KUVEMPU UNIVERSITY
BIOTECHNOLOGY

Bachelor of science (B.Sc.) Semester scheme
Curriculum structure for upgraded programme – 2024-25
In accordance with SEP

Sl. No	Course/ Paper Code	Title of Paper	Subject Category	Teaching hours	Semester end exams	Internal assessment	Total marks	Credits	Examination duration
Semester - 1									
1	BT – MC -I	**Biomolecules and metabolism**	MC – T	03	80	20	100	03	3Hrs
	Practical - 1		MC – P	04	40	10	50	02	3 Hrs
Total				**07**	**120**	**30**	**150**	**05**	**--**
Semester - 2									
2	BT –MC - II	**Cell and molecular biology**	MC – T	03	80	20	100	03	3Hrs
	Practical - II		MC – P	04	40	10	50	02	3 Hrs
Total				**07**	**120**	**30**	**150**	**05**	**--**
Semester - 3									
3	BT –MC - III	**Microbial technique, biophysics and biostatistics**	MC – T	03	80	20	100	03	3Hrs
	Practical - III		MC – P	04	40	10	50	02	3 Hrs
4	Elective/ Optional	**Immunology and Immonotechniques** **Genomics and Proteomics**	EL/ OP -1	02	40	10	50	02	2 Hrs
Total				**09**	**160**	**40**	**200**	**07**	**--**
Semester - 4									
5	BT – MC -IV	**Genetic Engineering and Bioinformatics**	MC – T	03	80	20	100	03	3Hrs
	Practical - IV		MC – P	04	40	10	50	02	3 Hrs

6	Elective/ Optional	**Environmental Biotechnology** **Medical Biotechnology and Bionanotechnology**	EL/ OP -2	02	40	10	50	02	2 Hrs
Total				**09**	**160**	**40**	**200**	**07**	**--**
Semester - 5									
7	BT –MC - V	**Plant and Animal Biotechnology**	MC – T	03	80	20	100	03	3Hrs
	Practical - II		MC – P	04	40	10	50	02	3 Hrs
Total				**07**	**120**	**30**	**150**	**05**	**--**
Semester - 6									
8	BT –MC - II	**Bioprocess Technology**	MC – T	03	80	20	100	03	3Hrs
	Practical - II		MC – P	04	40	10	50	02	3 Hrs
9	Project/ Dissertation/ internship			02	40	10	50	02	--
Total				**09**	**160**	**40**	**200**	**07**	**--**
Grand Total				**48**	**840**	**210**	**1050**	**36**	

II Semester B.Sc. Degree (SEP Scheme)
BIOTECHNOLOGY

Program Name	**B. Sc Biotechnology**		Semester	**Second**
Course Title	**Cell and Molecular Biology**			
Course No.	**BT -MC – II T**	**Theory**	No. of Credits	**3**
Contact hours	**48 hrs**		Duration of Exam	**3 Hours**
Formative Assessment Marks	**20**		Summative Assessment Marks	**80**

Unit I **10 Hrs**

Basic Cytology: The cell theory, ultrastructure of plant and animal cell, different types of Cells- Prokaryotes and eukaryotes. Cell cycle and its regulation; Cell-ECM and cell-cell interactions; cell motility and migration; cell death: different modes of cell death and their regulation (apoptosis, necrosis, necroptosis, autophagy, senescence etc.).

Unit II **14 Hrs**

Genetics: Monohybrid & dihybrid crosses, back-crosses, test-crosses, analyses of autosomal and sex linkages, genetic mosaics, genetic epistasis in context of developmental mechanism. Chromosomal aberrations: Numerical and structural.

DNA Replication and DNA Repair: DNA polymerases, mechanisms of DNA replication in prokaryotes and eukaryotes DNA replication models, Mutagens and DNA damage, DNA repair and recombination.

Unit III **12 hrs**

Transcription: Transcriptional initiation, elongation and termination; post-transcriptional modification: splicing and addition of cap and tail, breakdown of selective and specific mRNAs through interference by small non-coding RNAs (miRNAs and siRNAs).

Regulation of transcription: Concept of operon – Inducer and repressor operon models.

Unit IV **12 hrs**

Translation: protein translation machinery, ribosomes - composition and assembly; universal genetic codes, degeneracy of codons, Wobble hypothesis; Iso-accepting tRNA; mechanism of initiation, elongation and termination; post-translational modifications. Protein sorting and targeting.

