

<b>INSTITUTE</b>	<b>FACULTY OF SCIENCE</b>
<b>PROGRAM</b>	<b>BACHELOR OF SCIENCE (CHEMISTRY)</b>
<b>SEMESTER</b>	<b>4</b>
<b>COURSE TITLE</b>	<b>LABORATORY - IV</b>
<b>COURSE CODE</b>	<b>02CY0255</b>
<b>COURSE CREDITS</b>	<b>3</b>

**Objective:**

- 1 To equip students with the necessary skills to conduct experiments, analyse data, and interpret results accurately and to demonstrate the practical application of theory covered within the scope of the Chemistry and allied subject like Microbiology or Physics.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 In order to maintain a safe working environment, students will follow safety protocols and procedures, recognizing potential dangers, reducing risks, and reacting appropriately to crises.
- 2 Students will be able to learn and develop different practical skills in Chemistry, Biology or Physics.
- 3 Students will use the theoretical knowledge they have learned in lectures to plan experiments, evaluate information, and make decisions in a lab setting.

**Pre-requisite of course:** Students having a background in the science stream with a focus on chemistry, physics, or biology.

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
0	0	6	0	0	0	50	50
<b>Contents : Unit</b>	<b>Topics</b>						<b>Contact Hours</b>
<b>Total Hours</b>							

**Suggested List of Experiments:**

Contents : Unit	Topics	Contact Hours
1	<b>Chemistry Experiments</b> 1. Qualitative analysis of given unknown organic compound. [Bifunctional, compound, 1] 2. Qualitative analysis of given unknown organic compound. [Bifunctional, compound, 2] 3. Qualitative analysis of given unknown organic compound. [Bifunctional, compound, 3] 4. Qualitative analysis of given unknown organic compound. [Bifunctional, compound, 4] 5. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 1] 6. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 2] 7. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 3] 8. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 4]. 9. To determine the amount of Ester in the given solution. 10. To determine the amount of Glucose in the given solution. 11. To determine the amount of –CONH <sub>2</sub> in the given Acetamide solution. 12. To determine the amount of –COOH in the given carboxylic acid. 13. To determine the amount of Ni as Ni (DMG) <sub>2</sub> gravimetrically from the acidic solution of NiSO <sub>4</sub> .7H <sub>2</sub> O. 14. To determine gravimetrically, the amount of Ba present as BaSO <sub>4</sub> in the acidic solution of barium chloride (BaCl <sub>2</sub> .2H <sub>2</sub> O). 15. To determine the amount of Al as Al <sub>2</sub> O <sub>3</sub> from the solution of Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> .18H <sub>2</sub> O and free sulphuric acid.	20
2	<b>Environmental Microbiology Experiments</b> 1. To study sampling techniques and preservation methods. 2. Isolation of symbiotic nitrogen fixing bacteria. 3. Isolation of non-symbiotic nitrogen fixers (Azotobacter sp.) from soil. 4. To perform Standard Plate Count (SPC) of soil sample by serial dilution technique. 5. Bacteriological analysis of water: To perform presumptive test for sewage water. 6. Determination of Total Solids (TS), Total Dissolved Solids (TDS) and total Suspended Solids (TSS) of water sample. 7. To measure of hardness of water sample. 8. To measure chloride content of water sample. 9. To measure Dissolved Oxygen of water sample. 10. To measure Biochemical Oxygen Demand (BOD) of water.	20

### Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	<b>Wave Dynamics &amp; Crystal Structure Experiments</b> 1. To determine the wavelength of given sodium light source using plane transmission grating. 2. To study of polarization of light by reflection and thus verify Brewster law. 3. To determine the restoring force per unit extension of a spiral spring (Spring Constant) by stastical and dynamical method. 4. To study the dead time of GM Counter 5. To measure the speed of sound using Resonance tube. 6. To find the value of bending stress and young's modulus of elasticity of the material of cantilever beam and carrying a concentrated load at the end. 7. To determine frequency of A.C. Mains using Sonometer. 8. To study the variation of light intensity with distance from source. 9. To determine of surface tension of liquid (water) by capillary tube using travelling microscope. 10. To determine of resistivity and band gap of semiconductor by four probe method at different temperature. (V. Lab)	20
<b>Total Hours</b>		<b>60</b>

### Textbook :

- 1 Vogel's Textbook of Practical Organic Chemistry, A.I. Vogel, A.R. Tatchell, Prentice Hall, 1989
- 2 Textbook of quantitative chemical analysis, G. H. Jeffery J. Bassett J. Mendham R C. Denney, John Wiley & Sons, 1989
- 3 Experimental Physical Chemistry: A Laboratory Textbook, Arthur Halpern and George McBane, W.H. Freeman & Co Ltd, 2006
- 4 An Advanced Course in Practical Chemistry, A. K. Nad, B. Mahapatra and A. Ghoshal, New Central Book Agency (P) Ltd, 2022

### References:

- 1 Vogel's Qualitative Inorganic Analysis (7th Edition), Vogel's Qualitative Inorganic Analysis (7th Edition), G. Svehla, Dorling Kindersley (India) Pvt. Ltd, 2009
- 2 Practical in Physical Chemistry, Practical in Physical Chemistry, P S Sindhu, Macmillan, 2005
- 3 Environmental microbiology : a laboratory manual, Environmental microbiology : a laboratory manual, I.L. Pepper, C.P. Gerba ; photography and technical editor, K.L. Josephson, Amsterdam ; Boston : Elsevier Academic Press, 2005
- 4 Manual of Environmental Microbiology, Manual of Environmental Microbiology, Robert V. Miller, Marylynn V. Yates, Cindy H. Nakatsu, and Suresh D. Pillai , ASM Press, 2016
- 5 Engineering Physics Laboratory Manual, Engineering Physics Laboratory Manual, Jayaraman , Pearson Education India, 2013

### Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

## Distribution of Theory for course delivery and evaluation

<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
20.00	30.00	25.00	15.00	10.00	0.00

**Instructional Method:**

- 1 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 2 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.
- 3 Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
- 4 All students in the laboratory must wear lab coats during lab session.
- 5 During practical and experimental section student must wear shoes to avoid accidents cause by spilling or rush handling of acidic chemicals (Especially during inorganic estimation experiments).

**Supplementary Resources:**

- 1 <http://ocw.mit.edu/courses/chemistry/>
- 2 <https://www.youtube.com/watch?v=FUo428guKt0>
- 3 <https://www.youtube.com/watch?v=qPjGbrd4nJw>
- 4 <https://www.youtube.com/watch?v=3WvrzQceIso>
- 5 <https://www.youtube.com/watch?v=oqSGrRzd0mI>
- 6 <https://www.youtube.com/watch?v=4UH9ciVrCes>
- 7 <https://www.youtube.com/watch?v=0nKiVn1jcqg>
- 8 <https://www.youtube.com/watch?v=zo8-LToVuFk>
- 9 <https://www.youtube.com/@sdchemistryacademy-b.sc.526>