

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. GENERAL (SEMESTER PATTERN)  
B.Sc. FIRST YEAR  
BIOTECHNOLOGY (VOCATIONAL) - CURRICULUM**

**With Effect from June - 2009**

**B. Sc. BIOTECHNOLOGY (VOCATIONAL) CURRICULUM  
(SEMESTER PATTERN)**

<b>Class</b>	<b>Paper No. Code no.</b>	<b>Title of Paper</b>	<b>Periods/ Practicals</b>	<b>Time duration of Examination</b>	<b>Maximum Marks</b>
B.Sc.I Semester-I	Paper -I VBT- 101	Cell biology	45	3 Hrs.	50+10*
	Paper -II VBT-102	Microbiology	45	3 Hrs.	50+10*
B.Sc.I Semester-II	Paper -III VBT-103	Maths & Computers	45	3 Hrs.	50+10*
	Paper -IV VBT-104	Genetics & Biochemistry	45	3 Hrs.	50+10*
B.Sc.I	VBP-1 (Practical) Annual pattern	Practical based on theory papers of semester-I&II	26	4 Hrs. for two consecutive days	60

\* internal marks

**Workload:**

1. **Theory:** Per paper per week three periods
2. **Practical:** Per batch per week one practical (Three periods)

**B. Sc. FIRST YEAR BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER – I**  
**THEORY PAPER I**  
**VBT- 101 (CELL BIOLOGY)**

Periods – 45

Maximum Marks – 60

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**Unit-I ( 10 periods)**

Cell as a basic unit of living systems .the cell theory  
Precellular evolution: artificial creation of “cells”  
Broad classification of cell types :PPLO’s ,bacteria eukaryotic microbes,  
Plant and animal cells.A detailed classification of cell types within an organism.  
Cell ,tissue,organ and organism as different levels of organization of otherwise  
Genetically similar cells.

**Unit-II ( 10 periods)**

Ecological amplitude of cells in high altitude, sediments, arctic, hot spring, arid,  
Brackish and fresh water environments.  
Biochemical composition of cells(proteins ,lipids,carbohydrates ,nucleic acids and  
The metabolic pool)  
Ultrastructure of the cell membrane

**Unit-III ( 12 periods)**

Structure and function of the cell organelles:ultrastructure of cell membrane,cytosol,  
Golgi bodies,endoplasmic reticulum (rough and smooth),ribosomes,cytoskeleton structures (actin  
,microtubules etc.),mitochondria ,chloroplast ,lysosomes ,  
Peroxisomes,nucleus (nuclear membrane,nucleoplasm,nucleolus ,chromatin).

**Unit-IV ( 13 periods)**

Cell divisionand cell cycle (incl.cell synchrony and its application)  
Cell –cell interaction  
Cell locomotion (amoeboid, flagellar and ciliar).muscle and nerve cells  
Cell senescence and death  
Cell differentiation in plant and animals.

**Text & References:**

1. Cytology and Genetic – V R Dnyansagar.
2. Molecular biology of the Cell – Bruce Alberts
3. Molecular Cell Biology - Lodish.
4. Cell Biology CB Powar.
5. Cell and molecular Biology Gerald Karp.

**B.Sc. FIRST YEAR, BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER-I**  
**THEORY PAPER – II**  
**VBT- 102 (MICROBIOLOGY)**

Periods – 45

Marks – 60

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**UNIT – I ( 10 periods)**

Development of microscopy (optical ,TEM,and SEM)  
Pasteur's experiments disproving spontaneous generation  
The concept of sterilization ,methods of sterilization (dry heat ,wet heat, radiation  
Chemical and filtration etc)  
Concept of microbial species and strains.  
The various forms of microorganisms –PPLOs, cocci, bacilli, spirilla.

**Unit –II ( 10 periods)**

Genetic homogeneity in clonal population .  
Spontaneous and induced variation arising in microbial population.  
Gene transfer in microorganisms.

**Unit –III ( 12 periods)**

Nature of the microbial cell surface, Gram positive and Gram negative bacteria,  
Kinds of flagella ,serotypes.  
prokaryotic & eukaryotic microbial cells  
Nutritional classification of microorganisms.  
Microbes in extreme environments –the thermophiles & alkalophiles.  
Pathogenic microorganisms,defence mechanism against microorganisms.

**Unit –IV ( 13 periods)**

symbiosis and antibiosis among microbial populations.  
N<sub>2</sub> -fixing microbes in agriculture.  
Microbial metabolism : fermentation products ,a survey of products from  
Microorganisms, strain improvement by enrichment,selection and recombinant  
DNA methods .production of heterologous protein of interest in microorganisms.

