SEC : Basic Laboratory Techniques

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Basic Laboratory Techniques	**2**			**2**	XII pass	

Learning Objectives

This course will help students understand skills required for working in Laboratories. To comprehend the standard operating procedures for laboratory chemicals, autoclave and water wash applications. The specific objectives of the course are:

- To be familiar with laboratory safety manual and GLPs and regulatory requirements.
- To learn about use and working of lab instruments such as pH meters, auto clave, laminar flow, microscopes, spectrophotometers, centrifuges and incubators.
- knowledge of preparation and testing of reagent water in the laboratory Learn how to make solutions and buffers
- Learn about microbiological techniques

Learning outcomes

At the end of the course the students will be

- Trained in best lab practices
- Able to use lab instruments such as pH meters, auto clave, laminar flow, microscopes, spectrophotometers, centrifuges and incubators
- Able to prepare solutions and buffers
- Able to prepare media and grow microbial culture in aseptic conditions

Job opportunities:

Students trained in lab skills will be employable in research labs, R & D labs in Pharma and Biotechnology industry and Diagnostic labs

SYLLABUS OF SEC-

Unit 1 – Laboratory safety and standards **2 weeks**

- Precision, accuracy and sensitivity

Unit 2– Preparation of solutions/ media **2 weeks**

- Preparation of solution (w/w, w/v, Molar, Normal, Stock, standard and serial dilutions)
- Preparation of buffer solution, pH scale, pH meter, Henderson-Hasselbalch equation, pK, (acetate/ phosphate buffer)

Unit 3– Microbial Techniques **6 weeks**

Instrumentation (Microscopy, Laminar Hood, autoclave, shaker incubator, BOD incubator hot air oven)

- Sterilization methods
- Types of Microbial media: Microbial growth media: Minimal Media, Defined media, Complex media, Enriched media, Selective media, and Differential media.
- Staining techniques for microbes
- Isolation of pure cultures of bacteria by streaking method.
- Enumeration of colony forming units (CFU) count by spread plate method
- Growth curve of bacteria
- Culture transfer Techniques: Streaking, Serial dilution and Plating methods. Phases of bacterial growth

Unit 4 – Bioinstrumentation for Separation techniques **5 weeks**

Chromatography

- Separate biomolecules/dyes using paper/thin layer and column chromatography to illustrate the principle and application of chromatography. Calculate the Rf value of each component.

Centrifugation

- Principle of centrifugation, Basics of sedimentation, Sedimentation coefficient, Factors affecting sedimentation.
- Types of centrifuges and rotors. Microfuges
- Separation plasma and blood cells/ cell fractionation

Spectroscopy:

- Principle of UV-visible absorption spectrophotometry, Lambert's Law, Beer's Law, Working of a spectrophotometer.
- Determination of absorption maxima (λmax).

- Verification of Lambert's and Beer's law

Gel Electrophoresis

- Principle, instrumentation, application and maintenance of horizontal and vertical electrophoresis.
- Separation of protein sample in denaturing condition and calculation of its molecular weight and mobility.
- Demonstration of separation of nucleic acids using agarose gel electrophoresis.

Essential/Recommended readings

- Biochemistry Laboratory: Modern Theory and Techniques, (6th edition), Boston, Mass: Prentice Hall; ISBN-13:978-0136043027Boyer, R.F. (2012).
- An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4/ ISBN:10: 0-07-099487-0.
- Cappucino, J. and Sherman, N. (2013). Microbiology: A Laboratory Manual. (10th ed.) Pearson Education Limited; ISBN 13: 9780321840226 Additional Resources: 1. Madigan, M.T., Martinko, J.M., Dunlap, P.V. and Clark, D.P. (2010).

Examination scheme and mode:

Total Marks: 50
Internal Assessment: 25
Practical: 25
Exam (Internal): NIL
End Semester University Exam: NO End Term Exam
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.