



# **BAGALKOT UNIVERSITY**

Mudhol Road, Jamkhandi-587301 Dist.Bagalkot

**PROGRAM /COURSE STRUCTURE AND SYLLABUS FOR**

## **BIOTECHNOLOGY**

as per the Choice Based Credit System (CBCS) designed in  
accordance with Learning Outcomes-Based Curriculum  
Framework (LOCF)

For

## **Bachelor of Science(BIOTECHNOLOGY)**

**(General Degree)**  
I and II Semester

w.e.f.

**Academic Year 2024-25**

## Preamble for UG Syllabus of Bagalkot University

Bagalkot University Jamkhandi has been established by the Government of Karnataka and has started functioning from the academic year 2023-24. All the degree colleges other than engineering and medical colleges in the district of Bagalkote, are affiliated to this university as per the Karnataka State Universities Act 2000, as modified by the 26th Act of 2022. The students taking admission to any of the colleges in the district of Bagalkote, from the academic year 2023-24 will be students of Bagalkot University. The Government of Karnataka has instructed all the Universities to revise the under graduate syllabus as per the Government order no. ED 166 UNE 2023 Bengaluru Dated 08-05- 2024 from the academic year 2024-25.

Hence the Bagalkot University has revised the syllabus as suggested by its Board of Studies and approved by Academic Council and Syndicate. The subject code format for all the subjects of the new syllabus is also revised.

The subject code format is described in the following.

### Subject Code Format

1	2	3	4	5	6	7	8	9	10
VER	DEGREE	SEM	DISCIPLINE			SUB. TYPE	SL. NO.	FOR	TH/LAB/F
							SUB. TYPE		
2	A	1	C	H	E	M	0	1	T
2	B	1	P	O	L	M	0	1	T

**[1] The Version information gives the version of the syllabus. It can take values 1,2..9,a,b,...**

**[2] The UG degree codes to be provided as / The code applicable to all degrees**

Sl. No	Degree Code		Degree
1	B.Sc.	A	Bachelor of Science
2	B.A	B	Bachelor of Arts
3	B.Com.	C	Bachelor of Commerce
4	BBA	D	Bachelor of Business Administration
5	BCA	E	Bachelor of Computer Applications
6	BSW	F	Bachelor of Social Work
7.	-----	S	Applicable to all degrees

**[3] The Semester Information is provided as**

Sl. No	Semester
1	1
2	2
3	3
....	

**[4-6 ]The Discipline Information to be provided as**

Sl No	Degree	Discipline Code
1	B.Com.	XXX
2	BCA	XXX
3	BBA	XXX
4	BSW	XXX
5	B.A	'HIS', 'POL', 'GEO', 'KAN', 'HIN' etc. The detailed list is to be provided
6	B.Sc.	'PHY', 'CHE', 'BOT', 'ELE' etc. The detailed List is to be Provided

**[7] The Subject Type to be provided as**

Sl. No.	TYPE	Description
1	Major	M
2	Language	L
3	Constitutional Moral Values	C
4.	Elective	E
5.	Skill / Practical based learning	S
6.	Mini Project	P
7.	Internship	I
8.	Case study/ Survey using principles of Research methodology	R

**[8-9] The Running Serial Number is to be provided for a particular Subject type 01 to 99**

**[10] This character specifies the category of the subject namely, T=Theory, L-Practical, P-Project Work, F-Field work, Viva-V, I-Internship, Dissertation-D**

## PROGRAM STRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years B.Sc. with Biotechnology Undergraduate Programme with effect from 2024-25. **First Semester B.Sc.**

