



M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune- 1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

S.Y.B.Sc. Microbiology

(Autonomy NEP 2023 Pattern)

Course/ Paper Title	Medical Microbiology I
Course Code	23SBMB31MM
Semester	III
No. of Credits	2

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To Understand the human anatomy, pathogens and various diseases associated with organ systems.
2.	To Acquire knowledge of principles underlying establishment of pathogens in human body.
3.	To Comprehend pathogenesis of specific pathogens causing microbial diseases.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be introduced to the anatomy and physiology of the various organ systems of the human body.
2.	Students will study the viral, fungal and protozoal pathogens and their pathogenesis.
3.	Students will acquire basic knowledge of commonly occurring diseases with respect to their epidemiology, prevention, and treatment.

23SBMB31MM: Medical Microbiology I Syllabus

[illegible]

	i. Respiratory Viruses: Influenza Virus, Corona Virus	1
	ii. Hemorrhagic Virus: Dengue	1
	iii. Hepatic Virus: Hepatitis A	1
	iv. Gastrointestinal Virus: Rotavirus	1
	v. Neurological Viruses: Japanese Encephalitis Virus	1
	vi. Oncogenic viruses	1
	b. Animal Viruses: FMD Virus	1
Unit 5	Study of following groups of yeast and fungal pathogens (With respect to – Morphological and cultural characteristics, Classification, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis, Prophylaxis and Chemotherapy)	
	a. <i>Aspergillus</i> species (Pathogenic)	1
	b. <i>Candida</i>	1
	c. Dermatophytoses	1

References:

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- Links:
1. <https://www.who.int/travel-advice/disease-information>
 2. <https://Microbenotes.Com/Remdesivir/#Mechanism-Of-Action-Of-Remdesivir>
 3. Aspergillus <https://www.cdc.gov/fungal/diseases/aspergillosis/index.html>



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NAAC accredited 'A' Grade

S.Y.B.Sc. (NEP-Autonomy 2023 Pattern)

Course Title: Bacterial Physiology and Genetics	Semester: III
Course Code: 23SBMB32MM	No. of Credits: 02
Nature of Course: Major	Total Teaching Hours: 30

Course Objectives

1.	To enrich students' knowledge and train them in Bacterial Physiology and Fermentation Technology.
2.	To make them learn different types of pathways in bacterial metabolism.
3.	To enlighten the students with the basics of Genetics. To familiarize students with the detailed Chemical Structure of DNA with its functioning.
4.	To introduce the concept of Central dogma and flow of genetic Information.
5.	To understand the basic concept of Mutations and its types.

Course Outcome

1.	Students will be acquainted with the different types of pathways in bacterial metabolism
2.	Students will learn diverse metabolic pathways followed by microorganisms for utilization of different substrates to run cell cycle
3.	Students will be conversant with the mechanism of Mutations and its types.
4.	Students will acquire basic knowledge of Central Dogma and flow of genetic information.

23SBMB32MM: Bacterial Physiology and Genetics

Sr.No.	Topic	No. of Lectures
Credit I	Bacterial Physiology	15
1	Enzymes	5
	i. Introduction to Enzymes: Properties of enzymes, Nature of active site, commonly occurring amino acids at active site.	1
	ii. Definitions of ribozymes, coenzymes, Apoenzymes, prosthetic group and cofactors.	1
	iii. Introduction to Nomenclature and classification as per IUB	1
	iv. Models for catalysis– a. Lock and key b. Induced fit c. Transition state	1
	v. Effect of pH and temperature, substrate concentration and enzyme concentration, activators and inhibitors of enzyme	1
Credit II	Bacterial Genetics Central Dogma and DNA as master molecule.	15
1.	Understanding hereditary molecule i. Griffith's experiment ii. Avery and MacLeod-McCarthy's experiment iii. Hershey and Chase experiment	3
2	Detailed structure of DNA i. Nucleosides and Nucleotides of DNA ii. Different forms of DNA (A, B, and Z) iii. Organization of prokaryotic genome in the cell.	3
3	Prokaryotic DNA replication i. Basic concept and mechanism of DNA replication ii. Enzymes, proteins and other factors involved in the replication of	3