Suggested Readings:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008).Molecular Biology of the Cell (5th Ed.). New York: Garland Science.

2. Lodish, H. F. (2016). Molecular Cell Biology (8th Ed.). New York: W.H. Freeman.

3. Krebs, J. E., Lewin, B., Kilpatrick, S. T., & Goldstein, E. S. (2014). Lewin's Genes XI.

Burlington, MA: Jones & Bartlett Learning.

4. Cooper, G. M., & Hausman, R. E. (2013). The Cell: a Molecular Approach (6th Ed.).Washington: ASM; Sunderland.

5. Hardin, J., Bertoni, G., Kleinsmith, L. J., & Becker, W. M. (2012). Becker's World ofthe Cell. Boston (8th Ed.). Benjamin Cummings.

6. Watson, J. D. (2008). Molecular Biology of the Gene (5th ed.). Menlo Park, CA:Benjamin/Cummings.

PRACTICAL II: CELL AND MOLECULAR BIOLOGY

Program Name	**B. Sc Biotechnology**		Semester	**Second**
Course Title	**Cell and Molecular Biology**			
Course No.	**BT -MC - II P**	**Practical**	No. of Credits	**2**
Contact hours	**64 hrs.**		Duration of Exam	**3 Hours**
Formative Assessment Marks	**10**		Summative Assessment Marks	**40**

1. Basics of microscopy – simple, compound microscope.
2. Study on type of cells- Prokaryotes and Eukaryotes.
3. Use of Micrometer and calibration, measurement of onion epidermal cells and yeast.
4. Study of divisional stages in mitosis from onion root tips.
5. Study of divisional stages in meiosis in grasshopper testes/onion or Rheo flower buds.
6. DNA isolation: Sheep liver or Coconut endosperm
7. Agarose gel electrophoresis.
8. Spectral analysis and DNA quantitation
9. Genetics Problems.

Model Practical Examination Scheme

B.Sc. Biotechnology

PRACTICAL: II

II-SEMESTER (Biomolecules and Metabolism)

(Formative Assessment Marks: 10; Summative Assessment Marks: 40)

Time: 3 Hrs **Max Marks: 40**

Q1. Conduct any one of the following experiment **15 M**

a.

b.

c.

Scheme of Valuation

- Writing Principle -3M
- Conducting experiment -5M
- Calculation/Tabular column /observation -5M
- Result-2M

Q2. Conduct any one of the following experiment **10 M**

a.

b.

Scheme of Valuation

- Conducting experiment -5M
- Calculation/Tabular column /observation and report -5M

Q3. Identify and comment on A and B **2.5X2=5 M**

- Identification - 1M
- Comment/Description- 1.5 M

(Blood sugar level, Rf values of amino acids, urine profile, lipid profile)

Q4. Record **5 M**

Q5. Viva **5 M**

II Semester B.Sc. Degree Examination (SEP Scheme)
BIOTECHNOLOGY

Time: 3 Hrs **Max. marks: 80**

Instructions: 1. Answer all the questions.
2. Draw neat labelled diagrams wherever necessary

PART-A

1.Answer all the five questions **2 x 5 = 10**

a.
b.
c.
d.
e.

PART-B

Answer any six of the following: **5 x 6 = 30**

2.
3.
4.
5.
6.
7.
8.
9.

PART-C

Answer any four of the following: **10 x 4 = 40**

10.
11.
12.
13.
14.
15.

I Semester B.Sc. Degree (SEP Scheme)
BIOTECHNOLOGY

Program Name	**B. Sc Biotechnology**		Semester	**First**
Course Title	**Biomolecules and Metabolism**			
Course No.	**BT-MC - I**	**Theory**	No. of Credits	**3**
Contact hours	**48 hrs**		Duration of Exam	**3 Hours**
Formative Assessment Marks	**20**		Summative Assessment Marks	**80**

Unit I **12 hr**

Carbohydrates: Definition, Classification, Fischer and Howarth structure of monosaccharides and Disaccharides - Ribose, Glucose, Galactose and Fructose, Sucrose, Maltose, Lactose. Reducing and non-reducing sugars.Polysaccharidesclassification: homo and heteropolysaccharides, Structure of Starch and Chitin. Carbohydrates in health and diseases.

Lipids: Definition, Classification and biological properties. Fatty acids- unsaturated and saturated fatty acids. Essential fatty acids and their biological importance.Biological role of lipids- Phospholipids, Glycolipids and Cholesterol.

