7. Prescott L.M Harley JP., Klein DA 2000 - Microbiology Wm C publishers Iowa USA

.8. Sheath, PHA,, Mair NS & EJizabath M.Bergey's Manual of Systematic Bacteriology, 1995 (IX Edition).

9. Microbiology Laboratory Manual by T. Sundararaj Published by A. Sundararj No.5,I cross street, ThirumaJai Nagar, Pcrungudi, Chcnnai 600 096 2nd Edition 2003.

10. Davis, SD.DuIbccco R. Eisen HN and Ginsberg HS Microbiology 1980, edn.. Row New York Harpcrand

11.Brock TD., Smith DW and Madigan NT 1984 Biology of Microorganisms edn, Eniglcwood Cliffs, NJ Prentice Hall K

12.Boyd.R.F General Microbiology, 2nd edn Times mirror / Mosby College Publishing St. Louis 1988..

13. Microbiology (2005), Sixth edition by L.M. Prescott, J.P. Harley and D.A. Klein, McGraw Hill, Boston.

Paper -2
MICROBIAL PHYSIOLOGY AND METABOLISM

Semester : II

Hours/Week-4
Sub. Code: **Credit-4**

OBJECTIVES:

- .To acquire knowledge about Nutritional requirements and Different phases of growth – of Microorganisms
- To understand the physiological and metabolic principles underlying microbial life.
- To obtain knowledge about respiration and Oxygenic and An oxygenic Photosynthesis of microbes

UNIT – I

Nutrition: Nutritional requirements of Microorganisms – Autotrophs, Heterotrophs, phototrophs ,chemotrophs, lithotrophs,organotrophs,Photoautorophs, Chemoautotrophs, Chemohetrotrophs .

UNIT – II

Different phases of growth – Growth curve – Generation time – factors influencing Microbial growth – Temperature, pH, Pressure , Salt concentration , Nutrients – synchronous growth and continous cultivation . Diauxic growth.

UNIT -III

Metabolism – EMP – HMP – ED pathways – TCA cycle- Electron transport chain – Oxidative and Substrate level phosphorylation.

UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron Acceptor - Fermentation – alcoholic, propionic and mixed acid fermentation

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, Biosynthesis of aminoacids (Glutamic acid family) - Bioluminescence.

References

1. Prescott, L.M J.P. Harley and C.A. Klein 1995. Microbiology 2nd edition Wm, C. Brown publishers.

2. Tortora , Funke and case . Microbiology , *8th edition

3. Doelle . H.W.1975.Bacterial Metabolism . 2nd edition .Academic Press.

4. Moat. A.G. J.W.Foster. 1988.Microbial physiology. 2nd edition .Springer – Verlag.

5.Caldwell. D.R.1995, Microbial physiology and Metabolism . Wm. C Brown Publishers, England.

PRACTICAL-I
MICROBIAL TECHNIQUES-1 (For 1st and 2nd)

Semester- II

Hours/Week

Sub. Code: **Credit- 1**

OBJECTIVES

- To acquire knowledge about safety handling equipments.
- To acquire fundamental knowledge on various equipments essential for microbiology
- To acquire practice in culturing microorganisms under lab conditions
- To identify microorganisms with various staining techniques

I. Laboratory safety, General rules and Regulations,

Handling the equipments

Microscope

Autoclave

Colony counter

Electronic balance

P H meter

Incubator

Laminar Air flow

Hot air oven

Media preparation and sterilization

II. Staining technique

a. Simple staining

b. Gram's staining

c. Negative staining

d. Endospore staining

e. Capsule staining

f. Acid fast Staining (Demonstration Alone)

III. Hanging drop method

IV. Plating technique

a. Pour plate method

b. Spread plate method

c. Streak plate method

V. Biochemical test

a. Indole test

b. Methyl red

c. Voges Proskauer

d. Citrate utilization

e. Urease test

f . Catalase

g. Oxidase test

h. Starch hydrolysis

i. Triple Sugar Iron Agar Fermentation Studies of Different Bacteria

j carbohydrate fermentation test

k Gelatinase and Coagulase Test

l . Haemolyitc Pattern Demonstration on Blood Agar Plate

VI. Measurement of growth of microorganism

Calculating the generation time and growth time of given bacterial cultures

References:

1. Microbiology: A Laboratory Manual (2002) by J.G. Cappuccino and N. Sherman,Addison-Wesley.
2. Laboratory Manual of Experimental Microbiology (1995) by R.M. Atlas, A.E. Brown and L.C. Parks, Mosby, St. Louis.
3. Laboratory Manual in General Microbiology (2002) by N. Kannan. Panima Publishers.
4. Bergey's Manual of Determinative Bacteriology. Ninth edition (2000) by J.G.Holt,N.R.Krieg, Lippincott Williams & Wilkin Publishers.
5. Microbiology Laboratory Manual (2003) by T. Sundararaj Published by A. Sundararj No.5,I cross street, ThirumaJai Nagar, Pcrungudi, Chcnnai 600 096 2nd Edition.

Paper- 3

MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Semester : III

Hours/week : 4

Sub. Code : **Credit: 4**

OBJECTIVES:

- To understand the nature of genetic materials
- To Acquire Knowledge on Bacterial chromosome, Organization in prokaryotes and replication
- To acquire knowledge on gene alterations by gene mutation

UNIT-I

DNA-The genetic material, RNA - The genetic material, Characters of a genetic material, chemistry & Molecular structure of DNA, special structure of DNA, Structure and types of RNA.

UNIT-II

Bacterial chromosome, Organization of genes in prokaryotes, DNA – Replication in prokaryotes –Mechanism & enzymology of replication – Theta replication & Rolling circle replication.

UNIT-III

Transcription in prokaryotes – Genetic code – Translation of proteins – Regulation of gene expression in prokaryotes – Operon concept – lac & trp Operon.

UNIT-IV

Mutation - spontaneous and induced Mutagen & Mutagenesis – DNA repair mechanism.

UNIT-V

Genetic exchange – Transduction (specialized & generalized), Transformation, Conjugation & Hfr mapping, genetic recombination, TI Plasmid Transfer System and applications, Chromosomal DNA Transfer, Chromosomal Mobilization and Transfer System in Gram Positive bacteria.

References:

1. Gardner, E. J,Simmons, M J& D P Snustard ,1991 , Principles of Genetics, 8th edition. John Wiley & Sons.NY.
2. Freifelder .S ,1987 Microbial Genetics, Jones & Bartlett, Boston
3. Robert H .Tamarin. Principles of Genetics, 5th edition, Cm Brown Publishers.
4. Lewin.B, 1990. Genes, 6th edition, Oxford University Press.
5. Klug .W.S. & Cummings,MR, 1996, Essentials of Genetics, Mentics Hail. NewJersey.

PRACTICAL -II
LAB IN MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Semester : III

Hours/Week:3
Sub. Code : **Credit: 1**

OBJECTIVES:

1. To acquire knowledge about mutants

2. To acquire knowledge about effect of radiation on microorganisms

3. To acquire knowledge on isolation of mutants

4. To acquire knowledge on the models related to genetics

I. Determination of antibiotic resistance of a given bacterial culture

II. Isolation of spontaneous drug resistant mutants of *E.coli*.

III. Calculate the percentage killing of *E.coli* after exposure to UV radiation

IV. Isolation of antibiotic resistant mutants of *E.coli* using EMS.

V. Ampicillin selection for enrichment of auxotrophs

VI. Determination of lac+ and lac- organisms

VII. Assay of β galactosidase under inducible and repressible state

VIII. Molecular biology models- tRNA, RNA, DNA, Conjugation,

Replication and Transcription

Ix. Isolation of DNA from bacterial cultures.

X. Isolation of RNA from bacterial cultures.

References:

1. A. P.Gunasekaran Reprint 1996 Laboratory manual in Microbiology New age international publisher ISBN . 81-224-0783-8 ed.2.
2. Sathish Gupta Practical Microbiology Second edition Jaypee brother medical Pub:pvt ltd New Delhi ISBN -81-7179-579-9..
3 Gand R.S and Gupta G.D Practical Microbiology First edition Pub Nirali Prakashan.
4. Cappuccino Sherman Microbiology, A Laboratory Manual 6th edition Publisher Pearson Education
5. P.Gunasekaran 2009 Laboratory manual in Microbiology 1st edition Publisher New Age International publishers
6. Dr.N.Kannan Laboratory manual in General Microbiology Palani Paramount publisher
7. Cuppuccino, J.G. and Sherman, N.1996. Microbiology - A Laboratory Manual. Fourth edition. Benjamin and Cummings Publications, California.
8. Benson, J.H.1994. Microbiological Applications. A Laboratory Manual in General Microbiology. Sixth edition. Wmc. Brown Publications, IOWA, U.S.A.
9. Jeyaraman,J. 1996. Laboratory Manual in Biochemistry. Fifth edition. New Age International Publisher, New Delhi.