	bacterial DNA. iii. Meselson and Stahl's experiment(semi conservative)	
4	Gene expression and Central Dogma i. Concept of Genetic code and transcription. ii. Concept of translation.	3
5	Mutations i. Concept of Mutation ii. Concept of spontaneous mutation& Isolation of mutants by Replica Plate technique. iii. Concept of Induced Mutations by mutagens iv. Types of mutations: Nonsense, Missense and Silent mutations, Base pair substitution (Transitions, Transversions), Insertions and deletions-Frame shift mutations	3

References:

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3. Conn E. E., Stumpf P. K., Bruening G., Doi R. Y. (1987). Outlines of Biochemistry. 5th Edition, John Wiley and Sons, New Delhi. (Unit I&II)
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S.Y.B.Sc. Microbiology

(Autonomy NEP 2023 Pattern)

Course/ Paper Title	Adrishya Krimi Shastra- An overview of Microbiology in Ancient India (IKS)
Course Code	23SBMB33MM
Semester	III
No. of Credits	2 (1Unit equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To introduce students to the ancient knowledge in Vedic literature
2.	Preserving and disseminating Indian Knowledge Systems for further research and societal application.
3.	To introduce to students' the study related to ancient diseases
4.	To study the Indian system of medicine, including Ayurveda, Yoga, Unani, Homeopathy, and Siddha
5.	To teach the students to Traditional Fermentation Technology

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be acquainted with the different areas of Microbiology from ancient India.
2.	Students will become aware of ancient Indian system of medicine
3.	Promote and enable further research to address the societal challenges faced today in several areas including holistic health, psychology, neuroscience, nature, environment, and sustainable development.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	History Of Medicine in India	15
A	Knowledge of Microbiology in Ancient Indian Literature <ol style="list-style-type: none"> i. ‘Sage scientist Kannva’ as the Father of Microbiology ii. Sukshmjeevanu in Vedas iii. Medical Microbiology- Incidence of raktaja krimi (dermatophytes) iv. Surgical instruments in Sushrut Samhita v. Indian Medicinal Plants: Preventive and therapeutic vi. Nutrition: Ancient and Modern vii. Microbiological Properties of Beejamrit 	6
B	Medical science in ancient Indian culture with special reference to Vedas <ol style="list-style-type: none"> i. Health and Disease: Concept of health and Disease ii. Classification of Diseases; sources and reservoirs, Disease Prevention and Control Measures iii. Concept of harmful foods: Modes of disease transmission iv. Health Related Behavior: Expression of Symptoms v. Mental health and morbidity vi. Medical Ethics 	9
Unit II	Fermentation technology and traditional Indian Fermented Products	15
A	Traditional Indian fermented foods and beverages <ol style="list-style-type: none"> i. Local fermented products and their Microbial flora ii. Health benefits of traditional fermented foods 	5
B	Concept of fermentation technology <ol style="list-style-type: none"> i. Microbial biomass- based fermentation (Biofertilizer, biopesticide and Probiotics) ii. Production of Primary metabolites (Organic acids, amino acids, vitamins and enzymes) iii. Production of Secondary metabolites (Antibiotics) iv. Production of recombinant products (insulin and 	5

	growth hormones) v. Production of Fermented food products (Cheese, yoghurt) ii. Microbial biotransformation (Steroid transformation)	
C	Strains of industrially important microorganisms i. Desirable characteristics of industrial strain ii. Principles and methods of primary and secondary screening iii. Master, working and seed culture; development of inoculum iv. Preservation and maintenance of industrial strains.	5

References:

