

<b>INSTITUTE</b>	<b>FACULTY OF SCIENCE</b>
<b>PROGRAM</b>	<b>BACHELOR OF SCIENCE (MICROBIOLOGY)</b>
<b>SEMESTER</b>	<b>2</b>
<b>COURSE TITLE</b>	<b>EXPERIMENTAL LABORATORY-II</b>
<b>COURSE CODE</b>	<b>02MB0156</b>
<b>COURSE CREDITS</b>	<b>3</b>

**Objective:**

- 1 To enable students with practical skills of Cell Biology, Biomolecules and allied subject like Chemistry or Physics.

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

- 1 Students will become aware of the Microbiology related instruments.
- 2 Students will learn staining techniques and observation of microbes under Microscope.
- 3 Students will be able to learn about techniques related to qualitative and quantitative analysis of the biomolecules.
- 4 Students will be able to learn different practical techniques of Biology, Chemistry and Physics.
- 5 Students will be able to analyze, interpret and record the experimental results.

**Pre-requisite of course:**Not Applicable

**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:**

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Cell Biology and Biomolecules</b> Taxonomic study of plants- TS and LS study., Nucleus staining., Flagella staining., Demonstration of Mitosis from onion root., Buccal smear/Barr body identification, Permanent slide preparation., Isolation of mitochondria., Cultivation and microscopic observation of fungi., Preparation of buffer	2

**Suggested List of Experiments:**

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
2	<b>Cell Biology and Biomolecules</b> Qualitative test for identification of Carbohydrates, Quantitative test for estimating Carbohydrates, Qualitative test for identification of Proteins, Quantitative test for estimating Proteins, Quantitative test for estimating Nucleic acid (DNA), Quantitative test for estimating Nucleic acid (RNA), Quantitative test of carbohydrates using the DNSA., Quantitative test of proteins by Folin lowry's method., Quantitative method for estimation of reducing sugars.	2
3	<b>General Chemistry-II</b> To perform qualitative test for given known inorganic compound (Inorganic salt-1)., To perform qualitative test for given known inorganic compound (Inorganic salt-2)., To perform qualitative test for given known inorganic compound (Inorganic salt-3)., To perform qualitative test for given known organic compound (Mono functional organic compound-1), To perform qualitative test for given known organic compound (Mono functional organic compound-2), To crystallise the pure compound from an impure sample of copper sulphate., To crystallise the pure compound from an impure sample of benzoic acid., To determine total dissolved solids and total suspended solids in the given water sample.	2
4	<b>General Chemistry-II</b> Estimation of alkalinity of the given water sample., To determine concentration of HCl with the help of known concentration of NaOH by conductometry., To determine concentration and dissociation constant of CH <sub>3</sub> COOH with the help of known concentration of NaOH by conductometry., To determine concentration of HCl with the help of known concentration of NaOH by pH meter., To determine concentration and dissociation constant of CH <sub>3</sub> COOH with the help of known concentration of NaOH by pH meter., To determine concentration of each component in the given mixture of HCl and CH <sub>3</sub> COOH with the help of known concentration of NaOH by pH meter., To estimate total hardness of the given water sample.	2
5	<b>Mechanics and Thermodynamics Experiments</b> To determine the Young's modulus of the material of given beam supported on two knife edges and loaded at the middle point., To determination of surface tension of liquid (water) by capillary tube using travelling microscope., To determine g, the acceleration of gravity at a particular location. (kater's Pendulum), To Verify the truth table of the Half adder & Full Subtractor., 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.	1

### Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
6	<b>Mechanics and Thermodynamics Experiments</b> To study the V-I Characteristics of a Light emitting diode (LED)., To study the variation of light intensity with distance from source., 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), To find out fill factor of given a Solar cell., To measure the speed of sound using Resonance tube., To determine the wavelength of the given sodium light source using plane transmission grating.	1
<b>Total Hours</b>		<b>10</b>

### Textbook :

- 1 An Advanced Course in Practical Chemistry,, A. K. Nad, B. Mahapatra, A., New Central Book Agency, 2014
- 2 Experimental Physical Chemistry: A Laboratory Textbook, A. Halpern, G. McBane, W H Freeman & Co, 2006
- 3 Vogel's Qualitative Inorganic Analysis (7th Edition), G. Svehla, Dorling Kindersley (India) Pvt. Ltd, 2009
- 4 Handbook of Water Analysis (3rd Edition), L.M.L. Nollet, L.S.P. Gelder, CRC Press, 2013
- 5 Fundamentals of analytical chemistry (9th Edition), D.A. Skoog, Cengage, 2021
- 6 Cell Biology, Genetic, Molecular biology, Evolution and Ecology, P.S. Verma, V.K. Agarwal, S. Chand and company, 2005
- 7 Becker's World of the cell, 9th Edition, J. Hardin, G.P. Bertoni, Pearson Education, 2015

### References:

- 1 Molecular Biology of the Cell, Molecular Biology of the Cell, Bruce Albert, Garland Science, 2008
- 2 Advanced Practical Physics for students, Advanced Practical Physics for students, B.L. Flint, H.T. Worsnop, Asia Publishing House, 1971
- 3 A text book in Electrical Technology, A text book in Electrical Technology, B.L. Theraja, S. Chand & Co, 2008
- 4 A Laboratory Manual of Physics for Undergraduate Classes, A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, Vani Publication, 1985

### 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 / Creative
15.00	15.00	25.00	25.00	10.00	10.00

### **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.vlab.co.in/broad-area-chemical-sciences>
- 6 <https://www.youtube.com/user/TMPChem>
- 7 <https://www.youtube.com/watch?v=Sa0WfA9UGG0>
- 8 <https://www.youtube.com/channel/UCqk-dmk3AOfikaFDpsZorg>
- 9 <https://www.youtube.com/user/PradeepKshetrapal>
- 10 [https://www.youtube.com/watch?v=2iqUB\\_N-uzw](https://www.youtube.com/watch?v=2iqUB_N-uzw)
- 11 <https://vlab.amrita.edu/index.php?sub=2&brch=193>
- 12 <https://www.youtube.com/watch?v=ITv9cRbuF9Y>
- 13 <https://www.youtube.com/watch?v=EcPriPnjdDw>
- 14 <https://vlab.amrita.edu/?sub=3&brch=187&sim=327&cnt=2>
- 15 <https://vlab.amrita.edu/?sub=3&brch=187&sim=878&cnt=1>
- 16 [http://cbi-au.vlabs.ac.in/cell-biology-1/Basics\\_of\\_Plant\\_Tissue\\_Culture/](http://cbi-au.vlabs.ac.in/cell-biology-1/Basics_of_Plant_Tissue_Culture/)
- 17 <https://vlab.amrita.edu/?sub=1>