KUVEMPU UNIVERSITY

CHOICE BASED CREDIT SYSTEM (CBCS)

&

CONTINUOUS ASSESSMENT AND GRADING PATTERN

Based

B. Sc., MICROBIOLOGY SYLLABUS

(Case 1: 3 Majors with a General Degree)

For

2024-25

Board of Studies in Microbiology
Department of Microbiology
Kuvempu University
Jnanasahyadri, Shankarghatta-577451
Shivamogga, Karnataka, INDIA.

Proposed Semester-wise Distribution of the Course Structure

Case 1: 3 Majors with a General Degree for 2024-25

Major -1; Subject-Microbiology

Sem.	Major-1	Major-2	Major-3	Elective/ Optional	Languages	Compulsory
1	5	5	5	-	Language-1/3 Language-2/3	Compulsory-1 (Constitutional values)-2
2	5	5	5	-	Language-1/3 Language-2/3	Compulsory-2 (Constitutional values)-2
3	5	5	5	Elective-1/2	Language-1/3 Language-2/3	Environmental Science-2
4	5	5	5	Elective-2/2	Language-1/3 Language-2/3	Compulsory-3 (Practical knowledge/skill-1)-2
5	5	5	5	-	-	Compulsory-4 (Practical knowledge/skill-2)-2
6	5	5	5	-	-	Project/Internship) 2
Total	30	30	30	04	24	12
Grand Total Credits - 130						

Curriculum Structure for Undergraduate Programme for 2024-25
Syllabus to be framed by respective Science subjects (Departments)
for Microbiology

Sl. No.	Course/Paper Code	Title of the Paper	Subject Category	Teaching Hours/ week	Semester End Exam.	Internal Assessment	Total Marks	Credits	Examination Duration
1	2	3	4	5	6	7	8	9	10
Semester-I									
1	24-MC-I		**MC-T**	03	80	20	**100**	03	3 Hrs.
	Practical – I		**MC-P**	04	40	10	**50**	02	3 Hrs.
	Total			**07**	**120**	**30**	**150**	**05**	---
Semester-II									
2	24-MC-II		**MC-T**	03	80	20	**100**	03	3 Hrs.
	Practical – II		**MC-P**	04	40	10	**50**	02	3 Hrs.
	Total			**07**	**120**	**30**	**150**	**05**	---
Semester-III									
3	24-MC-III		**MC-T**	03	80	20	**100**	03	3 Hrs.
	Practical – III		**MC-P**	04	40	10	**50**	02	3 Hrs.
	Elective/Optional – I*		**EL/OP-I**	02	40	10	**50**	02	2 Hrs.
	Total			**09**	**160**	**40**	**200**	**07**	---
Semester-IV									
4	24-MC-IV		**MC-T**	03	80	20	**100**	03	3 Hrs.
	Practical – IV		**MC-P**	04	40	10	**50**	02	3 Hrs.
	Elective/Optional-II*		**EL/OP-II**	02	40	10	**50**	02	2 Hrs.
	Total			**09**	**160**	**40**	**200**	**07**	---
Semester-V									
5	24-MC-VA		**MC-T**	03	80	20	**100**	03	3 Hrs.
	Practical – V		**MC-P**	04	40	10	**50**	02	3 Hrs.
	Total			**07**	**120**	**30**	**150**	**05**	---
Semester-VI									
6	24-MC-VIA		**MC-T**	03	80	20	**100**	03	3 Hrs.
	Practical – VI		**MC-P**	04	40	10	**50**	02	3 Hrs.
	Total			**07**	**120**	**30**	**150**	**05**	---
	Grand total			**46**	**800**	**200**	**1000**	**34**	---

MC: *Major Course*; **MC-T:***Major Course Theory*; **MC-P:** *Major Course Practical*; **EI/Op:** *Elective/Optional*; **AEDP:** *Apprenticeship Embedded Degree Programme*. *In Semester-III and Semester-IV elective papers are offered. In Sem III. The Compulsory paper is Environmental Studies. There shall be two elective papers offered in Sem-III and Sem-IV by every major subject offering Departments. Out of this, a student shall choose/select/opt for ONE elective paper in each semester. (i.e Sem-III and Sem-IV) respectively.