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M K Rai 1, K K Shrivastava
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- Microbiological Properties of Beejamrit, an Ancient Indian Traditional Knowledge, Uncover a Dynamic Plant-Beneficial Microbial Network Shibasis Mukherjee Ramakrishna Mission Vivekananda University, and others
- Vedic Indians were Aware of the Microbial Biodiversity, Demanding 'Kannva' as the Father of Microbiology Sachidananda Padhye
- Mahdihassan, S.: 1981, ' Parisrut the earliest distilled Liquor of Vedic Times or of about 1500 BC', UHS, 16(2), 223-229.
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S.Y.B.Sc. (NEP– Autonomy 2023 Pattern)

Course Title: Practical: Bacterial Physiology and Genetics	Semester: III
Course Code: 23SBMB34MM	No. of Credits:02
Nature of Course: Major	Total Teaching Hours:60

Course Objectives

1.	To make students understand use of biochemical tests to identify microorganisms
2.	To make Students learn detection of DNA
3.	Students will learn the technique to isolate mutants

Course Outcome

1.	Students will learn to identify micro-organisms
2.	Students learn to detect DNA qualitatively
3.	Students will be able to isolate mutants

SYLLABUS

23SBMB34MM: Practical Bacterial Physiology and Genetics

Expt. No.	Topics	No. of Practicals
1.	Biochemical characterization of bacteria. 1.Sugar utilization test 2.Sugar fermentation test 3.IMViC test 4.Enzyme detection – Gelatinase, Catalase, Oxidase, Amylase, and Urease 5.Oxidative-fermentative test 6. Demonstration of Growth Curve of bacteria	11 1 1 2 5 1 1
2.	Detection of DNA by DPA method	01
3.	Study of bacterial mutations i. Induction of mutations by using physical mutagen (e.g. U V rays) ii. Isolation of antibiotic resistant mutants by Replica Plate Technique iii. Demonstration of UV survival curve	03 1 1 1
	TOTAL	15

References:

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2. Mahalingam B. L., Karuppan M. and Manickam V. (2013). Optimization of Minimal Salt Medium for Efficient Phenanthrene Biodegradation by Mycoplasma sp. MVMB2 Isolated from Petroleum Contaminated Soil Using Factorial Design Experiments. CLEAN - Soil, Air, Water. 41(1): 51–59. Wiley-VCH Verlag GmbH and Co. KGaA, Weinheim Experiment
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S.Y.B.Sc. (CBCS – Autonomy 2023 Pattern)

Under NEP 2020

Course Title: Field Project Related to Major	Semester: III
Course Code: 23SBMB3FP	No. of Credits: 02
Nature of Course: Field Project	Total Contact hours: 45 (15 + 30)

Course Objectives	
1	To introduce learning through tangible means like doing individual research and presenting it in a certain way
2	To develop cognitive abilities among students and making them sharper and more profound over time.
3	To expose students to the socio-economic issues in society so that the theoretical learnings can be supplemented by actual life experiences to generate solutions to real-life problems.

Course Outcome	
1	Students will learn to work on real-world challenges.
2	Holistic development of students through Interaction with local community, team work, literature survey, report writing and presentation.
3	Creating awareness about the socio economic issues in the society.

SYLLABUS

The field projects assigned to the students will be essentially epidemiological survey of various health related issues in the community in near vicinity of the college or residence of the student. This will help the student to develop a better understanding of the basic principles of epidemiology which will be introduced to them in the theory papers- Medical Microbiology I and Medical Microbiology II.

The students will learn to prepare questionnaire, interview people, collect data, assemble the data in required format, analyse it and draw conclusions. This will involve the supervision of faculty.

The student will gain practical knowledge with respect to the sources and reservoirs of infection, modes of disease transmission, methods of disease prevention and control and distribution of various diseases/disorders/disabilities among people in the society.