### (Biotechnology) Scheme

<b>SEMESTER-I</b>											
<b>Category</b>	<b>Course code</b>	<b>Title of the Paper</b>	<b>Marks</b>			<b>Teaching hours/ week</b>			<b>Credits</b>	<b>Duration of Exam (Hrs)</b>	<b>Teaching Department</b>
			<b>IA</b>	<b>SEE</b>	<b>Total</b>	<b>L</b>	<b>T</b>	<b>P</b>			
L1	-----	Language 1	20	80	100	3	-	-	3	3	-
L2	-----	Language 2	20	80	100	3	-	-	3	3	-
Major	2A1BIOM01T	Cell biology and Genetics	20	80	100	3	-	-	3	3	Biotechnology
	2A1BIOM01L	Practicals-1	10	40	50	-	-	4	2	3	Biotechnology
Major	-----	Major Subject 2	20	80	100	3	-	-	3	3	---
	-----	Practical	10	40	50	-	-	4	2	3	---
Major	-----	Major Subject 3	20	80	100	3	-	-	3	3	---
	-----	Practical	10	40	50	-	-	4	2	3	---
Common	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment studies									Environmental Studies,: Chemistry//Geography/ Botany
<b>Total Marks</b>					<b>700</b>	<b>Semester Credits</b>			<b>23</b>		

**L1 & L2: Languages**

## Second Semester B.Sc. (Biotechnology) Scheme

<b>SEMESTER-II</b>												
Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of exams (Hrs)	Teaching Department	
			IA	SE E	Total	L	T	P				
L3	-----	Language 3	20	80	100	3	-	-	3	3	-	
L4	-----	Language 4	20	80	100	3	-	-	3	3	-	
Major	2A2BIOM02T	Biochemistry and Genetics	20	80	100	3	-	-	3	3	Biotechnology	
	2A2BIOM02L	Practicals-2	10	40	50	-	-	4	2	3	Biotechnology	
Major	-----	Major Subject 2	20	80	100	3	-	-	3	3	---	
	-----	Practical	10	40	50	-	-	4	2	3	---	
Major	-----	Major Subject 3	20	80	100	3	-	-	3	3	---	
	-----	Practical	10	40	50	-	-	4	2	3	---	
Common	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Values: Political Science	
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/Geography/ Botany	
<b>Total Marks</b>					<b>700</b>	<b>Semester Credits</b>			<b>23</b>			

**L3 & L4 : Languages**

## First Semester B.Sc. (Biotechnology)

Paper Code: 2A1BIOM01T

Paper Title: Cell Biology and Genetics

Teaching Hours: 3 H / Week

Marks: Th-80+IA-20

Total hours: 40 Credits: 3

### Unit: 1

General Introduction and cell as a basic unit of life: Introduction to Biotechnology, Scope and branches of Biotechnology. Historical perspectives, the cell theory, Ultra structure of animal and plant cells and their organelles: Cell wall, Plasma membrane, Mitochondria, Chloroplast, Ribosome, Golgi complex, Endoplasmic Reticulum, Nucleus, Lysosome, Peroxisomes, Vacuoles,

**10Hours**

### Unit: 2

Chromosomes and Cell division: Discovery, morphology and structural organization: Number, size and types, Chromosomal Morphology, fine structure and models, heterochromatin and Euchromatin, Cancer Biology: Causes, symptoms, types of cancer and its prevention, Cell senescence and programmed cell death Cell Division: Cell cycle, Mitosis and Meiosis and its applications.

**10 Hours**

### Unit: 3

Introduction to genetics: History and scope and branches of Genetics Mendelism: Mendel's work, Laws of heredity, back cross, Test-cross, Incomplete Dominance and simple problems Supplementary factors: Comb pattern in Fowls, Complementary factors: Flower color in sweet pea Multiple factors: Skin color in human beings Multiple allelism : Blood group in human beings ,Epistasis : Plumage color in Poultry Sex determination in Plants and Animals: Concept of allosomes and autosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ Types

**10 Hours**

### Unit: 4

Linkage and crossing over: Coupling and repulsion hypothesis, Linkage in maize and Drosophila, Mechanism of crossing over and its importance, chromosomal mapping-Linkage map in maize Chromosomal Variation: Structural and numerical aberrations, chromosomal evolution in wheat and cotton Mutations: Types-Spontaneous and Induced; Mutagens – Physical and chemical mutagens, Induced Mutations in Plants, Animals and Microbes for economic benefit. Human Genetics: Karyotype in man, Inherited disorders – Allosomal (Klinefelter's and Turner's syndrome), Autosomal (Downs and Cri-du-chat syndrome)

