

V.S.K University, Ballari

**BIOTECHNOLOGY
SYLLABUS**

2016-17 onwards

BIOTECHNOLOGY STRUCTURE

Semesters	Subject code	Title of the paper	Teaching Hrs/ week	No of Credits	Duration of Exam/Hrs	Marks in examination				
						Theory	LA	LAB	LA	Total
I Semester	BT: 1.1	Cell Biology & Genetics	04	04	03	70	30	-	-	100
	BT Lab:1.1		03	02	03	-	-	40	10	50
		Total for I Semester	-	06	-	-	-	-	-	150
II Semester	BT: 2.1	Biochemistry & Biophysics	04	04	03	70	30	-	-	100
	BT LAB 2.1		-	02	03	-	-	40	10	50
		Total for II Semester	-	06	-	-	-	-	-	150
III Semester	BT :3.1	Molecular Biology	04	04	03	70	30	-	-	100
	BT LAB:3.1		03	02	03	-	-	40	10	50
		Total for III Semester	-	06	-	-	-	-	-	150
IV Semester	BT:4.1	Microbiology	04	04	03	70	30	-	-	100
	BT Lab:4.1		03	02	03	-	-	40	10	50
		Total for IV Semester	-	06	-	-	-	-	-	150
V Semester	BT:5.1	Immunology	04	04	03	70	30	-	-	100
	BT Lab:5.1		03	02	03	-	-	40	10	50
	BT:5.2	Recombinant DNA Technology	04	04	03	70	30	-	-	100
	BT Lab:5.2		03	02	03	-	-	40	10	50
		Total for V Semester	-	12	-	-	-	-	-	300
VI Semester	BT:6.1	Agriculture & Environmental Biotechnology	04	04	03	70	30	-	-	100
	BT: Lab6.1		03	02	03	-	-	40	10	50
	BT:6.2	Plant & Animal cell culture	04	03	03	70	30	-	-	100
	BT: Lab 6.2		03	02	03	-	-	40	10	50
		Total for VI Semester	-	12	-	-	-	-	-	300

BIOTECHNOLOGY
B.Sc I semester
Paper : Bt :1 - Cell Biology and Genetics

52 hrs,
4 credits

Theory

Unit:1

Cell theory

Structure and organization of prokaryotic and eukaryotic cells.

Cell organelles- structure, function and integration (Cell membrane, , cytosol, Golgi Bodies, endoplasmic reticulum, (rough and smooth), ribosomes, cytoskeletal structure (action microtubules etc.) mitochondria, chloroplasts, liposomes, peroxisomes, nuclease (nuclear membrane, nucleoplasm, nucleolus, chromatin)

13 Hrs

Unit:2

. Cell division- mitosis and meiosis, Cell cycle, its regulation and cancer, Characteristic of cancer cells.

Major signalling pathways of eukaryotic cells.

Cell locomotion (amoeboid, flagellar and cillary), muscle and nerve cell structure and functions in brief.

Cell senescence and death.

13 Hrs

Unit:3

Mendel's law of inheritance, Gene interactions.

Sex determination in plants & Animals XX-XY,XX-XO,ZW-ZZ, linkage, crossing over, recombination and gene mapping.

Chromosomes and their structure, Polytene and Lamp brush chromosome, Banding patterns in human chromosome, structural and numerical changes in chromosomes, hereditary defects.

13 Hrs

Unit:4

Extra-chromosomal inheritance, sex-linked inheritance in humans, .

Mutations: spontaneous and induced mutations, chemical and physical mutagens, beneficial and deleterious effects of mutagens, induced mutation in plants, animals and microbes for economic benefit of man

13 Hrs

References:

1. Strickberger M.W., "Genetics".
2. De Robertis E.D.P. and De Robertis E.M.F., (1980), Cell and Molecular Biology, Saunder's College, Philadelphia.
3. Goodenogh.U. (1990), Genetics.
4. Lewin B. (1990) Genes IV.