The distribution of contact hour will be as follows:

- 1) Guidance by faculty, planning for implementation and group discussions: 08 hours.
- 2) Field work in vicinity for data collection : 25 hours
- 3) Literature survey, referencing, preparation of report : 10 hours
- 4) Assessment and evaluation of student through presentations and report : 02 hours



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S.Y.B.Sc. Microbiology

(Autonomy NEP 2023 Pattern)

Course/ Paper Title	Medical Microbiology II
Course Code	23SBMB41MM
Semester	IV
No. of Credits	2

Aims & Objectives of the Course

Sr. No.	Objectives
1.	Gain Knowledge principles of chemotherapy of microbial diseases and development of drug resistance among pathogens and strategies to mitigate.
2.	To Acquire knowledge of principles underlying establishment of bacterial pathogens in human body.
3.	To Comprehend of pathogenesis of specific pathogens causing microbial diseases.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be introduced to the basic principles of chemotherapy and drug resistance.
2.	Students will study the mode of action of different classes of antibiotics and their use in treatment of diseases.
3.	Students will acquire basic knowledge of commonly occurring bacterial diseases with respect to their epidemiology, prevention, and treatment.

23SBMB41MM: Medical Microbiology II

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit 1	<p>Study of following groups of bacterial pathogens: (With respect to- Classification and Biochemical characters, Antigenic structure, Viability characteristics, Pathogenicity, Pathogenesis, Symptoms, Laboratory diagnosis, Epidemiology, Prophylaxis and Chemotherapy):</p> <p>a. <i>Salmonella</i>, <i>Vibrio</i>, <i>E.coli</i>, <i>Klebsiella</i>, <i>Proteus</i></p> <p>b. <i>Streptococcus spp.</i>, <i>Staphylococcus spp.</i>,</p> <p>c. <i>Neisseria meningitidis</i> and <i>Neisseria gonorrhoeae</i></p> <p>d. <i>Pseudomonas aeruginosa</i></p> <p>e. <i>Treponema</i>, <i>Leptospira</i></p> <p>f. <i>Clostridium tetani</i>, <i>Clostridium perfringens</i></p> <p>g. <i>Mycobacterium tuberculosis</i> and <i>Mycobacterium leprae</i></p> <p>h. <i>Rickettsia spp.</i></p>	<p>4</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>
Unit 2	<p>Chemotherapy</p> <p>1. Introduction : Selective toxicity, Bioavailability of Drug, MIC, MBC, LD-50 value, Antagonism and synergism in drugs</p> <p>2. Routes of drug administration.</p> <p>3. Mode of action of antimicrobial agents on:</p> <p>a. Bacteria:</p> <p>i. Cell wall: Beta lactams: 1st to 6th Generation- e.g. Carbapenems, Penicillins, Tazobactam</p> <p>ii. Cell membrane: Polymyxin</p> <p>iii. Protein synthesis: Streptomycin, Tetracycline</p> <p>iv. Nucleic acids: Fluroquinolones, Rifamycin</p> <p>v. Enzyme inhibitors: Trimethoprim, Sulfamethoxazole</p> <p>b. Fungi: Griseofulvin, Amphotericin B, Anidulafungin, Voriconazole</p> <p>c. Viruses: Acyclovir, Oseltamivir, Remdesivir</p> <p>d. Protozoa: Metronidazole, Chloroquine</p>	<p>1</p> <p>1</p> <p>5</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

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14. <https://Microbenotes.Com/Remdesivir/#Mechanism-Of-Action-Of-Remdesivir>



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S.Y.B.Sc. (NEP-Autonomy 2023 Pattern)

Course Title: Air, Water and Soil Microbiology	Semester: IV
Course Code: 23SBMB42MM	No. of Credits: 02
Nature of Course: Major	Total Teaching Hours: 30

Course Objectives	
1	To enrich students' knowledge and train them in understanding air, water and soil Microbiology
2	To make them learn different techniques to study air, water and from different environments like air, water and soil
3	To introduce the concept of harmful and beneficial microorganisms present in different environments like air, water and soil and their effect on our day to day life

