

**Details of course: Skill Enhancement Course (SEC)-2 (Development of Scientific Instrumentations and its applications (BT 106)**

Course Title	Course structure			Pre-requisite
	L	T	P	
Development of Scientific Instrumentations and its applications (BT 106)	1	0	2	Basic Instrumentations

**Course Objective:**

To impart broad knowledge of commonly used instruments and their working principles, in development of new scientific instrumentation and medical devices

**Course outcome (CO)**

1. To impart the knowledge about various basic instruments and its type and applications in diagnostics and scientific investigation.
2. To master the electrophoresis techniques in separation and analysis of Macromolecules (DNA, RNA and proteins) and their fragments, based on their size and charge.
3. To master the chromatographic techniques and application of methods in biotechnology, pharmacy, diagnostics, therapy and scientific investigation.
4. To master the MEMS technology and application of biomedical device development.
5. Understanding of Sensing technology and development of biosensors for medical diagnostics.

S. No.	Content	Contact Hours
Unit 1	<b>Basic Instrumentation:</b> <b>Optical Techniques:</b> Microscopy: Optical and Electron Microscopy, Fluorescence microscopy <b>Hydrodynamic Techniques:</b> Centrifugation: Viscosity and diffusion, Analytical and Preparative centrifuges <b>Spectroscopic:</b> UV and visible, spectrofluorimetry	3
Unit 2	<b>Advanced Instrumentation:</b> <b>Electrophoretic Techniques:</b> Paper and gel electrophoresis, Immuno electrophoresis,	2
Unit 3	<b>Chromatographic Methods:</b> Paper, TLC gas chromatography, gel filtration	2
Unit 4	<b>Medical device design and development:</b> Introduction to MEMS, Materials used- Technology involved in MEMS, <b>MEMS Application in Medicine</b> (BioMEMS): Special features / requirements for medical applications. Current scenario of MEMS for health care.	3
Unit 5	<b>Biosensors:</b> Sensors and transducers; Chemistry of biomolecules and their immobilization for biosensors, Types of biosensors and their application -Environmental monitoring, process control, and clinical/biochemical analysis, Immunosensors.	4
Total		14

## Books

S. No.	Name of Book/Author/Publisher
1	Principles and Techniques of Practical Biochemistry by Keith Wilson and John Walker, Fifth edition, Cambridge University Press
2	Biophysical Chemistry: The conformation of Biological Macromolecules by C.R.Cantor and P.R. Schimmel. Publisher: W.H. Freeman
3	Introduction to Spectroscopy by D.L. Pavia, G.M. Lampman and G. S. Kriz.and Vyvyan Publisher: Brooks Cole
4	MEMS & Microsystem, Design and manufacture by Tai-Ran Hsu , McGraw Hill.
5	Biosensors: An Introductory Textbook by Jagriti Narang, C.S. Pundir- <a href="#">Jenny Stanford Publishing</a>

## Lab Course

### BT 000 :Lab based on Development of Scientific Instrumentations and its applications

Experiment No.	Name of Experiment
1	To demonstrate the functioning of Microscope.
2	To demonstrate the working of Centrifugation - low speed and high speed.
3	Spectrophotometric techniques- Determination of Protein concentration using Lowry's method
4	To demonstrate Chromatography techniques in biomolecular separations, ion exchange, gel filtration and affinity columns
5	To demonstrate the working of Thin Layer Chromatography in pigment separation
6	To demonstrate the Cell disruption techniques for biomedical diagnostics
7	To demonstrate the Electrophoresis techniques – 1D and 2D.
8	To demonstrate the functioning of Ph Meter
9	To demonstrate the Photolithography techniques
10	To demonstrate the functioning of Micro array, Biochip and microfluidic devices

## Books:

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3	Biosensors: An Introductory Textbook by Jagriti Narang, C.S. Pundir- <a href="#">Jenny Stanford Publishing</a>

## Scheme and syllabus (BTech 2<sup>nd</sup> year)

### Third Semester

S.No.	Subject code	Subject	Credits	Category
1.	BT201	Applied mathematics (Interdisciplinary engineering science course -1)	4	ESC
2.	BT203	Cell Biology (Department core course-2)	4	DCC
3.	BT205	Genetics (Department core course-3)	4	DCC
4.	BT207	Fundamentals of computational biology (Department core course-4)	4	DCC
5.	BT209	Bioprocess Technology and Downstream Processing (Department core course-5)	4	DCC
6.	AEC/VAC	Value Addition course -1	2	VAC
7.	MS299	Community Engagement Course	2	Mandatory
		Total	24	

### Fourth Semester

S.No.	Subject code	Subject	Credits	Category
1.	BT204	Data Structure and Algorithm (Interdisciplinary core course-2)	4	ESC
2.	BT202	Molecular Biology (Department core Course-6)	4	DCC
3.	BT206	Microbiology (Department core Course-7)	4	DCC
4.	BT208	Advances in computational biology (Department Core Course-8)	4	DCC
5.	BT210	Biochemistry (Department Core Course-9)	4	DCC
6.	AEC/VAC	Value addition course -2	2	VAC
		Total	22	