Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara

(Autonomous)

Lead college of Karmaveer Bhaurao Patil University, Satara

Reaccredited by NAAC with 'A+' Grade

Syllabus For

Bachelor of Science

MICROBIOLOGY

Part -II

Syllabus to be implemented w.e.f. June, 2024

(As per NEP 2020)

CONTENT

Syllabus for B.Sc. II Microbiology

- **PREAMBLE:** This syllabus is framed to give sound knowledge with understanding of Microbiology to undergraduate students at second year of four years of B.Sc. degree course. The goal of the syllabus is to make the study of Microbiology popular, interesting and encouraging to the students for higher studies including research. The new and updated syllabus is based on a basic and applied approach with vigor and depth. The syllabus meets the needs of industries and research. The syllabus is prepared after long discussion with number of faculty members of the subject and experts from industries and research fields. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

- **PROGRAMME OBJECTIVES**:

1. To nurture academicians with focus and commitment to their subject.
2. To create a skilled work force to match the requirements of the industries and research.
3. To develop scientific attitude is the major objective so as to make students open minded, critical and curious.
4. To develop skill in practical work, experiments and laboratory materials and equipment along with the collection and interpretation of scientific data to contribute to science.

• PROGRAMME OUTCOMES:

1. The students will graduate with proficiency in the subject of their choice.
2. The students will be eligible to continue higher studies in abroad.
3. The students will be eligible to pursue higher position in industries.
4. The students will be eligible for jobs in government organizations.

• PROGRAMME SPECIFIC OBJECTIVES:

i] The broad goal of the teaching to under graduate students in Microbiology is to provide knowledge and skills in Microbiology to develop practical skills through the laboratory work, their presentation and articulation skills, exposure to industry and interaction with industry experts, write short research - based projects.

ii] The graduate students of microbiology should have basic skills such as culturing microbes, maintaining microbes, safety issues related to handling of microbes, Good Microbiological practices etc.

iii] The graduate students of microbiology should have Moderately advanced skills in working with microbes such as pilot scale culturing, downstream processes, diagnostics etc.

iv] At the time of completion of the programme the student will have developed extensive knowledge in various areas of Microbiology.

- **PROGRAMME SPECIFIC OUTCOMES (PSO):**

i] The student will be able to explain about various applications of Microbiology such as Environmental Microbiology, Industrial Microbiology, Food Microbiology, and Microbial Pathogenicity.

ii] The students will be able to design and execute experiments related to Basic Microbiology, Immunology, Molecular Biology, Recombinant DNA Technology, and Microbial Genetics, etc.

iii] The students will be able to execute a short research project incorporating techniques of Basic and Advanced Microbiology under supervision.

iv] The student will take up a suitable position in academia or industry and to pursue a career in research

Four Year UG Honours

Level	Sem	Subject - 1 Major				Subject - 2 Minor		Subject - 3 GE / OE		VSEC		AEC, VEC, IKS			OJT, FP, CEP, CC, RP					Total	Non - CGPA	
		DSC		DSE						VSC	SEC	AEC	IKS	VEC	CC	FP	CEP	OJT /Int/App /RT	RM			
		T	P	T	P	T	P	T	P													
4.5	I	4	2	---	---	4	2	4	2				2		2	-				22		
	II	4	2	---	---	4	2	4	2		2		---	2		-				22	DEGG	
5	III	4	4	---	---	2	2			2	2	4	---	2						22		
	IV	4	4	---	---	2	2			2	2	4	---		2					22		
5.5	V	4	2	4	2	---	-	-		4			---		2	2	2			22		
	VI	4	2	4	2	---	-	-		2					2	2		4		22	IIC	
6	VI	8	2	8			-	-		---		---	---			-			4	22		
	VII	8	2	8		---	-	-		-		---	---			-		4		22		
Total		4	20	24	4	12	8	12		10	6	8	2	4	8	4	2	8	4	176		
						20		12		16		14			26							

B.Sc. II SEMESTER III and IV

B.Sc. II SEMESTER III

Level	Major DSC	Practical	Minor	Practical Minor	Environmental Awareness	AEC	SEC	VSC	Total credits
5	Course V Microbial physiology and Metabolism Course VI Applied Microbiology	Microbiology practical III	Course-III-BMiT-Biomolecules	Practical course-I	BMiT-EA	English Department	BMiPSEC-Practical-I	BMiPC	
Credits	**4**	**4**	**2**	**2**	**2**	**4**	**2**	**2**	**22**

B.Sc. II SEMESTER IV

Level	Major DSC	Practical	Minor	Practical Minor	AEC	SEC	CC	VSC	Total credits
5	Course VII Bacteriology and genetics Course VIII Basics in medical microbiologyand Immunology	Microbiology Practical IV	Course IV-BMiT Applied Microbiology-II	Practical course- II	English Department	BMiPSEC-Practical-II	BMiTCC	BMiPC	
Credits	**4**	**4**	**2**	**2**	**4**	**2**	**2**	**2**	**22**
							Semester III + Semester IV		**44**

B.Sc. II Semester III

Major Course

BMiT-231 MICROBIAL PHYSIOLOGY AND METABOLISM

Course Objectives:

The Student should be able to,

1. Understand different environmental factors influencing microbial growth.
2. Know the transport mechanism in bacterial cells
3. Study various energy-yielding pathways in microorganisms
4. Learn anaerobic respiration

Credits (Total Credits 2)	SEMESTER-III BMiT-231 MICROBIAL PHYSIOLOGY AND METABOLISM	No. of hours per unit/credits
UNIT -I	**Effect of Environment on Microbial Growth-I**	**(8)**
	Microbial growth in response to environment A) Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermoduric, psychrotrophic) Thermal destruction of bacteria- D,F,Z value TDP and TDT B) pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic)	
UNIT -II	**Effect of Environment on Microbial Growth-II**	**(7)**
	A) Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe) B) Osmotic pressure isotonic, hypertonic, hypotonic, environment, xerophiles, halophiles C) Effect of UV and Heavy metals	
UNIT -III	**Nutrient uptake and Transport**	**(7)**
	A) Transport proteins-Properties of transport proteins, Structure and function of membrane transport proteins. B) i) Passive and facilitated diffusion ii) Primary and secondary active transport, concept of uniport, symport and antiport C) Group translocation,	

	D) Iron uptake	
UNIT -IV	**Chemoheterotrophic Metabolism-Aerobic Respiration**	**(8)**
	A) Concept of free energy, High energy compounds B) Concept of aerobic respiration, anaerobic respiration and fermentation C) Sugar degradation pathways i.e. EMP, TCA cycle D) Electron transport chain: components of respiratory chain	

Course outcomes:

Student will be able to.....