Unit II **14 hr**

Proteins and Enzymes: Amino acids- general structure, essential and non-essential amino acids, classification based on polarity, Titration of amino acids - zwitter ionic structure. D-and L- amino acids. Structure and properties of peptide bond. Structural organization of proteins -primary, secondary, tertiary and quaternary structure of proteins, Biological importance of proteins.

Enzymes: Nomenclature and classification, mechanism of enzyme action – Lock and key hypothesis, Induced Fit hypothesis. Enzyme kinetics – Michelis – Menton equation and Lineweaver-Burk plot. Enzyme inhibition. Application of enzymes in Agriculture,Industries and Medicine.

UNIT-III **08 hr**

Nucleic Acids: Nucleosides & Nucleotides - structure & nomenclature. DNA-Types, Secondary structure of DNA (Watson and Crick model), RNA- Types and biological functions, structure of t-RNA (Clover leaf model).

UNIT-IV **14 hr**

Basics of metabolism: Basic thermodynamics: free energy, enthalpy and entropy.
Basic terminologies: Anabolism, catabolism, primary metabolism and secondary metabolism.
Carbohydrate metabolism: Glycolysis and its regulation, gluconeogenesis. TCA cycle and electron transport chain. Calvin Cycle, C4 and CAM pathway.
Lipid metabolism: Beta-oxidation, Biosynthesis of fatty acids.

Amino acid Metabolism: Glucogenic and ketogenic amino acids, general pathways of degradation,Urea cycle, General pathways of synthesis of amino acids.

Metabolism of nucleotides: Biosynthesis of purines and pyrimidines and degradation of purines and pyrimidines.

Suggested Readings:

1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu.Pvt.Ltd. New Delhi, India
2. Biochemical Methods,1st Edition, (1995), S. Sadashivam, A. Manickam; New Age International Publishers, India
3. Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing. House,New Delhi, ISBN 81-7319-302-9
4. Experimental Biochemistry: A Student Companion, Beedu Sasidhar Rao& Vijay Despande(ed). I. K International Pvt. LTD, New Delhi. ISBN 81-88237-41-8
5. Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers, Ludhiana ISBN 81-7663-067
6. Principles of Biochemistry: 6Eds. **Albert L Lehninger**, Tata_McGrawHill Publications, New York, USA.

PRACTICAL 1: BIOMOLECULES AND METABOLISM

Program Name	**B. Sc Biotechnology**		Semester	**First**
Course Title	**Biomolecules and Metabolism**			
Course No.	**BT-MC – I P**	**Practical 1**	No. of Credits	**2**
Contact hours	**64 hrs**		Duration of Exam	**3 Hours**
Formative Assessment Marks	**10**		Summative Assessment Marks	**40**

1. Qualitative analysis of sugars.
2. Qualitative analysis of amino acids
3. Reducing sugar estimation by DNS method.
4. Protein estimation by Biuret method
5. Determination of activity of alpha amylase
6. Separation of amino acids by circular paper chromatography.
7. Estimation of iodine value of lipids.
8. Qualitative analysis of metabolites in urine sample-urea, uric acid, creatinine, albumin,glucose, sterol and ketone bodies

Model Practical Examination Scheme
B.Sc Biotechnology
PRACTICAL: 1
I-SEMESTER (Biomolecules and Metabolism)
(Formative Assessment Marks: 10; Summative Assessment Marks: 40)

Time: 3 Hrs **Max Marks: 40**

Q1. Conduct any one of the following experiment **15 M**

a.

b.

c.

Scheme of Valuation

- Writing Principle -3M
- Conducting experiment -5M
- Calculation/Tabular column /observation -5M
- Result-2M

Q2. Conduct any one of the following experiment **10 M**

a.

b.

Scheme of Valuation

- Conducting experiment -5M
- Calculation/Tabular column /observation and report -5M

Q3. Identify and comment on A and B **2.5X2=5 M**

- Identification - 1M
- Comment/Description- 1.5 M

(Blood sugar level, Rf values of amino acids, urine profile, lipid profile)

Q4. Record **5 M**

Q5. Viva **5 M**

I Semester B.Sc. Degree Examination (SEP Scheme)
BIOTECHNOLOGY

Time: 3 Hrs **Max. marks: 80**

Instructions: 1. Answer all the questions.
2. Draw neat labelled diagrams wherever necessary

PART-A

1.Answer all the five questions **2 x 5 = 10**

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