B.Sc I semester
Paper : Bt :1 - Cell Biology and Genetics

Practical

50 Marks
2 credits

1. Laboratory rules & regulations observed in biotechnology lab.
2. Study of Microscope.
3. Study of mitosis in onion root tips.
4. Study of meiosis in grasshopper testis/ onion flower bud.
5. Study of Monohybrid cross with garden pea as example.
6. Study of Dihybrid cross with suitable examples.
7. Study of Incomplete dominance.
8. Karyotyping of chromosomes.
9. Study of genetic disorders- Down's, Klienfelter's and Cri-Du chat syndromes.

BIOTECHNOLOGY

B.Sc II semester

Paper : Bt : 2 - Biochemistry and Biophysics

52 hrs

3 credits

Theory

Unit1

Introduction to Biochemistry

General properties of organic and inorganic compounds.

Types of chemical bonds and their functions.

13 Hrs.

Unit2

Classification and general properties of carbohydrates,

Classification and general properties of Amino acids,

Classification and general properties of Proteins, and.

Classification and general properties of Vitamins

Nucleic acid: DNA and RNA types, forms and chemical structures.

13 hrs.

Unit3

.Water: Structure and interactions, water as solvent, proton mobility, acid-base reactions,pH and buffers,Isoelectric pH.

Photometry: Basic principles and applications of UV-Visible spectrophotometry and colorimetry.

13 hrs

Unit4

Principles and applications of essential techniques Centrifugation, Chromatography, Electrophoresis

13 hrs

References:

1. Lehinger – Principles of Biochemistry.
2. Palanichamy – Principles of Biochemistry and Bio-techniques.
3. Streyer – Biochemistry.
4. Voet and Voet – Biochemistry.
5. Biophysics – Volkeustein.
6. Biophysics – Casey.
7. Introduction to Biophysics-Tanford.

B.Sc II semester

Paper : Bt : 2 - Biochemistry and Biophysics

Practical

50 Marks

2 credits

1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of protein.
3. Qualitative analysis of blood and urine components.
4. Qualitative analysis of lipids.
5. Preparation of buffers
6. Study of spectrophotometer and colorimeter.
7. Instrumentation or demonstration of centrifuge, chromatography.
8. Electrophoresis technique demonstration.
9. Study of radioisotopes and autoradiography
10. Quantitative estimation of carbohydrates by DNS
11. Quantitative estimation of protein by FCR method and biuret method.

BIOTECHNOLOGY
B.Sc III semester
Paper : Bt :3 - Molecular Biology

52 hrs
4 credits

Theory

Unit1

Nucleic acids as genetic material, structure of A-, B- and Z-DNA, palindromic sequences, structure of RNA (t-RNA, m-RNA and r-RNA), DNA denaturation and renaturation. DNA replication in prokaryotes, DNA polymerase I, II and III, modes and mechanism of DNA replication,

13 Hrs

Unit2

Transcription in prokaryotes, RNA polymerase, types and functions of RNA polymerases in eukaryotes.
Translation in prokaryotes, Post-translational modifications.

13 Hrs

Unit3

Gene organization, Operon concept and introduction to gene regulation mechanisms.
Genetic code
Transposable elements: IS elements, transposons

13 Hrs

Unit4

Structural organization of genomes in prokaryotes- exons, introns, cistrons, Recon and muton.
DNA repair mechanisms.

13 Hrs

References:

1. Molecular Biology of the gene – J.D.Watson.
2. Molecular Cell Biology – Darnell.
3. The Gene – Levin.
4. Molecular Biology of the Cell – Albert's.
5. Genetic Engineering – Williamson.

BIOTECHNOLOGY
B.Sc III semester
Practical : Bt : 3 - Molecular Biology

2 credits

1. Isolation of cells from buckle cavity.
2. Isolation of DNA from DNA from coconut endosperm.
3. Isolation of DNA from animal sample.
4. Restriction digestion and Agarose gel electrophoresis of DNA
5. Demo of transformation, conjugation and transduction.
6. Study of PCR
7. Study of blotting techniques.

