

**SHRI DHARMASTHALA MANJUNATHESHWARA
COLLEGE,
UJIRE – 574 240**

(AUTONOMOUS)

(Re-accredited by NAAC at 'A' Grade with CGPA 3.61 out of 4)



DEPARTMENT OF BIOTECHNOLOGY

SYLLABUS OF BACHELORS DEGREE IN SCIENCE

CHOICE BASED CREDIT SYSTEM – 2019-20

ONWARDS

APPROVED BY THE BOS MEETING HELD ON

13-06-2019

APPROVED BY THE ACADEMIC COUNCIL MEETING

HELD ON 10-10-2019



PREAMBLE:

Biotechnology is the controlled and deliberate manipulation of biological systems (whether living cells or cell components) to understand various processes in the living systems and the efficient manufacture or processing of useful products. The fact that living organisms have evolved such an enormous spectrum of biological capabilities means that by choosing appropriate organisms it is possible to obtain a wide variety of substances, many of which are useful to man as food, fuel and medicines. Biotechnologists have increasingly applied the methods of physics, chemistry and mathematics in order to gain precise knowledge, at the molecular level, of how living cells make these substances. By combining this newly-gained knowledge with the methods of engineering and science, the concept of biotechnology has aroused, which embraces all of the above-mentioned disciplines.

Biotechnology has already begun to change traditional industries such as food processing and fermentation. It has also given rise to the development of a whole new technology for industrial production of hormones, antibiotics and other chemicals, food and energy sources and processing of waste materials. This industry must be staffed by trained biotechnologists who not only have a sound basis of biological knowledge, but a thorough grounding in engineering methods. The degree programme in Biotechnology also places a major emphasis on practical work and on developing a wide range of analytical and manipulative skills, including pilot plant operational skills appropriate to the biotechnologist. Graduates will be in an ideal position to exploit the opportunities for biotechnology, in established or developing companies.

ELIGIBILITY:

- PUC CBPH, PCMB
- PUC CBSE Biology

PROGRAMME OBJECTIVES:

- This course will prepare the students to acquire knowledge on the fundamentals of Biochemistry, Cell biology, Microbiology, Molecular biology and plant tissue culture to enable them to understand emerging and advanced concept in modern biology and help them to take up their carrier in this field.



- The course will also provide a better understanding of the modern biotechnological techniques in the field of genetic engineering, protein engineering, and Bioprocess engineering and associated downstream processing enabling their application through Bioprocess technology
- This course will aid the students to learn the recent developments in the field of Genomics, Proteomics, Cancer Biology and modern drug discovery approach. It will also empower the students to have advanced focus on the molecular basis of diseases and development of advanced therapeutics.
- The course will equip the students in Drug design and development providing a solid background in pharmacology, chemistry and biochemistry, appropriate for a career in the pharmaceutical industry.
- This course will teach students the importance of Bioinformatics, pharmacokinetics, drug development methods and phytochemistry.
- The students gain knowledge on Gene technologies which are used to develop improved plants for more nutritious foods, and as renewable biofactories, allowing the production of sustainable industrial products and inexpensive drugs for medical and veterinary use.

PROGRAMME OUTCOMES:

PSO1: Understanding to apply the techniques of biotechnology in the field of Agriculture, aquaculture etc

PSO2: Designing and applying appropriate tools and techniques of Biotechnological manipulations

PSO3: Understanding the role of biotechnological tools in solving the problems related to agriculture and health

PSO4: Understanding the procedures involved in pharmaceuticals and the role of Biotechnology in it.

PSO5: Gaining knowledge on the medicinal plant biodiversity along with the medicinal values of various RET medicinal plants and also their conservation.

PSO6: Understanding the applicatory aspects of Biotechnology in the field of cancer biology and Immunology

PSO7: Learning to handle various instruments with biophysical principles.

PSO8: Undertake self employments in the fields such as Biofertilizer production, Phytochemical extraction, micropropagation etc



COURSE DISCIPLINE: (Core and elective Papers)

SL. NO.	SEMESTER	CODE NO. OF THE PAPER	TITLE OF THE PAPER
1	I	BSCBTV 131	BIOCHEMISTRY & BIOPHYSICS
2	II	BSCBTV 181	CELL BIOLOGY & GENETICS
3	III	BSCBTV 231	MICROBIOLOGY & IMMUNOLOGY
4	IV	BSCBTV 281	MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY
5	V	BSCBTV 331	MEDICINAL PLANT DIVERSITY & BIOETHICS
6	VI	BSCBTV 332	PLANT BIOTECHNOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY
7	VII	BSCBTV 381	ANIMAL BIOTECHNOLOGY & BIOINFORMATICS
8	VIII	BSCBTV 383	PHYTOCHEMISTRY & DRUG DEVELOPMENT
9	I EP	BSCBTCE 133	BIOSTATISTICS
10	II EP	BSCBTCE 183	Food science & Technology
11	III EP	BSCBTCE 233	Fermentation technology
12	IV EP	BSCBTOE 283	Immune system and Disease management



PAPER DESCRIPTION

Sl.No	Semester	Paper		Title
		Theory	Practical	
1.	I Sem	BT-1T		Biochemistry & Biophysics
			BT-1P	Biochemistry & Biophysics
2.	II Sem	BT-2T		Cell biology & genetics
			BT-2P	Cell biology & genetics
3.	III Sem	BT-3T		Microbiology & Immunology
			BT-3P	Microbiology & Immunology
4.	IV Sem	BT-4T		Molecular Biology and Recombinant DNA Technology
			BT-4P	Molecular Biology and Recombinant DNA Technology
5.	V Sem	BT-5T		Medicinal Plant Diversity
		BT-6T		Medicinal Plant Tissue Culture & Envio. Biotech
			BT-5P	Medicinal plant taxonomy and Tissue Culture
6.	VI Sem	BT-7T		Animal Cell Culture & Bioinformatics
		BT-8T		Phytochemistry & Drug Development
			BT-6P	Phytochemistry & Drug Development

SCHEME OF EXAMINATION

Sl.No	Semester	Paper	Credits	Marks		
				IA	Sem End	Total
1.	I Sem	BT-1T	2	20	80	100
		BT-1P	1	10	40	50
2.	II Sem	BT-2T	2	20	80	100
		BT-2P	1	10	40	50
3.	III Sem	BT-3T	2	20	80	100
		BT-3P	1	10	40	50
4.	IV Sem	BT-4T	2	20	80	100
		BT-4P	1	10	40	50
5.	V Sem	BT-5T	2	20	80	100
		BT-6T	2	20	80	100
		BT-5&6P	2	20	80	100
	VI Sem	BT-7T	2	20	80	100
6.		BT-8T	2	20	80	100
		BT-7&8P	2	20	80	100
	Total		24	240	960	1200



List of Elective Courses:

BSCBTCE 133: Biostatistics

BSCBTCE 183: Food science & Technology

BSCBTCE 233: Fermentation technology

BSCBTOE 283: Immune system and Disease management



I SEMESTER - Paper BT-1T (BSCBTV 131) BIOCHEMISTRY & BIOPHYSICS

Rationale /Learning Objectives:

- Understanding structure and characteristic of Biomolecules.
- Understanding the structure and application of enzymes.
- Imparting skills of instrument in assay of biological molecules.