PAPER-4
INDUSTRIAL MICROBIOLOGY -I

Semester - IV

Hours/week : 4
Sub. Code : **Credit: 4**

OBJECTIVES:

- To acquire knowledge on media preparation in industrial Microbiology
- To acquire knowledge about media formulations
- To acquire knowledge on designing a fermentor
- To obtain knowledge on sterilization techniques used in fermentation process

UNIT I

Screening – Primary Screening – Crowded plate techniques, Auxanography, Enrichment culture technique, secondary screening. Media – Media formulation – Energy sources- Carbon sources- Precursor, Regulator-, inhibitors, Inducers – Antifoams – Medium optimization. Animal cell media – Serum free media supplements protein free media – Trace elements – Osmolaity- P^H

UNIT II

Fomentors type:Waldholf type fermentor, Tower fermentors, Cylindro – Conical vessel,Airlift fermentors, Deepjet fermentors, Cyclone column, Packed tower, Rotatory Disc fermentors, Continuous Stirred tank fermentors, (CSTF)

UNIT III

Design of fermentors: Aerobic – Anaerobic, Basic functions of fermentors, Aseptic operation and containment. Body construction – Agitators, Baffles, Sparger -types of Spargers, Pilot plant.

UNIT IV

Industrial sterilization: Medium sterilization, Sterilization of fermentors, Sterilization of air, and feeds**,** upstream and downstream process: Recovery and purification of intracellular and extra cellular products-fermentation Economics.

UNIT V

Methods of measuring process: Temperature flow, Pressure, Foam, Biomass, Dissolved Oxygen, pH, Redox – Potential and chemical factor. Manual control, Automatic control, computer application in fermentation technology- components of a computer – linked system-, Data logging - Data analysis – process control.

REFERENCES:

1. Stanbury PR Whittaker A. Principles of Fermentation Technology Editon1984 Pregmaon Press Oxford

2. Reviere, J 1996. Industrial Application of Microbiology Edition 1996 Surrey University press

3. Demain, AL & Solman, NA Manual of Industrial Microbiology. American Society of microbiology Washinton

4. Abhilasha S.Mathuriya 2009 Industrial Biotechnology First edition Ane Books Pvt Ltd

5. Wulf crueger and Anneliese Crueger Biotechnology A textbook of Industrial Microbiology second edition Panima publishing Corporation New Delhi

6. A.H.Patel, 2007 Industrial Microbiology 11 th edition Rajiv Beri for Macmillan India ltd

7. E.M.T El-Mansi,C.F.A,Bryce,A.L.Demain,A.R.Allman 2009 Fermentation Microbiology and Biotechnology Taylor and Francis group London

8. Cruger, W. and Crueger, A. 1995. Biotechnology. Black Well Scientific Publications, Oxford.

9. Peppler, H.J. and D. Pearlman, 2004. Microbial technology, Vol-I and Academic Press, New Delhi.

10. Demain, A.L and Davis, J.E.2004. Industrial Microbiology and Biotechnology. Second Edition, ASM Press Washington, DC

11. R.O.Jebakumar solomon, 2009 Foundations in Bio Process Technology-Theory and Practice, Ratna Publications, Madurai.

PRACTICAL III
LAB IN INDUSTRIAL MICROBIOLOGY

Semester - IV

Hours/week:2
Sub. Code- **Credit:1**

OBJECTIVES:

To acquire knowledge on the screening of microbes from various sources

To acquire knowledge on immobilization techniques

To acquire knowledge for the preparation of important mediums

1. Screening of microorganisms from soil for morphological characterization
2. Screening of microorganisms from soil for an antibiotic producing organisms
3. Screening of microorganisms from soil for extra cellular enzyme (amylase) producing microorganisms
4. Screening of cyanobacteria from paddy field water sample.
5. Screening of yeast cells from flour /grapes
6. Screening of Organic Acid Producing Microorganism from Soil
7. Immobilization of yeast cells using Sodium alginate
8. Description of fermentors.

References:

1. A.P. Gunasekaran Second edition 1996 Laboratory manual in Microbiology New age international publisher ISBN. 81-224-0783-8
2. Sathish Gupta 1998 Practical Microbiology Second edition Jaypee Brother Medical Pub:pvt ltd New Delhi ISBN -81-7179-579-9..
3. Gand R.S and Gupta G.D1998 Practical Microbiology First edition Pub Nirali Prakashan.
4 Cuppuccino, J.G. and Sherman, N.1996. Microbiology - A Laboratory Manual. Fourth edition. Benjamin and Cummings Publications, California.
5.Benson, J.H.1994. Microbiological Applications. A Laboratory Manual in General Microbiology. Sixth edition. Wmc. Brown Publications, IOWA, U.S.A.
6.Jeyaraman,J. 1996. Laboratory Manual in Biochemistry. Fifth edition. New Age International Publisher, New Delhi.

Paper V
MEDICAL MICROBIOLOGY

Semester -V

Hours/week:5
Sub. Code - **Credit: 5**

OBJECTIVES:

- To update the present modern aspects in medical microbiology
- To acquire knowledge on the collection and preservation of clinical samples
- To acquire the knowledge of microbes and molecular mechanism of microbial disease, pathogenesis.
- To understand idea of the development of modern laboratory and diagnostic techniques.

UNIT I

Clinical specimen, Collection Transport & Processing of Blood, Urine, Sputum, CSF, Stool, Throat swab, Pus, Anti Microbial Chemo Theraphy, General Characters of Anti Microbial Drugs, Laboratory Testing Procedures for Anti Microbial Susceptibility Testing, Mode of Action of Antimicrobial Drugs, Drug resistance.

UNIT II

Gram-positive bacteria: Morphology, Pathogenesis & lab diagnosis of *Staphylococcus, Streptococcus, Clostridium tetani, Bacillus anthrax, Corynebacterium, Mycobacterium* .Gram negative bacteria: Morphology, Pathogenesis & Lab diagnosis of *E.coli, Salmonella and Pseudomonas*

UNIT III

Fungus; superficial (*Pityriasis versicolor*), subcutaneous (*Sporothrix*), Opportunistic (*Candidaalbicans*), Cryptococcosis, blastomycosis, Paracoccidioidmycosis, Rhino sporidiosis Viruses: Pathogenesis and Lab Diagnosis of viral diseases - Pox virus, Herpes virus, HIV, Influenza and Rabies. Liver Disease: Hepatitis

UNIT IV

Parasitology: Morphology, Pathogenesis – Lab diagnosis – Preventive measures of *Entamoeba histolytica, Plasmodium, Giardia lamblia, Trichomonas vagainalis , Taenia solium, Ascaris lumbricoides.*

UNIT V

Viral Assay Studies :ELISA,Western Blot,Cultivation studies of Virus using Embryonated Chick embryo,Cell line,Cyto pathetic effect of Virus on Cell line,Assay of Virus : Physical,ChemicalMethods,Radio ActivityTracers, Protein and Nuclic Acid assay, Infectivity Assay:Plauge and End Point assay

References:

1. Atlas, R.M., 2001. Principles of Microbiology, Moshby year Book Inc . Missouri
2. Ananthanarayan, R., Jayaram Panikar, C.K., 2004. Text Book of Microbiology. Orient Longman Limited, Chennai.
3. Luria. S.E., Darnel, J.E .Jr., Baltimore, D. and Camlal, A., 1978. General Virology, John Wiley and Sons, New York.
4. Satish Gupta .The short textbook of Medical microbiology Ninth edition. Pub:Jaypee brothers medical publishers(P) Ltd,New Delhi.
5. K.Rajeshwar Reddy Medical Microbiolgy 1st edition 2009 New age International pulishers New Delhi
6. S.Rajan Medical microbiology first edition 2007 publisher WWW.Mjp publishers
7. T.J.J Inglish Microbiology and Infection A clinically –oriented core text with self assessment First edition 1996 Publisher Churchill Livingstone NewYork
8. MN Chatterjea and Rana Shinde Medical biochemistry 6Th edition Jaypee brothers Medical Publishers(p) limited
9. .Kanai L Mukherjee Medical Laboratory Technology A Procedure Manual for Routine Diagnostic Tests Volume I Volume II and Volume III Edition 2008 Tata McGraw –Hill Company Limited New Delhi
10. Ramnik Sood ,Medical laboratory technology methods and interpretations 5th edition Publisher Jaypee brothers.New Delhi

Paper-6
BASIC TO BIOINFORMATICS

Semester -V

Hours / week -5
Sub.Code: **Credit:4**

OBJECTIVES:

- To give the symbiotic relationship between biological science and computational techniques
- It helps in gaining knowledge in the field of computer and well as in the field of biological sciences
- To acquire knowledge on searching databases through internet
- To obtain knowledge on predicting protein structure through bioinformatics tool
- To acquire knowledge on the packages used in the bioinformatic studies.

UNIT-I

Introduction,-Importance and applications of bioinformatics, an introduction to servers, operating systems, Unix, Linux, World wide web(WWW),Programming in Perl.

UNIT-II

Search engines-finding scientific articles- Pub med, Public biological databases, Protein data bank (PDB), Swiss prot, Gen bank-searching databases --depositing data to public databases.. Structure of DNA and protein-sequence -Sequence queries against biological data bases, dot blot, global alignment. The Needleman and Wunsch algorithm,Local alignment:.the smith –waterman algorithm

UNIT III

BLAST and FASTA-Multifunctional tools for sequence alignment, phylogenetic alignment, protein structure visualization-tools, structure-classification alignment and analysis.

UNIT IV

Predicting protein structure and function from sequence-determination of structure-feature detection-secondary structure prediction-predicting 3D structure, Protein modeling-Contemporary trends and applications-genomics and proteonomics-sequencing genome-sequence assembly-genomes on the web annotating and analyzing genome sequences, model system-*E.coli*,and *Homosapein.*Proteonomics-biochemical pathway databases.

