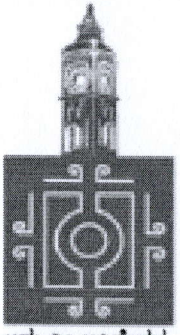

BENGALURU CITY UNIVERSITY

REGULATIONS AND SYLLABUS FOR
B.Sc. Biotechnology

CHOICE BASED CREDIT SYSTEM

(SEMESTER SCHEME)

2020-2021

B.Sc. CBCS SEMESTER SCHEME
BIOTECHNOLOGY
SCHEME OF INSTRUCTIONS AND CREDITS

Paper No.	Title of Paper	Type of Paper	Hours/ Week	Duration of Examination	IA Marks	Exam Marks	Total Marks	Credits
	I Semester							
BTP- 101	Biotechnology – I Cell biology, Genetics & Biochemistry	Theory	4	3	30	70	100	4
		Practical	3	3	15	35	50	2
	Total Marks and Credits for I semester						150	6
	II Semester							
BTP-201	Biotechnology - II Microbiology	Theory	4	3	30	70	100	4
		Practical	3	3	15	35	50	2
	Total Marks and Credits for II semester						150	6
	III Semester							
BTP-301	Biotechnology – III Molecular biology	Theory	4	3	30	70	100	4
		Practical	3	3	15	35	50	2
	Total Marks and Credits for III semester						150	6
	IV Semester							
BTP-401	Biotechnology – IV Genetic Engineering	Theory	4	3	30	70	100	4
		Practical	3	3	15	35	50	2
	Total Marks and Credits for IV semester						150	6
	V Semester							
BTP-501	Biotechnology – V Environmental Biotechnology & Immunotechnology	Theory	3	3	30	70	100	4
		Practical	3	3	15	35	50	2
BTP-502	Biotechnology – VI Plant & Animal Biotechnology	Theory	3	3	30	70	100	4
		Practical	3	3	15	35	50	2
	Total Marks and Credits for V semester						300	12
	VI Semester							
BTP-601	Biotechnology –VII Industrial Biotechnology	Theory	3	3	30	70	100	4
		Practical	3	3	15	35	50	2
BTP-602	Biotechnology – VIII Bioinformatics, Bio entrepreneurship & Research	Theory	3	3	30	70	100	4
		Practical	3	3	15	35	50	2
	Total Marks and Credits for VI semester						300	12

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Bengaluru City University

B Sc Biotechnology (CBCS) Syllabus 2020-21

B Sc I Semester – Biotechnology Paper I: Cell Biology, Genetics and Biochemistry

B Sc II Semester – Biotechnology Paper II: Microbiology

B Sc III Semester – Biotechnology Paper III: Molecular Biology

B Sc IV Semester – Biotechnology Paper IV: Genetic Engineering

B Sc V Semester – Biotechnology Paper V: Environmental Biotechnology and Immunotechnology

Biotechnology Paper VI: Plant and Animal Biotechnology

B Sc VI Semester – Biotechnology Paper VII: Industrial Biotechnology

Biotechnology Paper VIII: Bioinformatics, Bio entrepreneurship and research

B Sc I Semester

Biotechnology Paper I: Cell Biology, Genetics and Biochemistry

Theory: 60 Hours

Unit 1 Introduction

1.1 Introduction, Scope and applications of Biotechnology. 4Hr

1.2 Mendel's laws of heredity. Interaction of genes: supplementary genes-comb pattern in fowls, complementary genes- flower colour in sweet peas, epistasis- plumage colour in poultry and multiple allelism- blood groups in human being. 8 Hr

1.3 Mutations – Spontaneous and induced. Mutagens- physical and chemical. 3 Hr

Unit 2 Cell: the unit of life

2.1 General introduction and ultrastructure of a plant cell and animal cell. 2 Hr

2.2 Structure and functions of cell wall and Plasma membrane – ultra structure (fluid mosaic model) and functions – passive transport and active transport. 5 Hr

2.4 Structure and functions of nucleus, mitochondria, chloroplast, ER and ribosome. 3Hr

2.5 Chromosomes – Structure of metaphase chromosome, types based on position of centromere and ultrastructure (nucleosome model). 2Hr