Unit I

- Aims & scope of Biochemistry & biophysics
- General classification, structure & functions of biomolecules (carbohydrates, proteins, lipids & nucleic acids)
- Detailed structure of monosaccharide, glycosidic bonds, structural polysaccharides (cellulose & peptidoglycans), storage polysaccharide (starch)
- Classification of standard amino acids, peptide bonds, primary, secondary & quaternary structure of proteins, non-covalent bonds in protein structure

Unit II

- Enzymes: nomenclature, classification & active site, Michaelis-Menten's equation, allosteric enzymes-general properties.
- Types of reversible inhibition: Competitive, Non-competitive and Uncompetitive with examples.
- Application of enzymes in industry (Medicine, Food, Textile & biomass conversion).
- Enzymes in clinical applications (LDH, SGOT & SGPT)
- Enzymes as analytical tools (Glucose oxidase)

Unit III

- Structure & function of water
- Impact of pH on biomolecular reactions, application of Henderson & Hasselbalch's equation, buffers.
- Bioenergetics: Free energy, Enthalpy & Entropy. ATP as biological energy currency.
- Beer Lambert law, absorption spectrum & its specificity for a substance, chromophores, UV-visible & infrared spectrophotometry; application
- Fluorescence, phosphorescence instrumentation & its applications
- Methods employed to understand the structure of molecules: X-ray crystallography & NMR



Unit IV

- Microscopy, optical (bright field, dark field, phase contrast & fluorescence) and electron microscopy (TEM & SEM)
- Partition coefficient, significance of R_f-value, Adsorption chromatography (paper chromatography & TLC), Gel filtration chromatography, affinity chromatography.
- Agarose Gel Electrophoresis [SDS PAGE & Agarose]
- Principles of Centrifugation; differential, density gradient & ultra centrifugation.

Student Activities: Seminar, Assignments, Quiz.

Practical: B.Sc. I-Semester
Subject: BIOCHEMISTRY & BIOPHYSICS
Paper Number: BT-1P (BSCBTP 132)

1. Qualitative test for Carbohydrates
2. Qualitative test for Proteins
3. Qualitative test for Lipids
4. Assay of enzymes (Salivary amylase and urease)
5. Estimation of Carbohydrates (DNS & Somayaji methods)
6. Estimation of proteins (Biuret method, Lowry's method)
7. Lambert Beer law
8. Absorption maximum of solution.
9. Agarose gel Electrophoresis – demonstration.
10. Amino acid separation by Paper chromatography (ascending & circular).
11. Thin layer chromatography for separation of chlorophyll pigment.



Books for Reference- Basic Reading List

1. Nelson, D.L Cox., M.M., 2008. Lehninger Principles of Biochemistry 5th ed: Illustrated W.H. Freeman and Company,: New York
2. Berg,JM, Tymocozo JL, Stryer L,2006. Biochemistry,6 th ed,: WH. Freeman and Company, New York.
4. Palmer, t (2001), Enzymes: biochemistry, biotechnology and clinical chemistry. Horwood Publishing limited Wilson.k and Walker J.,2000
5. Wilson.K and Walker.J.,2010.Principles and Techniques of Biochemistry and molecular biology, &th Ed.Cambridge University Press,New York USA
6. Practical Biochemistry-Principle and techniques, 5th Ed. The Press of University of Cambridge, Cambridge,U.K.

Additional Reading List

1. Murray R.K, Granner D.K, Mayes P.A and Rodwell V.W,2006. Harper's Illustrated Biochemistry (Harper's Biochemistry).
2. Nicholas C.P.and Lewis Stevens, 1982. Fundamentals of Enzymology. Oxfard
3. Hames B.D. Hooper, N.M and Houghton, J.D. Biochemistry –Instant notes. Viva Books Pvt Ltd., New Delhi 19984.
4. Rajeshwari.S.Shetty and V.Shree Krishna, Biotechnology 1 , New age publication.
5. Upadhyay .A and Upadyay.K., and Nath, N., 2007, Biophysical chemistry, Third edition ,Himalaya Publication house, Mumbai



II SEMESTER - Paper BT-2T (BSCBTV 181) CELL BIOLOGY & GENETICS

Rationale /Learning objectives:

- Understanding the structure of cell organelles.
 - Understanding the structure of genes and inheritance of genetic pattern.
 - Understanding the genetic disorder.
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Unit I

- Cell theory, levels of organization in cell biology
- Classification of cell types; Cell, tissue, organ & organism.
- Prokaryotic & eukaryotic cells; ultra structure, cell membrane & cell wall.
- Cell organelles: Ribosomes, endoplasmic reticulum, mitochondria, Golgi complex, chloroplast, lysosomes, peroxysomes, interphase nucleus
- Cell locomotion (amoeboid, flagellar, ciliary)
- Cytosol & cytoskeletal structures: (ex-microfilaments, intermediate filaments & microtubules)

Unit II

- Cell division (mitosis & meiosis), cell cycle, cell synchrony & its importance
- Cell to cell interactions & signal molecules.
- Cell differentiation in plants(e.g.: Arabidopsis) & in animals (e.g. Drosophila)
- Cell senescence & programmed cell death (apoptosis).

Unit III

- Chromosomes : Structure, chemical composition, structural organisation of chromatids, centromeres, telomeres, chromatin, nucleosome organisation, euchromatin & heterochromatin.
- Special chromosomes (lampbrush & polytene), banding patterns in human chromosomes.
- Mendelian laws of inheritance.
- Concept of gene (recon, muton & cistron)
- Bacterial conjugation, transduction, & transformation.
- Sex determination in plant & animals, sex linkage, non disjunction, chromosomal theory of inheritance & gene mapping.



Unit IV

- Structural and numerical aberrations of chromosomes
- Hereditary defects: Klinefelter, Turner, Cri-du-chat & Down's syndrome
- Spontaneous & induced mutations, chemical & physical mutagens, induced mutations in plants, animals & microbes and its applications.
- Analysis of mutation in biochemical pathways, one gene-one enzyme hypothesis.
- Evolution of crop plants with examples of wheat, cotton & rice.

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Student Activities: Seminar, Assignments, Quiz, handling of drosophila cultures.

Practical: B.Sc. II Semester

Subject: CELL BIOLOGY & GENETICS

Paper Number: BT -2P (BSCBTP 182)

1. Study of mitosis by staining onion root tip squash
2. Study of meiosis by using permanent slides.
3. Preparation of permanent slide for Mitosis Division.
4. Microtome: Preparation of blocks for staining.
5. Study of cell organelles.(Isolation and staining of mitochondria and chloroplast)
6. Study of Drosophila (wild type and mutant).
7. Separation of Drosophila's eye pigments by paper chromatography.
8. Sex comb mounting of Drosophila.
9. Salivary gland chromosome isolation and staining
10. Counting of total RBC by Haemocytometer method.
11. Counting of total WBC by Haemocytometer method.
12. Micrometry: Measuring plant & animal cells & their organelles.
13. Karyotyping analysis in man.