1. Classify the microorganisms based on envirionmental conditions.
2. illustrate transport of nutrients and role of siderophores in iron uptake in microorganisms
3. explain the concept of energy change
4. analyze the concept of aerobic respiration.

Reference Books-

1. Rajak, Anupam. *Essentials of Microbiology*. Lulu. com, 2019.

2. Lehninger, Albert L., David L. Nelson, and Michael M. Cox. *Lehninger principles of biochemistry*. Macmillan, 2005.

3. Dewi, Yustiyana. "Identifikasi dan uji patogenisitas kandidat bakteri selulolitik asal ekosistem mangrove Tukak Sadai, Bangka Selatan." PhD diss., Universitas Bangka Belitung, 2018.

4. Willey, Joanne M., Linda M. Sherwood, and Christopher J. Woolverton. *Prescott, Harley, and Klein's microbiology*. McGraw-Hill, 2008.

5. A–PAIR, "CBCS PATTERN FOR MICROBIOLOGY B. Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS-2020."

6. Powar and Daginawala, General Microbiology Vol I. Himalaya publishing house, 2010.

7. Martinko, Dunlap, Clark. Brock Biology of Microorganisms. Pearson International edition Madigan, 2010.

B.Sc. II Semester III

Major Course

BMiT 232-Applied Microbiology

Course Objectives:

The Student should be able to.

1. Study the basic concepts of food microbiology
2. Understand methods of food preservation
3. Learn basic concept of fermentation with respect to fermentor design, fermentation media
4. Know types of fermentors and concept of primary and secondary metabolites.

Credits (Total Credits 2)	**SEMESTER-III** **BMiT-232** **Applied Microbiology**	**No. of hours per unit/credits**
UNIT-I	**Food Microbiology**	**(7)**
	Introduction, Classification of food based on stability, General principles and methods of food preservations- Asepsis, Removal of Microorganisms, Dehydration, Use of Heat, Irradiation, anaerobiosis, Use of chemical Preservatives	
UNIT-III	**Sewage Microbiology**	**(8)**
	A) Types B) Chemical characteristics C) Microflora D) BOD&COD- Definitions, basic concepts E) Treatment and disposal i. Primary treatment ii. Secondary treatment- trickling filter, activated sludge process, oxidation ponds iii. Final treatment-Anaerobic digestion, chemical treatment	
UNIT-III	**Basic concepts of fermentation**	**(7)**
	A) Definition, Typical Fermentor design – Parts and their functions B) Fermentation Media-Water, carbon source, nitrogen source, precursors, growth factors , antifoam agents and chelating agents	

	C) Factors affecting fermentation process	
UNIT -IV	**Industrial Microbiology**	**(8)**
	A) Screening-Primary and secondary screening B) Types of fermentations – Batch, continuous, dual and multiple C) Concept of primary and secondary metabolites	

Course outcomes-

Students will be able to.....

1. Recall the principles and the significance of the municipal water purification process.
2. Apply the food preservative methods.
3. Analyze Infectious dust, Droplets and Droplet nuclei.
4. Differentiate primary and secondary screening procedures

Reference Books:

1. Patel A. H. Industrial microbiology. 2nd edition. MacMillan.1984.
2. Casida L. E. Industrial microbiology. 2nd edition, NewAge International publisher. 2007.
3. Dr. Mahanta K. C. Dairy Microbiology. Omsonspublications. 1997.
4. Miller and Litsky. Industrial microbiology. Mcgraw- Hill publication. 1976.
5. R. Maneshwari D. K. S. Chand. A Textbook of Microbiology Dubey Co. Ltd. Ramnagar New Delhi 110055. 2013.
6. Frobisher et al. Fundamentals of Microbiology. 9th revised edition.W. B. Saunders company. 1974.

B.Sc. II Semester III

Major Course
BMiP-233 Microbiology Practical Course III

Course Objectives:

The Student should be able to....

1. Understand the effect of various environmental factors on growth of microorganisms.
2. Study diauxic growth pattern of E. coli.
3. Learn thermal death time of given bacterial culture
4. Know the preparation of microbiological media

Credits (Total Credit (2)	SEMESTER-III BMiP-233 Microbiology Practical III	No. of hours per unit/credits (20)
	A. Effect of environmental factors on microorganisms	
	1. Temperature 2. pH 3. Salt (NaCl) 4. Determination of thermal death time of given bacterial culture 5. Determination of decimal reduction time of *E.coli.* 6. Study of diauxic growth of *E.coli*	
	B. Preparation of microbiological media	
	7. H L medium 8. Peptone nitrate broth 9. Nutrient broth 10. Macconkeys broth	

Course outcomes-

Students will be able to.....

1. Explain various effects of environmental factors on microbial growth
2. Determine the significance of TDT and decimal reduction time.
3. Prepare different culture media.

4. Perform Study of diauxic growth of *E.coli*.

Reference Books-

1. Arora B. and Arora D. R. Practical Microbiology. CBS Publishers and Distributors, New Delhi, India. 2020.
2. Dubey R. C. and Maheshwari D. K. Practical Microbiology. S. Chand and Company Limited, New Delhi, India. 2012.
3. Atlas R. M. Handbook of Microbiological Media. Ukraine: Taylor and Francis. 2010.
4. Patel R. Experimental Microbiology. Aditya BookCentre 5 th edition, Vol.I and Vol.II. 2009.
5. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis. 2008.
6. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition. 1980.
7. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd. 1967.

B.Sc. II Semester III

Major Course
BMiP-234 Microbiology Practical Course IV

Course Objectives:

The Student should be able to....

1. Understand the biochemical tests.
2. Study the Water testing tests.
3. Learn about oxidative and fermentative metabolism of sugars
4. Know the technique for routine Bacteriological analysis of water

Credits (Total Credit (2)	SEMESTER-III BMiP-234 Microbiology Practical IV	No. of hours per unit/credits (20)
	A. Biochemical tests	
	1.H L test 2.Nitrate reduction test 3.Oxidase test	
	B. Qualitative tests–	
	4. .Presumptive test 5. confirmed test 6. completedtest	
	C. Quantitative tests-	
	7 . MPN	
	D. Primary Screening of -	
	8. Antibiotic producers–crowded plate technique 9. Amylase producers 10. Alcohol fermentation- Demonstration	

Course outcomes-

Students will be able to.....