BIOTECHNOLOGY
B.Sc IV semester
Paper : Bt : 4 – Microbiology

52 hrs

4 credits

Theory :

Unit1

Introduction and Scope of Microbiology: History of microbiology, contributions of eminent Microbiologist in the development of Microbiology.(Leuwenhoek, Edward Jenner, Joseph Lister, Louis Pasteur, Robert Koch, Alexander Flemming and Iwanosky)
Branches of Microbiology.

Microscopy – Principles, Light microscope, Phase Contrast, Dark field, Bright field, Fluorescent, Interference microscope (Stereo microscope), Confocal, Inverted microscope, and Electron microscope (TEM and SEM).

13 Hrs

Unit2

Microbiological techniques: sterilization- dry heat, moist heat, by radiation- UV, Gamma, Chemicals and filtration.

Stains and staining techniques: principles of staining, nature of dyes, types of stain- Differential and structural staining.

13 Hrs.

Unit3

Microbial growth: nutritional requirements of microorganisms, bacterial growth curve, factors affecting growth, counting of bacteria(Measurement of Microorganisms- Micrometry)
Control of microorganisms: antimicrobial agents and preservations, factors influencing antimicrobial activity, phenol Coefficient test.

13Hrs

Unit4

Study of pathogenic microorganisms: Streptococcus pneumonia clostridium tetani, mycobacterium tuberculosis, Salmonella typhi, vibrio.
Bacterial diseases and viral diseases: poliomyelitis, measals, hepatitis A and B, AIDS. Protozoan diseases: Amoebiasis and Malaria. General diseases syphilis and Gonorrhoea.

13 Hrs.

References:

1. Pelzar, M.J., J.R. Chan, E.C.S. Noel and Krieg, N.R., 1988, Microbiology – 5 Ed. Mc. Graco-Hill Book Co., New York.
2. Boyd.R.R. 1988, General Microbiology. Times Mirror/Mosby College, Publishing Missouri.
3. Atlas.R.M. 1995, Principles of Microbiology, I Ed., Mosby Year Book Ine-Missouri.
4. Ivan M Roitt. Essentials of Immunology 6th Editon, Blackwell Scientific Publications.
5. Richard A. Goldsby, Thomas J, Kindt, Barban A. Osborne. KUBY Immunology,th Edition, W.H Freeman and Company New York.

BIOTECHNOLOGY
B.Sc IV Semester
Practical : Bt : 4 – Microbiology

2 credits

1. Safety measures in microbiology laboratory.
2. Study of student microscope and Research microscope, use of mechanical stage and Oil immersion objective.
3. Use of micrometre and calibration, measurement of epidermal cell, yeasts fungal spores and bacteria.
4. Cleaning and sterilizing of glasswares.
5. Preparation of agar culture media and broth.
6. Staining of bacteria- gram stain, spore and capsule staining.
7. Counting of bacteria by using haemocytometer.
8. Study of bacterial motility by hanging drop method.
9. Isolation of bacteria and fungi by serial dilution, streak plate and pour plate method.
10. Study of Colony characters of bacteria.
11. Catalyse test.

BIOTECHNOLOGY

B.Sc V Semester

Paper : Bt :5.1 – Immunology

52 hrs

4 credits

Theory

Unit1

Basic principles of immunology.

Immunity: types of immunity- active, passive and acquired.

Antigens: definition and types, specificity, epitope, paratope and effector phase.

13 Hrs.

Unit2

Antibodies (immunoglobulins): types of immunoglobulins, structure and functions of immunoglobulins.

Antigen: antibody reactions- definitions, mechanism and application of precipitation, agglutination, complement fixation toxin-antitoxin reactions, immunoblotting, immunofluorescence, RIA and ELISA.

13 Hrs .

Unit3

Hypersensitivity: types of hypersensitivity- IgE mediated (Type 1), antibody mediated cytotoxic (type 2), immunocomplex mediated (type 3) and T-mediated (type 4) hypersensitivity reactions.