14. Genetics problems.

Books for Reference- Basic Reading List

1. Karp.G, 2009, Cell and Molecular Biology-Concepts and Experiments 6th Ed John Wiley and sons.
2. Cooper G.M 2007.The cell – A molecular Approach 2nd Ed SunderlandSinauer AssociatesInc
3. De Robertis , E.D.P andDe Roberties E.M.F., 1995 Cell and Molecular Biology 8Th Ed.,Waverly Pvt Ltd New Delhi B.I.
4. Ed: J.Gardner, 2003. Principles of genetics .Vii John Willey and sons, New York

Additional Reading List

1. Lewin,B. 2003Gene VII Oxford Univ.Press Oxford
2. C.B Powar, 2001. Cell Biology , Himalaya Publication House, Mumbai
3. B.D.Singh.,Ed:. 2004.Biotechnology. Kalyani Publishers-2004
4. Rajeshwari.S.Shetty and V.Shree Krishna, 1998. Biotechnology-2 , New age publication, New Delhi.



III SEMESTER - Paper BT-3T (BSCBTV 231) MICROBIOLOGY & IMMUNOLOGY

Rationale/Learning objective:

- To study the importance of microbiology and immunology.
 - To study the diversity of micro-organisms.
 - To study the techniques of identification and culture of micro-organisms under laboratory conditions.
 - Understanding the concept of immunity and its enhancement.
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Unit I

- Aim, scope and historical perspectives of microbiology
- Contribution of early microbiologists (e.g. Louis Pasteur, Robert Koch, Edward Jenner and Leeuwenhoek)
- Concepts of sterilization and disinfections (dry heat, moist heat, radiation, chemical and filtration)
- General classification of microbial kingdom (classical, nutritional and molecular approaches).
- Introduction to virology – Definition, structure, classification, Lytic cycle & Lysogenic cycle

Unit II

- Bacteria: Morphology (Size, Shape & arrangement), ultra structure, respiration & reproduction.
- Microbial cell components: Structure and function of cell wall, lipopolysaccharides, flagella, capsule, endospores, pili (fimbriae), cell membranes and cell inclusions.
- Structure and characteristics of eukaryotic microbes (*Plasmodium*, *Rhizopus*, *Penicillium*, *Aspergillus* & Yeast)

Unit III

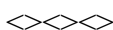
- Types of media and different culture techniques.
- Selective isolation of microorganisms (physical and chemical)



- Growth kinetics, Microbes in extreme environments (thermophiles and psychrophiles, acidophiles and alkalophiles, halophiles, barophytes).
- Microbial association: Symbiosis, mutualism and endophytism of microbes with plants, animals and microbes.
- Antibiotics: Definition, mode of action. & their classification with examples.
- Representative pathogenic microorganisms (e.g. *Protozoa*, *Candida*)

Unit IV

- Historical perspective in immunology and diversity of immune system.
- Classification of immunity- Innate ((mechanical & surface) & adaptive (cell mediated & humoral)
- Cells and organs of immune system, antigen presentation by MHC.
- Salient features of antigens.
- Structure, types and functions of antibodies.
- Antigen-antibody reactions (precipitation, agglutination, complement fixation)
- Immunological disorders: (e.g. autoimmune disease, acquired immunodeficiency syndrome) Hypersensitivity and allergy.
- Vaccines (classical and modern), vaccinations and immunization.
- Microbial defense mechanism. Steps in disease development in animals and plants (bacterial, fungal, protozoal and viral).



Student Activities: Seminar, Assignments, Quiz, blood grouping, handling of microbial culture.

Practical: B.Sc. III Semester

Subject: MICROBIOLOGY & IMMUNOLOGY

Paper Number: BT -3P (BSCBTP 232)

1. Instrumentation and Microscopy (w.r.t. microbiology and immunology)
2. Preparation of media (aseptic techniques & different types of media)



3. Isolation and characterization of micro-organisms (bacteria from water, soil, food, cow dung, plant sources etc.)
4. Isolation and characterization of micro-organisms (fungi from water, soil, food, cow dung, plant sources etc.)
5. Staining of microorganism (simple & differential staining, negative staining)
6. Antibiotic sensitivity test for micro-organisms.
7. Effect of pH and temperature on Bacterial growth.
8. Blood grouping and Rh factor determination.
9. Study of different types of Leucocytes.

Books for Reference- Basic Reading List

1. *Aneja K.R., Jain P, Aneja R*, 2008. A Text book of Basic and Applied Microbiology, New Age International, New Delhi.
2. *Tortura, Funk, B, R., Case C L*. 2010. Microbiology – an introduction. 9th edition. Communing Publishing Company Inc.,
3. *R.C Dubey and D.K Maheshwari*. Practical Microbiology 2004. S.Chand & Co. Ltd, New Delhi.
4. *Pelczar M.J, RD*. Microbiology, Haricot Brace College Publishers, New Delhi. R.C Dubey . Microbiology 2004. S.Chand & Co. Ltd, New Delhi.
5. *Subba Rao*, 2006. Soil Microbiology, 4th ed. Oxoford & IBH publishing Co. PVT. New Delhi.

Additional Reading List

1. Prescott, L. M., Harley, J.P and Klein, D.A 2007. Microbiology 6th ed, McGraw Hill, Boston
2. *Sullia S. B. & Shantharam S*. General Microbiology-cbPowar, hf Daginawala, Himalayan Publishing House (1998) General Microbiology.
3. *Goldsby R. A., Thomas J K, Osborne B.A.*, 2007. Kuby Immunology, W. H Freeman and Company, New York.
4. *Roitt, L., Brostoff, J. and Male*, 1990. Immunology, D. Grower Medical Publishing, London.



IV SEMESTER - Paper BT-4T (BSCBTV 281) MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY

Rationale/Learning objective:

- To study the molecular structure of genetic materials
- To study the central dogma of molecular biology in detail and in molecular levels.



- Learn to manipulate DNA for the production of Recombinant fruitful products.

Unit I

- Discovery, structure and types of DNA. Experiments on DNA as genetic material
- Replication of DNA in prokaryotes and eukaryotes.
- DNA repair mechanism- SOS, base excision & mismatch repair types
- Structure of prokaryotic and eukaryotic gene
- Prokaryotic transcription and translation, complexity & difference in eukaryotic transcription & translation

Unit II

- Prokaryotic gene expression (e.g. lac operon)
- Eukaryotic gene expression transcription factors (e.g. yeast)
- Mechanism of DNA recombination in prokaryotes and eukaryotes
- Discovery and types of transposons in eukaryotes
- Aims, objective and scope of gene cloning and recombinant DNA technology
- Isolation and purification of DNA from bacterial plant and animal cells

Unit III

- Tools of DNA modification restriction enzymes, ligation ,DNA modifying enzymes and DNA vectors(e.g. plasmids, bacteriophages, phagemids, cosmids and virus)
- Construction of genomic and cDNA libraries
- DNA Probes : Types, preparation and application
- screening and selection of recombinants by selection media probes
- Gene insertion & inactivation

Unit IV

- Gene cloning and its applications in Agriculture (e.g genetically modified crops)
- Gene sequencing & its methods (Maxam & Gilbert method & Dideoxy nucleotide method). Purpose & fulfillment of HGP
- Blotting techniques – DNA amplification and blotting (PCR)
- DNA Fingerprinting technology: Principles and application
- Hazards and bio-safety measures for recombinant DNA technology and GMO's



Student Activities: Seminar, Assignments, Quiz, molecular tools like DNA isolation, restriction digestion.