1. Explain various effects of environmental factors on microbial growth
2. Determine the significance of TDT and decimal reduction time.
3. Prepare different culture media.

4. Apply the techniques for routine Bacteriological analysis of water.

Reference Books-

1. Senthil Kumar B., Zothansanga. Practical Microbiology laboratory manual. Panima publishing corporation 2018.
2. Patel Rakesh. Experimental microbiology., 5th edition, VolI. Delhi Aditya book. 2009.
3. Media preparation – High media manual, 2nd edition.
4. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis. 2008.
5. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition. 1980.
6. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd. 1967.

B.Sc.II SEMESTER-IV

Major Course

BMiT-241Bacteriology and Genetics

Course Objectives:

Students should be able to.....

1. Learn variations in Gram positive and Gram negative bacterial cell wall
2. Understand in detail different structures and functions of cell organelles
3. Study about bacterial systematic and taxonomy
4. Know basic concepts of genetics w.r.t. various definitions.

Credits (Total Credits 2)	SEMESTER-IV BMiT 241 Bacteriology and Genetics	No. of hours per unit/credits
UNIT -I	**Bacterial cell structure**	**(8)**
	A) Structural components of Gram-positive and Gram-negative bacterial cell wall with their variations. C)Bacterial Endospore- Ultrastructure, Sporulation and Germination D) Flagella– Mechanism of movement, tactic behavior	
UNIT -II	**Modes of Gene transfer in bacteria and plasmids**	**(7)**
	A) Transformation B) Conjugation C) Transduction	
UNIT -III	**Basic concepts of Genetics**	**(7)**
	A) Gene, genome, genotype, phenotype, mutagen, recon, muton, cistron, Split genes. B) Forms of DNA- A, C, D, and Z C) DNA sequence with unusual structure, Palindromic, hairpin or cruciform mirror repeat, triplex DNA, Tetraplex and H-DNA D) Genetic code–definition and properties of genetic code.	
UNIT -IV	**Mutations**	**(8)**
	A) Basic Concepts, definitions-Missense, nonsense, neutral, silent. B) Types of Mutation:	

	a) Spontaneous mutation –Definition and basic concept b) Induced mutations- 1) Physical and chemical mutagens 2) Mechanism of mutagenesis by physical and chemical mutagens: i) Base analogues: 5-Bromouracil and 2-amino purines ii) Mutagens modifying nitrogen bases- Nitrous acid, Hydroxylamine, Alkylatingagents iii) Mutagens that distort DNA - a.Acridinedyes b. UV light	

Course outcomes:

Student will be able to.....

1. Explain structure and functions of different organelles and cytoplasmic inclusions of bacteria.
2. Recall ecological significance and economic importance of different groups of bacteri**a**
3. Explain the concept of gene, genetic code and Operon
4. Diffrentiate types of mutations.

Reference Books:

1. R. Maneshwari D. K. S. Chand. A Textbook of Microbiology Dubey Co. Ltd. Ramnagar New Delhi 110055. 2013.
2. Frobisher et al. Fundamentals of Microbiology. 9th revised edition.W. B. Saunders company. 1974
3. Stainer R.Y. General Microbiology. 5th ed Macmillan and CO. 1999.
4. Pelczar and Reid. Microbiology. 5th edition. McGraw Hill publication. 1993.
5. Madigan, Martinko, Dunlap, Clark Michael Madigan, Martinko John. Brock Biology of Microorganisms. 12th edition. Pearson International edition.
6. Stickberger Monroe W. Genetics. 3rd edn Mac Millan publication.1985.
7. Ronald M. Principles of microbiology., 2nd edition, Atlas, Mosby publications. 1996.

B.Sc. II
Major Course
BMiT-242 Basics in Medical Microbiology and Immunology

Course Objectives:

Student should be able to.....

1. Study the basic concepts and definitions regarding host-pathogen interactions.
2. Learn types of infections, modes of transmission, and process of disease production
3. Understand the defense mechanisms of the host
4. Know about antigen, antibody definition, types and reactions

Credits (Total Credits 2)	SEMESTER-IV BMiT-242 Basics in Medical Microbiology and Immunology	No. of hours per unit/credits
UNIT -I	**Host Pathogen Interaction**	**(8)**
	A) Definitions: Host, Parasite, Commensal, etiological agent, Infection , Invasion , Pathogen, Pathogenicity, Virulence, Toxigenicity, Signs of disease , symptoms, syndrome, sequelae infections B) Classification of disease: Occurrence(Epidemic, Endemic ,Pandemic, Sporadic), severity or duration (Acute , Chronic) ,Extent of host involvement, Infectious (Communicable), non-infectious (Noncommunicable). C) Types of Infections: Opportunistic infections ,Nosocomial infections, Primary, Reinfection, secondary, focal, Cross, Iatrogenic , In apparent, Latent, Inherited , congenital, Local, Generalized, Covert, overt, Simple, Mixed, Pyogenic D) Sources and modes of transmission of infection: Exogenous and Endogenous (Patient, Carrier: types of carrier, Animals, insects, soil, water, food, Reservoirs of infection), Fomites F) Modes of Transmission of disease: 1. Transmission by air, water and food 2. Contacttransmission 3. Vector borne transmission G) Disease Process: How bacteria Cause Disease: Entry and Exit of Organisms: Portal of entry, preferred entry Virulence:	

	Adherence, Attachment, colonization, Invasiveness, Enzymes and Toxin produced.	
UNIT -II	**Infection and Disease**	**(7)**
	A) Stages of infectious disease: Incubation period, Prodromal phase, invasive phase, decline phase, B) Laboratory Diagnosis: Sample collection, transport, culturing of clinical samples C) Causative agent, spread, pathogenesis, symptoms, microbiological diagnosis, prevention and control of Enteric fever, D) General principles of prevention and control: Isolation, Quarantine, Immunization,Vector control	
UNIT -III	**Host defence mechanism**	**(8)**
	A) Organs and tissue of the immune system: Types of primary and secondary lymphoid organs Cells of the immune system : Monocytes and macrophages, granulocytes, mast cells, dendritic cells, NK cells: Killer cells and Mechanism of Killing of lymphocytes ---B and T cells B) Types of Immunity: Active and Passive C) First line of defence: Physical, Chemical and Cellular mechanism D) Second line of defence: Inflammation and fever: Antimicrobial substances present in blood and tissue fluids, Phagocytic cells and phagocytosis. E) Third line of defence (Specific defence mechanism) – Antibody mediated and cell mediated immunity (activation of resting B lymphocytes to effect or cells, Activation of Tc cells and mechanism of Killing by CD_8 cells	
UNIT -IV	**Antigen and Antibodies**	**(7)**
	A) Antigens: Nature, types, factors affecting antigenicity B) Antibodies: Structure, Properties and Types C) Primary and Secondary immune response D) Antigen–Antibody reactions-precipitation and agglutination	

Course outcomes:

Student will be able to.....