**10 Hours**

**First Semester B.Sc. (Biotechnology)**  
**Paper Code: 2A1BIOM01L**                      **Paper Title: Practicals-1**  
**Teaching Hours: 4 H / Week**              **Marks: Th-40+IA-10**  
**Total hours:4 Credits :1**

**BTDSO P11: PRACTICALS I**

1. Study of fixatives and stains: Preparation of Formaldehyde (4-10%), Alcohol (70- 100%), Bouin's fixative, Carnoy's solution, Borax carmine (alcoholic), Eosin (alcoholic), Heamatoxylin, Acetocarmine, Aceto-orcein, Schiff's reagent (Feulgen method), Giemsa Stain.
2. Squash preparation: Onion root tip to study stages of mitosis.
3. Squash preparation: Grasshopper testis / onion flower bud/ Tradiscantia to study stages of meiosis.
4. Squash preparation of salivary gland chromosomes: Drosophila /Chironomous larva.
5. Karyotyping analysis.
6. Micrometry.
7. Buccal epithelial smear and Barr body.
8. Extraction of cellular materials in saline buffers, solvents and precipitation.
9. Demonstration of Laws of inheritance by using color beads
  - a. Law of segregation
  - b. Law of independent assortment
  - c. Solve genetic problems
10. Each student is required to submit 2 permanent slides of Mitosis and Meiosis:at least one from each.



## References:

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1. Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. 1994: 3rd edition, molecular biology of "The Cell". Garland, S.R. Hysams, J.E. Jones, S. Shepherd, E.A. and White, H.A. 1997: From genes to cells Wiley-Liss, Inc. New York.
2. Campbell, N.A. Mitchell, L.G. and Reece, J.B. 1996: General Biology. Benjamin Cummings.
3. Cooper, G.M. 1997 The Cell: A molecular approach, ASM press, USA.
4. De Robertis, E.D.P. and Robertis, E.M.S. 1996: Cell and Molecular Biology, Holt Saunders International
5. Garrett, R.H. and Gresham, C.M. 1995: Molecular aspects of cell biology, International edition, Saunders college publishing
6. P.K. Gupta Cell and molecular. Biology:
7. Gilbert and Raunio 1997: Embryology – constructing the organism
8. Holly Ahern 1992: Introduction to Experimental Cell biology, W.M.C. Brown publishers
9. Inder Singh, 1997: Text book of human Histology, Jaypee brothers Medical publishers, New Delhi.
10. Karp, G. 2000 Cell and Molecular Biology: Concepts and Experiments, John Wiley and sons Inc. New York.
11. Lodish, H. Berk. A. Zipursky, S.L. Matsiduvarya. P. Baltimore, D. Darnell, J. 2000: Molecular cell Biology, Freeman W.H. and co. New York.
12. Singh, H.R. 2000: Animal Physiology and related Biochemistry, S. Lobanlal Nagin Chand and co. Educational publishers, New Delhi.
13. Smith and Wood 1992: Cell biology, Chapman and Hall.
14. Tobin and Morel 1997; Asking about "Cells "Saunders College Publishing.
15. Vasudev Rao, K. 1994: Developmental Biology – A modern Synthesis,
16. Oxford IBH publishing. Wilson, E.B.: Cells in Development and inheritance, Mac Millan, New York.

### GENETICS :

- 1 Daniel. L. Hartl, "Basic Genetics", Jones and Barlett Publishers USA.
- 2 Edgar Attenburg, "Genetics", Oxford and IBH Publications.
- 3 Fairbanks, D.J.R. Anderson, W.R. 1999: Genetics, the continuity of life. Brooke and Cole

Publication. Co. New York.