Practical: B.Sc. IV Semester

Subject: Molecular Biology and Recombinant DNA Technology

Paper Number: BT –4P (BSCBTP 282)

1. Isolation of RNA & DNA
2. Estimation of total DNA / RNA / Protein from animal cells and plant cells
3. Agarose gel electrophoresis to separate DNA
4. DNA ligation
5. Restriction digestion
6. Bacterial transformation
7. Plasmid isolation

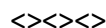


Books for Reference- Basic Reading List

1. *H., Berk, A., Zipursky et al.* 2008 Molecular Cell Biology, IV Ed. W.H. freeman & Co., New York.
2. *Watson J.D.* 2007. Recombinant DNA Technology: Genes & Genomes, III Ed., W.H. freeman & Co., New York.

Additional Reading List

1. *Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts et al.* 2008. Molecular Biology of cell, IV Ed., Garland Publishing, New York.
2. *Karp.G.* 2009, Cell and Molecular Biology-Concepts and Experiments 6th Ed John Wiley and sons.
3. *De Robertis, E.D.P and De Robertis E.M.F* 1995 Cell and Molecular Biology 8th Ed., Waverly Pvt Ltd New Delhi B.I.
4. *Lewin,B.* 2003. Gene VII Oxford Univ. Press Oxford



V SEMESTER - Paper BT-5T (BSCBTV 331)
MEDICINAL PLANT DIVERSITY & BIOETHICS

Rationale/Learning objective:

- Understanding the medicinal plant distribution at global, national and local levels.
- Learning identification, collection and preservation and field conservation techniques.
- Understanding the role of medicinal plants in different medicinal systems.
- Methodology of studying taxonomical, morphological, anatomical and phytochemical characters of herbal drugs.

Unit-I

- **Diversity of Plants:** The classification and distribution of plant kingdom with examples of medicinal plants from each group. (Algae, Bryophytes, Pteridophytes, Gymnosperms & Angiosperms)
- **Biosphere:** Definition, components, and significance.
- **Global Biodiversity:** Biomes, their characters & types with representative plant species.
- **Plant diversity of India. :** Biogeography regions, their salient features with representative medicinal plant species. Major Medicinal & Aromatic Plants of India.
- **Traditional use of plant resources:** Traditional knowledge systems, Ethnobotany, its branches & significance, with examples on traditional use of plant resources in Agriculture, food & medicine. Traditional Medicinal Formulations.

Unit II

- **Indian Systems of Medicine:** Salient features of Ayurveda, Unani, Siddha & Homeopathy and use of medicinal plants in them.
- **Introduction to Ayurvedic Pharmacognosy:** Concepts of *Panchamahabhuta*, *Saptapadārtha*, *Ayurvedic* drug combinations & formulations.
- **Modern use of plant resources:** The role of plants in modern medicine.
- **Herbal Drugs:** Definition, significance & commercially important herbal drugs of India & Karnataka



Unit-III

- Oil yielding Plants with examples.
- Gums, Resins & latex yielding plants with examples
- Species and aromatic plants
- Poisonous plants of India
- Stimulant & hallucinogenic plant species.
- **Drug substitution:** Reasons, principles & examples.
- **Drug adulteration:** Reasons and impact with examples.
- Herbal drug processing & storage methods.
- Conservation strategies of medicinal plants (*In-situ*, *Ex-situ*, *In-Vitro*)

Unit-IV

- WTO, GATT & TRIPS agreement, WIPO treaties, Budapest treaties
- Introduction to IPR
- Types of IPR (Copyright, Trademark, Industrial design, Geographical indication of Goods , Patent)
- Patent (Introduction, patentable matter and patent filing procedure)
- Legal protection of Biotechnological inventions
- Compulsory liscence and intringments.



Student Activities: Seminar, Assignments, Quiz, identification of plants based on medicinal properties.

Books for Reference- Basic Reading List

1. *Kokate & Gokale*, 2004. Text book of pharmacognosy, Nirali publication, Pune
2. *Kirthikar & Basu*, 1995. Indian medicinal plants, (volume I to IV, Chowkamaba Pub., Dehradun.
3. *Father Saldhana*, 1990. Flora of Karnataka, central college, Bangalore
4. *Kaveriappa & G.K. Bhat.*, et al. 2004. Plant resources of Dakshina Karnataka, Pilikula, Mangalore

Additional Reading List

1. *Pande*, b.p. 2005. Economic botany, Chand pub., New Delhi
2. *Albert, H.N.*, 1979. Economic botany, Tata Mc-Graw Hill pub., New Delhi.
3. Major Medicinal Papnts of India, 1990. CSIR Publication., NewDelhi.



V SEMESTER - Paper BT-6T (BSCBTV 332)
PLANT BIOTECHNOLOGY &
ENVIRONMENTAL BIOTECHNOLOGY

Learning objective:

- To learn the *in vitro* methods of culturing plant cells, tissues and organs.
- Practical knowledge of tissue culture media preparation and different culture techniques.
- Knowledge about the transgenic plants.
- Learn the biotechnological processes of environmental cleanup.
- Practical exposure to estimation of the water quality.
- Understanding the significance of biofuel and biofertilizers.

Unit I

- Introduction, history and scope of plant cell and tissue culture, terms and definitions. Sterilization technique,
- **Plant tissue culture media** - Types, role of macro & micro nutrients, pH, gelling agents, and growth regulators (MS media as example).
- Cellular totipotency and its significance.
- **Micro-propagation techniques** -meristem culture (axillary bud, shoot-tip, internodal culture).
- **Callus culture** and its application.
- **Organs cultures & their application** - Ovary and ovule culture, *in-vitro* pollination and fertilization, Embryo culture, embryo rescue, Endosperm culture and production of triploids.
- **Organogenesis and somatic embryogenesis** – Techniques and applications
- Somoclonal variation and their significance.

Unit II

- **Cell Culture:** cell suspension culture, Growth kinetics, growth measurements, Single cell suspension culture methods and their applications.
- **Haploid cultures:** direct and indirect androgenesis, anther culture and pollen culture. Gynogenesis and its application. Diploidization of haploid plants, application of haploids.



- **Protoplast culture:** Introduction of protoplast isolation (Mechanical and Enzymatic). Testing of viability of isolated protoplast.
Somatic hybridization: different methods of protoplast fusion, selection of hybrid Cells, cybrids, Protoplast regeneration techniques.
- **Transgenic plants:** Agrobacterium mediated transformation
- **Cryopreservation:** Technique and application.
- Examples for practical applications of tissue and organ culture in Agriculture, Horticulture & Pharmaceutical industry.