1. Classify the disease and understand modes of disease transmissions.
2. Apply the knowledge in diagnosis, prevention, and control of disease.
3. Explain the defence mechanisms of human host.
4. Explain the concept of antigen-antibody types and reactions.

Reference Books:

1. R. Maneshwari D. K. S. Chand. A Textbook of Microbiology Dubey Co. Ltd. Ramnagar New Delhi 110055. 2013
2. Frobisher et al. Fundamentals of Microbiology. 9th revised edition.W. B. Saunders company. 1977.
3. Stainer R.Y. General Microbiology. 5th ed Macmillan and CO. 1999.
4. Pelczar and Reid. Microbiology. 5th edition. McGraw Hill publication. 1993.
5. Madigan, Martinko, Dunlap, Clark Michael Madigan, Martinko John. Brock Biology of Microorganisms. 12th edition. Pearson International edition.
6. Stickberger Monroe W. Genetics. 3rd edn Mac Millan publication.1985.
7. Ronald M. Principles of microbiology., 2nd edition, Atlas, Mosby publications. 1996.
8. Ananthnarayan R. Ananthnarayan and Paniker's Textbook of Microbiology. 10th edition, Orient Black swan publications. 200

B.Sc. II SEMESTER-IV

Major Course

BMiP-243 Microbiology Practical Course–IV

Course objectives:

Student should be able to.....

1. Learn about the isolation of lac negative mutants of *E.coli*
2. Study staining of different bacterial organelles like flagella, endospore, nucleus and PHB granules.
3. Isolate *Salmonella* and *Proteus Spp* from the clinical sample.
4. Know rrquirments for media prepration

Credits (Total Credit 02)	SEMESTER-IV BMiP-243 Microbiology Practical's–IV	No. of hours per unit/credits (20)
	1. Isolation of lac negative mutants of *E. coli* by visual detection method 2. Effect of U. V. light on growth of bacteria. 3. Spore staining (Dorner's method) 4. Flagella staining (Bailey's method) 5. Nucleus staining (Giemsa's method) using yeast cells. 6. PHB granules staining 7. Micrometry 8. Preparation of Microbiological media a. Peptone water b. Sugar fermentation medium- Glucose, Mannitol c. Simmon's citrate agar slant d. Glucose phosphate broth e. Wilson and Blairs medium f. Christensen's urea agar. g. Phenylalanine deamination medium h. Gelatin agar i. Selenite F broth. j.Tetrathionate broth	

Course outcomes-

Students will be able to....

1. Demonstrate the techniques of isolation of lac negative mutants of *E. coli*
2. Able to perform Spore staining, Flagella staining.
3. Able to perform Nucleus staining, PHB granules staining.
4. Prepare culture media.

Reference Books:

1. Senthil Kumar B., Zothansanga. Practical Microbiology laboratory manual. Panima publishing corporation 2018.
2. Patel Rakesh. Experimental microbiology., 5th edition, VolI. Delhi Aditya book. 2009.
3. Media preparation – High media manual, 2nd edition.
4. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis. 2008.
5. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition. 1980.
6. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd. 1967.

B.Sc. II SEMESTER-IV

Major Course

BMiP-244 Microbiology Practical Course–V

Course objectives:

Students should be able to.....

1.Study isolation protocol for causative agent.

2. Learn Serological diagnosis of Enteric fever.

3.Know Blood group detection tests

4.UnderstandUrea hydrolysis test

Credits (Total Credit 02)	SEMESTER-IV BMiP-244 Microbiology Practical's–V	No. of hours per unit/credits (20)
	1. Isolation of causative agent of enteric fever: *Salmonella* 2. Isolation of causative agent of urinary tract infection: *Proteus* 3. Serological diagnosis of Enteric fever: Widal test (Qualitative) 4. Agglutination test: Blood group detection 5. RPR test 6. Phenyl alanine deamination test 7. Urea hydrolysis test 8. Gelatin hydrolysis test 9. Indole test 10. Methyl red test 11. Voges Proskauer's test 12. Citrate utilization test	

Course outcomes-

Students will be able to....

1. Understand the technique of isolation of lac negative mutants of *E. coli*
2. Able to perform Spore staining, Flagella staining, Nucleus staining, PHB granules staining
3. Isolate *Salmonella* and *Proteus Spp* from clinical sample
4. Determine the blood group.

Reference Books:

1. Arora B. and Arora D. R. Practical Microbiology. CBS Publishers and Distributors, New Delhi, India. 2020.

2. Dubey R. C. and Maheshwari D. K. Practical Microbiology. S. Chand and Company Limited, New Delhi, India. 2012.

3. Atlas R. M. Handbook of Microbiological Media. Ukraine: Taylor and Francis. 2010.

4. Patel R. Experimental Microbiology. Aditya BookCentre 5 th edition, Vol.I and Vol.II. 2009.

5. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis. 2008.

6. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition. 1980.

7. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd. 1967.

B.Sc. II SEMESTER III
Minor Course

BMiT 235:Biomolecules

The students should be able to …

1. study the structures of different monosaccharides and polysaccharides.
2. learn the primary, secondary, tertiary, and quaternary structures of protein.
3. understand Watson and Crick's double-stranded model of DNA and study the structure and function of three forms.
4. know the classification of lipids based on their composition.