UNIT V

Analysis packages-features of a stand alone analysis, packages, selected popular commercial packages-GCG, EGCN,Clustal W ,Staden. Special packages on DNA analysis, internet and intranet packages

References:

1. Seidman, L. A. and More, C.J. 1999. Basic Laboratory methods for Biotechnology – Text book and Laboratory references, Prentice Hall Publisher, New Jersey.
2. Baxevanis, A.D. and Quellette, B.F.f. 1998. Bioinformatics A Practical Guide to the Analysis of Genes and Proteins. Wiley-interscience Publication, New York.
3. Smith, D.W. 1994. Biocomputing Informatics and Genome Projects. Academic Press, San Diego.
4. Gibas, C. and Jambeck, P. Developing Bioinformatics Computer Skills. Shroff Publishers, Calcutta.
5. Sundara Rajan, S. and Balaji, R. 2002. Introduction to Bioinformatics. Himalaya Publishing House,New Delhi
6. S Ignacimuthu,SJ Basic Bioinformatics Editiion 2005 Narosa Publishing House New Delhi
7. Harshawardhan P.Bal Bioinformatics Principles and Applications 3rd Edition 2007 Tata McGraw –Hill Publishing Company Limited,New Delhi
8. Pierre Baldi and Soren Brunak Bioinformatics The machine learning approach 2nd edition Publisher Affilated East –west press private limited New Delhi.

9. C.S.V Moorthy Bioinformatics 1st Edition 2003 Himalaya publishing house New Delhi
10. S.R Penning ton and MJ Dunn 2002 Proteomics from protein sequence to function publisher Viva Books Pvt Ltd.
11. Teresa K Atwood and David J Parry-Smith Introduction to bioinformatics 4th edition Publisher Dorling Kindersley (India)Pvt Ltd.
12. Andreas D Baxevanis and B.F. Francis Ouellette Boinformatics A Practical guide to the analysis of gnes and proteins 3rd edition Publisher Wiley India(P) limited New Delhi

Paper-7
PRINCIPLES OF IMMUNOLOGY

Hours / week -5

Semester -V

Sub.Code: **Credit:4**

OBJECTIVES:

- To know the fundamental concepts in immunology
- To acquire knowledge on the origin of immune system
- To acquire knowledge on immuno-haemotology
- To acquire knowledge on antigen –antibiotic reaction
- To acquire knowledge on transplantation technology

UNIT- I

History and Scope of Immunology - The basis of defence mechanisms - Cell and Organs involved in immune system - Phagocytosis.

UNIT- II

Types of immunity – Antigen – Antibody – types - Complement pathways - Classical and Alternate – Immunoglobins - structure and functions.

UNIT- III

Allergy and Hypersensitivity - Classification types and Mechanisms – Autoimmunity mechanisms and autoimmune response diseases: RA, SLE and Myasthenia Gravis.

UNIT –IV

Quantitative study of Antigen - Antibody reactions –Agglutination: RPR and Hemaaglutination Precipitation: Double Immuno Diffusion, ELISA, Radioimmune assay (RIA) - Monoclonal antibodies and its applications (Hybridoma technology)

UNIT –V

Immunohematology - Blood transfusion - ABO grouping - Rh factor - Tissue transplantation- HLA typing - Mechanism of acceptance and rejection, Tumour immunology.

References :

1. Kuby.J.1997 . ,Immunology,W.H.Freeman,NY
2. Tizard,I R 1998.Immunology An Introduction ,Second edition.W.B.Saunders,Philadelphia.
3. Roitt, IM 1991.Essentials of Immunology,seventh edition Blackwell Scientific Publications.
4. Nandhini Shetti,1993.Immunology,Introductory Text Book.New Age International Limited

Paper-8
BIOCHEMISTRY

Semester -V

Hours - week -5

Sub.Code: **Credit:4**

OBJECTIVES:

To enable the learners to:

- understand the chemical nature of Bio Molecules
- Acquire knowledge on the Classification and Properties of Biomolecules
- Have an idea on Macromoleclecular assemblies
- Gain Knowledge on Biosynthetic Pathway of Hormones.
- Familiarize with Enzymes and Their Applications.

Unit-I

Carbohydrates:

Classification, Chemistry and Properties of Monosaccharides, Disaccharides and Poly Saccharides –Homo and Hetero Polysaccharides, Metabolism of Carbohydrates-Glycolysis, Glyconeogenesis, Gluconeogenesis.

Unit-II

Proteins:

Classification based on Chemical Nature, nutritive value and biological role, Structure and Classification based on their side groups and Polarity, Structural Organization of Proteins at Primary, Secondary, Tertiary and Quaternary Levels

Unit-III

Lipids:

Classification,Saponifiable and Non Saponifiable Lipids,Chemistry and Nomenculature of fatty acids, Chemistry Of Tri glycerides,phospholipids,Properties of fats, fatty acid oxidation-Omega, Beta Oxidation,Bio synthesis of Cholesterol.

Unit-IV

Nucleic Acid:

Chemistry and Structure of DNA, and RNA types, Metabolism of Purine and Pyrimidine nucleotides by Salvage and *Deno vo* Pathways, Hormones: Chemical Nature and Bio Synthesis of insulin, Catecholamines and Oestrogen.

Unit-V

Enzymes

Enzymes- Nomenclature classification, properties of Enzyme-- Michaelis - Mentan equation, Line Weaver Burk Plot, factors affecting enzyme action, types of inhibitor, enzyme specificity.

References:

1. Deb, A.C (2004) Fundamentals of Bio Chemistry, New Central Book Agency Pvt, Ltd, Kolkatta.
2. Lehinger, A.L., Nelson D.L and Cox, M.M (2002) The Principles of Biochemistry, CBS Publishers, New Delhi.
3. Voet D and Voet J.G (1996) Bio Chemistry John Wiley and Sons, New York.
4. Ambiga Shanmugam, A., 1998, Funtamentals of Biochemistry for Medical students, Published by the Author, Madras.
5. Delvin T.M (1997) Text book of Biochemistry with Clinical Correlations,john Wiely and Sons,New York.
6. Stryer, L (1995) Biochemistry, W.H Freeman&co, Newyork.
7. Murray, R.K., Gvannav, D.K., P.A Rod Well, V.W. and Harper,S(2000) Biochemistry , Mc Graw Hill,New York
8. Conn, E.E., P.K.Stummpf, G.Bruening and R.H.Doi, 1997, Outline of Biochemistry, John Wiley & Sons Inc., New York.
9. Weii.J.H.., 1990, General Biochemistry, Wiley Eeatern Limited, New Delhi.
10. Zubay,G. 1998. Biochemistry -2nd edition Mac Millan Publishers NY, Collier Mac Millan Publishers, London.

LAB-IV
LAB IN MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Semester-V

Hours week -4
Sub.Code: **Credit:1**

1. Isolation of microbes causing sore throat -isolation of *Streptococcus pyogens*
2. Isolation of microbes causing urinary tract infection-isolation of *E.coli*
3. Isolation of microbes from wounds and pus-*Staphylococcus aureus*
4. Blood collection techniques and separation of plasma and serum
5. Blood grouping and Rh typing
6. Separation and characterization of lymphocytes from blood
7. Enumeration of blood cells –Total RBC and WBC.
8. Precipitation reaction in gel: ODD, single and radial Immune diffusion

9 Widal test and VDRL

10. Separation of serum protein by Electrophoresis.
11. Description of HIV Structure- ELISA

References:

1. A. P.Gunasekaran 1996 Laboratory manual in microbiology New age international publisher ISBN . 81-224-0783-8 ed.2.
2. Sathish Gupta Practical Microbiology Second edition 1998 Jaypee brother medical Pub:pvt ltd New Delhi ISBN -81-7179-579-9..
3. Gand R.S and Gupta G.D1998 Practical Microbiology First edition Pub Nirali Prakashan.
4. Jane Roskams and Linda Rodgers Lab Ref A Handbok of Recipes,Reagents and Other Reference Tools for Use at the Bench Indian reprint 2004 Publisher I K International PVT Limited New Delhi
5. KanaiL Mukherjee Medical Laboatory technology A procedure Manual for Routine Diagnostic tests Voume I, VolumeII Volume III Reprint 2008 Publisher Tata Mcgraw-Hill Publishing Company Limited New Delhi.

LAB-V
LAB IN BIOCHEMISTRY AND BIOINFORMATICS

Semester-V

Hours - week -4
Sub.Code: **Credit:-1**

1. Preparation of Buffer
2. Estimation of Total Carbohydrates by Anthrone Method
3. Estimation of Protein by Lowery's method
4. Estimation of reducing sugars by Benedict's method
5. Lipid analyis: Cholesterol estimation
6. Separation of amino acids mixture using paper chromatography technique
7. Searching data bases using search Tools.
8. Using pub Med to find a journal using author's name.
9. Submission of data base on BLAST and FASTA

References:

1. Jeyaraman, J.1985, Laboratory Manual in Biochemistry, Wiley Eastern Limited, New Delhi.
2. Palanivel U.P., 2000. Laboratory manual for analytical biochemistry & separation techniques. School of Biotechnology, Madurai Kamaraj University, Madurai.
3. Williams, B.L. and K.Wilson, 1983, A Biologist's Guide to Principles and Techniques of Practical Biochemistry, Edward Amold Publishers Ltd., London
4. A. P.Gunasekaran 1996 laboratory manual in microbiology New age international publisher ISBN . 81-224-0783-8 ed.2.
5. Sathish Gupta Practical microbiology Second edition 1998 Jaypee brother medical Pub:pvt ltd New Delhi ISBN -81-7179-579-9..
6. Gand R.S and Gupta G.D1998 Practical microbiology First edition Pub Nirali Prakashan.

