



**BAGALKOT UNIVERSITY
JAMKHANDI**

**PROGRAM /COURSE STRUCTURE AND SYLLABUS
For**

**Bachelor of Science with MICROBIOLOGY
I and II Semester**

**w.e.f.
Academic Year 2024-25 and onwards**

PROGRAMSTRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years
B.Sc.with Microbiology Undergraduate Programme with effect from2024-25

First Semester B.Sc. With Microbiology Scheme

SEMESTER-I											
Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credits	Duration of Exam (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
L1	-----	Language1	20	80	100	4	-	-	3	3	-----
L2	-----	Language2	20	80	100	4	-	-	3	3	-----
Major	2A1MICM01 T	Introduction to Microbiology and Microbial Diversity	20	80	100	4	-	-	3	3	Microbiology
	2A1MICM01 L	Introduction to Microbiology and Microbial Diversity Lab	10	40	50	-	-	4	2	3	Microbiology
Major	-----	Major Subject 2	20	80	100	4	-	-	3	3	- - -
	-----	Practical	10	40	50	-	-	4	2	3	- - -
Major	-----	Major Subject 3	20	80	100	4	-	-	3	3	- - -
	-----	Practical	10	40	50	-	-	4	2	3	- - -
Common	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Vvalues : Political Science
	2S1XXXC02T	Environment studies									Environmental Studies: Chemistry /Geography/ Botany
Total Marks					700	Semester Credits			23		

Second Semester B.Sc. With Microbiology Scheme

SEMESTER-II											
Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credits	Duration of exams(Hrs.)	Teaching Department
			IA	SEE	Total	L	T	P			
L3	----	Language3	20	80	100	4	-	-	3	3	-----
L4	----	Language4	20	80	100	4	-	-	3	3	-----
Major	2A2MICM02T	Microbial Physiology and Biochemistry	20	80	100	4	-	-	3	3	Microbiology
	2A2MICM02L	Microbial Physiology and Biochemistry Lab	10	40	50	-	-	4	2	3	Microbiology
Major	----	Major Subject2	20	80	100	4	-	-	3	3	----
	----	Practical	10	40	50	-	-	4	2	3	-----
Major	----	Major Subject3	20	80	100	4	-	-	3	3	-----
	----	Practical	10	40	50	-	-	4	2	3	
Common	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environmental Studies									Environmental Studies: Chemistry/Geography/ Botany
Total Marks					700	Semester Credits			23		

BSc I-Semester MICROBIOLOGY(Theory)

Course Code: 2A1MICM01T

Paper Title: **Introduction to Microbiology and Microbial Diversity**

Teaching Hours /Week:3

Total Marks:Th-80 +IA-20 =100

TotalTeachingHours:52

Credits:3

Course Outcomes (CO's): At the end of the course students will be able to

1. Learning the scientific methods and the history of science is the embodiment of scientific knowledge.
2. As an introductory part of Microbiology, students will get the basic ideas and practices from the contribution of several Microbiologists in the field of microbiology.
3. They will have to know the diversity of microbial world like algae, fungi, protozoa and their general characteristics and importance.
4. They will be understood various laboratory practices, biosafety and also know the applications of important instruments like biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH
5. Concept building about the relevance of biodiversity of microbial world

(Course Content)

	Contents	Hours
Unit-I	History and milestones in Microbiology: Contributions of Antonov Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky. Importance and Applications of Microbiology. Classification of microorganisms. Whittaker's five Kingdom concept. General characteristics and outline classification of Bacteria, Archaea, Mycoplasmas, Cyanobacteria, Fungi, Algae, Protozoa and Viruses.	13
Unit-II	Methods of Sterilization: Physical methods – Dry heat, Moist heat, Radiation methods, Filtration methods, Chemical methods and their applications. Microbial cultures: Concept of pure culture, Methods of pure culture isolation, Enrichment culturing techniques, Single cell isolation, and Pure culture development. Preservation of microbial cultures: sub-culturing, over laying cultures with mineral oils, lyophilization, and cultures, Storage at low temperature. Staining Techniques-Simple and differential staining techniques.	13