Course Outcome	
1	Students will be acquainted with the air, water and soil Microbiology
2	Students will learn different techniques to cultivate micro-organisms from different environments like air, water and soil
3	Students will understand effect of Microorganisms present in air, water and soil in our day to day life

23SBMB42MM - Air, Water and Soil Microbiology

SYLLABUS

Sr.No	Air, Water and Soil Microbiology	[30]
Credit I	Air Microbiology and Water Microbiology	15
1	Air Microbiology	5
	i. Airflora <ul style="list-style-type: none"> • Transient nature of airflora • Droplet, droplet nuclei and aerosols 	1
	ii. Methods of Air sampling and types of air samplers <ul style="list-style-type: none"> • Impaction on solids • Impingement in liquid • Sedimentation • Centrifugation 	2
	iii. Air sanitation: Physical and chemical methods.	1
	iv. Air borne infections	1
2	Water Microbiology	10
	i. Types of water: surface, ground, stored, distilled, mineral and de-mineralized water	1
	ii. Water purification methods	2
	iii. Water borne Infections	1
	iv. Indicators of faecal pollution: <i>Escherichia coli</i> , <i>Bifidobacterium</i> , <i>Streptococcus faecalis</i> , <i>Clostridium perfringens</i> , New indicators: <i>Campylobacter</i> and <i>Pseudomonas</i>	3

	v. Bacteriological analysis of water for potability <ul style="list-style-type: none"> • Presumptive coliform count • Confirmed test • Completed test • Eijkman test • Membrane filter technique 	3
Credit II	Soil Microbiology	15
	i. Rhizosphere microflora and its role in the rhizosphere	1
	ii. Role of microorganisms in composting and humus formation	2
	iii. Biofertilizers: Bacterial, Cyanobacterial and their large-scale production	3
	iv. Bio control agents: Bacterial, Fungal and their large-scale production	3
	v. Brief account of microbial interactions: Symbiosis, Neutralism, Commensalism, Competition, Ammensalism, Synergism, Parasitism and Predation	4
	vi. Role of microorganisms in elemental cycles in nature: Carbon, Nitrogen	2

References:

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M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

S.Y.B.Sc. (NEP-Autonomy 2023 Pattern)

Course Title: Practicals based on Medical Microbiology	Semester: IV
Course Code: 23SBMB43MM	No. of Credits: 02
Nature of Course: Major	Total Teaching Hours: 60

Course Objectives	
1	To make students understand and train them for Isolation and identification of pathogens from Clinical samples
2	To introduce concept of Physical, Chemical and Microscopic examination of Clinical samples
3	To study the commonly occurring parasitic pathogens
4	To make students understand Isolation and identification of fungal pathogens from Clinical samples
5	To make them understand importance of multi drug resistance and antibiotic sensitivity

Course Outcome	
1	Students will learn Isolation and identification of pathogens from Clinical samples
2	Students will learn about the Physical, Chemical and Microscopic examination of Clinical samples
3	Students will learn about the commonly occurring parasitic pathogens
4	Students will learn Isolation and identification of fungal pathogens from Clinical samples

23SBMB43MM: Practical based on Medical Microbiology

SYLLABUS

Expt. No.	Topics	No. of Practicals
1.	Physical, Chemical and Microscopic examination of Clinical sample – Urine. Isolation, identification of following pathogens <i>E. coli</i> / <i>Klebsiella</i> species	4
2.	Physical and Microscopic examination of Clinical sample – Pus. Isolation, identification of following pathogens <i>Pseudomonas</i> spp. / <i>Staphylococcus</i> spp.	2
3.	Physical and Microscopic examination of Clinical sample – Stool. Isolation, identification of following pathogens <i>Salmonella</i> spp./ <i>Proteus</i>	2
4.	Microscopic study of following pathogens: a. <i>Entamoeba histolytica</i> b. Giardia c. <i>Plasmodium</i> spp. d. Dermatophytes	1
5.	Study and demonstration of differential and selective media with respect to pathogens.	2
6.	Isolation and identification of following yeast pathogens: <i>Candida albicans</i> / <i>Cryptococcus</i> spp. Slide Culture Technique	2
7.	Antibiotic sensitivity testing of the bacterial pathogens (for Gram negative and Gram Positive pathogens)	1
8.	Demonstration of Bacterial identification by Vitek 2 System Demonstration of Egg Inoculation Technique	1
	TOTAL	15