Unit III

- Introduction to environmental biotechnology, Scope and applications.
- **Microbial treatment of liquid waste-** Biological treatment of liquid wastes (sewage): primary treatment, secondary treatment (activated sludge system, trickling filters), sludge digestion, septic tanks, oxidation ponds. Tertiary treatments.
- **Microbiological treatment solid wastes :** composting, vermicomposting, land-farming.
- **Bioremediation:** introduction, types (phytoremediation, microbial remediation, Biosorption), *in-situ* and *ex-situ* bioremediation.
- **Biomining:** Definition, process and significance (e.g: Biomining of Cu & Fe)

Unit IV

- **Biofuels:** Principle & significance, (e.g: *Pongamia sp.* & *Jatropha sp.*).
- **Biofertilizers** – Principle & production methods of biofertilizer (e.g: *utilization of Rhizobium sp. & Mycorrhizae*).
- **Biopesticides :** Principle & production methods . (e.g.: *Bacillus thuringiensis*)
- **Pollution control measures-** Control measures of Hazardous waste

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Student Activities: Seminar, Assignments, Quiz, tissue culture techniques.



Practical: B.Sc. V Semester

Subject: Plant Biotechnology and environmental Biotechnology

Paper Number: BT –5P (BSCBT 333)

1. Plant Tissue culture laboratory organization
2. Methods of sterilization. (Wet heat, Dry heat, Chemical & radiations)
3. Preparation of plant tissue culture media- Stock & final (MS & Nitsch media)
4. Callus and multiple shoot culture.
5. Micro-propagation: Shoot culture, subculture for rooting and hardening & establishing plants in green house
6. Anther and pollen culture
7. Establishing cell lines by suspension cell culture.
8. Protoplast isolation and culture
9. Isolation of Agro bacterium from plant or soil sources
10. Culture of Agro bacterium in-vitro
11. Synthetic seeds
12. Water analysis: Estimation of oxygen & CO₂
13. Water analysis: BOD & COD
13. Field visit for study of Biofertilizers & Biopesticides



Books for Reference- Basic Reading List

1. *Bhojwani S.S and Razdan M.K*, 2004 Plant tissue culture, Panima Publishing Corporation, Delhi.
2. *Chawla H.S* 2004, Plant Biotechnology Oxford and IBH Publishing Co, Pvt.
3. *Ramawath K.G*, 2004 Plant Biotechnology ., Chand Publication, Delhi
4. *Chawla, H.S.*, 2003, Plant Biotechnology: A Practical Approach. Oxford and IBH.
5. *Kalyan Kumar D.E.*, 2000. Plant Tissue Culture., New Age Book Agency Kolkata.
6. *Giri C C and Giri A.*, 2007. Plant Biotechnology Practical Manual, I K International Publishing House Pvt. Ltd.
7. *Srivatsa P.S.* 1998. Plant tissue culture and Molecular Biology: Application and Prospects. Narosa Publishing House New Delhi.
8. *Sathynaraya U.*, 2011, Biotechnology, Books and Allied (P) Ltd.
9. *R. C .Dubey*, 2003. A text Book of Biotechnology, S Chnad & Co. Ltd, New Delhi.
10. *Purohit* , 1998. Agricultural Biotechnology, Biotechnology of Higher Plants. Pub: Russel G. E.

Additional Reading List

1. *R A Dixon and R A Gonzates* 1993. Plant cell culture: A practical approach..
2. *Alexander, G and Nikaido, H.* 2006. Microbial Biotechnology: Fundamentals of Applied Microbiology. W H Freeman and Company.
3. *Chatterji A K.*, 2002.Introduction to Environmental Biotechnology. Prentice – Hall of IndiaPvt. Ltd., New Delhi
4. *Foster C.F., Wae J. D. A*, Environmental Biotechnology, Ellis Horwood Ltd.
5. *Sathynaraya U.*, 2011., Biotechnology, Books and Allied (P) Ltd.
6. *Slater, A., Scott, n AND Flower, M*, 2008. Plant Biotechnology The Genetic manipulation of Plants. Second Edition, Oxford University Press, NY.

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VI SEMESTER - Paper BT-7T (BSCBTV 381)
ANIMAL BIOTECHNOLOGY & BIOINFORMATICS

Rationale/Learning objectives:

- Understanding the laboratory organization and animal tissue culture techniques.
- Studying the methods of culturing animal cells, tissues and organs invitro.
- Understanding the importance of secondary metabolites and its production by rDNA technology.
- Knowledge on transgenic animals, stem cells, gene therapy.
- Understanding the importance of Bioinformatics in life sciences.

Unit I

- History of development of cell cultures, organization of animal cell culture laboratory.
- Cell culture media- components, types (Natural & Artificial), Role of growth factors for proliferation of animal cells (EGF, FGF, PDGF, IL-1, IL-2, NGF, erythropoietin etc.)
- Metabolic capabilities of animal cells
- Natural factors stimulating growth of animal cells,
- Primary cultures- Cell (Enzymatic & Mechanical disintegration) & Explants culture techniques, Anchorage dependent & independent cells.

Unit II

- Cell line- finite & continuous, commonly used cell lines, their origin and characteristics.
- Bioreactors for large scale culture of cells
- Growth kinetics of cells in culture
- Organ culture
- Transfection of animal cells: Physical & chemical methods.
- Selective markers, HAT selection, antibiotic resistance.



Unit- III

- Introduction to animal metabolism- Anabolic & Catabolic.
- Secondary metabolism and production of secondary metabolites (insulin, growth hormones, Interferon, t-plasminogen, activator factor VIII etc.)
- Expression of cloned proteins in animal cells. (e.g. Alpha-1 anti-trypsin)
- Production of vaccine in animal cells. (e.g. Hepatitis B)
- Somatic cell fusion techniques, Production of monoclonal antibodies
- Stem cell culture (embryonic & non-embryonic) and its applications.
- Applications of animal cell culture: Transgenic animals (e.g. Dolly the sheep), Tissue engineering (e.g. Artificial skin) & Gene therapy.

Unit-IV

- Introduction to bio-informatics: Definition, scope and relevance
- Biological database & data tools, types of database, database software.
- Tools for genomics & proteomics, genome data visualization tools
- Annotations, genome comparison, sequence analysis & alignment.
- Application of bioinformatics in pharmacogenomics, agriculture & aquaculture

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Student Activities: Seminar, Assignments, Quiz, proteomics and genomics.



Books for Reference- Basic Reading List

1. *Shashidara R.*, Animal Biotechnology.
2. *Portner R.*, 2007. Animal Biotechnology: Methods and Protocols, 2nd ed., Humana press.
3. *P.K. Gupta*, Elements of Biotechnology, Rastogi publishers, Meerut.
4. *B.D.Singh*, Biotechnology- Kalyani Publishers, Ludhiana .

