Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara

Syllabus for Certificate Course (PG)

1. TITLE: ADVANCED TECHNIQUES IN LIFE SCIENCE
2. YEAR OF IMPLEMENTATION: 2018-19
3. PREAMBLE: The present certificate course is formulated for developing competent biotechnologist for which significant job opportunities exist in this country. The course is based on tool and techniques commonly used in life sciences. The additional skill of handling these instruments with more confidence and ease will help students in their employment.

4. GENERAL OBJECTIVES OF THE COURSE:

    1. To make students aware of different techniques used in life science research.
    2. To make students user friendly to advanced instruments.
    3. To give more technical exposure to the students towards instruments used in life science.

5. DURATION: One Year
6. PATTERN: Annual
7. MEDIUM OF INSTRUCTION: English
8. STRUCTURE OF COURSE:

Year	Paper No and Name	Contact hours	Credits	Marks
1	C *T 101:	48	4	100
	C * L102:	96	4	100
	C *P103:	24	2	50
	Total	**168**	**10**	**250**
2	D *T 101:	48	4	100
	D * L102:	96	4	100
	D *P103:	24	2	50
	Total	**168**	**10**	**250**
Total		**336**	**20**	**500**

C*T 101 Name of paper

C*L 102

C*P 103

indicates subject
T indicates Theory
L indicates Lab work
P indicates Project work

A) LIBRARY :

Reference and Textbooks, Journals and Periodicals, Reference Books for Advanced Books for Advanced studies. –List Attached

B) SPECIFIC EQUIPMENTS :

Necessary to run the Course.

Computer, LCD, Projector, Visualizer, Smart board

c) Laboratory Equipments:

Sr No.	Name of Instrument
1	Atomic Absorption Spectrometer
2	Autoclave Vertical
3	Bacteriological Incubator
4	Binocular Research Microscope CX 21i
5	BOD Incubator
6	Centrifuge Remi R-4C
9	COD refluxing unit
10	Colorimeter
11	Combined pH and Conductivity Meter
12	Compound Microscope
13	Conductivity Meter
14	Deep freezer
16	Dissection microscope
17	Distillation assembly
18	Flame Photometer
19	Hemocytometer
24	Horizontal Electrophoresis unit
25	Horizontal Laminar Airflow
26	Hot Plate
27	Lux Meter
29	Microcentrifuge
30	Microscope camera device
31	Microwave Oven
32	MiniCentrifuge Remi
33	Mixer
34	pH Meter
35	Refractometer
38	Refrigerator
39	Rotary Shaker

40	Sonicator Waterbath
42	Spectrophotometer UV-Vis
43	Stabilizer
44	Thermal Cycler
45	Ultra microtome
46	UV transilluminator
47	Vacuum pump
48	Variable type power pack
49	Vertical Electerophoresis Unit
51	Visible Spectrophotometer
52	Water bath
53	Weighing balance

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Syllabus Introduced from June, 2018

ADVANCED TECHNIQUES IN LIFE SCIENCE

Theory: Paper I: ADVANCED TECHNIQUES IN LIFE SCIENCE-I

Learning Objectives:

- To make students aware about principle and working of bioinstrumentation
- To increase the understanding about evaluation of qualitative and quantitative study of biomolecules.
- To introduce the techniques of sectioning and analysing of tissue using microtomy.

UNIT I: General Introduction to Laboratory Techniques 12L

Laboratory Safety, Construction, working and principle of pH Meter, Conductivity meter, Safety cabinets, autoclave, centrifugation techniques, Maintenance and preservation of industrially important microbes

UNIT II: Extraction and estimation techniques: 12L

Extraction of phytochemicals using Soxlet apparatus, Methods for estimation of Protein, Carbohydrate, Amino acid and Lipid.

UNIT III Microscopic Techniques 12L

Introduction, Light microscope, Stereomicroscope, Electron microscopy, Histo-Pathological studies using microtome.

UNIT IV Spectroscopic Techniques 12L

Introduction, principle, construction, working and applications of UV-Vis spectrophotometer, FTIR, Flame photometer, Atomic Absorption spectrophotometer, Nuclear magnetic resonance, Electron spins resonance.

Recommended Books: (Unit wise)

1. Principles and techniques of Biochemistry and Molecular biology by Wilson and Walker, Cambridge 6th Ed.
2. Biochemical methods by Sadashivam And Manikam , New age international, 1996.
3. An introduction to practical biochemistry By David T. plummer Mc Graw-Hill.

Learning Outcomes per unit

1. Students will understand the principle and working of instruments using life sciences.
2. Students will learn about evaluation of qualitative and quantitative study of biomolecules.