Curriculum Structure for Undergraduate Programme for 2024-25

Case 1 : 3 Majors with a General degree in all 6 Semesters – Number of courses and credit course-wise in all semesters

Semester	Major Course (Paper) Major 1	Elective/ Optional	AEDP
01 Theory paper and 01 Practical paper in each Major Subject (T+P)			
I	3+2 **= 5**		
II	3+2 **= 5**	**---**	
III	3+2 **= 5**	Elective1- **2**	
IV	3+2 **= 5**	Elective- **2**	
V	3+2 **= 5**	**---**	
VI	3+2 **= 5**	**---**	Project/Internship/ Dissertation**-2**
Total	**30**	**04**	**02**
Grand Total 36 Credits			

Note:

1. Credit for the three major courses includes theory, practical (skill enhancement course), and tutorial/assignment/survey-based assignment/internship.

2. Practical paper(s) (Compulsory/Skill enhancement course) should provide practical experience which is complimentary to theory major paper(s).

3. Project Work/Dissertation/Internship/Apprenticeship Embedded Degree Programme (AEDP) should also be considered to be part of the curriculum.

4. **Project work/Dissertation/Internship during Semester-VI:** Students for Project work may be allotted as per following formula,

$$Project\ allotment\ to\ Students = \frac{Total\ number\ of\ students\ in\ a\ three\ subjects\ combination}{Number\ of\ subjects\ in\ a\ combination\ (Three)}$$

Undergraduate Microbiology Syllabus

(Case 1: 3 Majors with a General Degree) for 2024-25

Proposed Semester-wise Distribution of the Course Structure

Paper code	Paper type	Title of the paper	Credits Assigned	Instructional hours per week
SEMESTER – I				
DSC-	Theory-I	Fundamentals of Microbiology and Microbial Diversity	**3**	**3**
DSC-	Practical-I	Fundamentals of Microbiology and Microbial Diversity	**2**	**4**
SEMESTER – II				
DSC-	Theory-II	Microbial Physiology and Microbial Genetics	**3**	**3**
DSC-	Practical-II	Microbial Physiology and Microbial Genetics	**2**	**4**
SEMESTER – III				
DSC-	Theory-III	Molecular Biology and Recombinant Technology	**3**	**3**
DSC-	Practical-III	Molecular Biology and Recombinant Technology	**2**	**4**
ELE-	Elective	Microbes in Environment	**2**	**2**
SEMESTER – IV				
DSC-	Theory-IV	Environment and Agriculture Microbiology	**3**	**3**
DSC-	Practical-IV	Environment and Agriculture Microbiology	**2**	**4**
ELE-	Elective	Microbial Applications	**2**	**2**
SEMESTER – V				
DSE-	Theory-V	Food and Industrial Microbiology	**3**	**3**
DSE-	Practical-V	Food and Industrial Microbiology	**2**	**4**
SEMESTER – VI				
DSE-	Theory-VI	Immunology and Medical Microbiology	**3**	**3**
DSE-	Practical-VI	Immunology and Medical Microbiology	**2**	**4**
		Project/Internship/Dissertation	**2**	**2**
		Total Hours	**36**	**46**

SCHEME OF VALUATION

MAXIMUM MARKS

COURSE TYPE	C1		C2		C3		TOTAL
	THEORY	LAB	THEORY	LAB	THEORY	LAB	
DSC	5+5	5	5+5	5	80	40	**150**
DSE	5+5	5	5+5	5	80	40	**150**
ELE	5	-	5	-	40		**50**

NOTE;

1. C1 and C2 will be conducted for 10 marks (theory) with 30 minutes duration, 10 marks (lab) with continuous assessment through record valuation and marks reduced to assigned marks.
2. C3 will be conducted for 80 marks (theory) with 3 hours duration, 40 marks (lab) with 3 hours duration.
3. In case of ELE, C1 and C2 will be conducted for 10 marks with 30 minutes duration and reduce to assigned marks. C3 will be conducted for 40 marks.

