

Deccan Education Society's  
**FERGUSON COLLEGE, PUNE**  
**(AUTONOMOUS)**

**SYLLABUS UNDER AUTONOMY**

**FIRST YEAR B.Sc. VOCATIONAL BIOTECHNOLOGY**  
**SEMESTER –I**

**Academic Year 2016-2017**

**Deccan Education Society's  
Fergusson College (Autonomous), Pune  
Faculty of Science  
First Year B.Sc. (Vocational Biotechnology) Syllabus**

<b>Particulars</b>	<b>Code</b>	<b>Title of Paper</b>	<b>Credits</b>
F.Y. B.Sc. Semester I	VBT1101	Biochemistry	2
	VBT1102	Microbiology	2
	VBT1103	Practicals in Biochemistry and Microbiology	2
F.Y. B.Sc. Semester II	VBT1201	Biophysical Techniques	2
	VBT1202	Biostatistics	2
	VBT1203	Practicals in Biophysics and Biostatistics	2

PAPER CODE: VBT1101

PAPER – I: BIOCHEMISTRY

{Credit – 2: No of lectures: 36}

UNIT. No	Title and Contents	No. of Lectures
I	<b>Introduction to Biochemistry:</b> History and development of subject, cell and organism and biochemical entities	1
II	<b>Properties of water:</b> Water as the universal solvent, Polarity, Definitions of hydrogen bond formation, heat of vaporization, heat of fusion, melting point, and boiling point.	1
III	<b>Carbohydrates:</b> Definition, classification, monosaccharides, disaccharides, and polysaccharide and their functions.	5
IV	<b>Amino acids and proteins:</b> Definition, properties and classification of amino acids. Definition, physical and chemical properties of proteins, structure of protein, Classification of proteins based on their functions.	8
V	<b>Lipids:</b> Definition, Classification, properties, and functions of lipids.	4
VI	<b>Enzymes:</b> Definition, classification, properties of enzymes, Lock and key hypothesis, factors affecting activity of enzymes, Coenzymes and Isoenzymes and their role in biological systems.	7
VII	<b>Nucleic acids :</b> Definition, components of nucleic acids, structure of DNA and RNA, Biological functions.	2
VIII	<b>Introduction to metabolism:</b> Concept of free energy, energy rich compounds, and significance of ATP <b>Metabolic pathways :</b> Glycolysis , Features and energetics of glycolysis, TCA cycle, Features and energetic of TCA, $\beta$ -Oxidation of fatty acids, and features and energetics of $\beta$ -Oxidation of fatty acids	8

**Learning Outcomes:**

**At the end of the semester, students should understand:**

- The basics of biochemistry.
- The correlation and interdependence of different processes in the body.
- The basics of metabolism and their role in carrying out various metabolic reactions
- The basic structure of different biomolecules.

**References:**

1. Principles of Biochemistry by Nelson and Cox
2. Outlines of biochemistry, Conn, Stumph, Bruening, Doi by Wiley international publication.
3. Biochemistry by Harper

**PAPER CODE: VBT1102**

**PAPER – II: MICROBIOLOGY**

**{Credit – 2: No of lectures: 36}**

<b>UNIT. No</b>	<b>Title and Contents</b>	<b>No. of Lectures</b>
<b>I</b>	<b>Unit-1 Introduction to Microbial World</b> ii. Historical Account – Important developments leading to major discoveries. Path breaking discoveries. Product Development (18th – 20th Century including pre-golden, golden and post golden era)	5
<b>II</b>	<b>Outline Classification</b> of all 5 major groups of Microorganisms Prokaryotic and Eukaryotic Bacteria, Fungi, Algae, cyanobacteria and viruses. (Life cycle, Nutrition and Growth)	7
<b>III</b>	<b>Microscopy:</b> i. Wet mount and dry mount. ii. Staining Techniques :Definitions ,Classifications of stains(Basic ,Acidic ,Neutral ), Fixative ,Mordant,Decoloriser ,Accentuator , iii. Principles of Staining Techniques for following : Theory of staining – A) Simple staining ( Monochrome, Negative) B) Differential (Gram ,Acid fast ,Blood staining ) C) Special staining( spore,Flagella ,Cell wall, Nucleic Acid ,Capsule)	5
<b>IV</b>	<b>Enrichment culture techniques</b> Extremophiles- Thermophiles, Acidophiles, Algae, Fungi, Blue green algae- (Phosphate solubilising organisms, Rhizobium, Azotobacter) Colliforms (MPN/Presumptive) Screening of antibiotic producer by crowded plate	8
<b>V</b>	<b>Culturing of microorganisms.</b> Preparation of media, Nutritional classification, Types of media, Different components of media, Simple media, enrichment media, selective media, differential media (NA, PDA, BAP, MAC, SS) biofilm formation & quorum sensing	6
<b>VI</b>	<b>Viruses</b> Structure of viruses, Classification, cultivation with representative example.	5

**Learning outcomes**

At the end of the semester; students should understand:

- The basics of microbiology.
- Theory behind various staining techniques to stain micro-organisms
- Culturing methods of micro-organisms
- Characteristic features of different viruses.

**References:**

1. Ingraham J. L. and Ingraham C.A. (2004). Introduction to Microbiology. 3rd Edition. Thomson Brooks / Cole.

2. Madigan M.T., Martinko J.M. (2006). Brock's Biology of Microorganisms. 11th Edition. Pearson Education Inc.
3. Tortora G.J., Funke B.R., Case C.L. (2006). Microbiology: An Introduction. 8th Edition. Pearson Education Inc
4. Stanier R.Y., Adelberg E.A. and Ingraham J.L. (1987) General Microbiology, 5th Edition. Macmillan Press Ltd. Biswas and Biswas "Introduction to viruses."