Cells of the immune system: lymphoid cells, B-lymphocytes, T-lymphocytes and null cells. Mononuclear cells- phagocytosis, antimicrobial and cytotoxic activities, antigen processing Cells granulocytic cells, mast cells and dendritic cells.

13 Hrs

Unit4

Organs of immune system: primary lymphoid organs- thymus, bone marrow, lymphatic system. secondary lymphoid organs- lymph nodes, spleen and mucosal associated lymphoid tissue.

Blood groups: ABO blood group system- distribution and transitions of ABO blood groups.

13 Hrs

References:

1. Ivan M Roitt. Essentials of Immunology 6th Editon, Blackwell Scientific Publications.
2. Richard A. Goldsby, Thomas J, Kindt, Barban A. Osborne. KUBY Immunology,th Edition, W.H Freeman and Company New York.
3. Robert M. Coleman, Mary F. Lombard, Raymond E. Sicard. Fundamental Immunology 2nd Edition WCB Publishers.
4. Ananthanarayan S.A Text Book Of Microbiology.
5. Chandrakanth kelmani .A Text Book Of Microbiology Vol. 4th United Publishers.
6. Barret T.T.1986, A Text Book Of Immunology, 5th Edition. The C.V.Mosby Co, St. Louis.

BIOTECHNOLOGY
B.Sc V Semester
Practical : Bt :5.1 - Immunology

2 credits

1. Preparation of bacterial antigens.
2. Preparation of fungal antigens.
3. Preparation of serum.
4. Preparation of complement.
5. Total WBC and RBC count.
6. Differential WBC counts.
7. Estimation of haemoglobin content in blood.
8. Mantoux-test.
9. Enzyme-linked immunosorbent assay (ELISA).
10. Radial immunoassay (RIA).
11. Generation of ascetic fluid.
12. Diagnosis of infectious diseases by immunoassay-Widal test for typhoid and Wassermann reaction for syphilis.

BIOTECHNOLOGY

B.Sc V Semester

Paper : Bt :5.2 - Recombinant DNA technology

52 hrs

4 credits

Theory

Unit1

Principles of Recombinant DNA technology.

Tools of genetic engineering: passenger of foreign DNA, isolation by shotgun method

. Vehicle DNA cloning vectors plasmids and their features. Some common plasmid vector:

PBR 322 PUC 18. Vector from bacteriophage Lambda- phage and phage M-13, cosmids

Vector from animal viruses Sv-40 and retroviruses. Special vectors-Shuttle and expression vectors. Yeast vectors.

13 Hrs

Unit2

Enzymes involved in gene cloning: restriction endonucleases- classifications, nomenclature, types and their applications in Recombinant DNA technology. Ligases: DNA ligases and their applications enzyme to modify ends of DNA molecules.

Gene cloning: methods of introducing gene. In prokaryotes and eukaryotes (E-coli and yeast cells as cloning host).

13 Hrs

Unit3

Detection of the right clones: direct screening, direct selection, indirect screening techniques, nucleic acid probes, hybridization technique, immunodiagnostic probes.

Cells for cloning: *E-coli*, *Bacillbessubtilis*, *Saccharomyces cerevisiae*, and In mammalian fertilized egg cell.

Gene library: Genomic library of DNA library and phage Lambda vscosmid for gene libraries.

13Hrs

Unit4

Mapping the DNA: Restriction mapping, DNA footprinting, chromosome walking and mapping by somatic cell hybridization.

DNA Sequencing: Maxam Gilbert's method, Sanger and Coulson's method- the primer, template, the dideoxynucleotides Terminators and deoxynucleotides and the polymerases, using computers for Sequencing and analysing DNA sequence.