4 Lewin. B. 2000: Gene VII, Oxford University Press, New York.

5 Lewin, R 1999: Human Genetics: Concept and applications, 3rd edition WCB, Mc Graw Hills Dubuque, IA.

6 Miglani G.S. 2000, "Basic Genetics" Narosa publishing house. New Delhi.

7 Sandhya Mitra, "Genetics – Blue print of life" Tata Mc. Graw Hill publications

8 Snuustad , P.D. and Simmons , M.J. 2000 : Principles of Genetics , 2nd Ed. John Wiley and Sons Inc. New York.

9 Stricberger, M.W. 1995: Genetics 3 Ed. Prentice Hall Inc. London.

10 Sturitevant, A. Hand Bredle, G.W. 1989: An Introduction to genetic W.B. Saunders Philadelphia.

11 Tamarin, R.M. 2000: Principles of genetics 6 Ed. WMC Publication co. London.

Winchester Sinnot and Dorm, "Principles of Genetics".

**Second Semester B.Sc. (Biotechnology)**

**Paper Code: 2A2BIOM02T**

**Paper Title: Biochemistry and Biostatistics**

**Teaching Hours: 3H / Week**

**Marks: Th-80+IA-20**

**Total hours: 40 Credits: 3**

**Unit: 1**

Carbohydrates: Structure, Properties, Classification and functions Lipids: Structure, Properties, Classification and Functions Amino acids and Proteins: Structure, Properties, Classification and functions of amino acids and proteins. Structural organizations of proteins (primary, secondary, tertiary and quaternary structures) Enzymes: Nomenclature, classification, properties, factors influencing enzyme catalyzed reactions, enzyme inhibition (reversible and irreversible), outline of purification, industrial application of enzymes. **10**

**Hours**

**Unit: 2**

Bioenergetics: Concept of free energy transformations, Redox potentials, Regulations of Glycolysis, Krebs's cycle and Electron Transport System. Principles and applications of Solutions, pH and buffers: Theory of water ionization and its purity (KW), pKa & pKb acids and bases. Buffers: Criteria for selection of buffers, types of buffers, Buffers in Biological systems and their mechanism of action. **10 Hours**

**Unit: 3** Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, d Analytical techniques: Principles and applications of Chromatography (Paper, thin-layer, column and GLC), Centrifugation (RPM and G, Ultracentrifugation), Spectroscopy (UV-Visible)

**10 Hours**

**Unit: 4** : Biostatistics: Data & its types, Tabulation and classification of data, Frequency distribution and Graphical representation of data, Measures of central tendencies: Mean, Median, Mode and their properties, Measures of Dispersion: Mean deviation, Variance, Standard deviation and coefficient of Variation, Different models of data presentation with special reference to biological samples, Chi square test

**10 Hours**

**Second Semester B.Sc. (Biotechnology)**

**Paper Code: 2A2BIOM02L**

**Paper Title: Practicals-2**

**Teaching Hours: 4 H / Week**

**Marks: Th-40+IA-10**

**Total hours: 45 Credits: 2**

BTDCS P21: PRACTICAL-II

1. Preparation of percent molarity, molality and normality of solution, Measurement of pH and buffer.
2. Qualitative analysis of Carbohydrates, Amino acids, Proteins and Lipids.
3. Paper Chromatography of amino acids and sugars.
4. Qualitative analysis of body fluids such as blood and urine.
5. Assay of amylase activity.
6. Colorimetric estimation of protein by Biuret method.
7. Colorimetric estimation of blood sugar.
8. Estimation of amino acids.
9. Estimation of creatinine in urine sample.
10. Testing of acid phosphates (Potato) and alkaline phosphates (milk) activity.
11. Demonstration of catalase activity.

