



OFFICE OF THE REGISTRAR :: DIBRUGARH UNIVERSITY :: DIBRUGARH

Ref. No. DU/DR-A/131st AC/Chemistry-Syllabus-SEC/2024/1456

Date: 12.08.2024

NOTIFICATION

As recommended by the Interdepartmental Board of Studies (BoS) meeting held on 03.06.2024 and Joint Meeting (Special) of the Under Graduate Board (128th) and Post Graduate Board (155th), Dibrugarh University held on 06.06.2024, the 131st Meeting (Special) of the Academic Council, Dibrugarh University held on 13.06.2024 vide **Resolution No. 16** has approved the syllabus of Skill Enhancement Course (SEC) in Analytical Tools and Techniques for Semester – III to be offered jointly by the Department of Chemistry and Life Sciences for the Five Year Integrated Postgraduate Programme (FYIPGP) with effect from the academic session 2024-2025.

The syllabus is attached herewith.

Issued with due approval.

12/08/2024
Deputy Registrar (Academic)
Dibrugarh University

Copy for kind information and necessary action to:

1. The Hon'ble Vice-Chancellor, Dibrugarh University.
2. The Deans, Dibrugarh University.
3. The Registrar, Dibrugarh University.
4. The Head, Department of Chemistry, Dibrugarh University.
5. The Head, Department of Life Sciences, Dibrugarh University.
6. The Controller of Examinations i/c, Dibrugarh University.
7. The Joint / Deputy Controller of Examinations – 'B', 'C' & 'A', Dibrugarh University.
8. The Programmer, Dibrugarh University with a request to upload the notification in the Dibrugarh University Website.
9. File.

12/08/2024
Deputy Registrar (Academic)
Dibrugarh University

FYIPGP

DETAILED SYLLABUS OF 3rd SEMESTER

Course Code : SEC-03

Nature of the Course: SKILL ENHANCEMENT COURSE

Title of the Course : Analytical Tools and Techniques in Science

Total Credits : 03

Distribution of Marks: 60 (End-Sem) + 40 (In-Sem)

Course Coordinators: Dr. Kalyanjyoti Deori (Chemistry)

Dr. Minakshi Puzari (Life Sciences)

COURSE OBJECTIVES:

- 1) To analyze different separation techniques
- 2) To compare various microscopic techniques
- 3) To examine the structure of DNA and its amplification
- 4) To contrast among blotting techniques
- 5) To investigate biological and chemical samples through the application of different tools and techniques

UNITS	CONTENTS	L	T	P	Total Hours
I	Chromatographic methods: Adsorption and partition principle. Thin layer chromatography (TLC), Paper (radial, ascending, descending), and column chromatography. Fundamentals of spectroscopic techniques: (a) UV-vis spectroscopy: Overview of spectroscopy techniques, Basic principles of electromagnetic radiation, Interaction of light with matter, Components of a UV-Vis spectrophotometer, Sample handling techniques, Beer-Lambert Law and its application in UV-Vis spectroscopy, Factors affecting absorbance spectra (solvent, pH, temperature, etc.), Applications of UV-Vis Spectroscopy in qualitative and quantitative analysis, in kinetic studies (monitoring reaction rates). (b) IR Spectroscopy: Introduction to IR Spectroscopy, Components of an IR spectrometer, Sample handling techniques, Vibrational modes of molecules, Theory behind IR spectra interpretation.	12	3	-	15

II	Microscopy- Concept of Resolution and Magnification, Optical Microscopy- Bright Field Microscopy, Dark Field Microscopy, Phase Contrast Microscopy, Fluorescence Microscopy and Electron Microscopy. Centrifugation technique- Principle of centrifugation, Differential and Density gradient centrifugation (Rate Zonal Centrifugation, Isopycnic Centrifugation). Concept of DNA structure, PCR-based DNA amplification: PCR chemicals and principle of PCR. Electrophoretic separation of biomolecules- principle; Blotting techniques—Southern, Northern, and Western.	12	3	-	15
III	Experimental: <ul style="list-style-type: none"> • Separation of biological/ chemical samples using paper Chromatography and TLC • Spectroscopic analysis of biological/organic/inorganic compounds using spectrophotometer • Structural information of unknown compounds using IR spectroscopy • Handling of Microscope and visualization of different samples • Separation of samples using centrifuge • Amplification of DNA using PCR • Agarose gel electrophoresis of PCR amplified DNA 	0	0	30	30
	Total	24	6	30	60

Where,

L: Lectures

T: Tutorials

P: Practicals

MODES OF IN-SEMESTER ASSESSMENT:

- Two Internal Examination (20 marks)
- Others (20 marks)
 - Home Assignment
 - MCQ
 - Seminar presentation on any of the relevant topics
 - Lab notebook
 - Written exam/Viva voce on practicals

Course Outcomes:

At the end of this course, students will be able to:

- CO 1. demonstrate various separation techniques
- CO 2. operate different microscopes
- CO 3. describe DNA structure and amplification
- CO 4. distinguish between blotting techniques

CO 5. evaluate biological and chemical samples with the use of various tools and techniques

Cognitive map of course outcomes with Bloom's Taxonomy:

Knowledge Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual						
Conceptual						
Procedural				CO1, CO2, CO3, CO4	CO5	
Metacognitive						

SUGGESTED READINGS:

1. Introduction to nanoscience and nanotechnology by K. K. Chattopadhyay and A. N. Banerjee, PHI Learning Private Limited.
2. Introduction to nanoscience and nanotechnology by Charles P. Poole and Frank J. Owens, Wiley Publisher.
3. Biophysical Chemistry: Principles and Techniques. Upadhyay, Upadhyay and Nath. Himalaya Publishing House. ISBN: 978-93-5142-227-3
4. Wilson and Walker's Principles And Techniques Of Biochemistry And Molecular Biology. Andreas Hofmann (Editor), Samuel Clokie (Editor). ISBN: 978-1316614761
5. Biological Instrumentation & Methodology. Bajpai P.K. (Author) ISBN: 978-8121926331