2.6 Cell cycle – Mitosis, Meiosis and apoptosis. 3Hr

Unit 3 Biomolecules

3.1 Carbohydrates – structure, properties, classification and biological importance. 4Hr

3.2 Lipids -structure, properties and biological role. 3Hr

3.3 Proteins – Amino acids – names, symbols (3 & single letter), general structure and properties; Classification of proteins with examples; structure- primary, secondary, tertiary and quaternary; biological importance of proteins. 6Hr

3.4 Vitamins – water soluble and lipid soluble vitamins and their dietary sources. 2Hr

Unit 4 Enzymes and Hormones

4.1 Enzymes – Introduction, chemical nature, nomenclature and classification with examples. 3Hr

4.2 Mechanism of enzyme action – active sites, enzyme-substrate complex formation, lock and key model and induced fit theory. 3Hr

4.3 Factors influencing enzyme activity – substrate concentration, temperature, pH, inhibitors and activators; Enzyme inhibition – competitive and non-competitive. 3Hr

4.4 Enzyme kinetics – Michaeli's and Menten equation. 1Hr

4.5 Cofactors and coenzymes. 1Hr

4.6 Hormones – General introduction, protein hormones (insulin and growth hormone) steroid hormones (glucocorticoids, androgens, oestrogens and progesterone) and their basic functions. Mechanism of action of steroid hormones. 4Hr

Practical I: Cell biology, Genetics and Biochemistry

15 Units of 3 Hours each

1. Study of simple and compound microscope and colorimeter.	1 unit
2. Study of Mitosis - preparation of temporary squash from onion root tips.	2 units
3. Study of meiosis - preparation of temporary squash from onion flower buds.	2 units
4. Definition of molarity, normality and calculations.	1 unit
5. Estimation of protein by Biuret and FC methods.	2 units
6. Estimation of glucose by Somoji's method.	2 units
7. Estimation of maltose by DNS method.	1 unit
8. Estimation of amino acid by Ninhydrin method.	1 unit
9. Estimation of salivary amylase activity.	2 units
10. Study and analysis of human karyotypes – normal and abnormal.	1 unit

B Sc II Semester

Biotechnology Paper II: Microbiology

Theory: 60 Hours

Unit 1 **Fundamentals of microbiology**

1.1 General introduction, scope and relevance of microbiology. Important contributions of Robert Koch, Leeuwen Hoek, Edward Jenner, Louis Pasteur, Alexander Fleming and Iwanowsky. 3hr

1.2 Concept of prokaryotes and eukaryotes. General account on structure, classification and reproduction of bacteria, virus and fungi; bacteria classification based on shape, flagella and staining reaction; virus classification based on host and genetic material, plant virus- CaMV, animal virus-HIV, bacteriophage-lambda phage. 8hr

1.3 Microbial diseases- causative agents, mode of transmission, symptoms and preventive measures of pneumonia, tuberculosis, typhoid, cholera, hepatitis, dengue and dermatomycosis. 4hr

Unit 2 **Microbial techniques**

2.1 Principles and applications of sterilization – a) Physical -autoclave, hot air oven, LAF, Seitz filter, sintered glass filter and membrane filter, b) Chemical – alcohols, aldehydes, phenols, halogens, gaseous agents and antibiotics (Penicillin and Tetracycline), c) Radiation – UV and gamma rays. 4hr

2.2 Bacteria staining techniques – simple and differential staining (Gram's staining), Types of stains – simple stains, structural stains and acid fast stains. 3hr

2.3 Microscopy: Construction and working principles of Bright field, dark field, phase contrast and Electron (SEM & TEM) microscopes. 4Hr

2.4 Bacterial counting techniques – plate (colony) counting, coulter-counter counting and turbidometry. 2Hr

2.5 Antimicrobial sensitivity tests – diffusion test and dilution test. 2Hr

Unit 3 **Microbial growth and metabolism**

3.1 Isolation, culture, identification and preservation of bacteria. Nutritional types of bacteria, essential macro and micro nutrients for growth of bacteria and growth curve. 3Hr

3.2 Microbial respiration – aerobic and anaerobic respiration, EMP, HMP and ED pathway, Krebs's cycle and oxidative phosphorylation. 5Hr