Additional Reading List

1. *Freshney I. R.*, *Wiley – Liss*. 2000. Culture of Animal Cells: A Manual of Basic Technique 4th edition.
2. *Davis J. .M*, 2002. Basic Cell Culture: A Practical approach, 2nd edition, Oxford University Press, Oxford.

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VI SEMESTER - Paper BT-8T (BSCBTV 383)
PHYTOCHEMISTRY & DRUG DEVELOPMENT

Learning objectives:

- Understanding the structure, function and diversity of plant metabolites.
- Understanding the physiological reasons behind the unique chemical nature of a plant.
- Knowledge the major principal and techniques used analyzing the plant chemicals.
- Understanding how pharmaceutical products can be developed from different plant sources.

Unit I

- Primary metabolism in plants.
- Role of analytical chemistry in phyto-chemistry and instrumentation
- Isolation and purification of plant compounds: Principles and techniques
- Principles and working modes of Chromatography, Spectrophotometry & radioisotope labeling
- Different models of Chromatography: Paper. TLC. HPLC, HPTLC, GLC
- Different models of Spectrophotometers: Visible, UV-Visible, IR.

Unit-II

- Secondary metabolism in Plants; Principles, functions & significance
- Major metabolic pathways leading to production of secondary metabolic products: Glycolysis , Citric Acid pathway, Shikmic Acid pathway & Pentose-Phosphate pathway
- Structure and functions of Isoprenoid compounds, Alkaloids, Glycosides and Phenolic compounds.
- Biosynthesis of Alkaloids and steroids
- Distribution of Volatile oils, Steroids, growth Regulators in plants
- Therapeutic applications of phytochemicals.



Unit III

- Plant compounds as drug candidates, Identification & chemical evaluation of New Chemical Entities (NCE) for therapeutic properties, High Throughput Screening.
- Principles & approaches of Pharmaceutical chemistry
- Pharmacokinetics & pharmacodynamics
- Drug modulators & drug intermediates

Unit IV

- Drug administration
 - Ethno-pharmacognosy & Bioprospecting.
 - Drug development protocol
 - Organisms used for clinical trials
 - Clinical trial and legal framework for the drug screening
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Student Activities: Seminar, Assignments, Quiz, extraction of plant compounds and TLC.

Books for Reference- Basic Reading List

1. *Kokate & Gokale*, 2004. Text Book Of Pharmacognosy, Nirali Publication, Pune
2. *Kirthikar & Basu*, 1995. Indian Medicinal Plants, (Volume I To IV, Chowkamaba Pub., Dehradun.
3. Major Medicinal Plants of India, 1990. CSIR Publication. New Delhi.
4. *Kaveriappa & G.K. Bhat.*, et al. 2004. Plant Resources Of Dakshina Karnataka, Pilikula, Mangalore

Additional Reading List

1. *Chatwal*, 2000. Chemistry of Natural Products
2. *J.Mann*, 2012. Secondary metabolism., Oxford Univ. Press, New Delhi.
3. *Pande, B.P.* Plant Physiology, S. Chand Publishers., New Delhi.
4. *P.V. Sharma*, Dravyaguna Shastra, Chowkamaba Pub., Varansi.

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Practical: B.Sc. Semester-VI.
Subject: Phytochemistry & Drug Development Practical
Paper Number: BT-6P (BSCBTP 383)

1. Crude drug evaluation: Morphological
2. Crude drug evaluation: Anatomical
3. Crude drug evaluation: Chemical
4. Crude drug evaluation: Biological
5. Isolation of therapeutically active ingredients by Solvent extraction (Two different organic solvents) & centrifugation technique.
6. Qualitative analysis of plant extracts
7. Soxhlet extraction.
8. Thin Layer Chromatography (TLC) for separation of phytochemicals
9. Basics of Bioinformatics

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Question Paper Pattern
Question paper pattern
S.D.M.College(Autonomous) – Ujire
B.Sc -- Semester
Biotechnology

Time 3 hrs.

Max. Marks:80

Note:

1. Answer Part A and Part B
2. Answer Three full questions from Part B choosing one full question from each unit
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

PART - A

1. Answer any Ten of the following

2 x 10 = 20

- i.
- ii.
- iii.
- iv.
- v.
- vi.
- vii
- viii
- ix
- x
- xi
- xii

PART - B

UNIT - I

- | | |
|-------|---|
| 2. a. | 4 |
| b. | 5 |
| c. | 6 |

OR

- | | |
|-------|---|
| 3. a. | 4 |
| b. | 5 |
| c. | 6 |

UNIT - II

- | | |
|-------|---|
| 4. a. | 4 |
| b. | 5 |
| c. | 6 |

OR

- | | |
|-------|---|
| 5. a. | 4 |
| b. | 5 |
| c. | 6 |

UNIT - III

- | | |
|-------|---|
| 6. a. | 4 |
| b. | 5 |
| c. | 6 |

OR



7. a.	4
b.	5
c.	6

UNIT - IV

8. a.	4
b.	5
c.	6

OR

9. a.	4
b.	5
c.	6



1. Basis for internal assessment in theory and practical:

The internal assessment marks in the theory papers shall be based on two tests. The Tests shall be of at least 1 hour duration each and to be conducted after 6 and 12 weeks after the start of a semester. The average of the two tests shall be taken as the internal assessment marks in theory papers.

The practical internal assessment marks shall be based on one test and continuous evaluation during the practical. The practical test shall be conducted after 10 weeks after the start of a semester. The average of the test and continuous evaluation shall be taken as the internal assessment marks in practical.

2. Theory question paper pattern:

Theory question papers in science subjects with practical shall carry 80 marks. The syllabus of each paper is grouped into four(4) units of 12 teaching hours each in the first 4 semesters and 10 teaching hours each in the 5th and 6th semesters for all science subjects with practical. The question paper shall consist of part A and B. Part A is an objective type compulsory question(Q.No.1) containing twelve(12)very short answer objective type questions/divisions, carrying 2 marks each drawn from all the four units of the syllabus(4 questions per unit).. Part B shall contain eight (8) short and long answer questions(Q.Nos.2 to9) carrying 15 marks each drawn from all the four units of the syllabus. There shall be three divisions per questions. The marks splitting shall be 4+5+6. The students are required to answer 10 questions in part A and 4 full questions from part B (Q.Nos.2to9),choosing one full question from each unit. The same is detailed as follows:

Part A:

Part A shall contain 12 objective type questions/divisions(Q.No.1) drawn from all the 4 units of the syllabus(4divisions per unit) carrying 2 marks each (i to vi),10 divisions are to be answered.

10X2=20marks.

Part B:

Part B shall contain (6) short and long answer questions(Q.Nos.2 to9) carrying 15 marks each drawn from all the 4 units of the syllabus(2questions per unit).There shall be five divisions per question. The students are required to answer 3 full questions,choosing one full question from each unit.
4X15=60marks.