Practical Proper Examination I-VI semesters

Duration: 3Hrs

- Experimentation (Major & Minor/Spotters) - 30 Marks
- Viva Voce - 10 Marks

Total 40 Marks

Internal Assessment for Practical Paper I-VI semesters

- Attendance - 05 Marks
- Record/Journal - 05 Marks

Total 10 Marks

Project Work/Internship during VI semester

- Project work/Dissertation/Internship and preparation of Report - 40 Marks
- Viva Voce - 10 Marks

Total 50 Marks

Continuous Assessment Programme/Internal Assessment/ Formative Assessment
Major Courses

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
(1)	(2)	(3)
01	Two Session Tests with a proper record for assessment (5+5 = 10)	**10**
02	Assessment of Skill Development activities/Seminars/Group Discussion/ Assignment etc., with proper record	**05**
03	*Attendance with proper record*	**05**
TOTAL MARKS		**20**

- **Attendance Marks-breakup**

<75% - 00 Marks
75-80% - 01 Mark
80-85% - 02 Marks
85-90% - 03 Marks
90-95% - 04 Marks
>95% - 05 Marks

Continuous Assessment Programme/Internal Assessment/ Formative Assessment
Elective/Optional Papers

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
(1)	(2)	(3)
01	Two Session Tests with proper record for assessment (2+2 = 4)	**04**
02	Assessment of Skill Development activities/Seminars/Group Discussion/ Assignment etc., with proper record	**03**
03	*Attendance with proper record*	**03**
TOTAL MARKS		**10**

- **Attendance Marks-breakup**

<75% - 00 Marks
75-80% - 01 Mark
85-90% - 02 Marks
90-100% - 03 Marks

Under Graduate Microbiology
FIRST SEMESTER

Course Learning Objectives ;

a) To give basic aspects of Microbiology and diversity of microorganisms.
b) To explain the contributions of microbiologists and applications of various microscopes.
c) To demonstrate vairous staining techniques and sterrilization methods.
d) To throw knowledge about significance of prokaryotic diversity and cellular organization.
e) To discuss the diversity of eukaryotes and viruses.

Course outcomes ; the student will able to:

a) Understand the historical developments in the area of Microbiology.
b) Visualization of microorganisms through staining techniques and microbial control by sterilization methods.
c) Understand the diversity, cellular organization and importance of prokaryotes.
d) Gain knowledge about algae, fungi, protozoa and viruses and their significance.

DSC-1: FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY

PAPER-I **48 (3hrs./week)**

Unit I: History of microbiology and microscopy **12 hrs.**

History of microbiology: Scope and branches of Microbiology. Contributions of Anton Von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner and E. J. Butler. **Systems of classification**: Whittaker's five kingdom classification and Carl Woese's three domain classification. Classical and molecular characteristic used in microbial taxonomy.

Microscopy: Working principle, construction and application of compound microscope, dark field microscope, phase contrast microscope, fluorescent microscope and scanning & transmission electron microscope.

Unit II: Staining and sterilization techniques **12 hrs.**

Staining techniques: Chemical nature and types of microbiological stains. Methods of staining: simple (positive and negative), differential (Gram staining and acid fast staining) and structural (capsule, endospore).

Sterilization techniques: Physical methods:dry heat (hot air oven, incineration), moist heat (autoclave), filtration: filters (membrane filters and HEPA filter), radiation: UV and gamma radiation. Chemical methods:definition of terms-disinfectants, antiseptics, sanitizers, microbicides, microbiostasis. Mode of action and uses of alcohols, aldehydes, halogens, phenols (tabulation).

Unit III: Microbial diversity **12 hrs.**

Biodiversity: Definition and levels, Bergey's Manual of Systematic Bacteriology.Comparison of bacteria, archaea and eukarya (tabulation).

Cell organization:Cell size, shape and arrangement, structure and functions of capsule, flagella, fimbriae, pili, cell wall, cell membrane, ribosomes, mesosomes, inclusion bodies, nucleoid and plasmids. Bacterial endospore-structure and formation.