<p>Unit-III</p>	<p>Principles of microscopy- Bright field and Electron microscopy (SEM and TEM). Nutritional types of bacteria. Microbiological media-Natural and Synthetic media basal, defined, complex, enrichment, selective, differential, maintenance and transport media Microbial growth: Principles of growth, Kinetics of growth, Methods of measuring growth: Direct methods: viable plate counts, membrane filtration. Indirect methods: Metabolic activity – Measurements of DNA, Protein, Microscopic counts, electronic counters, most probable number; Batch and continuous growth, Synchronous culture, Diauxic growth, Types of cultures-stock, batch, continuous and synchronous cultures.</p>	<p>13</p>
<p>Unit-IV</p>	<p>Cultivation of aerobes and anaerobes. Reproduction in bacteria and spore formation. Ultra structure of Prokaryotic cell- Variant components and invariant components. Cell wall of bacteria and fungi, Gram positive and Gram negative cell wall, Cell wall of fungi and yeasts. Morphology, Ultrastructure and Chemical composition of bacteria, Actinomycetes, Spirochetes, Rickettsiae, Mycoplasma, Chlamydiae. Economic importance of algae and fungi. SCP..</p>	<p>13</p>

B.Sc. I -Semester MICROBIOLOGY (Practical)

Course Code: 2A1MICM01L

Paper Title: **Introduction to Microbiology and
Microbial Diversity Lab**

Lab Hours / Week: 4 Total Marks: Th- 40 + IA- 10 = 50 Total Teaching Hours: 50

Credits:2

(CourseContent)

Contents	Hours
1. Microbiology Good Laboratory Practices and Biosafety. 2. Preparation of culture media for cultivation of bacteria 3. Preparation of culture media for cultivation of fungi	15
4. Sterilization of medium using Auto clave 5. Sterilization of glass ware using Hot Air Oven 6. Light compound microscope and its handling	10
7. Microscopic observation of bacteria (Gram +ve bacilli and cocci, Gram -ve bacilli), Cyano-bacteria, Algae and Fungi. 1. Simple staining 2. Gram's staining 3. Hanging-drop method.	15
8. Isolation of pure cultures of bacteria by streaking method. 9. Preservation of bacterial cultures by various techniques. 10. Any other practical depending on feasibility	10

Suggested Readings:

1. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Dube, R.C. and Maheswari, D.K. (2000) General Microbiology. S Chand, New Delhi. Edition), Himalaya Publishing House, Mumbai.
3. Power, C.B. and Dagainawala, H.F. (1986). General Microbiology Vol I & II. 4. Prescott, M.J., Harley, J.P. and Klein, D.A. (2010). Microbiology. 5th Edition, WCB McGraw Hill, New York.
5. Reddy, S.M. and Reddy, S.R. (1998). Microbiology □ Practical Manual, 3rd Edition, Sri Padmavathi Publications, Hyderabad.
6. Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
7. Stanier, R. Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.

8. Microbiology Edited by Prescott
9. Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology.
Kalyani Publishers, New Delhi.
10. Gopal Reddy *et al.*, Laboratory Experiments in Microbiology

B.Sc.II-Semester MICROBIOLOGY (Theory)

Course Code: 2A2MICM02

Paper Title: **Microbial Physiology and Biochemistry**

Teaching Hours /Week:3

Total Marks:Th-80+IA-20 =100

Total Teaching Hours: 52

Credits:3

Course Outcomes (CO's): At the end of the course, students will be able to

1. Students will have to acquire the clear cut knowledge of microbial growth and effect of environmental factors (like pH, temperature, salt concentration etc.) on microbial growth, nutrient uptake and transport, aerobic, anaerobic respiration, fermentation and at the same time phototrophic metabolism and nitrogen metabolism.
2. Here students will have to know the Properties of water, Concept of pH and buffers, preparation of buffers and Numerical problems on calculations of Standard Free Energy Change and Equilibrium constant and also Standard Free Energy Change of coupled reactions.
3. Students will have to acquire the clear cut knowledge regarding the properties, functions, structures of different bio-molecule like Carbohydrates,Lipids,Proteins,EnzymesandVitamins.
4. Students will be able to run various biochemical tests like qualitative or quantitative tests for carbohydrates, reducing sugars, non reducing sugar ,Lipids, and proteins.
5. They will have to study the protein secondary, tertiary structures, enzyme kinetics– calculation of Vmax, Km, Kcat values and effect of temperature, pH and heavy metals onenzymeactivity.