**Paper code: VBT1103**

**Paper III PRACTICALS IN BIOCHEMISTRY AND MICROBIOLOGY**

**{Credit: 2: no of practicals =10}**

<b>UNIT. No</b>	<b>Title and Contents</b>	<b>No. of Lectures</b>
	<b>Biochemistry</b>	5
I	Qualitative tests for carbohydrates	1
II	Quantitative estimation of reducing sugars from a given Sample- By DNSA method	1
III	Quantitative estimation of carbohydrates by using anthrone reagent	1
IV	Quantitative estimation of proteins by using Folin Lowry method	1
V.	Quantitative estimation of proteins by using Biuret method	1
	<b>Microbiology</b>	5
I	Monochrome & Gram staining	1
II	Capsule and Spore staining	1
III	Isolation of microorganisms by Streak Plate method, pour plate method, spread plate method	2
IV	Potability test for water : Presumptive test	1

### **Learning outcomes**

At the end of the semester; students should understand:

- Qualitative and quantitative analysis of different biomolecules like carbohydrates and proteins
- Various methods staining and other basic microbiological techniques
- Microbiological analysis of various water samples.

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**SYLLABUS UNDER AUTONOMY**

**FIRST YEAR B.Sc. VOCATIONAL BIOTECHNOLOGY**  
**SEMESTER –II**

**Academic Year 2016-2017**

**PAPER CODE: VBT1201**

**PAPER – I: BIOPHYSICAL TECHNIQUES**

**{Credit -2: No of lectures: 36}**

<b>UNIT. No</b>	<b>Title and Contents</b>	<b>No. of Lectures</b>
<b>I</b>	<b>Introduction to Biophysics</b>	1
<b>II</b>	<b>Chromatographic techniques</b> Partition principle, Thin layer chromatography , Paper chromatography , Ion exchange chromatography , Affinity chromatography ,Gel filtration chromatography	12
<b>III</b>	<b>Spectrophotometry</b> 1) uv and visible spectrophotometry - With Basics 2) Nephelometry 3) Turbidometry	9
<b>IV</b>	<b>Microscopy</b> 1) Introduction to microscopy 2) Compound microscopy 3) Dark field, and phase contrast microscopy, 4) Fluorescence microscopy	5
<b>V</b>	<b>Radioisotopic techniques</b> Radioisotopes in biology and their applications, detection& estimation of radioactivity by Geiger-Muller counter, Solid and liquid scintillation counters	6
<b>VI</b>	<b>Electrophoretic Techniques</b> factors affecting electrophoretic mobility, Paper electrophoresis , agarose gel electrophoresis	3

### **Learning outcomes**

At the end of the semester; students should understand:

- Various biophysical techniques like chromatography, electrophoresis , microscopy, spectrophotometry.
- Applications of biophysical techniques in industry and research.
- Analysis of unknown molecules by biophysical techniques.

### **References:**

1. Wilson Keith and Kenneth H.Goulding (1994) principles of techniques of practical biochemistry. 4TH Edn. Cambridge University Press, London.
2. Biophysical chemistry principals and techniques by Upadhyay & Nath Khandpur R.S. (1989) Handbook of Analytical Instruments Tmh Pub Co. Ltd.New



**Paper code: VBT1202**

**Paper – II: BIostatistics**

**{Credits – 2: No of lectures: 36}**

<b>UNIT. No</b>	<b>Title and Contents</b>	<b>No. of Lectures</b>
<b>I</b>	Descriptive statistics Arithmetic mean, geometric mean, harmonic mean, mode median, range, standard deviation, Variance, mean variance	18
<b>II</b>	Frequency distribution : Introduction to normal, binomial and Poisson distribution. Test for goodness of fit.	6
<b>III</b>	Comparison of two sample means, T-Tests, non-parametric tests	4
<b>IV</b>	Regression and correlation	4
<b>V</b>	Experimental design and sampling	4

### **Learning outcomes**

At the end of the semester; students should understand:

- Basics of biostatistics.
- Analysis of data statistically in research and industry.

### **References**

1. Wardlaw A.C. Practical statistics for experimental biologists.
2. Cochran W.G. and G.W. Snedeco statistical methods –Sixth Ed.
3. Biostatistics by Khan and Khanum
4. Introductory biostatistics. 1st edition. (2003), Chap T. Le. John Wiley, USA
5. High YieldTMBiostatistics. (2001) Antony N Glaser. Lippincott Williams and Wilkins, USA

**Paper code: VBT1203**

**Paper III PRACTICALS IN BIOPHYSICS AND BIOSTATISTICS**

**{Credit: 02 : no of practicals =10}**

<b>UNIT. No</b>	<b>Title and Contents</b>	<b>Practicals (Total 10 P)</b>
	<b>Biophysics and instrumentation</b>	
1.	Determination of molar extinction coefficient using colorimeter, visible spectrometer	1
2.	Estimation of PH of given sample	1
3.	Determination of dry weight, total solids and moisture content by gravimetric method	1
4.	TLC/Paper Chromatography	2
	<b>Biostatistics and computers</b>	
1.	Data entry and statistical analysis using excel	1
2.	Data sorting	2
3.	Tabulation, ANOVA	2

**Learning outcomes:**

**At the end of the semester; students should understand:**

- The principle and working of spectrophotometer and colorimeter.
- Determination of pH of any unknown sample.
- Statistical analysis using Excel.