13 Hrs

References:

1. Glick, B.R. and Pasternak (1994) molecular Biotechnology: principles and application of recombinant DNA, American society for Microbiology Washington.DC.
2. Watson J.D, Molecular Biology of the gene
3. Edward Alcoma (1990) DNA –Technology.
4. Sandhu, D.K. and Virid G.S.(1980) Gentic Engineering Techniques , Sciences reporter
5. SandyaMitra (1996)Gentic Engineering MacMillan India Ltd- New Delhi.

BIOTECHNOLOGY
B.Sc V Semester
Practical : Bt :5.2 - Recombinant DNA technology

2 credits

Practical.

1. Isolation of plasmid DNA by boiling method from bacteria.
2. Study of denaturation and renaturation of DNA.
3. Isolation of chromosomal DNA from bacteria plants and animal.
4. Study of transformation by kits.
5. Study of conjugation by kits.
6. Isolation of phages by using Sawage samples.
7. Restriction digestion.
8. Production of protoplast from bacteria and plants.
9. Separation of DNA fragments by using agarose gel electrophoresis.

BIOTECHNOLOGY

B.Sc VI Semester

Paper : **Bt :6.1 - Agricultural and Environmental biotechnology.** 52 hrs
4 credits

Theory

Unit1

Introduction to Agricultural biotechnology.

Crop improvement hybridization and plant breeding techniques.

Micropropagation and plant tissue culture technique and its application in agriculture.

Somatic hybridization, haploid production and cryopreservation.

Study of biopesticides used in agriculture (neem as example). integrated pest management. 13 Hrs

Unit2

Mechanism of biological nitrogen fixation process. study of NIF, NOD and HUP genes in nitrogen fixation process.

Production of biofertilizers and applications of rhizobium, azotobacter, azolla and mycorrhiza.

Use of plant growth regulators in agriculture and horticulture. 13 Hrs

Unit3

Introduction to Environmental studies

Ecosystem and ecological pyramids

Treatment of municipal water & industrial effluents

Environmental pollution 13 hrs

Unit3

Biodegradation & Bioremediation

Environmental Impact Assessment

Case studies of Environmental pollutions. 13 hrs

References:

1. Environmental Biotechnology-W.D.Grant
2. Environmental Biotechnology –C.F. Foster
3. Soil Microbiology-N.S.SubbaRoa
4. Waste water treatment,engineering and Disposal Metcalf
5. Biofertilizers in agriculture- N.S.SubbaRoa .

V.S.K UNIVERSITY, BALLARI
BIOTECHNOLOGY
B.Sc VI Semester

Practical : Bt :6.1 - Agricultural biotechnology and Environmental biotechnology

2 credits

1. Isolation of soil microorganisms- rhizobium, azotobacter and mycorrhiza.
2. Estimation of soil alkalinity.
3. Isolation of rhizobium from root nodules.
4. Biofuel and Biodiesel.
5. Vermicomposting.
6. Estimation of COD.
7. Estimation of the BOD.
8. Estimation of DO.
9. Estimation of alkalinity.
10. Estimation of total solids
11. Conduct MPN test for coliforms.

BIOTECHNOLOGY

B.Sc VI semester

Paper : Bt :6.2 - Plant and Animal cell culture

52 Hrs

4 credits

Theory

Unit 1

Introduction to in vitro culture methods and laboratory facilities.

History of plant tissue culture methods, terms and definitions of common words used in cell culture Technology.

Growth medium composition, use of growth regulators and their effect on cell growth differentiation and organogenesis, study of MS BS and HiTech media. 13 hrs

Unit 2

Callus, cell Suspension and embryo culture, regeneration of shoots and roots, ovary and endosperm culture.

Micro propagation, clonal propagation of Elite species, auxiliary bud, shoot tip and meristem culture, applications of micro propagation. 13 Hrs

Unit 3

in vitro haploids and their applications, somaclonal variations and applications.

Single cell suspension culture and their applications in selection of variants or mutants of agronomic importance (salt stress and disease resistant varieties).

Introduction to protoplast isolation, principles and applications, somatic hybridization. 13 Hrs

Unit 4

Basic techniques of animal cell culture and their applications

Animal cell culture growth media and its sterilization, balanced salt solution and its quality.

