INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**BACHELOR OF SCIENCE (CHEMISTRY)**
SEMESTER	**2**
COURSE TITLE	**LABORATORY - II**
COURSE CODE	**02CY0155**
COURSE CREDITS	**3**

Objective:

1 To provide students practical awareness and both quantitative and qualitative methodologies in order to enhance their understanding and problem-solving abilities.

2 To practice the theoretical concepts students have learned and to comprehend how chemistry, physics, and biology use these ideas.

3 To develop and inculcate the various laboratory skills and techniques.

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

1 Handling, safety and precautionary used of chemicals and instruments in the laboratory.

2 Students will learn and apply basic techniques used in the field of chemistry, physics and biology.

3 Experimental skills will be developed within students and able to analyse, interpret and record the experimental data.

Pre-requisite of course:N/A

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	6	0	0	0	50	50

Contents : Unit	Topics	Contact Hours
Total Hours		

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Chemistry Experiments** 1) To perform qualitative test for given known inorganic compound (Inorganic compound-1). 2) To perform qualitative test for given known inorganic compound (Inorganic compound-2). 3) To perform qualitative test for given known inorganic compound (Inorganic compound-3). 4) To perform qualitative test for given known organic compound (Mono functional organic compound-1) 5) To perform qualitative test for given known organic compound (Mono functional organic compound-2) 6) To crystallise the pure compound from an impure sample of copper sulphate. 7) To crystallise the pure compound from an impure sample of benzoic acid. 8) To determine total dissolved solids and total suspended solids in the given water sample. 9) To estimate total hardness of the given water sample. 10) Estimation of alkalinity of the given water sample. 11) To determine concentration of HCl with the help of known concentration of NaOH by conductometry. 12) To determine concentration and dissociation constant of CH3COOH with the help of known concentration of NaOH by conductometry. 13) To determine concentration of HCl with the help of known concentration of NaOH by pH meter. 14) To determine concentration and dissociation constant of CH3COOH with the help of known concentration of NaOH by pH meter. 15) To determine concentration of each component in the given mixture of HCl and CH3COOH with the help of known concentration of NaOH by pH meter.	20
2	**Cell Biology Experiments** 1) Taxonomic study of plants- TS and LS study. 2) Nucleus staining. 3) Flagella staining. 4) Demonstration of Mitosis from onion root. 5) Buccal smear/Barr body identification. 6) Permanent slide preparation. 7) Permanent slide observation. 8) Isolation of mitochondria. 9) Cultivation and microscopic observation of fungi. 10) Cultivation and microscopic observation of Yeast.	20

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	**Mechanics and Thermodynamics Experiments** 1) To determine the Young's modulus of the material of given beam supported on two knife edges and loaded at the middle point. 2) To determination of surface tension of liquid (water) by capillary tube using travelling microscope. 3) To determine g, the acceleration of gravity at a particular location. (kater's Pendulum) 4) To Verify the truth table of the Half adder & Full Subtractor. 5) To find the values of bending stresses and young's modulus of elasticity of the material of a cantilever beam and carrying a concentrated load at the end. 6) To study the V-I Characteristics of a Light emitting diode (LED). 7) To study the variation of light intensity with distance from source. 8) To study the relationship between the temperature of a hot body and it's time of cooling by plotting a cooling curve. (Newton's cooling law) 9) To find out fill factor of given a Solar cell. 10) To measure the speed of sound using Resonance tube. 11) To determine the wavelength of the given sodium light source using plane transmission grating.	20
Total Hours		**60**

Textbook :

1 An Advanced Course in Practical Chemistry, A. K. Nad, B. Mahapatra, A. Ghoshal, New Central Book Agency (P) Ltd. , 2014

2 Experimental Physical Chemistry: A Laboratory Textbook, A. Halpern, G. McBane, W H Freeman & Co. , 2006

3 Advanced Practical Physics for students, B.L. Flint, H.T. Worsnop, Asia Publishing House, 1971

4 A text book in Electrical Technology, B.L. Theraja, S. Chand & Co. , 2008

5 A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, Vani Publication, 1985

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 Handbook of Water Analysis (3rd Edition), Handbook of Water Analysis (3rd Edition), L.M.L. Nollet, L.S.P. Gelder, CRC Press, 2013

3 Fundamentals of analytical chemistry (9th Edition), Fundamentals of analytical chemistry (9th Edition), D.A. Skoog, Cengage, 2021

4 Cell Biology, Genetic, Molecular biology, Evolution and Ecology, Cell Biology, Genetic, Molecular biology, Evolution and Ecology, P.S. Verma, V.K. Agarwal, S. Chand and company, 2005

5 Becker's World of the cell, Becker's World of the cell, J. Hardin, G.P. Bertoni, Pearson Education, 2015

6 Molecular Biology of the Cell, 5th Edition, Molecular Biology of the Cell, 5th Edition, Bruce Albert, Garland Science, 2008

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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					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking**

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.
5. Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
6. All students in the laboratory must wear lab coats during lab session.
7. 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://www.nptel.ac.in/courses/104103069/#
2. https://chemcollective.org/vlabs
3. http://ocw.mit.edu/courses/chemistry
4. https://vlab.amrita.edu/?sub=2
5. https://www.youtube.com/user/TMPChem
6. https://www.youtube.com/channel/UCqk-dmk3AOFtikaFDpsZorg
7. https://www.youtube.com/watch?v=2iqUB_N-uzw
8. https://vlab.amrita.edu/index.php?sub=2&brch=193
9. https://www.youtube.com/watch?v=ITv9cRbuF9Y
10. https://www.youtube.com/watch?v=EcPriPnjnDw
11. https://vlab.amrita.edu/?sub=3&brch=187&sim=327&cnt=2
12. https://vlab.amrita.edu/?sub=3&brch=187&sim=878&cnt=1
13. http://cbi-au.vlabs.ac.in/cell-biology-1/Basics_of_Plant_Tissue_Culture/
14. https://vlab.amrita.edu/?sub=1

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