**Text & References:**

1. General Microbiology-Powar and Dagainawala.
2. Fundamental Principles of Bacteriology Iled. A.J.Salle. TATA-McGrawHill(Pub.).
3. General Microbiology-Pelczar.
4. Text-book of microbiology- Anantnarayan, C.K. Jayram, Panikar, Orient Longman.
5. General Microbiology – Dey and Dey.

**B. Sc. FIRST YEAR, BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER - II**  
**THEORY PAPER – III**  
**VBT- 103 (MATHS & COMPUTERS )**

Periods – 45

Maximum Marks – 60

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**Unit –I (12 Periods )**

The set theory properties of subsets  
Linear and geometric function  
Limits of functions ,derivatives of function  
The binomial theorem

**Unit –II (10 Periods )**

Logarithm  
Differentiation  
Integration  
Probability calculation

**Unit –III (13 Periods )**

Methods of sampling ,confidence level  
Measurements of deviations  
Computers:General introduction to computers ,organization of computers ,  
Digital and analogue computers, computer algorithm

**Unit – IV (10 Periods )**

Computers in online monitoring and automation  
Application of computers in co-ordination of solute concentration, pH and  
Temperature etc.of a fermenter in operation .  
Demonstration of the above utilities (along with the above lectures )

**Text and Reference:**

1. Bailey N.T.J Statistical methods in biology.
2. Visweshwara R.K. Biostatistics, Jaypee New Delhi.
3. Batschelete : Introduction to Mathematics for life scientists , Springer Verlag New York.
4. Mathematical statistics H.C. Saxena and V.K. Kapoor S Chand.
5. Fundamentals of Statistical Methods - S.P. Gupta
6. Schaum's outline of introduction of computer science - Pushman and R. Mata, Mc.  
Grawhill
7. Fundamentals of Computer - Rajaramana
8. Computer Fundamentals – Oka
9. Fundamental Computer - Sinha

**B. Sc. FIRST YEAR, BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER - II**  
**THEORY PAPER – IV**  
**VBT- 104 (GENETICS & BIOCHEMISTRY )**

Periods – 45

Maximum Marks – 60

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**Unit –I (10 Periods)**

Nature of genetic material ; nucleic acids; DNA replication.  
Mendelian laws of inheritance, Gene interaction.  
Sex determination in plants & animals; Sex linkage; non disjunction as a proof  
Of chromosomal theory of inheritance.  
Linkage; mapping genes, interference; coincidence in pro & eukaryotes.

**Unit –II (13 Periods)**

Chromosomes: chemical composition ; structural organization of chromatids,  
Centromeres ,telomeres, chromatin, nucleosome organization :eu - &  
Heterochromatin; special chromosomes (eg polytene & lampbrush chromosome)  
Banding patterns in human chromosomes .  
Structural & numerical aberrations involving chromosomes ;evolution of wheat,  
Cotton & rice ;hereditary defects –kleinfelter, turner,cri-du –chat & Down  
Syndromes.  
Mutations-spontaneous & Induced ;chemical & physical mutagens in plants, animals  
& microbes for economic benefit of man.

**Unit –III (10 Periods)**

Basic microbial genetics; conjugation, transduction, transformation ;isolation of auxotrophs,  
replica plating ; techniques, analysis of mutations in biochemical  
Pathways ,one gene –one enzyme hypothesis.  
Extra chromosomal inheritance , mitochondrial & chloroplast genetic systems  
Population genetics :Hardy –weinberg equilibrium, gene & genotypic frequencies

**Unit –IV (12 Periods)**

Nature of biochemical reactions underlying biosynthesis and degradation .role of enzymes in  
such reactions .protein and non protein enzymes.kinetics of enzyme catalysed reaction  
In vitro activity of purified enzymes their applications in industry. Various uses of enzymes –  
enzymes in food processing ,medicine,diagnostics and production of new compounds.  
Enzymes as research tools –ELISA methods ,modification of biological compounds with the help  
of enzymes.

