SANDIP UNIVERSITY

School of Science
B.Sc. Microbiology

Year: First Year **Semester: II**

Course: Basic Techniques in Microbiology **Course Code: XMI201**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
4	0	-	4	10	20	10	10	-	50	-	100
Max. Time, End Semester Exam (Theory) - 3Hrs.											

Prerequisite	Basic knowledge about Microbiology.

Objectives	
1	Descriptive study of Microscopy and principle of microscopic staining techniques
2	To study the importance of sterilization and disinfection in microbiological studies.
3	To establish the skills for microbial cell cultivation and theoretical studies of bacterial growth.

Unit Number	Details	Hours
1	**Microscopy** : 1.1. Structure, working of and ray diagram, concepts of magnification, numerical aperture and resolving power. 1.2.Types, ray diagram and functions of – condenser, eye-pieces and objectives Aberration of lenses - spherical, chromatic, comma and astigmatism 1.3.Principles, construction, working and applications of: Dark field microscopy, Fluorescence microscopy, Phase Contrast microscopy, Transmission Electron Microscope and Scanning Electron Microscope	**12 L**
2	**Staining Techniques** 2.1. Definitions: Stain(Basic and Acidic), Fixative, Mordant, Decoloriser, Accentuator 2.2. Principles of staining techniques for following:: – Monochrome staining and Negative staining 2.3. Differential staining - Gram staining and Acid fast staining 2.4. Special staining techniques – Spore, Acid fast, Spirochete, Capsule	**12 L**
3	**Sterilization and Disinfection** 3.1. Physical Agents - Heat, Radiation, Filtration 3.2. Chemical agents and their mode of action - Aldehydes, Halogens, Quaternary ammonium compounds, Phenol and phenolic compounds, Heavy metals, Alcohol, Dyes, and Detergents, Ethylene oxide. 3.3.Characteristics of an ideal disinfectant	**12 L**
4	**Cultivation of Microorganisms** 4.1. Introduction to concept of pure culture and methods for pure culture Nutritional requirements and nutritional classification 4.2. Design and preparation of media – Ingredients of media and types of media. Techniques of enrichment.	**12 L**

	4.3. Methods of cultivating protozoa, photosynthetic organisms, extremophiles, chemolithotrophs. 4.4. Isolation and maintenance of bacterial and fungal cultures.Culture collections and their role.	
5	**Bacterial Growth** 5.1. Growth Kinetics and growth curve;definitions of Generation time, Growth rate, specific growth rate. 5.2. Methods of enumeration -Microscopic methods; Plate counts; Biomass; Chemical methods; Optical density 5.4. Continuous culture – Chemostat and Turbidostat models. 5.4. Diauxic growth and Synchronous culture	**12 L**
	Total	**60 L**

Course Outcome	
Students should able to	
CO1	Students will aware about the Microscopy and principle of microscopic staining techniques
CO2	Students will understand the importance of sterilization and disinfection in microbiological studies.
CO3	Students will establish the skills for microbial cell cultivation and therotical studies of bacterial growth.

	Resources
Recommended Books	1. Prescott L.M., Harley J.P., AND Klein D.A. (2005). Microbiology, 6th Edition. MacGraw Hill Companies Inc. 2. Salle A.J. (1971) Fundamental Principles of Bacteriology. 7th Edition. Tata MacGraw Publishing Co. 3. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology, 5th Edition. Macmillan Press Ltd. 4. Wilson K. and Walker J.M. (2005) Principles and Techniques of Biochemistry and Molecular Biology. 6th Edition. Cambridge University Press. 5. Ingraham J. L. and Ingraham C.A. (2004). Introduction to Microbiology. 3nd Edition. Thomson Brooks / Cole. 6. Madigan M.T., Martinko J.M. (2006). Brock's Biology of Microorganisms. 11th Edition. Pearson Education Inc. 7. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: An Introduction. 8th Edition. Pearson Education Inc.

School of Science
B.Sc. Microbiology

Year: First Year **Semester: II**

Course: Basic Techniques In Microbiology Laboratory **Course Code: XMI211**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
0	0	2	1	-	-	-	-	25	-	25	50
Max. Time, End Semester Exam (Theory) - 3Hrs.											

Prerequisite	Basic knowledge about microbiology

Objectives	
1	To study the micro flora from natural source.
2	Impart the knowledge of microbial growth cultivation, prevention and control.
3	To execute the study of growth and enumeration of fungal family.

