

**Course: Discipline Specific Elective**

Semester	5
Paper Number	HMBDS541
Paper Title	<b>Chemical biology, instrumentation and biotechniques</b>
No. of Credits	6 (Th:4, Pr:2)
Theory/Composite	Composite
No. of periods assigned	Th: 4 Pr: 3
Course description/objective	<ol style="list-style-type: none"><li>1. To understand the stereochemistry of biomolecules and importance of thermodynamics and chemical kinetics in biology</li><li>2. To understand the aspects of important physicochemical method which held in quantification and resolution of biomolecules.</li></ol>
Reading/Reference Lists	<ol style="list-style-type: none"><li>1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.</li><li>2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.</li><li>3. Willey MJ, Sherwood LM &amp; Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 9thEd., McGraw Hill.</li><li>4. Physical Biochemistry by David Freifelder (1982) WH Freeman and Co</li><li>5. Cooper G.M. and Hausman R.E. (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press &amp; Sunderland, Washington D.C., Sinauer Associates, MA.</li><li>6. Nigam A and Ayyagari A. 2007. Lab Manual in Biochemistry, Immunology and Biotechnology. Tata McGraw Hill.</li><li>7. Solomons TWG and Fryhle CB. 2009. Organic Chemistry. 10<sup>th</sup> Ed. John Wiley and Sons.</li><li>8. Voet D and Voet JG. 2013. Fundamentals of Biochemistry. 4<sup>th</sup> Ed. John Wiley and Sons.</li></ol>
Evaluation	CIA: 20 End-Sem:80 (Th:50 and Pr:30)

	Question paper format of Th paper (Mod 1 & 2: 25 Marks each) For each module: Objective questions 5 marks (5 questions out of 7) 2 questions of 10 marks each (2 questions out of 3)
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**CHEMICAL BIOLOGY, INSTRUMENTATION AND BIOTECHNIQUES (THEORY)  
SEMESTER –V**

**HMBDS5022T**

**TOTAL HOURS: 52**

**CREDITS: 4**

**MODULE-1**

**Marks 25**

**Unit 1 Stereochemistry of Biomolecules**

**No. of Hours: 8**

Basic ideas of molecular conformation and configuration, Stereochemistry of amino acids, peptides, sugars and nucleosides.

**Unit 2 Thermodynamics in Biology**

**No. of Hours: 8**

Basic thermodynamic aspects of water as solvent, molecular interactions in water, macromolecular folding, membrane transport, energy-rich biomolecules, information storage in cell.

**Unit 3 Chemical Kinetics in Biology**

**No. of Hours: 10**

Application of rate laws, concept of steady state and importance of catalysis to explain kinetics of biochemical reactions.

**MODULE-2**

**Marks 25**

**Unit 4 Centrifugation**

**No. of Hours: 5**

Theory of sedimentation, introduction to preparative and analytical centrifugation, types of centrifuges, rotors and types of preparative centrifugation.

**Unit 5 Chromatography**

**No. of Hours: 7**

Principles and applications of paper chromatography, Thin layer chromatography. Gel filtration chromatography, ionexchange chromatography and affinity chromatography, GC/GLC, HPLC and reverse phase chromatography

**Unit 6 Electrophoresis**

**No. of Hours: 5**

Principle and applications of agarose gel and different types of polyacrylamide gel electrophoresis

**Unit 7 Spectroscopy and Advanced Microscopic Techniques**

**No. of Hours: 9**

Principles and application of UV-Vis, Basics of infrared and mass spectrometry, Introduction to

fluorescence, Fluorescence spectroscopy and microscopy (wide field, evanescent wave, confocal and super resolution) .

**PRACTICAL  
HMBDS5022P**

**TOTAL HOURS: 39**

**CREDITS: 2**

1. Separation of mixtures by thin layer chromatography.
2. Separation of protein mixtures by column chromatography.
3. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE) and corresponding western detection of protein
4. Separation of components of a given mixture using a laboratory scale centrifuge.
5. Determination of purity of sample by using UV-Vis spectrophotometer.