Total Credits 2	**SEMESTER-III Course I -BMiT 235: Biomolecules**	**No. of hours per unit**
UNIT I	**Carbohydrates**	**7**
	a) Definition, classifications, and brief account of Monosaccharides - Structure of glucose, fructose. Disaccharides - Structures of lactose and sucrose. Polysaccharides - Structures of starch and cellulose.	
UNIT II	**Protein**	7
	a) Amino acids- the building blocks of proteins, General formula and classification of amino acids, concept of zwitterion. b) Structure of protein: Primary structureofproteins, secondary structure of proteins (alpha helix, ß pleated sheet), tertiary and quaternary structure ofproteins. c) Enzyme: Definitions, Structure - Concept of apoenzyme, coenzyme, cofactor, prosthetic group and active site. Types- extracellular, intracellular, constitutive and inducible enzyme	
UNIT III	**Nucleic Acids**	**8**
	a) **DNA:** Composition- Structure of Purines, Pyrimidines, Structure of nucleoside, nucleotide, Structure of DNA (Watson and Crick's double helical model), salient features. b) **RNA** - Composition, Structure, and function of mRNA, tRNA, rRNA	

UNIT IV	**Lipids**	**8**
	a) Simple Lipids- Fats and oils, waxes b) Compound Lipids- Phospholipids, Glycolipids c) Derived lipids	

Program outcomes:

Student will be able to…

1. draw the structures of different monosaccharides and polysaccharides.
2. compare the primary, secondary, tertiary, and quaternary structures of protein.
3. describe Watson and Crick's double-stranded model of DNA and compare the structure and functionsof three forms of RNA.
4. classify lipids based on their composition.

Reference Books:

1. Satyanarayana U., Chakrapani U. Biochemistry. 4th Edition. Elsevier, India. 2013.
2. Berg, M.J. Tymoczko L.J., and Stryer L. Biochemistry. 7th edition.H Freeman, New York. 2010.
3. Nelson D.L. Lehninger A.L. Michael M.C. Lehninger Principles of Biochemistry. 5thEdition .Palgrave Macmillan. 2008.
4. Sadasivam S. Manickam A. BiochemicalMethods, New Age International (P) Limited. 2007.
5. Powar C. B. and Daginawala H. I., General microbiology Volume I. Himalaya Publishing House Private Limited, Pune, India. 2005.
6. Powar C. B. and Daginawala H. I. General microbiology Volume II. HimalayaPublishing House, Private Limited, Pune, India. 2005.

B.Sc. II SEMESTER III

Minor Course

BMiP 236-Practical Course III

Course objectives:

The students should be able to…

1. Study preparation of buffer.
2. understand the qualitative analysis of carbohydrates.
3. understand the qualitative analysis of protein.
4. study the isolation of pure culture by pour plate, spread plate, and streak plate technique.

Total Credits=2	SEMESTER-II BMiP 236 -Practical Course III	No. of hours per unit/credits (20)
	1. Preparation of buffer solutions 2. Instructions and handling of colony counter 3. Instruction and handling of shaker incubator 4. Isolation and enumeration of microorganisms from food sample 5. Isolation of microflora from human 6. Phosphatase test 7. Qualitative analysis of biomolecules Carbohydrate, General Test for Carbohydrate- Molisch Test 8. Qualitative analysis of biomolecules Carbohydrate, Test for Reducing Sugar – Benedict's Test. 9. Qualitative analysis of biomolecules Carbohydrate, Test for Non-reducing Sugar- Benedict's Test. 10. Qualitative analysis of biomolecules Carbohydrate, Test for Starch- Iodine Test. 11. Qualitative analysis of biomolecules Proteins, Detection of Protein by Biuret Test. 12. Qualitative analysis of biomolecules Proteins, Acetic Acid Test 13. Qualitative analysis of biomolecules Nucleic acids- DNA (Diphenyl amine test) 14. Qualitative analysis of biomolecules Nucleic acids- RNA (Orcinol test) 15. Isolation of pure cultures of bacteria by four quadrant streaking method and study of colony characteristics, Gram Staining, and motility of E. coli 16. Isolation of pure cultures of bacteria by four quadrant streaking method and study of colony characteristics, Gram Staining, and motility of Bacillus species. 17. Isolation of pure cultures of bacteria by four quadrant streaking method and study of colony characteristics, Gram Staining, and motility of Staphylococcus aureus.	

Course outcomes:

Students will be able to…

1. demonstrate the safety measures in the microbiology laboratory and handling of microscope and laboratory instruments.
2. demonstrate basic techniques in microbiology like spread plate, streak plate, and pour plate etc.
3. prepare stains, buffer, reagents & physiological saline.
4. perform qualitative analysis of biomolecules.

Reference Books:

1. Arora B. and Arora D. R. Practical Microbiology. CBS Publishers and Distributors, New Delhi, India. 2020.
2. Dubey R. C. and Maheshwari D. K. Practical Microbiology. S. Chand and Company Limited, New Delhi, India. 2012.
3. Atlas R. M. Handbook of Microbiological Media. Ukraine: Taylor and Francis. 2010.
4. Patel R. Experimental Microbiology. Aditya BookCentre 5 th edition, Vol.I and Vol.II. 2009.
5. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis. 2008.
6. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition. 1980.
7. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd. 1967

B.Sc. II SEMESTER IV
Minor Course
BMiT-245: Applied Microbiology II

Course objectives:

The students should be able to…

1. understand the importance of food.
2. study the industrial microbiology.
3. know the beneficial and harmful effects of microorganisms in air, water, soil, and milk.
4. learn the analytical techniques used for purification, separation etc.

Total Credits=2	SEMESTER-IV BMiT 245- Applied Microbiology II	No. of hours per unit
UNIT I	**Food Microbiology**	**8**
	a) Importance of studying food microbiology. b) Primary sources of microorganisms in foods. Principles of food c) preservation - preservation methods - irradiations - drying, heat processing, chilling and freezing, high pressure, modification of atmosphere and chemical preservatives.	
UNIT II	**Introduction of Industrial Microbiology**	**8**
	a) Definition of Industrial Microbiology, Fermentation Process. b) Industrially important Microorganisms and its selection process. c) Design and operation of typical Fermenters, Parts of Fermenters (Baffles, Spargers, Agitator, Antifoaming agents etc.)	
UNIT III	**Analytical Techniques**	7
	Introduction, Principle and Application of a) Spectroscopy b) Electrophoresis c) Chromatography	

	d) Centrifugation	
UNIT IV	**Biofertilizers and Biopesticides**	**7**
	a) Introduction production and applications of biofertilizers - Azofertilizer, Rhizofertilizer. b) Introduction to biopesticides- Microbial Pesticides, Genetically Modified Organisms.	

Program outcomes:

Student will be able to…

1. Preservation of food by various methods.
2. Classify biofertilizers and fertilizers.
3. explain the beneficial effects of microorganisms in industries.
4. apply different techniques for separation and purification of analytes.