UNIT I

Question No:2

with the marks splitting of 4+5+6 = 15

Or

Question No:3

with the marks splitting of 4+5+6 = 15

UNIT II

Question No:4

with the marks splitting of 4+5+6 = 15

Or



Question No:5 with the marks splitting of 4+5+6 = 15

UNIT III

Question No:6 with the marks splitting of 4+5+6 = 15

Or

Question No:7 with the marks splitting of 4+5+6 = 15

UNIT IV

Question No:8 with the marks splitting of 4+5+6 = 15

Or

Question No:9 with the marks splitting of 4+5+6 = 15

Final Scheme:

Part-A. Q.1 10 out 12 question (4 each from. Three units) **10X2=20**

Part-B. Two questions from each unit. Only one has to be written. Each question having the sub question with the break up of **10+5+5=20.**

Unit –I	Q.2	OR	Q.03	15
Unit –II	Q.4	OR	Q.05.	15
Unit –III	Q.6	OR	Q.07	15
Unit –IV	Q.8	OR	Q.09	15

3. The pattern of practical examinations:

They shall be evolved by the HOD and Senior Faculty of the Department.



Department of Biotechnology CBCS
BSCBTCE 133: Biostatistics

Duration: 24 Hours

Marks: 50

Objective:

- 1 Recognize the importance of data collection and its role in determining scope of inference.
- 2 Interpret statistical results correctly, effectively, and in context
- 3 Use technology to perform descriptive and inferential data analysis for one or two variables
- 4 Choose and apply appropriate statistical methods for analyzing one or two variables
- 5 Demonstrate a solid understanding of interval estimation and hypothesis testing

Learning Outcomes:

- 1 Communicate the results of statistical analyses accurately and effectively
- 2 Make appropriate use of statistical software.
- 3 Read and learn new statistical procedures independently
- 4 Represent data systematically and scientifically

Syllabus:

Unit : I

1. Introduction to Biostats (Definition & scope)
2. Collection of data (Questionnaire, survey, oral history & Case study)
3. Sampling techniques (Random & Non Random)
4. Graphical & Diagrammatic data representation (Bar graph, linear graph, pie chart and tabular columns)
5. Methods of central tendency (Mean, Mode & Median)

Unit : II

1. Measures of dispersion (Range, Mean deviation, Variance & Standard deviation)
2. Correlation
3. Coefficient of variation
4. Plagiarism

Evaluation

Continuous Internal Evaluation (10 Marks): Methodology: It is done based on

1. Assignments
2. Projects
3. Presentation
4. Quizzing

Suggested reading & References:

1. Lee, ET and Wang, JW. (2003): Statistical Methods for survival data analysis, 3rd Edition, John Wiley and sons, 2. Biswas (2007)
2. Applied stochastic processes: A biostatistical and population oriented approach reprinted 2nd edition, New central book agency
3. Kleinbaum, DG (1996): Survival analysis, Springer.
4. Chiang C L (1968): Introduction to Stochastic process in Biostatistics



Sri Dharmastala Manjunatheshwara College (Autonomous) Ujire – 574240 D.K.
Department of Biotechnology
CBCS
BSCBTCE 183: Food science & Technology

Duration: 24 Hours

Marks: 50

Objective:

- 1 To understand the importance of maintaining food quality
- 2 To study the different techniques involved in food preservation
- 3 To know the microbial role in contamination of food
- 4 To understand the relationship between health & Food

Learning Outcomes:

- 1 To understand the basic food safety issues in the food market
- 2 To understand the basic concepts in food chemistry and food analysis.
- 3 Apply scientific thinking in the analysis, synthesis and evaluation of knowledge within the discipline of food science
- 4 To have preventive measures to avoid food infection
- 5 Managing the food borne diseases

Syllabus:

Unit : I

1. Definition and scope of Food science
2. Factors that affect growth and survival of microbes in food
3. Microbial spoilage of food
4. Temperature & irradiation preservation techniques(Freezing, drying, & Radiation)
5. Aseptic packaging & chemical methods of food preservation

Unit : II

1. Common microbes responsible in food spoilage (Bacteria & fungi)
2. Food borne diseases (Botulism, Salmonellosis, Shigellosis, Enteropathogenic Escherichia Coli Diarrhoea, Clostridium Perfringens gastroenteritis, Bacillus cereus Gastroenteritis)
3. Safety measures and precautions to avoid food borne diseases

Evaluation

Continuous Internal Evaluation (10 Marks): Methodology: It is done based on

1. Assignments
2. Projects
3. Presentation
4. Quizzing



Suggested readings and references:

1. Khanna K Gupta S, Seth R, Mahna R, Rekhi T (2004). The art and science of cooking:
2. Practical Manual, revised Edition. Elite Publishing House Pvt Ltd. Raina U, Kashyap S, Narula V Thomas S Suvira, Vir S, Chopra S (2010).
3. A Complete manual, 4th Edition, Orient Black Swann Ltd. Bamji MS, Krishnaswamy K, Brahman GNV (2009). Textbook of Human Nutrition, 3rd edition.
4. Wardlaw and Insel MG, Insel PM(2004). Perspectives in nutrition, 6th Edition Mosby



Sri Dharmastala Manjunatheshwara College (Autonomous) Ujire – 574240 D.K.
Department of Biotechnology
CBCS

BSCBTCE 233: Fermentation technology

Duration: 24 Hours

Marks: 50

Objective:

- 1 To understand the chemistry of fermentation
- 2 To learn the techniques of fermented food production
- 3 To design a large scale bioreactor
- 4 To understand the industrial application of fermentation

Learning Outcomes:

- 1 evaluate factors that contribute in enhancement of cell and product formation during fermentation process
- 2 Understand and explain the science underlying the conversion of raw materials to final products
- 3 Skilled in alcohol preparation
- 4 Knowledgeable in principle of bioreactor

Syllabus:

Unit : I

1. Definition & Types of fermentation
2. Advantages of Bioprocessing over Chemical processing
3. Basic design of fermenter
4. Sterilization techniques
5. Chemistry of fermentation

Unit : II

1. Fermented food products
2. Production of Vitamin B12
3. Production of Alcohol(wine)
4. Downstream processing (Cell harvesting, Cell lysis and precipitation)

Evaluation

Continuous Internal Evaluation (10 Marks): Methodology: It is done based on

1. Assignments
2. Projects
3. Presentation
4. Quizzing



Suggested readings and references:

1. Casida LE (1991). Industrial Microbiology. 1st Edition. Wiley Eastern Ltd
2. Crueger W and Crueger A (200). Biotechnology : A Text Book Of Industrial Microbiology 2nd Edition. Panima Publishing Co. New Delhi
3. Patel A H (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
4. Stanbury PF, Whitaker A and Hall SJ(2006). Principles of Fermentation Technology 2nd Edition Elsevier Science Ltd



Sri Dharmastala Manjunatheshwara College (Autonomous) Ujire – 574240 D.K.
Department of Biotechnology
CBCS
BSCBTOE 283: Immune system and Disease management

Duration: 24 Hours

Marks: 50

Objective:

