Semester-V / Value Added Course - I	TOOLS AND TECHNIQUES IN BIOSCIENCES	Course Code :
Instruction Hours : 6	Credits: 2	Exam Hours: 3
Theory – 40 Marks	Practical – 60 Marks	Total Marks: 100

Cognitive Level	**K1 – Recalling** **K2 – Understanding** **K3 - Applying** **K4 – Analyzing** **K5 – Evaluating** **K6 – Creating**
Course Objectives	This course aims at providing knowledge on 1. To learn about the various techniques used in biological sciences 2. To understand the types of Microscope and centrifuge their use. 3. Principles and use of analytical instruments: spectrophotometer, pH meter. 4. To understand the Students Chromatography and its types, Electrophoresis and PCR Techniques 5. To enable the students understand the Calibration, Validation of instruments.

UNIT	CONTENT	HOURS
I	Basic Instruments and techniques: Working principles, basic operation and application of Microtome, weighing balance, PH meter, autoclave, Oven, laminar air flow, Water Baths, CO_2 Incubators, Shaking Incubators, Hot Air Ovens, Bio-Safety Hoods, Fume Hoods, Pipettes and MiliQ water system. Principle of asepsis and sterilization technique.	18
II	Microscopy and its modifications – Working principles, basic operation and application ofLight, phase contrast and interference, Fluorescence, Confocal, Electron (TEM and SEM)	18
III	Centrifugation: Working principles, basic operation and application of micro-centrifuge, ultracentrifuge and density gradient centrifugation, applications (isolation of cell components), determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods	18
IV	Electrophoretic and PCR techniques: Working principles, basic	

		operation and application of agarose, polyacrylamide and SDS-polyacrylamidegel electrophoresis, capillary electrophoresis, 2-D electrophoresis, pulsed field gel electrophoresis. Working principles, basic operation and application of Gradient PCR,RT-PCR and Gel Documentation system.	18
V		Calibration, Validation, and certification of instruments like PCR's, Ovens, Incubators, Volumetric Dispensers, Spectrophotometers, and Electronic Balances etc. using International Standards. Documentation for Instrumentation systems and procurement procedures, design of typical laboratory, safety measurement and IPR's.	18
	Practical's: Practicals based on theory papers		

Text Books:
1. Freifelder D.,Physical Biochemistry, Application to Biochemistry and Molecular Biology, W.H.Freeman and Company, San Fransisco.
2. Wilson, K. and Walker, J. Principles and Techniques of Practical Biochemistry Cambridge University Press.
3. Holmeand, D. and Peck, H. Analytical Biochemistry. Longman.
4. NarayananP. Essentials of Biophysics, New Age International PvtLtd.

Reference Books:
1. Pattabhi V and Gautham N. Biophysics, Kluwer Academic Publishers.
2. Volkenshtein, M.V.General Biophysics Academic Press, Inc.
3. Daniel, M.Basic Biophysics for biologists Agrobios.
4. Van, Holde, Johnson, K. E., Cutis, W. and Shing Ho, P. Principles of physical biochemistry, Pearson education Pvt. Ltd.
5. Holmeand, D. and Peck, H. Analytical Biochemistry. Longman.
6. Scopes, R.Protein Purification-Principles and Practices. Springer Verlag. Pattabhi V and Gautham N. Biophysics, Kluwer Academic Publishers.

Web-Resources:

1. https://biology4isc.weebly.com/uploads/9/0/8/0/9080078/toolsin_bio.pdf

Course Outcomes:

1. Discuss the fundamental knowledge related to basic Instruments and Techniques.
2. Applications of various types of Microscope and Centrifuge.
3. Describe and use various analytical techniques like Electrophoresis and PCR
4. Demonstrate the principal, operational procedure and application of chromatograpy and Spectroscopy techniques.
5. Evaluate the Calibration, Validation, and certification of instruments.

Mapping of Course Outcomes with Programme Outcomes & Programme Specific Outcome

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S – STRONG   M - MEDIUM   L - LOW