7. Jane Roskams and Linda Rodgers Lab Ref A Handbok of Recipes,Reagents and Other Reference Tools for Use at the Bench Indian reprint 2004 Publisher I K International PVT Limited New Delhi

8. KanaiL Mukherjee Medical Laboatory technology A procedure Manual for Routine Diagnostic tests Voume I,VolumeII Volume III Reprint 2008 Publisher Tata Mcgraw-Hill Publishing Company Limited New Delhi
9. Harshawardhan P.Bal Bioinformatics Principles and Applications 3rd Edition 2007 Tata McGraw –Hill Publishing Company Limited,New Delhi
10. S Ignacimuthu,SJ Basic Bioinformatics Editiion 2005 Narosa Publishing House New Delhi
11. Pierre Baldi and Soren Brunak Bioinformatics The machine learning approach 2nd edition Publisher Affilated East –west press private limited New Delhi.
12. C.S.V Moorthy Bioinformatics 1st Edition 2003 Himalaya publishing house New Delhi
13. S.R Penning ton and MJ Dunn 2002 Proteomics from protein sequence to function Publisher Viva Books Pvt Ltd.
14. Teresa K Atwood and David J Parry-Smith Introduction to bioinformatics 4th edition Publisher Dorling Kindersley (India)Pvt Ltd.
15. Andreas D Baxevanis and B.F. Francis Ouellette Bioinformatics A Practical guide to the analysis of gnes and proteins 3rd edition Publisher Wiley India(P) limited New Delhi.

PAPER -9
MICROBIAL BIOTECHNOLOGY

Hours/ week –5 **Semester-VI**

Sub.Code- **Credit:-4**

OBJECTIVE

- To learn about biotechnological advancement in microbiology
- Assessment of biotechnology and its impacts on man, society and Environment
- To acquire new techniques to analysis DNA
- To acquire knowledge on biosafety rules

Unit –I

Induction to gene manipulation, Restriction enzyme , - Nomenclature, Properties, Application- Techniques-Prokaryotic and Eukaryotic gene, Pseudo Gene, Split gene,Super GeneFamily,Transposon, C-Value paradox, Reassociation Kinetics, DNA amplification- PCR, Electrophoresis-Agarose- SDS- PAGE and Pulsed feild Electrophoresis

.

Unit-II

Cloning vectors- Plasmid- Types- pBR322, pUC vector, Cosmid- Bactriophage- λ Phage, M13, Expression vector: Shuttle vector, Broad host range vector- Yeast artificial Chromosome vector.

Unit –III

Cloning strategies, cloning and selection of individual gene, Gene Libraries:
Genomic libraries- c DNA libraries – Short gun methods, Genetic analysis of Microbes- *E.coli* and *Bacillus.*

Unit –IV

DNA sequencing methods: dideoxy and chemical method, sequence analysis- Automate sequencing, Gene expression pathway: Post transcriptional (RNA splicing) and Post translational (Protein Folding) Processes.

Unit -V

Recombinant DNA technology- Agriculture- Role of Ti plasmid in Plant biotechnology, Medical: Insulin-Vaccine. Industrial: Amino acid, Protein, Vitamin. Development and uses of transgenic animals- Disease resistant, meat and milk Production, Transgenic Plants- Herbicide and Disease resistant developed plant

References:

1. Old R.M., and Primrose S.B., 1985, Principles of gene manipulations, Blackwell Scientific Publications, London
.
2. Plant biotechnology - Murray Moo - Young Pcrgamon Press, 1992.
3. Industrial Microorganisms - Basic and Applied Molccules George D. liegeman and Paul L. Skalrud, A--Washington, 1993.
4. Plant.Biotcchnology - J, Hammond P.Mc.Garvey and V.Yuisbov, Springer, 2000.
5. Text book of Biotechnology; R.C,DUBY:2007

PAPER-10

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Semester : VI **Total hrs/ week- 4hrs**

Sub. Code: **Credit-4**

OBJECTIVES:

- To Acquire knowledge on the role of soil in agriculture
- To obtain knowledge about the use of microbes in the beneficial aspects to create a hazardous free environment
- To obtain knowledge on the role of microorganisms in biogeochemical cycle
- To acquire knowledge on water and aero microbiology

Unit -I

Soil Microbiology Physical and chemical characteristics and mircoflora of various soil types Rhizosphere – Phyllorphere – Microbial interaction symbiosis neutralism, mutualism commensalisms, competition Amensalisum synergisms, parasitism and predation. Bio-fertilizer Biological N_2 fixation – Diazotrophs, Associative symbiosis -- Rhizobium – Azospirillum – Azotobacter, Phospho bacteria- mycorhizae- AM and Ecto & Endo – mycorhizae

Unit -II

Microbes in biogeochemical cycle –C,N,P&S Bio-degradation- Xenobiotics, bio accumulation, bio magnitification & Bioleaching.

Air microbiology, atmospheric layers and microbes -microbes in aerosol- assessment of quality of air- Air borne disease caused by bacteria, fungi and viruses- symptoms and preventive measure.

Unit -III

Aquatic Microbiology Eco System – Microbes in fresh and Marine – Eutrophication- water zonation- potablity of water- microbial quality testing of water- water purification- water born disease and preventive measures.

Water treatment – characteristic of solid and liquid waste – BOD - & COD gasification composing – aerobic & anaerobic treatment method.

Unit-IV

Plant disease caused by bacteria: Citrus Canker, Little leaf of Brinjal, Corn Stunt disease, Blast of rice, Late blight of potato, Wilt of Cotton, Virus: TMV, CMV, Viroids- mechanism of pathogen, establishment and symptoms.

Unit- V

Disease control- fungicide- bacterial disease control- insecticide – bio pesticides-- nematicide and weedicide, control & viral disease.

References:

1. Alexander,M. 1971, Microbial Ecology John-Wiley & Sons, inc. NewYork.
2. Alexander, M.1977, Introduction to Soil Microbiology, John Wiley & Sons Newyork.
3. Baker. K,H and-Herson D,S. 1994, Bioremcdialion, McGraw Hill, inc. New York.
4. Marshell K.C 1985., Advances in Microbiology Ecology Vol.8, Phenum Press
5. Bums, RG/&Slater JH; 1982, Experimental Microbial Ecology- Blackwell scientific Publications,-Oxford .London.
6. Vanghan, D and Malcolm RE, 1985, Soil Organic Matter and Biological Activity. Martinus Nighoff W.Junk Publishers.
7. Michel R 1999, Introduction to Environmental Microbiology.
8. Boyd R.F., General Microbiology, 2nd Edition, Times Mirrof/Mosby College Publishing St. Louis.1988.
9. Alexander, M 1977, Introduction to Soil Microbiology, John Wiley & Sons, inc. York.
10. Norris JR. and Pettipher, GL. 1987, Essays in Agricultural and Food Microbiology,JohnWileyandSons,Singapore.
11. Burges, A and Raw, F. 1967, Soil Biology, Academic Press, London.
12. Martin-Alexander Wiley, 1961, Introduction to Soil Microbiology International Ed New York.
13. Vanghan, D. and Maleolm,R.F: 1985; Organic Matter and biological activity,Martinus Nighoff,W. junk Publishers.
14. Harry Bukman and Nyle C. Brady, 1960: The Nature and Properties of soil Eurasis Pub House (Pvt) Ltd, New Delhi.
15. Malhothra Plant Pathology
16. Subbha Rao- Bio Fertilizers in agriculture and Forestry
17. Agriculture micro Bilogy -Rengasamy and Bakhyaraj

PAPER-11

FOOD AND DAIRY MICROBIOLOGY

Hours /week4hrs **Semester : VI**

Sub. Code : **Credit-4**

OBJECTIVES:

- To study the impact of microbes on foods
- To acquire knowledge of preservation methods
- To acquire knowledge on the fermented foods produced from milk andmilkproduct.
- To acquire knowledge on the fermented foods produced from cereals
- To acquire knowledge on the fermented foods produced from fruits
- To acquire knowledge on the food borne illness

Unit-I

Food as a substrate for growth of microbes Role of microbes (mold yeast, bacteria) in food General characteristic & importance principles of food preservation - Asepsis – Removal of microorganism, aerobic condition - High temperature – Low temperature - Drying – Food additives

Unit -II

Contamination and spoilage – cereal , Vegetables , sugar product, fruits, meat and meat products, fish & their product – poultry , spoilage of canned foods.

Unit -III

Milk & milk product - role of microbes in milk and milk products – quality testing- MBRT, SPC Breed Count- spoilage of organism - preservation method - pasteurization.

Unit- IV

Food borne infection and intoxification- bacterial, non – bacterial – Food borne disease- outbreaks - Laboratory testing - preventing measures. Food sanitation – plant

sanitation – quality control, HACCP, GMP, International and Federal agencies in Food Control.

Unit –V

Food fermentation - yoghurt, cheese, pickle, bread, vinegar, fruit juice, jam – spoilage & general prevention method.

References:

1. Adams MR & Moss MO;, 1995,'Food Microbiology, New Age International P. Ltd. Publications.
2. Frazier WC and Westhoff DC, 1988, Food Microbiology, 4th Edition, McGraw| Hill-New York.
3. Hobbs B.C. and Roberts D, 1993, Food poisoning and Food hygiene, Edwards] Arnold, London.
4. Stanbury, PF., Whitaker," A and Hall, SJ., 1995, Principles of Fermentation Ecology, 2nd Edition, Pergamon Press.
5. Boyd, R.F., General Microbiology, 2nd Edition, Times Mirror Mosby college Publishing, St. Louis, 1988.