Diversity of prokaryotes:General characteristics of Rickettsiae, Chlamydia, Mycoplasma, Spirochaetes, Actinomycetes. Cyanobacteria: occurence, structure, reproduction and importance of *Microcystis,Anabaena*and *Spirulina.*

Unit IV: Diversity of eukaryotes and viruses **12 hrs.**

Diversity of eukaryotes: Structure, reproduction and importance of Algae (*Spirogyra,* Diatoms and *Gracilaria*), Fungi (*Rhizopus, Aspergillus, Agaricus, Fusarium*) and Protozoa (*Euglena* and *Paramecium*)

Diversity of viruses: General characteristics of viruses. ICTV system of classification. Structure and importance of viruses. Structure and replication of viruses: Bacteriophages-T4 phage, cyanophages-LLP-1, phytophagenae-TMV, zoophagenae-Influenza. Subviral particles- viroids, virusoids and prions.

FIRST SEMESTER

PAPER-I ; FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY

PRACTICAL-I **(4hrs/week)**

1. Microbiological laboratory standards and safety protocols.
2. Study of simple and compound microscopes.
3-4. Working principle and operation of basic equipment of microbiological laboratory (Autoclave, Hot air Oven, Incubator, laminar air flow system, Membrane Filter, colony counter,pH meter, Spectrophotometer, Colorimeter, Vortex mixer, Magnetic stirrer).
5. Applications of basic microbiological tools (Pipettes, Micropipette, Inoculation loop and needle, Spreader, Cork borer).
6. Preparation of stains and mordant -methylene blue, crystal violet, safranin, nigrosin, carbol fuchsin, malachite green, Gram`s iodine and cotton blue.
7. Simple (direct and indirect) staining of bacteria.
8. Gram staining and endospore staining.
9. Observation of bacterial motility by hanging drop method.
10. Measurement of microbial cell size by micrometry
11. Study of cyanobacteria-*Microcystis, Anabaena* and *Spirulina.*
12. Study of Algae-*Spirogyra,* Diatoms and *Gracilaria.*
13. Study of Fungi-*Rhizopus, Aspergillus, Agaricus* and *Fusarium.*
14. Study of Protozoa-*Euglena* and *Paramecium.*
15. Study of viruses ; T4 phage, TMV and Influenza virus.

Text Books / References ;

1. Alexopoulas, C.J. and Mims, C.W., Introductory Mycology, Wile Eastern Limited, New Delhi.
2. Atlas, R. M. (1997). Principles of Microbiology. 2nd edition. W. M.T.Brown Publishers.
3. Bold, H.C. and Wynne, M. J. Introduction to Algae, Prentice Hall of India Private Limited , New Delhi.
4. Brock, T. D. and Madigan, M. T. Biology of Microorganisms, Prentice Hall of India Private Ltd,New Delhi.
5. Cappucino. J. and Sherman, N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.
6. Carter, J. and Saunders, V. (2007). Virology: Principles and Applications. John Wiley and Sons.
7. Dimmock, N. J., Easton, A. L and Leppard, K. N. (2007). Introduction to Modern Virology. 6th edition, Blackwell Publishing Ltd.
8. Dubey, R. C. and Maheshawari, D.K, (2013) Text book of Microbiology, S Chand and company limited, Ramnagar, New Delhi.
9. Flint, S. J., Enquist, L. W., Krug, R. M., Racaniello, V. R. and Skalka, A. M. (2004). Principles of Virology, Molecular biology, Pathogenesis and Control. 2nd edition. ASM press Washington DC.
10. Lansing, M. Prescott, John, P. Harley, Donald A. Klein. (2002). Microbiology, 5th edition WCB Mc Graw Hill, New york.
11. Madigan, M. T., Martinko, J. M., Dunlap, P. V. and Clark, D. P. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.
12. Michael, J. Pelczar, Jr. E. C. S. Chan and Moel (2001). Microbiology, Mc Graw Hill Book Company, New york).
13. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
14. Srivastava, S. and Srivastava, P. S. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht.
15. Stanier, R. Y., Ingraham, J. L., Wheelis, M. L. and Painter, P. R. (2005). General Microbiology. 5th edition McMillan.
16. Tortora, G. J., Funke, B. R. and Case, C. L. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
17. Versteeg, J. (1985). A Color Atlas of Virology. Wolfe Medical Publication.
18. Wagner, E. K., Hewlett, M. J. (2004). Basic Virology. 2nd edition. Blackwell Publishing.