Applications of animal cell culture in regenerative medicine and vaccine preparation

Human Genome Project and its implications. 13 Hrs

References:

1. Chawala (2001) plant Biotechnology, oxford and IBH Publication co. New Delhi.
2. Razdan m.K. (1994)an Introduction to Plant Tissue culture .Oxford &IBH Publication, Co New Delhi
3. Soppier R.E and Griffit j.b.(1998)Animal Cell Biotechnology. Academic press.
4. Naraganswamy S. (1994) plant cell and tissue culture. Tata mcGiaw- II Publishing, Co New Delhi
5. Biotel (1994) in Vitro cultivation of animal cells.

V.S.K University, Ballari
BIOTECHNOLOGY
B.Sc VI semester
Practical : Bt :6.2

2 credits

Practicals.

1. Preparation of MS media.
2. Callus induction using plant explants (carrot, nicotiana, sugarcane).
3. Demonstration of organ culture, micro propagation, organogenesis and anther culture.
4. Protoplast isolation using enzymatic methods.
5. Study of cell suspension culture and its growth (haemocytometer method and packed cell volume).
6. Preparation of synthetic seeds from plant material.
7. Culture of lymphocytes from Blood samples.
8. Cloning of animal cells by cell and Colony purification.
9. Fusion of cultured cells with Myeloma cells.

VSK University, Ballari
B. Sc. II Semester Degree Examination, April/May-2017

BIO-TECHNOLOGY

Bt-2 : Biochemistry and Biophysics

[Max. Marks: 70]

[Time: 3 Hours]

Instruction: 1.) Answer all the questions.
2.) Draw diagrams wherever necessary.

SECTION A

Answer **any FIVE** of the following :

(5X2=10)

- 1.
- 2.
- 3..
- 4..
- 5..
- 6..

SECTION-B

Answer **any SIX** of the following:

(6X5=30)

- 7..
- 8..
- 9.
- 10..
- 11.
- 12..
- 13
- 14.

SECTION-C

Answer **any THREE** of the following:

(3X10=30)

- 15.
- 16..
- 17.
- 18.
- 19..

V.S.K UNIVERSITY, BALLARI

**OPEN ELECTIVE SUBJECT
BIOTECHNOLOGY**

2016-17 Onwards

V.S.K UNIVERSITY, BALLARI
Open Elective Syllabus for II Semester
Biotechnology
Cytogenetics

4 credits, **52 hours**

100 marks

UNIT -1

Introducing Life Sciences, The Importance of Interdisciplinary Biology

Themes in the Study of Life: Properties of life, Reductionism, Emergent Properties, From Biosphere to Biomolecules(Scale-Down), Structure-Function Relationships

Transmission of Genetic Information: What is Gene Expression? Acquainting with the vocabulary- Gene, Allele, Genome, DNA, Chromosome, RNA(mRNA, tRNA, rRNA), Proteins,Transcription, Translation & Genetic Code.

13 hrs

UNIT- 2

Evolution as the foundation: Unity in Diversity, Natural Selection, Classification of Organisms, Tree of Life

Scientific Inquiry: Making Observations & Testing Hypotheses.

13 hrs

UNIT- 3

Fundamentals of Cell Theory, A bit of History

The Hidden Universe of the Cell, Cellular Organization and Metabolism

The Organelles: Nucleolus, Nucleus, Ribosomes, Endoplasmic Reticulum, Vesicles, Golgi Apparatus, Mitochondria, Chloroplast, Lysosome, Peroxisome & The PlasmaMembrane. **13 hrs**

UNIT - 4

Transport of Proteins: Vesicular & Non-Vesicular System

Cell Culture Techniques: Culture Media, Cell-lines, 2D & 3D Cultures

13 hrs

References

1. Campbell Biology – 11th Edition(link is external) - Jane B. Reece et. al. - Boston: Benjamin Cummings / Pearson
2. The Cell, A Molecular Approach – 7th Edition(link is external) – Geoffrey M.Cooper/Robert E.Hausman- Sinauer Associates, Inc.