For Clinical microbiology practicals, use of keys/charts as well as Bergey's Manual is recommended

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S.Y.B.Sc. (NEP– Autonomy 2023 Pattern)

Course Title: Practical: Environmental Microbiology	Semester: III
Course Code: 23SBMB44MM	No. of Credits:02
Nature of Course: Major	Total Teaching Hours:60

Course Objectives

1	To make students learn the importance of air microflora
2	To make Students understand the methods for testing potability of water.
3	To make students aware with the beneficial effects of microorganisms in the field of soil Microbiology.

Course Outcome

1	Students will learn the importance of air micro flora and its diversity.
2	Students will understand the importance of testing potability of water samples.
3	Students will learn the beneficial effects of microorganisms in the field of soil Microbiology.

SYLLABUS

23SBMB44MM: Environmental Microbiology

Expt. No.	Topics	No. of Practicals
1.	Study of Air Microflora. i. Study of Simpson index of diversity ii. Determination of Air settling velocity	02
2.	Bacteriological analysis of water. i. Presumptive test, Confirmed and Completed test ii. Membrane filter technique (Demonstration)	04
3.	Soil Microbiology. i. Enrichment and Isolation of cellulose degrading microorganisms ii. Enrichment and Isolation of pollutant degrading microorganisms iii. Primary screening of industrially important organisms: Antibiotic producing microorganisms by crowded plate technique.	04
4.	Enrichment, Isolation, Preparation and Application of Bioinoculants, Checking BIS of Bioinoculants. i. <i>Azotobacter</i> species ii. <i>Rhizobium</i> species	05
	TOTAL	15

References:

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2. Cox C. C. and Wathes C. M. (2020). Bioaerosols Handbook. United States: CRC Press.
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S.Y.B.Sc. (CBCS – Autonomy 2023 Pattern)

Under NEP 2020

Course Title: Community Engagement Programme Related to Major	Semester: IV
Course Code: 23SBMB4CEP	No. of Credits: 02
Nature of Course: Community Engagement Programme	Total Contact hours: 45 (15 + 30)

Course Objectives	
1	To introduce learning through tangible means like doing individual research and presenting it in a certain way
2	To develop cognitive abilities among students and making them sharper and more profound over time.
3	To expose students to the socio-economic issues in society so that the theoretical learnings can be supplemented by actual life experiences to generate solutions to real-life problems.

Course Outcome	
1	Students will learn to work on real-world challenges.
2	Holistic development of students through Interaction with local community, team work, literature survey, report writing and presentation.
3	Creating awareness about the socio economic issues in the society .

SYLLABUS

The **Community Engagement Programme** assigned to the students will be essentially survey of various health related issues in the community in near vicinity of the college or residence of the student. This will help the student to develop a better understanding of the health related issues with respect to blood group determination and drinking water quality.

The students will learn to prepare questionnaire, interview people, collect samples, analyse the samples, assemble the data in required format, analyse it with laboratory work and draw conclusions. This will involve the supervision of faculty.

The student will gain practical knowledge with respect to blood group determination and checking quality of water.

The distribution of contact hour will be as follows:

- 1) Guidance by faculty, planning for implementation and group discussions: 08 hours.
- 2) Community Engagement : 25 hours
- 3) Literature survey, referencing, preparation of report : 10 hours
- 4) Assessment and evaluation of student through presentations and report : 02 hours