## References:

1. Biomolecules and analytical techniques Boyer Rodney, 1999 "Concepts of biochemistry", Pacific Grove, Brooks/cole publishing company.
2. Deb, A.C. "Fundamental of Biochemistry", New Central Book Agency, Calcutta.
3. Jain, J.L. "Fundamentals of Biochemistry".S. Chand and Company. Keshav Trehan; "Biochemistry", wiley Eastern publication.
4. Lehninger, et.al., 1997: Principal of Biochemistry CBS publishers.Mathews and Van Horde:
5. Moron, L.A. sceimgeour, K.G. Hostan, H.R. Ochs, R.S. and Rawn, J.D. 2000: Biochemistry, 3rd edition
6. Biomolecule: Mohan P. Arora Biophysics: Mohan P. Arora
7. Biochemistry: A. C. Deb
8. Biophysics: Pattabh & Gautham Text book of Biochemistry (1997), Devlin, Thomas, M.
9. Biochemistry (1993) Zubay, G.
10. Biochemistry Fundamentals, Voet et al.
11. Biochemistry, Friedfider, D.
12. Practical Biochemistry, Plummer.
13. Physical Biochemistry: Application to Biochemistry and Molecular Biology – Freilder.
14. Principle of Instrumental Analysis – Skoog & West
15. Bliss, C.J.K. (1967) Statistics in Biology Vol 1. I Mc Graw hill. New York
16. Campbell R.C. (1974) Statistics for Biologists, Cambridge Univ, Press, Cambridge
17. Daniel (1999) Biostatistics (3rd Edition) Panima Publishing, Comotation
18. Sward law, A.C. (1985) Practical statistics for Exponents Biologists, Jhon Wiley and Sons, In
19. Khan (1999) Fundamentals of Biostatistics, Publishing Corporation

**ASSESSMENT METHODS**  
**Formative Assessment for Theory**

Evaluation Scheme for Internal Assessment: Continuous Internal Assessment (CIA)

Assessment Criteria 20 marks		
1st Internal Assessment Test for 20 marks of 1 hour duration after 8 weeks and later marks should be reduced to 5	CIA : C1	5 Marks
2nd Internal Assessment Test for 40 marks 2 hours duration after 15 weeks and marks should be reduced to 10	CIA : C2	10 Marks
Assignment/ Activity	CIA : C3	05 Marks
Total		20 Marks

Summative Assessment for Theory:

SEMESTER END EXAM : SEE	C4	80 Marks
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**Formative Assessment for Practical:**

Assessment Criteria 10 marks		
Internal Test including basic understanding of the concept, Viva Voce, Journal. Test should be conducted for 50 marks and later it should be reduced for 10 marks	CIA : C1	10 Marks

Summative Assessment for Practical:

SEMESTER END EXAM : SEE	C2	40 Marks
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### Schema of Evaluation for Practical Examination

	Particulars	Marks Allotted
<b>1</b>	<b>Experimental preparation involving the following *</b>	<b>30</b>
<b>2</b>	<b>Journal (record) assessment</b>	<b>05</b>
<b>3</b>	<b>Oral performance (Viva-voce)</b>	<b>05</b>
<b>TOTAL</b>		<b>40</b>
	Brief description & tabulation	04
	Basic diagrams/specimen identification	04
	Preparation of required solutions and Experimental set-up	04
	Record of observation and performance of experiment	10
	Calculation including drawing graph	06
	Accuracy of result with unit	02

#### **Instruction to set the question paper.**

1. Question number 1 has 12 sub questions consisting of 3 questions from each unit. Each question carries two marks. Student has to answer any ten questions.
2. Question number 2 to 7 are from unit I to IV.  
Each question carries five marks. Student has to answer any four questions.
3. Question number 8 to 12 are from unit I to IV. Each question carries ten marks. Student has to answer any four question.

# Question Paper pattern

First Semester B.Sc. Degree Examination (SEP)

Biotechnology

Time: 3 hours

Max. Marks: 80

Part- A		
1.		Answer any <b>TEN</b> questions <span style="float: right;"><b>10 x 2 = 20</b></span>
	a)	
	b)	
	c)	
	d)	
	e)	
	f)	
	g)	
	h)	
	i)	
	j)	
	k)	
	l)	
Part-B		
		Answer any <b>Four</b> questions <span style="float: right;"><b>4 x 5 = 20</b></span>
	2	
	3	
	4	
	5	
	6	
	7	
Part-C		
		Answer any <b>FOUR</b> questions <span style="float: right;"><b>4 X 10 = 40</b></span>
	8	
	9	
	10	
	11	
	12	