6 Industrial Microbiology A.H.Patel

PAPER-12

INDUSTRIAL MICROBIOLOGY II

Hours /week-4hrs **Semester : VI**

Sub. Code : **Credit-4**

OBJECTIVES:

- To emphasize the importance of industrial microbiology in the aspects of producing economically favorable microbial products.
- To give the knowledge of various concepts of technology handled in the industries.
- T acquire knowledge on the importance of antibiotics
- To acquire knowledge on the production of organic acids using microorganisms

UNIT I

Microbial growth kinetics: Batch culture, continuous culture, feed back system, comparison of bacterial continuous culture in Industrial process – fed batch culture

UNIT II

Antibiotics – Classification – production and purification- Penicillin – Streptomycin Tetracyline and Griseofulin, bacterial antibiotics. Organic acids- citric acids – production and purification-Lactic acid,- Tartaric acid- Acetic acid. Gluconic acid; solvents – Acetone, butane, 2, 3 – Butanediol.

UNIT III

Instrumentation: Principle and function of chromatography –Paper chromatography, TLC, Column chromatography, HPLC, centrifugation – Principles – functions and types. UV – VIS Spectrophotometry.

UNIT IV

Recovery and purification of fermentation products: Removal of microbial cells – Physical and mechanical methods: filtration – centrifugation –Chemical methods: extraction – chromatography – Drying –precipitation - crystallization.

UNIT V

Vitamin – Vitamin B12, B2, C, single cell proteins: Bacterial proteins, Actinomycetous proteins, yeast proteins, fungal protein, algal protein, Enzymes – Amylase, Pigments: Beta Carotinoides

References:

1.Stanbury PR Whittaker A 1984 Principles of fermentation technology Pregmaon Press Oxford

2. Reviere, J 1996. Industrial application of microbiology. Surrey University press.

3. Demain, AL & Solman, NA Manual of industrial microbiology. American Society of microbiology, Washinton

4. Abhilasha S.Mathuriya 2009 Industrial biotechnology First edition Ane Books Pvt Ltd

5. Wulf crueger and Anneliese Crueger Biotechnology A textbook of Industrial Microbiology second edition Panima publishing Corporation New Delhi

6. industrial Microbiology by Prescott and Dunn

7.Industrial Microbiology by A.H Patel

8. Industrial Microbiology by Perlman and Peppler Volume 1 and 2.

PAPER-13

MEDICAL LABORATORY TECHNIQUES

Hours /week- 4hrs **semester - VI**

Sub. Code: **Credit-4**

OBJECTIVES:

To obtain knowledge on the principles of Laboratory works

1. The main objective of the work is to make a brief knowledge about tissue processing and preservation for future studies
2. To make a fundamental clinical and laboratory knowledge regarding pathogens
3. To make a fundamental clinical and laboratory knowledge regarding hematology of human beings.
4. To Acquire a fundamental knowledge on the collection .preservation and testing of urinary samples

UNIT 1

Principles of Laboratory work, Essential Principles used in the laboratory – Personal Cleanliness & Care with Regard to infected materials, Glass wares, Flammable materials & Chemical burns- Principle Construction, Maintenance, Use and Care of Equipments & Instruments in Lab, SI Units, Collection & Dispatch of Specimens

UNIT 2

Haematology & Blood Banking – Determination of hemoglobin concentration, Tallquist Method, Sahlis acid hemoglobin method- Cyan met hemoglobin Method, Enumeration of Blood cells, Total RBC, WBC, Platelet – Indirect Method & Simple Method, Erythrocyte Sedimentation Rate(E.S.R), Westergren's Method, Wintrobe's Method, RBC Indices,Packed Cell Volume(PCV) , Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration(MCHC), Color Index (CI), Differential Leucocytes Count- Arnith Count- Schilling Count, Anemia- Types of Anemia, leukemia, Blood Parasites Eg : *Plasmodium, Leishmania,Tryponosoma Filariasis*.

UNIT 3

Preparation of Reagents for Urine Examination- Characterization of Urine ,pregnancy test,chemical Examination- Microscopical Examination of Stool, Protozoa,Ashelminthys Platyhelminthus, Nematohelminthus Eg:(Entameoba histolytica, Ascaris, Taenia)

UNIT 4

Basic steps for tissue processing-Fixation, Routine fixative-formalin-normal saline. Secondary fixative- Cornoy's fluid, normal alcohol fixative- Zenker's fluid, Helly's fluid.

UNIT 5

Decalcification, Dehydration, Clearing, Waxing, Embedding, Blocking, Section cutting, Microtome-types-Staining-Routine Haemotoxylin and Eosin Staining, Perl's stain for Iron, Vonkossa silver nitrate procedure for calcium.

References:

1. KanaiL Mukherjee Medical Laboatory technology A procedure Manual for Routine Diagnostic tests Voume I,VolumeII Volume III Reprint 2008 Publisher Tata Mcgraw-Hill Publishing Company Limited New Delhi
2. Satish Gupta The short textbook of Medical microbiology 2006 Ninth edition.Pub:Jaypee brothers medical publishers(P) Ltd,New Delhi.
3. T.J.J Inglish Microbiology and Infection A clinically –oriented core text with self assessment First edition 1996 Publisher Churchill Livingstone NewYork
4. S.Rajan Medical microbiology first edition 2007 publisher WWW.Mjp publishers
5. MN Chatterjea and Rana Shinde Medical biochemistry 6Th edition Jaypee brothers Medical Publishers(p) limited
6. K.Rajeshwar Reddy Medical Microbiolgy 1st edition 2009 New age International pulishers, New Delhi.
7. Kanai L Mukherjee Medical Laboratory Technology A Procedure Manual for Routine Diagnostic Tests Volume I Volume II and Volume III Edition 2008 Tata McGraw – Hill Company Limited New Delhi.

LAB IN FOODAND DAIRY, AGRICULTURE &ENVIRONMENTAL MICROBIOLOGY

Hrs/ week- 4hrs

Semester : VI

Sub. Code: **Credit-4**

Objectives

- To acquire practical knowledge on the relation between microbes and plants
- To gain knowledge on the separation of food spoiling organisms from various food materials
- To acquire knowledge on the quality control of milk and water

1. Isolation of *Rhizobium* from root nodules of leguminous plants

2. Isolation of *Azotobacter* from the soil

3 Observation of VAM from plant root

4. Isolation of *Xanthomonas* from cotton leaves

5 Mushroom cultivation

6 Isolation of microbes from milk, pickles, Ice creams & soft drinks.

7. Detection of milk quality by Methylene blue reductase test.

8 Water quality analysis by MPN method

9. Isolation of microbes from air sample technique- settle plate method

10. Isolation and counting of faecal bacteria from sewage water

11. Isolation and enumeration of Coli phage from Sewage water Sample.

References

1.A.P.Gunasekaran 1996 Laboratory Manual in Microbiology New age international publisher ISBN . 81-224-0783-8 ed.2.

2. Sathish Gupta Practical Microbiology Second edition 1998 Jaypee brother medical Pub:pvt ltd New Delhi ISBN -81-7179-579-9..

3. Gand R.S and Gupta G.D1998 Practical Microbiology First edition Pub Nirali Prakashan.

4.Jane Roskams and Linda Rodgers Lab Ref A Handbok of Recipes,Reagents and Other Reference Tools for Use at the Bench Indian reprint 2004 Publisher I K International PVT Limited New Delhi

LAB IN MEDICAL LAB TECHNIQUES, MICROBIAL BIOTECHNOLOGY &INDUSTRIAL MICROBIOLOGY

Hrs/ week- 3

Semester : **VI**

Sub. Code : **Credit**-1

Objectives

- To acquire knowledge on the preparation of specimen samples from human beings
- To acquire knowledge on the testing of specimen samples
- To gain knowledge on the identification of Human parasites
- To acquire knowledge on the production of biofuels
- To acquire practical knowledge on using electrophoresis technique

1 Preparation of permanent slides for blood smears

2. Estimation of Erythrocyte sedimentation Rate by Westergren's method

3 Estimation of total sugar in the urine sample

4 Estimation of total sugars in blood samples

5 Estimation of blood cholesterol in human blood

6. Determination of blood bleeding time and clotting time (BT, CT).

7. Alcohol production using sugarcane molasses and yeast

8. Protease production

9. Isolation of plasmid DNA from the given bacterial culture

10. Agarose gel electrophoresis

References

1.A.P.Gunasekaran 1996 Laboratory Manual in Microbiology New age international publisher ISBN . 81-224-0783-8 ed.2.

2. Sathish Gupta Practical microbiology Second edition 1998 Jaypee brother Medical Pub:pvt ltd New Delhi ISBN -81-7179-579-9..

3. Gand R.S and Gupta G.D Practical microbiology First edition Pub Nirali Prakashan.

4. Jane Roskams and Linda Rodgers Lab Ref A Handbok of Recipes,Reagents and Other Reference Tools for Use at the Bench Indian reprint 2004 Publisher I K International PVT Limited New Delhi

SELF STUDY PAPER

PLANT TISSUE CULTURE

SEMERSTER III

SUBJECT CODE-R3SMB1 **CREDITS: 3**

Objective

- To acquire knowledge on the techniques used in plant tissue culture
- To achieve knowledge on the role of metabolites in plant tissue culture
- To acquire knowledge on the plant genome
- To acquire knowledge on the development of new traits

UNIT-1

Introduction of plant tissue culture and cell suspension culture, physical-chemical conditions for propagation of plant cells and tissues, composition of media, nutrient and hormone requirement, continuous culture, techniques for immobilization of plant cells, continuous product recovery system using immobilized plant cell system

UNITII

Plant tissue culture-product and recovery: primary and secondary metabolic products (photochemical) of plant cells, Biosynthesis of secondary metabolites of biotechnological importance biotransformation for product development and selection of cell culture process technology with salient features for specific products.