Reference Books :

1. Pareek R. P. and Pareek N. Agricultural Microbiology. Scientific Publishers, Jodhpur, Rajasthan, India. 2019.
2. Pawar C. B. and Daginawala H. F. General Microbiology. Volume I. Second Edition. Himalaya Publishing House, Mumbai. ISBN: 9789350240892. 2019.
3. Pawar C. B. and Daginawala H. F. General Microbiology. Volume II. Second Edition. Himalaya Publishing House, Mumbai. ISBN: 9789350240908
4. Subba Rao N. S. Advances in Agricultural Microbiology. Netherlands: Elsevier Science.
5. Tortora G. J., Funke B. R. and Case C. L. Microbiology: An introduction 12th Edition, Pearson. ISBN: 9780321929150. 2016.
6. Aithal S. C. and Kulkarni N. S. Water microbiology ~ an Indian perspective. I st Edition. Published by Himalaya Publishing House. ISBN: 9789352021291.
7. Ingraham J. L. and Ingraham C. A. Introduction to Microbiology. United Kingdom: Brooks/Cole. ISBN: 9780534552244
8. Dubey R. C. and Maheswari D. K. Textbook of Microbiology. S. Chand Publishing, New Delhi. ISBN: 978812191803
9. Salle A. J. Fundamental Principles of Bacteriology. New York and London: McGraw-Hill Book Co.1973.
10. Frobisher M. Fundamentals of Microbiology. 9th Edition. Saunders, Michigan University Press. ISBN: 9780721639222. 1974.
11. MPCB, CPCB, BIS and WHO websites guidelines for drinking water quality

B.Sc. II SEMESTER IV

Minor Course

BMiP-246 Practical Course IV

Course Objectives:

The students should be able to…

1. understand the microbial load in fermented food.
2. learn the bacteriological examination of Spoiled food.
3. know the demonstration of analytical techniques.
4. study the isolation of industrially important bacteria.

Total Credits=2	SEMESTER-IV BMiP-246 - Practical Course IV	No. of hours per unit/credits (30)
	1. Isolation of bacteria from fermented food curd. 2. Isolation of Microorganisms from common food items (Bread, Pickles) 3. Isolation of bacteria from water samples. 4. Detection of microbes from spoiled meat, egg, and fish 5. Isolation of microbes from soil samples at different temperatures. 6. Isolation of Azotobacter 7. Isolation of Rhizobium from root nodule. 8. Direct microscopic count (DMC) 9. Yoghurt Fermentation 10. Citric acid 11. Sauerkraut Fermentation 12. Enumeration of microorganisms from street foods. 13. Studies on the principle of Beer and Lambert law. 14. Measurement of OD of different color solutions at different wavelengths by colorimeter 15. Separation of amino acids by paper chromatography 16. Demonstration of gel electrophoresis 17. Demonstration of centrifugation 18. To detect the ability of bacteria to produce casinase enzymes. 19. MBRT Test (Determination of microbiological quality of milk by MBRT test	

Course outcomes

The students will be able to ...

1 compare the fresh food and spoiled food.
2 identify the quality of food samples.
3 learn laws of analytical techniques.
4 analyze different samples of biomolecules by using chromatography, colorimeter and electrophoresis

Reference Books:

1. Willey J. M., Sherwood L. M. and Woolverton C. J. Prescott's Microbiology, 8th Edition, McGraw-Hill Higher Education. 2013.

2. Powar,C.B., Daginawala H.F. General Microbiology, Himalaya Publications.

3. Madigan M.T., Martinko J.M. Brock's Biology of Microorganisms. 11th Edition. Pearson Education Inc.

4. Tortora G.J., Funke B.R., Case C.L. Microbiology: An Introduction. 8th Edition. Pearson Education Inc

5. Prescott, Lancing. M., John, P. Harley and Donald, A. Klein. Microbiology, 6th Edition, McGraw Hill Higher Education.

6. Prescott L.M., Harley J.P., and Klein D.A. Microbiology, 6th Edition. MacGraw Hill Companies Inc.

7. Ingraham J. L. and Ingraham C.A. Introduction to Microbiology. 3rd Edition. Thomson Brooks / Cole.

8. Michael J Pelczar, JR. E.C.S. Chan, Noel R. Krieg. Microbiology, 5th Edition, Tata MacGraw Hill Press. 1993.

9. Stanier R.Y., Adelberg E.A. and Ingraham J.L. General Microbiology, 5th Edition. Macmillan Press Ltd.

10. Salle A.J. Fundamental Principles of Bacteriology. 7th Edition. Tata MacGraw Hill Publishing Co. 1971.

11. Frobisher M, Fundamentals of Microbiology. W. B. Saunders, Philadelphia.7th edition.

B.Sc. II Semester III
COURSE– BMiTVEC-2 Environmental awareness for Microbiology

Course Objectives:
Students will able to.....

1. Understand the different role of microorganisms on environmental factors.
2. Study the various environmental protection acts.
3. Learn goals of sustainable development
4. Know the role of microorganisms in reclamation of soil and composting.

Credits (Total Credits 2)	**SEMESTER-III** **BMiTVEC-2 Environmental awareness for Microbiology**	**No. of hours per unit/credits (30)**
UNIT -I	**Environmental issues**	**(8)**
	a) Pollution (Air, Water, Land), Fresh-water overuse, Natural disasters, Fuel and Energy shortages due to overuse, Increase in wasteland, Biodiversity loss, Global warming, and climate change (Causes and intensity of the problem), b) Role of microorganisms in creation of environmental issues	
UNIT -II	**Environmental laws and ethics**	**(7)**
	a) Environmental Protection Act b) Wildlife Protection Act c) Forest Protection Act d) Prevention and control of pollution Act (Air, Water, Land), from unsuitable to sustainable development e) Responsibilities of an Environmentally aware citizen.	
UNIT -III	**Unit II. Sustainable Development Goals**	**(8)**
UNIT -IV	**Role of Microorganisms in reclamation of soil and composting**	
	a) Role of Microorganisms in the reclamation of soil b) Manure and Compost. Methods of Production – i) Green manure and farm yard manure ii) City compost- Windrow and pit method. iii) Vermicompost iv) Optimal conditions for composting regarding -	**(7)**

	Composition of organic waste, Availability of microorganisms, Aeration, C: N:P ratio, Moisture content, Temperature, pH, and Time.	