V.S.K UNIVERSITY, BALLARI
Open Elective Syllabus for III Semester

BIOTECH: Microbial-Biotechnology

4 credits, **52 hours**

100 marks

UNIT- I

Basic concepts– Spontaneous generation, Germ theory of diseases, Cell theory. Contributions of Antonie van leuwenhoek, Joseph Lister, Robert Koch, Louis Pasteur, Edward Jenner, John Tyndall, Sergei N. Winogradsky, Selman A waksman, Alexander Flemming, Paul Erlich, Fannie Hesse, Elie Metchnikoff, Kary Mullis. Development of pure culture methods. Cell structure: Peptidoglycan structure and synthesis. Cytoplasmic matrix and components: Inclusion bodies.

13 hrs

UNIT- II

Sterilisation and disinfection- Definitions, Principles. Methods of sterilization- Physical methods (Heat, Filtration), Radiation and Chemical methods. Control of sterilization and Testing of sterility. Microscopy – Principles, Light microscope, Phase Contrast, Dark field, Bright field, Fluorescent, Interference microscope (Stereo microscope), Confocal, Inverted microscope, and Electron microscope (TEM and SEM). Measurement of Microorganisms- Micrometry. Staining- Simple, Gram staining, Negative staining, Capsule staining, Spore staining, Flagellar staining, Nuclear staining and Acid fast staining.

13 hrs

UNIT- III

Microbiological media, composition and types: selective and differential media Growth curve and growth kinetics. Influence of environmental factors for microbial growth. Nutritional groups of bacteria: overview Estimation of Microbes- Direct Microscopic count, Turbidometric assay, TVC- Indirect Method- CO₂ liberation- Protein estimation- Maintenance and Preservation of cultures.

13 hrs

UNIT – IV

Taxonomy– Principle and its types (Classical approach– Numerical, Chemical, Serological and Genetic). Bacterial taxonomy– Bergey's manual of Systematic Bacteriology (Eubacteria and Archaeobacterium).

13 hrs

REFERENCES

- Prescott, L.M J.P. Harley and C.A. Klein 1995. Microbiology 2nd edition Wm, C. Brown publishers.
Michael J. Pelczar, Jr. E.C.S. Chan, Moel : Microbiology McGraw Hill Book R. Krieg, 1986 Company
Stainer R.Y. Ingraham J.L. Wheolis H.H and Painter P.R. 1986 The Microbial world, 5th edition. Eagle Works
Cliffs N.J. Prentica Hall.

V.S.K UNIVERSITY, BALLARI
Open Elective Syllabus for IV Semester
GENETIC ENGINEERING

4 credits, 52 hours

100 marks

Unit I- MOLECULAR TOOLS FOR GENE CLONING
 Nucleases: Exonucleases and Endonucleases, Restriction Enzymes (Type I, Type II, Type III, Type IV & Type V), RNases
 Polymerases: DNA Pol I, Klenow Fragments, Reverse Transcriptase, Taq&Pfu Polymerases
 Ligases: T4 DNA Ligase, *E.coli* DNA Ligase, T4 RNA Ligase
 Topoisomerases: Type I(A, B) & Type II(A,B)
 End Modifying Enzymes: Terminal Transferase, T4 Polynucleotide Kinase, Alkaline Phosphatases .
13 hrs

Unit II-VECTORS AND GENE CLONING
 Introduction to cloning vectors -- Desirable properties of vectors – Prokaryotic & Eukaryotic Expression Systems (Constitutive & Inducible)
 Plasmid Vectors -- Phage Vectors -- Cosmids -- Phagemids -- BACs -- Yeast Vectors -- YACs -- Lent viral Vectors -- Adenoviral Vectors -- Plant Vectors).
13 hrs