UNIT III

Plant tissue culture-genetic engineering- (a): structure and organization of plant genome, regulation of plant genome expression, transcriptional, translational and post transcriptional regulation in plant genome.-transposons, chloroplast and mitochondrial genome.

UNIT IV

Plant tissue culture-genetic engineering (b) Transfer of nucleic acid to plant cells –direct transformation by electroporation and particle gun bombardment.-Agrobacterium,Ti plasmid vector.

UNIT –V

Theory and techniques for the development of new genetic traits, conferring resistance to herbicide, pesticide, plant pathogens, plant engineering towards development of enriched to products, plant growth regulators.

References:

1.S.S Lele Jyothi Kishen Kumar Algal bioprocess technology 1 st Edition 2008 New Age International Publishers

2.Rev Fr Dr S Ignacimuthu Methods in Biotechnology 1st Edition 2003 Phoneix Publishing House Pvt Limited

3.H.E.Street. Tissue culture and plant science. Ed 1974 Academic press. London

4.M.K.Sateesh 2003 Biotechnology Edition 2003 New age Int Publishers

5.D.Balasubramnian,Brycee,Dharmalingam,Green,Jayaraman 1996 Concepts in Biotechnology Univ.press.

6.Colin Ratledge and Bjorn Kristiansen Basic Biotechnology 2nd edition Cambridge university Press

7.Hiva Aithal and Nikhilesh Kulkarni Glossary in Biotechnology and Genetic engineering and Bogaphs of related scientists Hand book 1st edition Hilmalaya Publishing House New Delhi

8.S.Chand Genetic Engineering 1st edition S.Chand and Company New Delhi

SELF STUDY PAPER

PROTEOMICS AND PROTEIN ENGINEERING

Subject Code : S3SMB2 **Semester : IV**

Credit :3

Objective

- To acquire knowledge on the structure of protein
- To acquire knowledge on techniques for the separation of protein
- To acquire knowledge on the role of protein –genome relation
- To acquire knowledge on the protein synthesis

Unit I

Primary and secondary and tertiary structure of proteins, enzymes as a class of protein, active site and protein folding

Unit II

Introduction to proteomics and protein engineering- protein pre fractionation and sample preparation- two dimensional electrophoresis (2-D PAGE) - protein identification – post translational modification

Unit-III

Functional and genomics- proteomics and drug delivery –reverse genetics – transcription and replication of negative strand viruses

Unit IV

Protein engineering and transfer RNA world-Essential requirements for protein synthesis- Role of messenger RNA-SNIJRPS and introns- translation

Unit V

Protein folding-Hierarchic protein folding-defective protein folding-molecular chaperones-the HSP 70 Chaperone system. Proteasomes, prions, polyketides and nonribosomal peptides-combinational manipulation of polyketides and nonribosomal peptides

References:

1. H.D.Kumar Molecular biology 2nd edition Vikas Pblishing House Pvt Ltd
2. B.Alberts,D.Bray,J.Lewis etal. Molecular cell of the cell Edition1983 Garland pub. New York
3. D.Balasubrqmainian ,Bryce,Dharmalingam,Greenand Jeyaraman Concepts in Biotechnology Edition1996 Univ.press.
4. S.N.Mukhopadhyay Advanced process biotechnology Edition 2008 Publishers Viva books New Delhi
5. Nandan Hazare Protein Biotechnology edition 2010 Publisher Wisdom press New Delhi
6. K.G.Ramawat and Shaily Goyal Comprehensive Biotechnology 4th edition 2009 S Chand and Company Private Limited New Delhi
7. S V S Rana Biotechniques Theory and Practice first edition 2005 Rastogi publications Meerut
8. CM Brown I Campbell and F G Priest Introduction to Biotechnology 2nd edtion Panima publishing corporaqation New Delhi
9. ColienRatledge and Bjorn Kristiansen Basic biotechnology 2nd edition Cambridge University Press
10. Abhilasha S Mathuriya Industrial Biotechnology 1st edition Ane Books Pvt Ltd New Delhi

SELF STUDY PAPER

GENETIC ENGINEERING

Semester **Subject Code:**

Hours/week: **Credit: 3**

OBJECTIVE

- To acquire knowledge on recent trend in genetic studies
- To acquire knowledge on the proteomics
- To acquire knowledge on the vectors used in genetic engineering
- To give ideaas about making cells and doing jobs

Unit 1

Basic principles of gene cloning- basic principles of modern biotechnology protein engineering, and gene cloning, scope of genetic engineering.

Unit 2

Gene cloning vectors-plasmids, bacteriophage vectors for E.coli,cosmids.vectors for plant cells, vectors for anima cells, shuttle vectors,YAC vectors,BAC vectors, expression, Vectors,genecatridges,synthetic regulator sequences.

Unit 3

Enzymes in genetic engineering-restriction endonucleases, types of restriction enzymes, naming and target sites of endonuclease, host controlled and restriction and modification, uses of restriction enzymes in genetic engineering. Ligase enzyme-activity and application. Uses of alkaline phosphatase, phosphonucleotidide kinase,terminal deoxynucleotidyl transferase,holoenzyme,T4 DNA polymerase, TAQ DNA polymerase, TAQ DNA poymease, Ribonuclease H,Reverse transcriptase,poly – A polymerase, deoxyrionuclease-I, and exonuclease.

Unit-4

Tools of genetic engineering.-isolation and use of restriction enzymes, ,southern plotting,northen plotting.western plotting,Vectors ,transformation and molecular cloning.isolatiion of ribosomal RNA genes in Xenopus,. Sequencing of gene- sangers dideoxynucleotide synthetic method ,Maxam and gilbert s chemical degradation method,Direct DNA sequencing using PCR.Synthesis of gene,restriction maps and RFLPS

Unit-5

Gene transfer in plants-A*grobacterium tumefaciens*,direct gene transfer.expression of foreign DNA in eukaryotic cells.transgenic animals,genetics and ethics..enetic engineering in service of mankind.

References

Text Book:

1. S.Verma and V.K.Agarwal Genetic engineering.. Ed:2009 Pub:S.Chand and Company Ltd. New Delhi

2. J.M Walker and R.Rapley Molecular biology and biotechnology Ed 2006 Pub.Panima publishing corporation, Bangalore.

3.P.K.Gupta Molecular Biology and Genetic Engineering Ed 2005 Pub.Rastogi .Meerut.

4.H.D.Kumar Molecular biology 2nd Edition, Vikas Pblishing House Pvt Ltd

5.D.Balasubrqmainian ,Bryce,Dharmalingam, Green and Jeyaraman Concepts in Biotechnology Ed 1996 . Univ.press.

6.S.N.Mukhopadhyay Advanced process biotechnology Edition 2008 Publishers Viva books New Delhi

7.Nandan Hazare Protein biotechnology edition 2010 Publisher Wisdom press New Delhi

8.K.G.Ramawat and Shaily Goyal Comprehensive biotechnology 4th edition 2009 S Chand and Company Private Limited New Delhi

9.S V S Rana Biotechniques theory and practice first edition 2005 Rastogi publications Meerut

10. C M Brown I Campbell and F G Priest Introduction to Biotechnology 2nd edtion Panima publishing corporaqation New Delhi

11.ColienRatledge and Bjorn Kristiansen Basic biotechnology 2nd edition Cambridge University Press

12.Abhilasha S Mathuriya Industrial Biotechnology 1st edition Ane Books Pvt Ltd New Delhi

SELF STUDY PAPER

AQUACULTURE

Semester: VI **Subject Code :**

Hours/week: **Credit : 3**

OBJECTIVE

- To gain knowledge on the role of blue revolution in our economy
- To acquire knowledge in constructing fish ponds
- To acquire knowledge on the type of fish culture
- To acquire knowledge on the disease and prevention methods of fish diseases
- To acquire knowledge on the fish spoilage and its preservation methods

Unit 1

Scope of aquaculture, aquaculture in India, aquaculture in world, culture organisms

Unit 2

Requirements of fresh water fish farm, fish seed farm, barrage pond, diversion pond, brackish water fish farm, paddy fields, and coastal lagoons. Types of ponds- nursery, rearing, stocking, seasonal and perennial

Unit 3

Culture of organisms- monoculture, polyculture. Culture of Indian major corps, freshwater prawn, marine prawn, edible oyster, pearl oyster and seaweed culture.

Unit 4

Common fish diseases and their control. Behavioral changes and suspected causes of fish disease. External appearance related to fish disease. Fungal disease- gill rot, bacterial disease-abdominal dropsy, fin and tail rot, eye disease, Viral disease - SVC, protozoan diseases - costiasis, myxosporodiosis, ichthyophthiriasis, knot disease ,parasites-worm disease, crustaceans diseases.

Unit-5

Contamination, preservation and spoilage of fish and fishery products. Preservation-use of low temperature, chilling, freezing, irradiation, drying, use of preservatives. Factors influencing spoilage, bacteria causing spoilage.