Unit Number	Details
1	Study of normal flora of the skin and saliva (Spirochetes staining)
2	Isolation and staining extremophiles.
3	Effect of time, temperature and pH on the growth of bacteria.
4	Effect of UV rays and desication for control of microorganims.
5	Methods for controlling microbial growth- Phenolics and dye (disk method), surfactant, and oligodynamic action of heavy metals.
6	Cultivation of yeast and fungus on Sabourauds medium using shaker and static condition followed by fungal wet mount.
7	Membrane filteration of water sample and enumeration of coliform using differential medium and confirmation by biochemical (IMViC test)
8	Study of growth curve and use of absorbance measurement for bacterial culture and calculation.

Term Work:

Term Work assessment shall be conducted for the Project, Tutorials and Seminar. Term work is continuous assessment based on Attendance, Good Laboratory Practice (GLP), Timely Completion, Journal/Record book and Oral. It should be assessed by subject teacher of the institute. At the end of the semester, the final grade for a Term Work shall be assigned based on the performance of the student and is to be submitted to the University.

Notes	
1	The regular attendance of the students during semester for practical course will be monitored and marks will be given accordingly (05 Marks)
2	Good Laboratory Practices (05 Marks)
3	Timely Completion (05 Marks)
4	Journal / Record Book (05 Marks)
5	Oral / Viva (05 Marks)
Practical/Oral/Presentation:	
Practical/Oral/Presentation shall be conducted and assessed jointly by at least a pair of examiners appointed as internal and external examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.	

Notes	
1	One experiment from the regular practical syllabus will be conducted (20 Marks).
2	Oral/Viva-voce (05 Marks).

SANDIP UNIVERSITY

School of Science
B.Sc. Microbiology

Year: First Year **Semester: II**

Course: Plant Diversity **Course Code: XBO201**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Theory**	**Lab**	
4	0	-	4	10	20	10	10	-	50	-	100
Max. Time, End Semester Exam (Theory) - 3Hrs.											

Prerequisite	Student should have the basic knowledge of Plant Kingdom.

Objectives	
1	To study the Plant diversity.
2	To study the Algal diversity and lichen diversity.
3	To study Fungal and Bryophyte diversity.
4	To study the life cycle pattern Pteridophytes and Gymnosperms diversity.

Unit Number	Details	Hours
1	**Introduction of Plant diversity –** Concept, Plant kingdom- Cryptogams and Phanerogams**,** diversity in plant kingdom – habit, habitat**,** Position of plants in five kingdom system. **Algal diversity** 1. General characters of Algae 2. Classification of Algae (As per F.E.Fritsch,1935) 3. Systematic position, occurrence, thallus structure, vegetative reproduction, asexual reproduction, sexual reproduction and graphic life cycle with alternation of generation of the following Algal types *Chara* or *Sargassum*. 4.Economic importance of Algae (Food, fodder and medicinal)	**12 L**
2	**Lichen Diversity:** Thallus, Types, Reproduction, and Economic importance of Lichen. **Fungal diversity:** Systematic position, occurrence, structure of mycelium, asexual reproduction, sexual reproduction and graphic life cycle of following fungal types Basidiomycotina – *Agaricus*; Deuteromycotina – *Cercospora* (Tikka disease of groundnut) Role of fungi in Mushroom cultivation and fermentation industries (Bakery and Brewery)	**12 L**
3	**Bryophyte diversity-** 1. General characters of Bryophytes 2. Classification of Bryophytes (As per N.S.Parihar) 3. Systematic position, occurrence, thallus structure (external and internal),	**12 L**

	vegetative reproduction, asexual reproduction, sexual reproduction and graphic life cycle with alternation of generation. 4. Economic importance of Bryophytes.	
4	**Pteridophyte diversity** General characters of Pteridophytes Classification of Pteridophytes Sporophyte, Gametophyte and Reproduction, Life cycle pattern Stelar evolution.	**12 L**
5	**Gymnosperm diversity** Sporophyte, Gametophyte, Reproduction and wood structure, Life cycle pattern in Gymnosperms Affinities with Pteridophytes and Angiosperms. Economic importance.	**12 L**
	Total	**60 L**

Course Outcome	
Students should able to	
CO1	Students will understand the Plant diversity among plants.
CO2	Students will understand the Algal diversity and lichen diversity and their applications.
CO3	Students will understand the fungal and Bryophyte diversity and their applications.
CO4	Students will understand life cycle pattern Pteridophytes and Gymnosperms diversity as well as economic importance.