(CourseContent)

	Contents	Hours
Unit-I	<p>Carbohydrates–Classification, chemistry, properties, and functions– mono, di,and polysaccharides.</p> <p>Lipids – classification, chemistry, properties and functions – free fattyacids,triglycerides, phospholipids,glycolipids& waxes</p> <p>Proteins-Isolation and characterization of proteins. Structural levels ofproteins–primary, secondary, tertiary and quaternary, denaturation ofproteins. Hydrolysis of proteins. Outlines of Protein sequencing using various methods.</p> <p>Amino acids –Classification, structure and functions. Essential amino acids and functions of carboxyl and amino groups and side chains.</p>	13
Unit-II	<p>Nucleic acids–Structure, function and their properties. Structural polymorphism of DNA, RNA. Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA), deviations from Watson-Crick model, other forms of DNA (A-and Z-DNA), forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking). Structural characteristics of RNA. Types of RNA.</p>	13

Unit-III	<p>Aerobic respiration - Glycolysis, HMP pathway, ED path way, TCA cycle, Electron transport, oxidative and substrate level phosphorylation. Krebs'cycle, glyoxylatecycle, hexose monophosphate (HMP) shunt, gluconeogenesis.</p> <p>Anaerobic respiration Fermentation, biochemical mechanisms of lactic acid, ethanol, butanol and citric acid fermentations. Nitrate and sulphate respiration. Outlines of oxygenic and an oxygenic photosynthesis in bacteria..</p>	13
Unit-IV	<p>Properties and classification of Enzymes. Biocatalysis-induced fit and lock and key models.</p> <p>Co-enzymes and Co-factors. Factors affecting catalytic activity.</p> <p>Inhibition of enzyme activity-competitive, non competitive, uncompetitive and allosteric.</p> <p>Enzyme kinetics: Michaelis-Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of pH and temperature,.</p>	13

B.Sc. II-Semester MICROBIOLOGY (Practical)

Course Code: 2A2MICM02L

Paper Title: **Microbial Physiology and Biochemistry Lab**

Teaching Hours / Week: 4 TotalMarks:Th-40+IA-10=50 TotalTeachingHours:50

Credits:2

(CourseContent)

Contents	Hours
1. Qualitative Analysis of Carbohydrates. 2. Qualitative Analysis of Amino acids. 3. Colorimetric estimation DNA by diphenylamine method.	15
4. Estimation of RNA by Orcinol method. 5. Colorimetric estimation of proteins by Biuret/Lowry method. 6. Estimation of reducing sugar-Anthrone method.	10
7. Estimation of sugar by titration method–Benedict’s method. 8. Determination of p KaandpI values of amino acids. 9. Assayofamylaseactivity.	15
10. Effect of temperature/pH onenzyme activity 11. Demonstration of immobilization of enzymeactivity. 12. Anyotherpractical dependingonfeasibility	10

SuggestedReadings:

1. BergJM,Tymoczko JLand Stryer L(2011) Biochemistry, W.H.Freeman andCompany
2. Caldwell,D.R.(1995).MicrobialPhysiologyandMetabolism,W.C.BrownPublications,Iowa, USA.
3. Lehninger,A.L.,Nelson,D.L.andCox,M.M.(1993).PrinciplesofBiochemistry,2nd Edition,CBSPublishers and Distributors,NewDelhi.
4. SashidharaRao,B.andDeshpande,V.(2007).ExperimentalBiochemistry:AstudentCompanion.I.K.International Pvt.Ltd.
5. TymoczkoJL,BergJManStryerL(2012)Biochemistry:Ashortcourse,2nded.,W.H.Freeman
6. Voet,D.andVoetJ.G(2004)Biochemistry3rdedition,JohnWileyandSons
7. White,D.(1995).ThePhysiologyandBiochemistryofProkaryotes,OxfordUniversityPress,New York