References:

1.G.N.Vankhede and S.V.Deshmukh. Fresh water fish culture development and management. Ed 2002 Pub:Sarup and sons,New Delhi.

2.G.Santhakumar and A.M Selvaraj Concepts of Aquaculture Ed. 2005 Pub:Lekshmi papers Nagercoil

3.Frazier WC and Westcoff DC Food Microbiology 4th Ed Mc grow Hill NewYork.

4.N Shakuntala and M Shadaksharaswamy Foods Facts and Principles 3rd revised edition Publishers New Age International (P) limited New Delhi

5.Keshav Trehan Biotechnology 3rd reprint 1996 New Age International (P) Limited publishers New Delhi

6.S.K Kulshrestha Food preservation Edition 1996 Vikas Publishing PVT Ltd New Delhi

7.SN Tripathy Food biotechnology dition 2006 Dominant publishers and Distributors New Delhi

8.Yeshajahu Pomeranz and Clifton E Meloan Food analysis Theory and Practice 3rd edition CBS Pulishers and Distributors New Delhi

NON MAJOR ELECTIVE
MUSHROOM CULTIVATION
PAPER IV

Semester: III **Hours/Week: 2**

Subject code: S4NMB1 **Credit:2**

Unit1:

History of Mycology ,Mycology in Twentyth Century,Fungi general Characteristics:nutrition,thallus,cellwall,Karyons,life cycle:asexual and sexual reproduction.

Unit2:

Taxonomy,nomenculature and classification of fungi upto class levels,natural and artificial classification.Mastigomycotina –eg:Physoderma maydis,Zygomycotina –eg Mucor,Sscomycotina Eg:Sacharomyces Cerevisae,Basidiomycotina eg-Agaricus Camposteces,Deuteromycotina eg:Candida albicans.

Unit 3:

Cultivation of Edible Mushroom –Agaricus bispores,Pleurotus ostereolatus,Lentimu edodes,Volvariella volvaceae,Auricularia auricular,Tremella fusciformis.

Unit4:

Growing conditons of Mushrooms,Nutrition of fungus – nutritional requirements-Carbon source,nitrogen sources,minerals and vitamins.

Unit5:

Mycotoxins and Mycotoxicases-alfotoxins,esterogenictoxins,tricothecene toxin,alimentory toxic aleukia (ATA),Mushroom toxin-Amantia toxins,cyclopeptides,orellonine,gryomitrin,muscarine,psilocybinand psilocin.

References:

1. An introduction to Fungi .H.C Dubeed 1990 Vieofrey kibby,-Pkas Publishing House Pvt Ltd.Mushroom and toad stool- Geofrey kibby – Pub::chartwelbooksINC.1977.Octobus book Limited.

Non Major Elective
Catering and Food Processing

Semester: IV

Hours/Week:2

Subject Code: R4NMB2

Credits:2

Unit -I:

Food as a Substrate for Microorganism, Contamination and spoilage of Vegetables, Fruits, Meat Products ,Fish, and Fishery Products, Milk and Milk Products, Spoilage of Canned Foods.

Unit -II:

Food quality, Reception and Preparation of Raw Materials, Cleaning, Sorting, Grading ,Peeling , Heat Transfer in Food Processing-Blanching, Pasteurization, Sterilization, UHT, Cooling and Freezing.

Unit –III:

Processing Based on Heat and Mass transfer Evaporation , Drying, Frying, Baking, Extrusion, Agglomeraization, Process Based on Mechanical Separation, Centrifugation, Filtrations, Membrane Separations, Process Based on Electromagnetic Radiations, Microwave and Dielectric Heating, Infrared Heating, Irradiation.

Unit IV:

Food Packing, Functions of packaging, types of Packaging, active and Intelligence packing, Safety aspects of Packing and Migrations.

Unit V:

Production of Fermented Foods, Principles of Cheese Making, Swiss cheese, Yogurt, Bakery food Methods of Bread Production. Oriental Fermented Food: Sou Sauce, Miso, Temph.

References:

1. Frazier WC and Westcoff DC Food microbiology 4th Ed Mc grow Hill NewYork.
2. N Shakuntala and M Shadaksharaswamy Foods Facts and principles 3rd revised edition Publishers New Age International (P) limited New Delhi
3. S.K Kulshrestha Food preservation edition 1996 Vikas Publishing PVT ltd New Delhi
4. SN Tripathy Food biotechnology edition 2006 Dominant publishers and Distributors New Delhi
5. Yeshajahu Pomeranz and Clifton E Meloan Food analysis Theory and Practice 3rd edition CBS Pulishers and Distributors New Delhi
6. Keshav Trehan Biotechnology 3rd reprint 1996 New Age International (P) limited publishers New Delhi

QUESTION PAPER PATTERN

Under graduate courses

(Both Major and Ancillary papers)

Maximum Marks – 75 Marks **Duration of Examination: 3 hrs.**

PART – A.

Answer any **ten** questions out of 15 questions 10 x 2 = 20 Marks.

PART – B.

Answer any **five** questions out of 8 questions

(Answer not exceeding a page) 5 x 5 = 25 Marks.

PART – C.

Answer any **three** out of 5 questions

(Answer not exceeding 3 page) 3 x 10 = 30 Marks.

TOTAL **75 Marks.**

The serial No. of the questions has to be continuous from 1 to 28 from section A to Section C

ALLIED – II

Concepts in Biology

Common for B.Sc., Biochemistry & B.Sc., Microbiology (For those who joined in June 2015-16)

ALLIED – II

Concepts in Biology

Common for B.Sc., Biochemistry & B.Sc., Microbiology

(For those who joined in June 2015-16)

Sem	Code	Title of the Paper	Teach. Hours/ Week	Exam Hours	Credits	Evaluaton		Total
						Internal	External	
I		General Biology	5	3	2	25	75	100
II		Cell Biology	3	3	2	25	75	100
II		Practical-I General & Cell Biology	2	3	1	40	60	100
III		Genetics	5	3	2	25	75	100
IV		Biostatistics	3	3	2	25	75	100
IV		Practical-II Genetics &Biostatistics	2	3	1	40	60	100

GENERAL BIOLOGY

Semester: I **Subject Code:**
Paper – 1 **Credits: 2**
Hours per Week: 5 hrs **Total Hours per Semester: 75 hrs**

To enable the learners

to have basic knowledge of classification and general characters of plants and animals
to enrich their knowledge on human physiology

Part A - BOTANY

Unit I

Introduction, general characters and classification of the following groups, Morphology, structure and reproduction of the following types.

Algae - *Sargassum*

Fungi - *Saccharomyces*

Bryophytes - *Funaria*

Economic importance of Algae and Fungi

Unit II

Introduction, general characters and classification of the following groups, Morphology, structure and reproduction of the following types.

Pteridophytes - *Selaginella*

Gymnosperms - *Pinus*

Vegetative and floral characters of the following

Angiosperms - *Polyanthes tuberosa (Monocot)*
Ervatamia divaricata (Dicot)

Economic importance of Pteridophytes and Gymnosperms.

PART B - HUMAN ANATOMY AND PHYSIOLOGY

Unit III

1. **Digestive system**: Organization of digestive system, movements and secretions of gastro intestinal tract, digestion and absorption of food

2. **Respiratory system**: Organization of respiratory system, respiratory pigments and process of respiration

Unit IV

3**. Circulatory system**: Organization of circulatory system, composition, components and functions of blood.

4. **Excretory system:** Organization of excretory system, maintenance of homeostasis.

Unit V

5**. Endocrine system:** Organization and functions of endocrine glands – Hypothalamus and maintenance of body temperature.

6**. Reproductive system:** Organization of male and female reproductive organs, development of primary and secondary sexual characters, menstrual cycle, pregnancy trimesters, birth control measures.

Reference

1. Dutta, A.C., Botany for degree students, Oxford University press.
2. Vashista.B.R., Sniha,A,K., Singh.V.P., Botany for Degree students. S.Chand Company LTD.
3. Pandey. B.P., Text Book of Botany Vol. I and II, S.Chand and Company. New Delhi
4. Roa, K.N., Ancillary Botany, Viswanathan. S., and Company, Chennai.
5. Srivastava. H. N., Plant Physiology, Pradeep Publications, Jalandhar
6. Taylor W.T., and Wehe. R.J. – General biology, East West Press Pvt. LTD.
7. Guyton A.C., and Hall J.E, Textbook of Medical Physiology, W.B.Saunders Company

8. Sujit. K. Chaudri., Concise Medical Physiology, New Central Book Agency, Kolkata, 4th Edition, 2002.

CELL BIOLOGY

Semester: II **Subject Code:**
Paper – II **Credits: 2**
Hours per Week: 3 hrs **Total Hours per Semester: 45 hrs**

To enable the learners

to have knowledge of the cell, it's constituents and life cycle.

to make aware of techniques in cell biology.

Unit I

1. A brief comparative study of prokaryotic and eukaryotic cell structures.
2. Ultra structure, chemistry and functions of plasma membrane.
3. Organization and chemistry of protoplasm, functions of microtubules and microfilaments.

Unit II

1. Eukaryotic membrane system: ultra structure, chemistry and functions of endoplasmic reticulum (rough and smooth), Golgi bodies, lysosome, and mitochondria.
2. Nuclear organization: Prokaryotic nuclear organization (chromosomal and extra chromosomal) chemistry and structure. Eukaryotic nuclear envelope, Euchromatin and heterochromatin, nucleosomes, chromosome.