	Resources
Recommended Books	**1.** Textbook of Biodiversity-K V Krishnamurthy, Science Publisher 2. Vashistha B. R. et al., Botany for degree students-Algae 3. Das, Datta and Gangulee-College Botany Vol I 4. Sharma, O.P. -Algae 5. Vashishta B.R. et al., Botany for degree students- Fungi 6. Sharma, P.D.-The Fungi 7. Sharma, O.P.-Fungi 8. Chopra G.L. and Yadav D.L. A Text book of Bryophytes.
Reference Books	1. Text book of Fungi. Tata McGrawHill Pub. Com. New Delhi Sharma, P.D. 1998 2. A text book of Algae. Tata Mc.GowHill, New Delhi. Smith, G.M. (1950). 3. Introduction of Bryophytes, Vashista 4. Botany: Plant Diversity, R. Moore, D. Clark , Kingsley R. Stern

SANDIP UNIVERSITY

School of Science
B.Sc. Microbiology

Year: First Year **Semester: II**
Course: Plant Diversity Laboratory **Course Code: XBO211**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Theory**	**Lab**	
0	0	2	1	-	-	-	-	25	-	25	50
Max. Time, End Semester Exam (Practical) – 2 Hrs.											

Objectives	
1	To understand the Algal diversity
2	To study Fungi and Lichen with example.
3	To study the Bryophytes and Pteridophytes with example
4	To understand the Gymnosperm diversity.

Sr. No.	Description
1	Study of thallus diversity in Algae : *Chara, Sargassum*, *Chlorella, Volvox, Hydrodictyon, Ulva, Batrchospermum* (Any-1)
2	Study of thallus diversity in fungi :Mushroom, *Phytopthora, Mucor Agaricus Aspergillus Yeast* (Any-1)
3	Study of Lichen diversity : Crustose, Foliose, Fruticose
4	Study of Bryophyte diversity : *Riccia, Anthoceros, Funaria* (Any-1)
5	Study of Pteridophyte diversity (Sporophytes) : *Psilotum, Selaginella, Equisetum, Nephrolepis* (Any-1)
6	Study of Gymnosperm diversity (Sporophyte) : *Cycas, Pinus, Gnetum* account of vegetative and reproductive diversity. (Any-1)
7	Visit to Mushroom Cultivation Industry
8	Visit to plant protection laboratory / plant disease clinic/ Agri. clinic/ Bio control laboratory

Term Work:
Term Work assessment shall be conducted for the Project, Tutorials and Seminar. Term work is continuous assessment based on attendance, good laboratory practice (GPL), timely completion, journal/record book, oral/viva, respectively. It should be assessed by course teacher of the institute. At the end of the semester, the final grade for a Term Work shall be assigned based on the performance of the student and is to be submitted to the University.

Notes	
1	The regular attendance of the students during semester for practical course will be monitored and marks will be given accordingly (05 Marks).
2	Good Laboratory Practices (05 Marks)
3	Timely Completion (05 Marks)
4	Journal / Record Book (05 Marks)
5	Oral / Viva (05 Marks)
Practical/Oral/Presentation:	
Practical/Oral/Presentation shall be conducted and assessed jointly by at least a pair of examiners appointed as internal and external examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.	

Notes	
1	One experiment from the regular practical syllabus will be conducted (20 Marks).
2	Oral/Viva-voce (05 Marks).

School: Science	Programme: Bachelor of Science (B.Sc.)
Year : First Year	**Semester -II**
Course: Physical and Analytical Chemistry I	**Course Code:XCH201**
Theory: 4 Hrs/Week	**Max. University Theory Examination:50 Marks**
Max. Time for Theory Exam.: 3 Hrs	**Continuous Internal Assessment: 50 Marks**

Course Objectives	
1	To teach fundamental concepts of Physical Chemistry, Analytical Chemistry and their Applications
2	To understand the definition of Logarithms, rules of logarithms and problem based on logarithms
3	To teach differentiation and integration and problems based on differentiation and integration
4	Explain ideal and non-ideal behavior of gas
5	To learn atomic structure

Unit Number	Details	Hours
1	**Chemical Mathematics** **Logarithm**:- Rules of logarithm, Characteristic and mantissa, Change of sign and base, Problems based on pH and pOH. **Graphical representation of equations**: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems. **Derivative**:- Rules of differentiation and partial differentiation, Algebraic, logarithmic and exponential functions and problems. **Integration**:- Rules of integration, Algebraic and exponential functions and problems.	**10**
2	**Gaseous and Liquid State** Ideal and non- ideal gases, deviation of gases from ideal behavior, compressibility factor (Z), van der Waal's equation of state and its application to explain deviation of gases. 2.2 Critical constant of gas in terms of van der Waal's constant, Experimental determination of Pc, Tc and Vc, Reduced equation of state, Law of corresponding state. Measurable physical properties of liquid such	**10**