Course outcomes:

Students will be able to.....

1. Analyze the environmental issues, types of microorganisms growing in different extreme environmental conditions.
2. Learn the environmental laws and ethics
3. Explain the concept of sustainable development and goals
4. Describe the role of microorganisms in reclamation of soil and composting.

Reference Books: -

1. Nelson D.L. Lehninger A.L. Michael M.C. Lehninger Principles of Biochemistry. 5thEdition .Palgrave Macmillan. 2008.
2. Sadasivam S. Manickam A. BiochemicalMethods, New Age International (P) Limited. 2007.
3. Powar C. B. and Daginawala H. I., General microbiology Volume I. Himalaya Publishing House Private Limited, Pune, India. 2005.
4. Patel R. Experimental Microbiology. Aditya BookCentre 5 th edition, Vol.I and Vol.II. 2009.
5. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis. 2008.
6. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition. 1980.
7. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd. 1967.

B.Sc. II SEMESTER III

Basic Microbial Techniques-I

BMiPSEC-2

Course Objectives:

Student should be able to.....

1) Study different culture media
2) Perform staining of blood and preparation of stains
3) Estimate of calcium and magnesium from soil
4) Understand the mean, median and mode of the population

Credits (Total Credit 02)	SEMESTER-III BMiPSEC-2 **Basic Microbial Techniques-I**	No. of hours per unit/credits (20)
	1) Media Preparation- Egg yolk agar 2) Media Preparation- blood agar 3) Media Preparation- chocolate agar 4) Phosphatase test 5) Lipase test 6) Lecithinase test 7) Preparation of Buffer solution 8) SPC of Soil 9) SPC of Water 10) To detect the ability of bacteria to produce caseinase enzyme. 11) Demonstration of gel electrophoresis 12) Demonstration of membrane filtration technique 13) Estimation of calcium ions from soil. 14) Estimation of magnesium from soil. 15) Antibiotic sensitivity test by disc diffusion method. 16) Blood staining by leishman's method. 17) Preparation of stains - 1) Giemsa stain 2)Eosin methylene blue 18) Measurment of cell dimension 19) Measurement of mean 20) Measurement of median and mode	

Course outcomes:

Students will be able to.....

1) Make blood agar, chocolate agar, egg yolk agar.
2) Prepare various stains required for staining.
3) Perform an estimation of calcium and magnesium from soil.
4) Differentiate media based on composition.

Reference Books:

1. Jayaraman, J., and J. Jayaraman. *Laboratory manual in biochemistry*. Delhi, India: Wiley Eastern, 1981.
2. Plummer, David T. "Introduction to practical biochemistry." 1978.
3. Patel R.J., Patel K.R., Experimental Microbiology Vol.I , Aditya Publishers. 2003.
4. Patel R.J., Patel K.R., Experimental Microbiology Vol.II , Aditya publishers. 2003.
5. Goldman E., and Green L. Practical Handbook of Microbiology, Taylor &Francis.
6. Cruick S.R., Dugaid, J.P., Marmion, B.P. and Swain, R.H. Medical Microbiology, Churchill Livingstone Publishing, Edinburgh, Vol. 1 & 2, 12th Edition.
7. Baker F. J. Bacteriologicaltechniques, Butterworth Publishers Ltd.1967.

B.Sc. II SEMESTER IV

Basic Microbial Techniques-II

BMiPSEC-3

Course Objectives:

Students should be able to.....

1) learn the isolation of microorganisms.
2) Study Rapid Plasma Reagin Test.
3) Know the qualitative analysis of Carbohydrates.
4) Learn the qualitative analysis of Proteins and Nucleic acid.

Credits (Total Credit 02)	**SEMESTER-IV** BMiP SEC-3 **Basic Microbial Techniques-II**	**No. of hours per unit/credits (20)**
	1. Isolation of microbes from soil samples at different temperatures. 2. Isolation of Rhizobium species from root nodules. 3. Isolation of starch degrading bacteria. 4. Isolation of Phophate solubilizing bacteria. 5. Differential blood staning of WBCs. 6. RPR (Rapid Plasma Reagin) Test. 7. Demonstration of Ammonification. 8. Demonstration of Nitrification. 9. Demonstration of Denitrification. 10. Determination –Separation of serum from blood sample. 11. Estimation citric acid fermentation. 12. Effect of copper on microbial growth. 13. Demonstration of alcohol fermentation. 14. Demonstration of Centrifugation. 15. Use of standard buffers caliberation and determination of pH of a given solution.	

	16. Qualitative analysis of biomolecules-Proteins ,Detection of Proteins by Biuret test,Acetic acid test 17. Qualitative analysis of Biomolecules- Carbohydrates , Test for reducing sugar and non reducing sugar. 18. Qualitative analysis of Biomolecules – Nucleic acids – DNA (diphenyl amine test) 19. Qualitative analysis of Biomolecules – Nucleic acid – RNA (Orcinol test) 20. Visit to related labs,hospitals and Institutes.	

Course outcomes:

Student will be able to.....

1) Perform isolation of different types of microorganisms.
2) Understand the qualitative analysis of Carbohydrates.
3) Perform Rapid Plasma Reagin test.
4) Able to perform qualitative analysis of Proteins and Nucleic acid.

Reference Books:

1. Jayaraman, J., and J. Jayaraman. *Laboratory manual in biochemistry*. Delhi, India: Wiley Eastern, 1981.
2. Plummer, David T. "Introduction to practical biochemistry." 1978.
3. Patel R.J., Patel K.R., Experimental Microbiology Vol.I , Aditya Publishers, 2003.
4. Patel R.J., Patel K.R., Experimental Microbiology Vol.II , Aditya publishers, 2003.
5. Arora B. and Arora D. R. (2020). Practical Microbiology. CBS Publishers and Distributors, New Delhi, India.
6. Dubey R. C. and Maheshwari D. K. Practical Microbiology. S. Chand and Company Limited, New Delhi, India. 2012.
7. Atlas R. M. Handbook of Microbiological Media. Ukraine: Taylor and Francis.
8. Patel R. Experimental Microbiology. Aditya BookCentre 5 th edition, Vol.I andVol.II,

Vocational skill course (VSC)

B.Sc II Semester III

BMiPVSC-1 Instrumentation in Microbiology-I

Course objectives:

Students should be able to.....