Unit III

1. Plastids – types, ultra structure, chemistry and functions.
2. Cell cycle - significance of various phases of cell cycle, mitosis and meiosis.
3. Normal and cancerous cell growth, cell culture, maintenance of cell lines.

Unit IV

1. Histo chemical staining - Iodine, mercuric bromophenol blue, sudan black, Schiff's reagent, toludine blue dyes and their significance.
2. Microscopy – light, electron and fluorescent microscopes and their significance.
3. Cell fractionation – gradient and differential centrifugation.

Unit V

Viruses – Classification based on structure, nucleic acid and host. Life cycle of T4 phage, TMV, adenovirus, retrovirus. Virion, Prion.

Reference

1. Albert, B.Bray , Lewis. D., J.Raff, M. Roberts K and Watson JD, Molecular biology of the cell, Newyork, Garland 1983.
2. De Robertis, E.D.P.and De Robertis, Jr. E.M.E, Essentials of cell and molecular biology 1st Edition 1995.
3. Fawcett, D.W., The cell, its organelles and inclusions – Philadelphia W.B. Saunders 1st Edition, 1966.
4. Shukla. R.M. A Textbook of Cell Biology, Dominant Publishers & Distributors 1st Edition, 2005.
5. Carl. P. Swagon and Peter L. Wester. The Cell, Prentice-Hall India Pvt.Ltd, 1st Edition, 1989.
6. Powar. C.B., Cell Biology, Himalaya Publishing house, Mumbai, 3rd Edition, 1996.
7. Krishnasamurthy, K.V., Methods in Plant Histochemistry, Viswanathan printers and publishers, 1st Edition. 1966.
8. Dimmoth.N.J., Easton. A.J., and. Leppard K.N., Introduction to Modern Virology, Blackwell Publishers. 2001.

GENERAL BIOLOGY AND CELL BIOLOGY

Semester: II **Subject Code:**
Practical Paper- I **Credits: 1**
Hours per Week: 2 hrs **Total Hours per Semester: 30 hrs**

To enable the learners

to instill knowledge of morphological and anatomical structures of plants.

to instill knowledge on morphological developments of various Phyla.

to instill knowledge on various systematic organizations of insects and mammals.

to identify various stages in somatic cell division and techniques to

Identify chemical nature of cells.

BOTANY

1. Vegetative and reproductive structure in *Sargassum, Saccharomyces Funaria, Selaginella*, and *Pinus ,* Section cutting of S*argassum*, *Selaginella*, and *Pinus* needle.
2. Structure of Monocot flower – *Polyanthes tuberosa*
3. Structure of Dicot flower – *Ervatamia divaricata*
4. Study of cell inclusions, Cystolith and Raphides
5. Study of mitosis by smear technique of *Allium cepa* root tip

ZOOLOGY

1. Morphology of the following spotters only - *Amoeba,* Euglena*, Paramecium, Hydra, Dugesia*, *Fasciola, Taenia, Ascaris*, *Pheretima*, *Penaeus, Pila, Asterias, Scoliodon, Mugil, Bufo, Calotes, Columbia and Rattus.*
2. Study of Blood Cells of Man.
3. Study of different types of muscles.
4. Demonstration of histochemical staining techniques with potassium iodide, mercuric bromo phenol blue, sudan black, Schiff's reagent, toludine blue dyes.

Reference:

1. Dutta,A.C., Botany for degree students, Oxford University press.
2. Taylor, W.T., and Wehe R.J., General biology, East West Press Pvt. LTD.
3. De Robertis, E.D.P.and De Robertis, Jr. E.M.E., Essentials of cell and molecular biology.
4. Fawcett, D.W., The cell, its organelles and inclusions – Philadelphia W.B. Saunders
5. Krishnasamurthy K.V., Methods in plant Histochemistry Viswanathan printers & publishers.

GENETICS

Semester: III **Subject Code:**
Paper – III **Credits: 2**
Hours per Week: 3 hrs **Total Hours per Semester: 45 hrs**

To enable the learners,

to have knowledge on Mendelian and Human genetics.

to make aware of role of genes in life and pre natal diagnosis of genetic disorders.

Unit I

Mendelian genetics – Mendel's works – Mendel's methods, experiments, observations and results. Rediscovery of Mendel – Mendel's laws – Terminology, Back / Test Cross – problems. Mendel's law is not universal – Modifications – complete & incomplete dominance. Co dominance – Lethal factor – Non – allelic gene interactions – Complementary genes – Supplementary genes, Inhibitory genes, Epitasis – Biochemical aspects – Duplicating genes – Pleotrophism.

Unit II

Allelic gene interaction – Multiple alleles – blood group inheritance – Rh factor. Polygenic / Multiple gene inheritance –Eye colour of Drosophila – quantitative inheritance – height in man. Genes and chromosomes linkage and crossing over – theories of crossing over – cytological basis – mapping of chromosome – single cross over and double cross over maps.

Unit III

Population genetics – gene pool concept, Hardy Weinberg law – gene frequencies – calculations – factors affecting Hardy – Weinberg equilibrium.

Unit IV

Human chromosomes: History and nomenclature, Banding technique, genetic map of human chromosomes, Primary and secondary Non – disjunction, in man. Autosomal syndromes : Down's, Patau's,. Sex chromosomal syndromes: Klinefelter's, Turner's

Genetic basis of thalassemia, cystic fibrosis. Genetics of cancer – types and characteristics – oncogenes and antioncogenes.

Unit V

Prenatal Diagnosis of genetic diseases: Amniocentesis, Chorionic villi sampling and Ultrasonography - principle, procedure and applications.

Pedigree analysis, eugenics, positive and negative eugenics, euthenics, euphenics, treatment of genetic diseases, Genetic counseling

Reference

1. Edmund. W. Sinnot., Dunn. L. C., Theodusius Dobzansky., Principles of Genetics, Tata Mc. Graw Hill Publishing Company LTD, NewDelhi. 5th Edition, 1973.
2. Alhuwalia., Genetics, Wiley publishers. 1st Edition, 1991
3. Attenburg, Genetics, Oxynol publishers.2000.
4. Sarin .C., Genetics, Tata Mc. Graw Hill Pvt. LTD. 8th Edition, 1999.
5. Strickberger. M, Genetics,. Prentice Hall India Pvt. LTD.3rd Edition.,2003.

BIOSTATISTICS

Semester: IV **Subject Code:**
Paper – 1V **Credits: 2**
Hours per Week: 3 hrs **Total Hours per Semester: 45 hrs**

To enable the learners

to have knowledge of statistics and it's application in the field of biology.

to aware about the research methods.

Unit I

Introduction: Basics of statistics – Definition – Statistical Methods – Kinds of biological data. Collection, types, organization and representation of data. Sampling and sampling designs. Classification of data, grouped and ungrouped data.

Frequency distribution: Continuous – Discrete – Cumulative frequency.

Tabulation: parts of a table – advantage. Representation of the data: Diagrammatic-Simple bar, pie diagram. Graphical representation: Histogram, frequency polygon, frequency curve, cumulative frequency curve.

Unit II

Measures of Central Tendency: arithmetic mean – simple and weighed arithmetic mean, median, mode. Measures of dispersion : Range, mean deviation, standard deviation and variance.

Unit III

Measures of symmetry: Skew ness and kurtosis, positive and negative skew ness. Measures of kurtosis – Correlation and regression: Types of correlation. Methods of studying correlation using Karl Pearson's co-efficient. Regression line, regression equation X on Y and Y on X.

Unit IV

Probability theorem – types of probability – probability measure.

Theoretical distributions – binomial - poisson – normal distribution.

Unit V

Sampling hypothesis, sampling distribution, Standard error - $\chi 2$ test (goodness of fit), character and applications. ANOVA – one way analysis.

Reference

1. Bhaskararao, T. Methods of Biostatistics, Paras Publication. Hyderabad. 2001.
2. Daniel W.W. Biostatistics : A foundation for analysis in the Health Sciences.. John Willey and sons, New York. 7th Edition 1989.
3. Sancheti. D.C. and Kapoor V.K. Statistics. S. Chand & Sons, New Delhi. 7th Edition 1991
4. Palanichamy. S. and Manoharan. M, Stastical methods for biologist. Palani Paramount Publications, Palani. 2003..

GENETICS AND BIOSTATISTICS

Semester: IV **Subject Code:**
Practical Paper- II **Credits: 1**
Hours per Week: 2 hrs **Total Hours per Semester: 30 hrs**

to know the occurrence of Mendelian laws and genetical syndromes in life.

to know the fundamental ideas of statistics to implement in biology and computer applications for the same.

1. Survey of Mendelian traits in man.
2. Use of models to illustrate Mendel's laws.
3. Determination of blood groups and Rh factor.
4. Spotters only – Down's, Patau's, Klinefelter's, Turner's syndromes.
5. Finding central tendency using biological data
6. Study of quantitative characters using neem leaves.
7. Laws of probability
8. Study of quantitative characters using coin - tossing test.
9. Computer application in Biostatistics.(demonstration only)

Reference :

1. Alhuwalia, Genetics 1st Edition, Wiley publishers, 1991.
2. Attenburg, Genetics, Oxynol publishers, 2000.
3. Sarin. C., Genetics, Tata Mc. Grand Hill Pvt. LTD., 8th Edition, 1997.
4. Daniel W.W. Biostatistics : A foundation for analysis in the Health Sciences.. John Willey and sons, New York. 7th Edition, 1989.
5. Palanichamy. S. and Manoharan. M, Stastical methods for biologist. Palani Paramount Publications, Palani. 2003.