	as vapour pressure, Surface tension and viscosity and their experimental determination (One method of each)	
3	**A. Chemical Thermodynamics** Second law of thermodynamics, Carnot cycle, mechanical efficiency, Entropy changes for system and surroundings for reversible and irreversible processes, Entropy changes for an ideal gas in isothermal, isobaric and isochoric changes, Entropy Changes in chemical reactions. Entropy changes accompanying fusion. **B. Colloids** Preparation, purification, Optical properties, Tyndall effect, shape and size, stability, solvation, interaction between, colloids, solution, emulsions and gels.	**10**
4	**A. Introduction to Analytical Chemistry** Introduction, Chemical analysis, applications of chemical analysis, sampling, types of analysis, Common techniques, Instrumental methods, other techniques, factors affecting on choice of method. **B. Errors in Quantitative Analysis** Introduction, Error, Accuracy, precision, methods of expressing accuracy and precision, classification of errors, significant figures and computations, distribution of random errors, mean and standard deviations, reliability of results, Numericals. **C. Inorganic Qualitative Analysis** Basic principle, common ion effect, solubility, solubility product, preparation of original solution, classification of basic radicals in groups, separation of basic radicals, removal of interfering anions (phosphate and borate), detection of acid radicals.	**10**
5	**Analysis of Organic Compounds** **Qualitative Analysis**:- Types of organic compounds, Characteristic tests and classifications, reactions of different functional groups, analysis of binary mixtures. **Quantitative Analysis**:–estimation of C, H, (O) by combustion tube, detection of nitrogen, sulfur, halogen and phosphorous by Lassigen's test. Estimation of nitrogen by Dumas's Kjeldahl's method, estimation of halogen, sulphur and phosphate by Carious method. Determination of empirical and molecular formula, numerical problems.	**10**
	Total	**50**

Course Outcomes	
1	Student able to explain fundamental concepts of Physical Chemistry, Analytical Chemistry and their Applications
2	To understand t Student able to explain he definition of Logarithms, rules of logarithms and problem based on logarithms
3	Student able to explain differentiation and integration and problems based on differentiation and integration
4	Student able to explain ideal and non-ideal behavior of gas
5	Student able to explain to learn atomic structure

Resources	
Reference Books	1. Mathematical preparation for Physical Chemistry by F. Daniel, Mc. Graw Hill publication. 2. University General Chemistry by C. N. R. Rao, Mc. Millan Publication. 3. Principles of Physical Chemistry by Maron and Pruton, Oxford and IBH publication, 4th edition. 4. Physical Chemistry by G.M. Barrow. 5. Physical Chemistry by W.J. Moore, 5th edition, 6. Physical Chemistry by P.W. Atkin, 4th edition. 7. Physical Chemistry by D. Alberty 3rd edition. 8. Analytical Chemistry by G.D. Christian, 6th edition. 9. Vogel's textbook of Quantitative Analysis by J. Mendham, R.C. Denney, J.D. Barnes and MJK Thomas, 6th edition.

School: Science	Programme: Bachelor of Science (B.Sc.)
Year: First Year	Semester - II
Course: Physical and Analytical Chemistry Laboratory I	Course Code: XCH211
Practical: UG - 4 Hrs/Batch (20 Students)	Practical Examination: 25 Marks
	Term Work: 25 Marks

Course Objectives	
1	To study different analysis techniques
2	To perform volumetric titrations
3	To determine viscosity of liquids

Sr. No.	Description
1	Determination of molecular weight of given volatile organic liquid by using ideal gas equation.
2	Determination of Viscosity of liquid by Oswald's viscometer.
3	Determination of viscosity of two pure liquids **A** and **B** hence find the composition of the two liquids.
4	To determine the surface tension of a given liquid by capillary rises method.
5	Estimation of sodium carbonate content of washing soda.
6	Determination of Ca in presence of Mg using EDTA.
7	Preparation of standard 0.05N Oxalic acid solution and standardization of approx. 0.05 N $KMnO_4$ solutions.
8	Determination of the strength of given H_2O_2 solution with standard 0.05 N $KMnO_4$ solutions.

Term Work:
Term Work assessment shall be conducted for the Project, Tutorials and Seminar. Term work is continuous assessment based on work done, submission of work in the form of report/journal, timely completion, attendance, and understanding. It should be assessed by subject teacher of the institute. At the end of the semester, the final grade for a Term Work shall be assigned based on the performance of the student and is to be submitted to the University.

Course Outcomes	
1	Student will learn chemical analysis techniques
2	Student will able to perform volumetric titrations to determine concentration of unknown species
3	Student will able to determine viscosity of liquids

Notes	
1	The experiments from the regular practical syllabus will be performed (15 Marks).
2	The regular attendance of students during the syllabus practical course will be monitored and marks will be given accordingly (5 Marks).
3	Good Laboratory Practices (5 Marks)

Practical/Oral/Presentation:

Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.

Notes	
1	One experiment from the regular practical syllabus will be conducted. (Total 15 Marks).
2	Complete laboratory journal/records (05 Marks).
3	Viva-voce (05 Marks).