1. Know how to analyze and interpret biological signals.
2. Learn the proficiency in using bioinstrumentation tools and software.
3. Understand the competence in designing and testing bioinstrumentation systems.
4. Create awareness about critical thinking and problem-solving skills in bioinstrumentation applications.

Credits=2	B.Sc II Semester III **BMiPVSC-1 Instrumentation in Microbiology-I**	No. of hours (20)
	1. Study and observation of microscopic sample 2. Working and principle of colorimeter 3. Working and principle of UV visible spectrophotometer 4. Study of paper chromatography 5. Study and working of thin layer chromatography 6. Demonstration of gas chromatography 7. principal and working of centrifuge 8. study of paper electrophoresis 9. study of page electrophoresis 10. study of SDS page 11. Study of Agarose gel electrophoresis 12. Study and calibration of pH meter 13. Preparation of standard solutions- Molar and Normal 14. Study and working principle of laminar air flow cabinet 15. Preparation of buffer solutions 16. Instructions and handling of colony counter 17. Instruction and handling of shaker incubator 18. Isolation and enumeration of microorganisms from food sample 19. Isolation of microflora from human skin 20. Demonstration of ELISA test	

Course outcomes:

Student will be able to.....

1. Demonstrate proficiency in understanding bioinstrumentation systems for specific biomedical applications.
2. Analyze and interpret various results using appropriate bioinstrumentation techniques.
3. Evaluate the performance of bioinstrumentation devices through experimental testing and validation.
4. Demonstrate ELISA test

Reference Books:

1. Lacey, Alan J., ed. Light microscopy in biology: a practical approach. Vol. 195. OUP Oxford, 1999.
2. Wilson, Keith, and John M. Walker, eds. Practical biochemistry: principles and techniques. Cambridge University Press, 2000
3. Practical Biochemistry- David Plummer- Tata McGraw Hill
4. Nelson, David L. (David Lee), 1942-. Lehninger Principles of Biochemistry.

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Vocational skill course (VSC)
B.Sc II Semester II

BMiPVSC-1 Instrumentation in Microbiology-II

Course objectives:

Students should be able to.....

1. Understand the principles of bioinstrumentation,
2. Design and working of instrumentation systems
3. Learn the microbiological media preparation techniques
4. Study Chromatographic techniques.

Credits 2	B.Sc II Semester II BMiPVSC-2 **Instrumentation in Microbiology-II**	No.of hours (20)
	1. Demonstration of PCR 2. Demonstration of western blot 3. Demonstration of southern blot 4. Demonstration of northern blot 5. Maintain bacterial cultures in viable condition using agar slants 6. Maintain bacterial cultures in viable condition using oil overlay method 7. Plotting the graphs 8. Demonstration of HPLC 9. Efficacy testing of autoclave 10. Liquid media preparation- Nutrient broth 11. Solid media preparation- SDA plates 12. Preparation of agar slants 13. Cleaning and sterilization of glasswares 14. Care and maintainance of microscope 15. Aseptic techniques- culture transfer from solid to solid, solid to liquid, and liquid to liquid 16. Serial dilution technique 17. Calculation of PPB (parts per billion) 18. Calculation of PPM (parts per million) 19. Detection of blood sugar by glucometer 20. Preparation of standard solution.	

Course outcomes:

1. Demonstrate the principles of bio-instrumentation.
2. Illustrate the design and working of instrumentation systems.
3. Implement the microbiological media preparation techniques.

Reference Books:

1. Biophysical Chemistry- Upadhyay, Upadhyay and Nath-Himalaya
2. Instrumental Methods of Chemical Analysis- Chatwal Anand- Himalaya
1. Instrumental Methods of Chemical Analysis –B.K. Sharma-Goel
2. Physical Biochemistry-D. Friefilder

B.Sc. II Semester-III

BMiTCC-2 Village survey of health and hygiene Structure of NSS Course

Course Objectives:

Student will able to.....

1) Know the basic concepts of NSS.
2) Realize the importance of NSS in Life
3) Inculcate the awareness and preparation of basic of social important goals
4) Volunteer in spreading awareness regarding Health and Hygiene in public

Credits (TotalCredits-2)	Nameof the units	**No. of hours per unit/credits**
UNIT -I	**Introduction to Basic concept of NSS**	**(7)**
	1.1 Basic of NSS, The motto, Symbol, Badge, NSS song, aims and objective of NSS, 1.2 Classification of NSS programme. 1.3 Organisational structure, roles and responsibilities of various NSS functionaries.	
UNIT -II	**NSS Programmes and activities**	**(8)**
	2.1 NSS Regular activities in adopted villages, Slums and with Voluntary Organisations. 2.2. Contributions of Special Camping Programm, Planning and preparation of special camping programme. 2.3 Guidelines for the success of Camp.Importance of successful camping programme. Organization,	
UNIT -III	**Problems of Youth in India**	**(7)**
	3.1 Health –Adolescent heath problem, Nutrition related problems Anaemia in adolescents, Obesity and non communicable disease, Roots of Life style disease 3.2 Unemployment –Types, Causes, Consequences and Measures to solve unemployment problem 3.3 Addiction	

UNIT -IV	Health, Hygiene and Personal Hygiene	
	4.1 Health, Education-Definition of need and area 4.2 Healthy Lifestyle –Diet and Nutrition 4.3 Clean Drinking Water, Diseases caused by clean water, cleanliness 4.4 Home Medicine, First Aid, National Health Program Yoga is a tool for a healthy lifestyle	**(8)**

Course outcomes:

After completion of the course, students will be able to...

1. Explain the importance of National Service Scheme.
2. Participate in social activities like shramdan.
3. Works as a Volunteer in spreading awareness regarding health and Hygiene.
4. Motivate others to attend public health awareness programs.

Reference Books:

1. National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi. 2.University of Mumbai National Service Scheme Manual 2009.

3.Avhan Chancellor's Brigade – NSS Wing, Training camp on Disaster Preparedness Guidelines, March 2012

4. Rashtriya Seva Yojana Sankalpana – Prof. Dr. Sankay Chakane, Dr. Pramod\ Pabrekar, Diamond Publication, Pune

5.Javetz and Melnick: Adelbergs Medical Microbiology, 2019.

6.Duguid et al. Textbook of Medical microbiology Volume1,1978.

7.Mary-Jane Schneider Introduction to Public Health .Jones & Barlett, 4th Edn, 2014.

8.Gordon Edlin and EricGolanty Health & Wellness (10th Edn) Jones & Barlett Publisher