Practical Course: (for 24 practical) 96 periods

1. Laboratory safety demonstration. 01
2. Culturing and preservation of industrially important microbes. 02
3. Extraction of medicinal plant extracts. 02
4. Quantitative estimation of proteins. 03
5. Quantitative estimation of amino acids 02
6. Quantitative estimation of carbohydrates 03
7. Quantitative estimation of lipids. 02
8. Histopathological studies of plant tissues. 03
9. Analysis of electron microscope images 02
10. FTIR- sample analysis 03
11. Estimation of Na, K in soil using flame photometer 02
12. Estimation of microelements in soil using AAS 02.

Learning outcomes for each practical

1. Students will understand the handling of instruments using life sciences.
2. Students will learn about evaluation of qualitative and quantitative study of biomolecules.
3. Student's will be able analyse the biological data obtained using different techniques.

Recommended Books: (Unit wise)

1. Principles and techniques of Biochemistry and Molecular biology by Wilson and Walker, Cambridge 6^{th} Ed.
2. Biochemical methods by Sadashivam And Manikam , New age international, 1996.
3. An introduction to practical biochemistry By David T. plummer Mc Graw-Hill.

Project course: for 24 periods and 2 credits

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Syllabus Introduced from June, 2018

ADVANCED TECHNIQUES IN LIFE SCIENCE

Theory: Paper I: ADVANCED TECHNIQUES IN LIFE SCIENCE-II

Learning Objectives:

- To make students aware about principle and working of bioinstrumentation
- To increase the understanding about evaluation of qualitative and quantitative study of biomolecules.
- To introduce the techniques of sectioning and analysing of tissue using microtomy.

UNIT I: Qualitative and quantitative analysis of chromatography. 12L

Chromatographic Fundamentals : Retention, Band Spreading, Resolution, Dynamics of Chromatography. Basic mass transfer equations, Method of moments, Linear dispersion model, Linear staged models for chromatography, Instrument Requirements for Chromatography : System design and Column packing techniques

UNIT II: Qualitative and quantitative analysis of chromatography. 12L

Definition, theoretical principles, types of chromatography- Paper chromatography, Thin layer chromatography, Liquid-liquid chromatography, HPLC chromatography, Adsorption, chromatography, column Ion exchange chromatography, Gas chromatography.

Unit III: Tools and Techniques in Molecular Biology 12L

Instrumentation in molecular biology, isolation of nucleic acid, plasmid DNA, Blotting techniques, PCR, Types of PCR, Electrophoresis of proteins and nucleic acids - 1D & 2D gels, SDS-PAGE, Agarose gel electrophoresis, Western Blotting, Gel documentation

Unit IV : **Good Manufacturing Practices** 12L

GMP in manufacturing, processing and packaging of drugs, GMP practices in finished products, organization, personnel, buildings and facilities, equipments, production and packaging, Brief introduction of GLP, Third party GMP certification, Good Manufacturing Practices (GMP) guidelines 2) GMP for raw materials, finished products, organ Good Manufacturing Practices (GMP) guidelines, GMP for raw materials, finished products, organization, personnel, building & facilities, equipment, containers & closures, production & process controls, packaging & labeling, records & reports etc.

Recommended Books: (Unit wise)

1. Principles and techniques of Biochemistry and Molecular biology by Wilson and Walker, Cambridge 6th Ed.
2. Biochemical methods by Sadashivam And Manikam , New age international, 1996.
3. An introduction to practical biochemistry By David T. plummer Mc Graw-Hill.
4. Chatwal GR (1998),Instrumental Methods of Chemical Analysis,(5 th Ed) Himalaya Publishing House
5. Sharma BK (1994) Instrumental Methods of Chemical Analysis, (5 th Ed)Krishna Prakashan Media Pvt Ltd
6. Willard, Merit Dean & Settle, (1986),Instrumental methods of analysis (6 th Ed) CBS Publishers and Distributers,

Practical Course: (for 24 practical) 96 periods

1. Separation of amino acids using paper chromatography and TLC 02
2. Preparation of column 02
3. Demonstration of adsorption chromatography 02
4. Separation of biomolecules using HPLC. 02
5. Separation of biomolecules using gas chromatography 02
6. Purification of protiens using ion exchange chromatogtaphy 02
7. Isolation and separation of DNA. 02
8. Isolation and separation of RNA. 02
9. Analysis og DNA gel electrophoresis using gel documentation system 02
10. Separation of proteins using PAGE 02
11. Southern Blotting 02
12. Western blotting 02

Learning outcomes for each practical

1. Students will understand the handling of analytical instruments.
2. Students will learn about DNA and RNA isolation techniques
3. Student's will be able analyse the biological data obtained using different techniques.