- 1 To identify common infectious agents and the diseases that they cause.
- 2 To evaluate methods used to identify infectious agents in the clinical microbiology lab.
- 3 To explain general and specific mechanisms by which an infectious agent causes disease.
- 4 To recognize and diagnose common infectious diseases
- 5 To assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance

Learning Outcomes:

- 1 Knowledgeable in using and intake of antibiotics
- 2 Understanding the principle of immune system in our body
- 3 Knowledgeable in precautions to be taken to maintain good health
- 4 Understanding the mode of actions of antibiotics

Syllabus:

Unit : I

1. History of immunology
2. Innate and adaptive immunity
3. Microbial diseases (bacterial, viral protozoal & fungal)
4. STD(Sexually transmitted disease): Types, route cause of infection and clinical symptoms

Unit : II

1. Mode of infection
2. Active and passive immunity
3. Blood grouping and its significance
4. Cancer and its types

Evaluation

Continuous Internal Evaluation (10 Marks): Methodology: It is done based on

1. Assignments
2. Projects
3. Presentation
4. Quizzing



Suggested readings and references:

1. Textbook Of Biochemsitry with Clinical Correlations (2011) Devlin, T M John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4
2. Immunology : A Short course (2009) 6th ed., Coico, R and Sunshine, G., John Wiley & Sons, Inc (New Jersey), ISBN: 978-0-470-08158-7
3. Biochemistry (2012) 7th Edition Berg, J M., Tymoezko, J L and Stryer L., W H Freeman and Company (NEW YORK), ISBN: 13; 978-1-4292-7635-1
4. Genetics (2012) 6th Edition., Snustad, D P and Simmons., M J John Wiley and Sons (Singapore), ISBN: 978-1-118-09242-2



Question Paper Pattern
S.D.M.College(Autonomous) – Ujire
Biotechnology
Elective Course Paper

Time 2 hrs.

Max.

Marks: 40

Note:

1. Answer Part A and Part B
2. Answer **THREE** full questions from Part B choosing one full question from each unit
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

PART – A

1. Answer any EIGHT of the following

2 x 08 = 16

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)
- i)
- j)

PART – B

UNIT - I

2. a.
b.
c.

3
4
5

OR

3. a.
b.
c.

3
4
5

UNIT - II

4. a.
b.
c.

3
4
5

OR

5. a.
b.
c.

3
4
5



S.D.M. College (Autonomous), Ujire (D.K.), Karnataka-574240
Practical Examinations: Model Question Paper .

Class: I Semester B.Sc.

Sub: Medicinal Plant Biotechnology

Paper: BT-1P. Biochemistry & Biophysics

Time : 03 Hrs.

Max Marks: 40

QI. Major Experiment: Write down the requirement, write down the procedure, conduct the experiment & show the results in **A.** (2 + 3+6+4) **15**

Q.II. Minor Experiment / Procedure Writing: Write down the requirement & procedure and / or conduct the experiment & give the inference in **B.** (2+3+3) . **08**

Q.III. Spotters.: Identify & give brief explanations in **C, D & E.** (1+2) 3X3=09

Q.IV. Records & Viva-voce . (5+3)= **08**

S.D.M. College (Autonomous), Ujire (D.K.), Karnataka-574240
Practical Examinations: Model Question Paper

Class: II Semester B.Sc.

Sub: Medicinal Plant Biotechnology

Paper: BT -2P. Cell Biology & Genetics

Time : 03 Hrs.

Max Marks: 40

QI. Major Experiment: Write down the requirement, write down the procedure, conduct the experiment & show the results in **A.** (2+3+6+4) **15**

Q.II. Minor Experiment / Procedure Writing: Write down the requirement & procedure and / or conduct the experiment & give the inference in **B.** (2+3+3) . **08**

Q.III. Spotters.: Identify & give brief explanations in **C, D & E.** (1+2) 3X3=09

Q.IV. Records & Viva-voce . (5+3)= **08**



S.D.M. College (Autonomous), Ujire (D.K.), Karnataka-574240
Practical Examinations. Model Question Paper

Class: III Semester B.Sc.

Sub: Medicinal Plant Biotechnology

Paper: BT-3P. Microbiology & Immunology

Time : 03 Hrs.

Max Marks : 40

Q.I. Major Experiment: Write down the requirement, write down the procedure, conduct the experiment & show the results in **A**. (2+3+6+4) 15

Q.II. Minor Experiment / Procedure Writing: Write down the requirement & procedure and / or conduct the experiment & give the inference in **B**. (2+3+3). 08

Q.III. Spotters.: Identify & give brief explanations in **C, D & E**. (1+2) 3X3=09

Q.IV. Records & Viva-voce . (5+3)= 08

S.D.M. College (Autonomous), Ujire (D.K.), Karnataka-574240
Practical Examinations: Model Question Paper

Class: IV Semester B.Sc.

Sub: Medicinal Plant Biotechnology

Paper: BT-4P. Molecular Biology & Recombinant DNA Technology

Time : 03 Hrs.

Max Marks: 40

Q.I. Major Experiment: Write down the requirement, write down the procedure, conduct the experiment & show the results in **A**. (2+3+6+4) 15

Q.II. Minor Experiment / Procedure Writing: Write down the requirement & procedure and / or conduct the experiment & give the inference in **B**. (2+3+3) . 08

Q.III. Spotters.: Identify & give brief explanations in **C, D & E**. (1+2) 3X3=09

Q.IV. Records & Viva-voce . (5+3)= 08



S.D.M. College (Autonomous), Ujire (D.K.), Karnataka-574240
Practical Examinations: Model Question Paper

Class: V Semester B.Sc.

Sub: Medicinal Plant Biotechnology

Paper: BT-5P. Plant Tissue Culture & Environmental Biotechnology

Time : 03 Hrs.

Max Marks: 80

Q.I. Major Experiment: Write down the requirement & procedure, conduct the experiment & show the results in **A**.
(8+12)= 20

Q.II. Minor Experiment: Write down the requirement & procedure and conduct the experiment & give the inference in **B**.
(4+8)=12

Q.III. Procedure Writing: Write down the requirement & procedure and give the expected inference in **C**.
12

Q.IV. Spotters.: Identify & give brief explanations in **D, E, F, G & H**. (1+3) 4X5=20

Q.V. Records & Viva-voce. (10+6)= 16

S.D.M. College (Autonomous), Ujire (D.K.), Karnataka-574240
Practical Examinations: Model Question Paper

Class: VI Semester B.Sc.

Sub: Medicinal Plant Biotechnology

Paper: BT-6P. Phytochemistry & Drug Development

Time : 03 Hrs.

Max Marks : 80

Q.I. Major Experiment: Write down the requirement & procedure, conduct the experiment & show the results in **A**.
(8+12)= 20

Q.II. Minor Experiment: Write down the requirement & procedure and conduct the experiment & give the inference in **B**.
(4+8)=12

Q.III. Procedure Writing: Write down the requirement & procedure and give the expected inference in **C**.
12

Q.IV. Spotters.: Identify & give brief explanations in **D, E, F, G & H**. (1+3) 4X5=20

Q.V. Records & Viva-voce. (10+6)= 16