3.3 Microbial photosynthesis – Photosynthetic pigments in prokaryotes, photophosphorylation and dark reaction. 3Hr

Unit 4 **Microbial food spoilage and food preservation**

4.1 Microbial spoilage of food: cereal grains, fruits and vegetables, milk, bread, meat and egg. 4Hr

4.2 Preservation of food – high temperature, low temperature, dehydration, osmotic pressure, chemical and radiation methods. Emphasis on Pasteurization. 6Hr

4.3 Testing of microbial contamination of water – MPN method. 2Hr

4.4 Microbial foods – Curd, Yogurt, Buttermilk and Cheese. 3Hr

Practical II: Microbiology

15 Units of 3 Hours each

1. Safety measures in the laboratory, cleaning and sterilization of glassware. 1 unit
2. Preparation of nutrient agar, nutrient broth, MRBA and PDA media. 2 units
3. Instrumentation -Autoclave, Hot-air oven, Incubator, pH meter, LAF, Inoculation loop and glass spreader. 1 unit
4. Isolation of bacteria and fungi from soil and water- serial dilution technique. 3 units
5. Inoculation techniques- pour plate, spread plate, stab, point and streak plate methods. 1 unit
6. Microbial growth determination by turbidometry. 1 unit
7. Bacterial staining techniques- simple staining, Gram staining and endospore staining techniques. 3 units
8. Enumeration of microorganisms- total count- Haemocytometer, bacteria and yeast. 2 units
9. Biochemical Tests- Catalase, starch hydrolysis and gelatin liquefaction. 2 units

REFERENCES BOOKS

CELL BIOLOGY

1.Molecular Biology of Cell - Bruce Alberts et al, Garland publications. 2. Animal Cytology and Evolution – MJD, White Cambidge University Publications. 3. Molecular Cell Biology –Daniel, Scienific American Books. 4. Cell Biology - Jack d Bruke, The William Twilkins Company. 5. Principles of Gene Manipulations – Old & Primrose, Black Well Scientific Publications. 6. Cell Biology – ambrose & Dorouthy M Easty, ELBS Publications. 7. Fundamentals of Cytology – Sharp, McGraw Hill Company. 8. Cytology – Willson & Marrison, Reinform Publications. 9. Molecular Biology – Smith Faber & Faber Publications. 10. Cell Biology & Molecular Biology – EDP Roberties & EMF Roberties, Saunder College. 11. Cell Biology – C.B Powar, Himalaya Publications.

GENETICS

1. Basic Genetics – Daniel L. Hartl, Jones &Barlett Publishers USA. 2. Human Genetics and Medicine lark Edward Arnold P London. 3. Genetics – Monroe W Strickberger, Macmillain Publishers, New York. 4. Genes V - Benjamin Lewin, Oxford University Press. 5. Genes I - Benjamin Lewin, Wiley Eastern Ltd., Delhi. 6. Genes II - Benjamin Lewin, Wiley & Sons Publications 7. Genes III- Benjamin Lewin, Wiley & Sons Publications. 8. Principles of Genetics – Winchester Sinnot & Dom. 9. Genetics – Blue print of life by Sandhya Mitra, Tata McGraw Hill Publication. 10. Genetics – Edgar Altenburg Oxford & IBH publications. 11. Principles of Genetics – E.J. Gardener, M.J. Simmons and D.P. Snustad, John Wiley & Son Publications.

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1. Microbiology-Pelzer, Chan, Krieg Tata McGraw Hill Publications. 2. Microbiology- Concepts and applications by Paul A. Ketchum, Wiley Publications. 3. Fundamentals of Microbiology – Furbisher, Saunders & Toppan Publications. 4. Microbiology –Ronald M.Atals. 5. Introductory Biotechnology-R.B Singh C.B.D. India (1990). 6. Industrial Microbiology-Casual Wiley Eastern Ltd. 7. Fundamentals of Bacteriology – Salley. 8. Fontiers in Microbial technology-P.S. Bison, CBS Publishers. 9. Biotechnology, International Trends of perspectives A. T. Bull, G. HollM.D.Lilly Oxford & T Publishers. 10. General Microbiology –C.B. Powar, H.F. Daginawala, Himalayan Publishing House.