SECOND SEMESTER

Course Learning Objectives ;

a) To impart knowledge on microbial nutrition, metabolism and microbial genetics.
b) To identify various nutritional requirements of microbes and to understand different cultivation techniques.
c) To understand the physiology of microbes with reference to enzymes and metabolism.
d) To give knowledge about DNA as genetic material and bacterial recombination.
e) To know more about microbial genetics using viral and fungal model organisms.

Course Outcomes ; The student will able to:

a) Understand cultivation and preservation of microbes using various methods.
b) Study the role of enzymes in microbial physiology and metabolic pathways.
c) Get knowledge about experimental proof for DNA as genetic material and bacterial genetics.
d) Become aware of genetics of viruses and fungi through various model organisms.

DSC-2: MICROBIAL PHYSIOLOGY AND MICROBIAL GENETICS

PAPER-II **48 (3hrs./week)**

Unit I: Microbial nutrition **12 hrs.**

Bacterial nutrition: Introduction to bioenergetics. Nutritional requirements andmajor nutritional types of microorganisms, Uptake of nutrients-passive transport,facilitated diffusion, active transport, group translocationand iron uptake.Bacterial growth curve-phases of growth and their significance, factors affecting microbial growth. Measurement of growth by cell number and cell mass.

Cultivation of bacteria: Culture media and their types. Pure culture techniques and colony characteristics of bacteria. Methods of preservation of microorganisms-slant culture, stab culture, mineral oil overlaying, glycerol stock preservation, cryopreservation and lyophilization.

Unit II: Microbial metabolism **12 hrs.**

Introduction to enzymes: Nomenclature and classification, structure of enzyme, mechanism of enzyme action. Lock and key model and induced fit theory. Factors affecting enzyme activity, Enzyme inhibition and regulation.

Chemotrophic metabolism: Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway. Krebs cycle. Electron transport chain. Fermentation-Alcohol and lactic acid fermentation

Phototrophic metabolism: Photosynthetic microorganisms, light harvesting pigments, photophosphorylation, CO_2 fixation pathway: Calvin cycle. **Nitrogen metabolism**:Biological nitrogen fixation-nodulation in leguminous plants, nitrogenase, leghaemoglobin and ammonia assimilation.

Unit III: DNA as genetic material and Bacterial genetics **12 hrs.**

DNA as a genetic material: Griffith experiment, Avery, MacLeod and McCarty experiment, Hershey and Chase experiment to prove DNA carries the genetic information. Fraenkel-Conrat experiment. Structure and organization of chromosomes in prokaryotes. Plasmid-types.

Bacterial genetics: Genome organization of *Escherichia coli*. Mechanism of genetic exchange in bacteria: Bacterial transformation-Principle and types of transformation mechanisms in prokaryotes. Bacterial Conjugation: U-tube experiment, F^+ x F^- conjugation, F′ x F^- conjugation, Hfr x F^- conjugation, Bacterial Transduction: Generalized and specialized transduction.

Unit IV: Genetics of Viruses and Fungi **12 hrs.**

Genetics of viruses: Genetic recombination in phages, Heterozygosity in phages. Phenotypic mixing, Genotypic mixing. Genetic basis of lytic-lysogenic switch in phage lambda.

Genetics of fungi: Life cycle of *Neurospora*, ordered tetrad analysis in *Neurospora*, unordered tetrad analysis in yeast, two point and three point test cross.

Mutation: Nature and types, Mutagenic agents: physical and chemical mutagens, repair of mutated DNA: Photoreactivation and SOS repair. Transposable elements in prokaryotes.