Unit III-ADVANCED TECHNIQUES IN MOLECULAR BIOLOGY
 Polymerase Chain Reaction -- Quantitative Real Time PCR -- Gel Electrophoresis: AGE & PAGE -- Blotting Techniques: Southern, Western & Northern
 Methods of gene transfer in Plants and Animals: Chemical, Physical & Viral mediated DNA transfer
 Construction of Genomic & cDNA Libraries -- DNA Sequencing -- Protein Engineering: Site Directed Mutagenesis .
13 hrs

Unit IV-RECENT TRENDS IN MOLECULAR BIOLOGY RESEARCH
 Targeted Genome Editing: ZFNs, TALENs, CRISPRs -- Gene Targeting: Knock-ins& Knock-outs -- DNA Finger Printing .
13 hrs

REFERENCES:

- [Principles of Gene Manipulation and Genomics](#)(link is external) – 7th Edition – Sandy B. Primrose, Richard Twyman – Blackwell Publishing
- [Gene Cloning and DNA Analysis: An Introduction](#)(link is external) - 6th Edition - T. A. Brown - John Wiley & Sons
- [An Introduction to Genetic Engineering](#)(link is external) - 3rd Edition - Desmond S. T. Nicholl - Cambridge University Press
- [Molecular Biotechnology: Principles and Applications of Recombinant DNA](#) (link is external)- 4th Edition - Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten - ASM Press

V.S.K UNIVERSITY, BALLARI
Open Elective Syllabus for V Semester
Industrial & Environmental Biotechnology

4 credits, 52 hours

100 marks

SYLLABUS

Unit I - Industrial Biotechnology:

Introduction and history, Isolation and screening, Primary and Secondary screening, Production strains, Production media, Inoculum preparation and inoculum Development. **13 hrs**

Unit II-

Fermentation Technology: Introduction to Fermenter, Industrial sterilization, Scale up fermentations, Types of fermenters, Acetator and cavitator, product recovery, Industrial production of penicillin, production of streptomycin, Industrial production of organic acids- introduction, production of citric acid, production of lactic acid, Industrial production of enzymes, introduction; general aspects, production of amylases & proteases, production of nucleotides & nucleotides, production of alcohols-acetone-butanol, production of ethanol, production of amino acids-introduction, production of L- glutamic acid, production of vitamin B12, production of single cell proteins, production of yeast/ mushrooms, production of fermented foods, production of microbial insecticides, production of Biopolymers, Biofuels, biogas, production of Bioplastics, Biosurfactants, and Biofertilizers, General rules in patents and practices. **13 hrs**

Unit III- Environmental Biotechnology –

Waste water treatment, Bioremediation, Genetically Engineered Microorganisms in Biotreatment of wastes. **13 hrs**

Unit IV- Biotechnological methods for pollution detection, Biosensors.

13 hrs

REFERENCE

1. Biotechnology-A textbook of Industrial Microbiology. II edition. Wulf Crueger and Anneliese Crueger.
2. Industrial Microbiology by L.E Casida, John Wiley and sons INC.
3. Industrial Microbiology by A.H.Patel, Macmillan India Ltd.
4. Principles of fermentation technology by P.Stanbury & Allan Whitekar, Pergamon.
5. Manual of Industrial Microbiology and Biotechnology, II edition. Arnold L.Demain and Julian E.Davis.

VSK UNIVERSITY,BALLARI.
B.Sc II Semester Degree Examination,
OPEN ELECTIVE SUBJECT (BIOTEHNOLOGY)

Paper- 1.

[Max.marks : 70

Time : 3 Hours]

Instructions: 1) Answer ALL questions.

2) Draw labeled diagrams wherever necessary.

SECTION-A

Answer any TEN of the following.

(10X2=20)

- 1.?
- 2.
- 3.
- 4.
- 5..
- 6..
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

SECTION-B

A. Answer any FOUR of the following:

(4X5=20)

- 13..
- 14..
- 15.
- 16..
- 17..

SECTION-C

Answer any THREE of the following in detail :

(3X10=30)

- 18.
- 19.
- 20.
- .21.