**Text & References:**

1. Genetics, P.J. Russel, Benjamin/Cummings.
2. Principles of Genetics, E.J. Gardner, John W.H. Sons Inc.
3. Principles of Genetics, D.P. Suttan & M.J. Simmons, John Wiley & Sons Inc.
4. Molecular Biology of Gene (Fifth Edition) J.D. Watson, A.M. Weiner & N.H. Hopkins, Addison-Wesley publishing.
5. Biochemistry- U. Satyanarayana.
6. General Biochemistry- J.H. Weil.
7. Biochemistry- A.C. Deb.
8. Principle of Biochemistry- Cohn and Stumpf.
9. Biochemistry- Stryer.
10. Biochemistry- Voet and Voet.

**B.Sc. FIRST YEAR, BIOTECHNOLOGY ( VOCATIONAL)  
PRACTICAL PAPER – I (Annual)  
BASED ON THEORY PAPERS OF SEMESTER-I & II**

Practical – 14+12

Maximum Marks – 60

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**CELL BIOLOGY & MICROBIOLOGY**

Practical 1: Cleaning of glasswares and Aseptic techniques

Practical 2: Preparation of media, cotton plugging and sterilization

Practical 3: . Isolation of microorganisms from air ,water and soil samples ,dilution  
And pour plating .colony purification and Enumeration of microorganisms. Total vs viable counts.

Practical 4 :.Identification of isolated bacteria , Gram staining,other staining methods ,  
Metabolic characterization (e.g. IMViC test)

Practical 5 : Determination of cell density by turbidometer and Growth curve of microorganisms.

Practical 6 : Antibiotic sensitivity of microbes ,use of antibiotic discs

Practical 7 : Testing of water quality

Practical 8 :.Alcoholic and mixed -acid fermentation.

Practical 9: Study of different Cell types

Practical 10 : Isolation of Mitochondria & Chloroplast.

Practical 11 : Study of Meiosis and Mitosis

Practical 12 : Study of Karyotyping.

Practical 13 : Study of Polytene Chromosome.

Practical 14 : Microscopy; Bright field microscope

## **MATHS & COMPUTERS, GENETICS & BIOCHEMISTRY**

Practical 1 : Two examples each on Dihybrid & Monohybrid cross

Practical 2 : One example each on interaction of genes.

Practical 3 : Two examples on Hardy Weinberg law.

Practical 4 : Study of Human blood group.

Practical 5 : Observe sex linked characters in tabulation from surroundings

Practical 6 : Assay of enzyme activity

Practical 7 : Kinetics studies on enzymes

Practical 8 : Problems on Derivations of functions, limits.

Practical 9 : Problems on Differentiation, Integration, probability.

Practical 10: Problems on sampling, deviations.

Practical 11 : Introduction to computers, computer algorithms.

Practical 12 : Study of Osmosis



**SKELETON OF QUESTION PAPER**  
**B.Sc. FIRST YEAR BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER-I**  
**THEORY PAPER – I /II/III/IV**  
**VBT- 101 (CELL BIOLOGY) /**  
**VBT- 102 (MICROBIOLOGY) /**  
**VBT- 103 (MATHS & COMPUTERS) /**  
**VBT- 104 (GENETICS & BIOCHEMISTRY)**

**Time:** Three hours

**Maximum Marks:** 50

**Note: -**

- (i) Attempt all questions
- (ii) All questions carry equal marks
- (iii) Draw neat and well labeled diagrams wherever necessary

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**Q.1. (Unit –I :)**

Long Answer type 10  
Or  
a. Short answer type 05  
b. Short answer type 05

**Q.2. (Unit –II :)**

Long Answer type 10  
Or  
a. Short answer type 05  
b. Short answer type 05

**Q.3. (Unit –III :)**

Long Answer type 10  
Or  
a. Short answer type 05  
b. Short answer type 05

**Q.4. (Unit –IV :)**

Long Answer type 10  
Or  
a. Short answer type 05  
b. Short answer type 05

**Q.5. (Unit – I to IV)**

Ten Multiple Choice Questions 10

**PROFORMA FOR PRACTICAL EXAMINATION**  
**SWAMI RAMANAND TREETH MARATHWADA UNIVERSITY, NANDED**  
**Faculty of Science**  
**B. Sc. I year Vocational Biotechnology (I & II Semester)**  
**Practical Examination**  
**VBT- I**

Time: 9.00 am to 1.00 pm ( for two consecutive days)

Marks: 60

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Q 1) Major Question	(Cell biology / microbiology)	15
Q 2) Minor Question	(Cell biology / microbiology)	10
Q 3) Major Question	(Maths & computers / genetics & biochemistry)	15
Q 4) Minor Question	(Maths & computers / genetics & biochemistry)	10
Q 5) Viva-Voce		05
Q 6) Record Book		05