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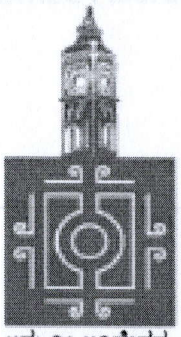
7. Textbook of Organic Chemistry (A Modern approach) P.L. Soni, Sultan Chand and Sons, Publishers. 8. The Biochemistry of Nucleic acid-tenth Edition-Roger L.P. Adams, John T. Knower and David P. Leader, Chapman and Hall Publications.

BIOPHYSICS

1.Essentials of Biophysics, New Age Int. Pub. New Delhi. 2. Bliss, C.J.K. (1967) Statistics in Biology, Vol. I McGraw hill. New York. 3. Campbell R.C. (1974) Statistics for Biologists, Cambridge Univ, Press, Cambridge. 4. Daniel (1999) Biostatistics (3rd edition) Panima Publishing, Compotation. 5. Sward law, A. C. (1985) Practical Statistics for Exponents Biologists, John Wiley and Sons, Inc. 6. Khan (1999) Fundamentals of Biostatistics Publishing Corporation. 7. Roy R.N. (1999) A Text Book of Biophysics New Central Book Agency.



BENGALURU CITY UNIVERSITY

REGULATIONS AND SYLLABUS FOR
B.Sc. Biotechnology

CHOICE BASED CREDIT SYSTEM

Scheme of Examination in Theory and Practical

2020-2021

Theory Examination Scheme - B.Sc. I Semester to VI Semester

Duration of examination: 3 hours

Maximum Marks: 70

Question Paper Pattern:

Section – A: Short Notes – 5 x 2marks = 10

Section – B: Short answer- 4 out of 5; 4 x 5marks=20

Section – C: Essay type- 3 out of 5; 3 x 10marks=30

Section – D: Answer in one word or a sentence- 10 x 1mark=10

(No objective type or fill in the blanks questions).

Total: 70 Marks

Internal Assessment:

Theory: 30 Marks

Tests – 10

Assignments/Seminars/Training project/Add-on course – 15

Attendance - 05

Practical: 15 Marks

Tests – 10

Attendance - 05

Note: To improve quality of education and to provide hands-on practical knowledge to individual students, in a practical class 10-12 students (maximum 12 students) per batch per teacher to be allotted.

Practical Examination Scheme

B.Sc. I Semester:

Biotechnology Paper I (Cell and Biochemical Technology):

Duration – 3 Hours Maximum Marks – 35

Q 1. Prepare a temporary squash of given material (Mitosis/Meiosis) and report the stage identified with diagram. 8

Q 2. Estimate the amount of Protein/sugar in the given sample (Biuret/FC /DNS method). 12

Q 3. Principle & procedure writing of the assay of activity of salivary amylase. 6

Q4. Spotters (human karyotype - normal, down's, turners, klinefelters) any one. 4

Q 5. Class record. 5

Scheme of valuation:
Q1. Performanace – 5m
Identification and diag- 3m

Q2. Performance- 7m
Protocol table-2m
Graph & result- 3m
Note: Candidate must perform the experiment for 7 tubes

Q3: Principle – 2m
Procedure- 4m

Q4: Identification – 1m
Points of relevance – 3m

B.Sc. II Semester:

Biotechnology Paper II (Microbial Technology):

Duration – 3 Hours Maximum Marks – 35

Q 1. Prepare a temporary slide of given material by Grams Staining and report the identified specimen with diagram. 7

Q 2. Enumerate the microorganism from the given sample by haemocytometer (bacteria/yeast). 5

Q 3. Prepare the temporary slide of the given fungal sample and report the identified specimen with diagram. 5

Q4. Perform Catalase test for given sample, report and comment. 4

Q5. Spotters a) Instruments(any two)
b) media(any one) 9

Q 6. Class record. 5

Scheme of valuation:
Q1. Performanace – 3m
Principle - 2m
Identification and diag- 2m

Q2. Calculation & result-5m

Q3: Performance & Identification – 3m
Diagram- 2m

Q4: Report & comment – 4m

Q5 - Identification – 1m
Points of relevance – 2m