SECOND SEMESTER

PAPER –II; MICROBIAL PHYSIOLOGY AND MICROBIAL GENETICS

PRACTICAL-II **(4hrs/week)**

1. Cleaning and sterilization of glassware and preparation of media-nutrient broth, nutrient agar and potato dextrose agar.
2. Preparation of physiological saline and serial dilution.
3. Estimation of CFU count by spread plate/pour plate method and study of colony characteristics of bacteria.
4. Cultivation of microorganisms on agar plate (point inoculation) and broth inoculation.
5. Isolation and preservation of bacterial cultures by streak plate, agar slants and stab culture.
6. Effect of temperature and pH on microbial growth.
7. Effect of salt and carbon source on microbial growth.
8. Measurement of growth by cell number using hemocytometer.
9. Microscopic examination of root nodules for bacteroids.
10. Demonstration of lactosefermentation.
11. Preparation of competent cells and demonstration of bacterial transformation.
12. Demonstration of bacterial conjugation by plate mating method.
13. Study of survival curve of bacteria after exposure to ultraviolet (UV) light.
14. Isolation of streptomycin resistant mutants of *Escherichia coli* by gradient plate method.
15. Study of culture media, Haemocytometer, Gaspakjar, Griffith experiment, plasmid, transformation, conjugation and transduction in bacteria, life cycle of *Neurospora* and transposable elements using photographs and model.

Text Books / References ;

1. Brock, T. D. and Madigan, M.T.,(2012). Biology of Microoragnisms, Prentice hall of India Pvt. Ltd, New Delhi.
2. Gardner, E. J., Simmons, M. J., Snustad, D. P. (2008). Principles of Genetics. 8th Ed. Wiley-India.
3. Gottschalk, G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag.
4. Klug, W. S., Cummings, M. R., Spencer, C. and Palladino, M. (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings.
5. Krebs, J., Goldstein. E., Kilpatrick, S. (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning.
6. Lansing, M., Prescott,J., Ohn, P., Harley,Donald A. Klein, (2002) Microbiology,5th ed. WCB Mc Graw Hill, New york.
7. Madigan, M. T. and Martinko, J. M. (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
8. Maloy, S. R., Cronan, J. E. and Friefelder, D. (2004) Microbial Genetics 2nd edition. Jones and Barlett Pub.
9. Moat, A. G. and Foster, J. W. (2002). Microbial Physiology. 4th edition. John Wiley & Sons.
10. Nelson David, L and Cox Michael, M., Lehninger, (2008) Principles of Biochemistry, Macmillan Press, Worth Publishers, New Delhi.
11. Pierce, B. A. (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning.
12. Primrose, S. B. and Twyman, R. M. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.
13. Reddy, S. R. and Reddy, S. M. (2005). Microbial Physiology. Scientific Publishers India.
14. Russell, P. J. (2009). Genetics- A Molecular Approach. 3rd Ed, Benjamin Cummings
15. Stanier, R. Y., Ingrahm, J. I, Wheelis, M. L. and Painter, P. R. (1987). General Microbiology. 5th edition, McMillan Press.
16. Willey, J. M., Sherwood, L. M. and Woolverton, C. J. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

SCHEME OF PRACTICAL EXAMINATION

FIRST SEMESTER

PRACTICAL-I: FUNDAMENTALS OF MICROBIOLOGYAND MICROBIAL DIVERSITY

Duration: 3 hours **Max. Marks: 40**

I. Stain the given material A by……method. Write the principle and procedure. Leave the preparation for evaluation. 08 Marks

(Direct staining/ Indirect staining/ Gram staining/Endospore staining)

(Preparation-4 Marks, Principle-1 Mark, Procedure- 2 Marks and Result-1 Mark)

II. Identify the materials B and C with labeled diagrams and reasons. 2x4=08 Marks

(One material each from Cyanobacteria, Algae and Fungi)

(Identification- 1 Mark, Diagram and Reasons- 3 Marks)

III. Measure the size of the microbial cell D using stage and ocular Micrometer. 05 Marks

(Calibration factor- 1 Mark, Principle and procedure- 3 Marks and Result- 1 Mark)

IV. Write critical notes on E, F and G. 3x3=09 Marks

(Microbiologists/ Microscopes/ Stains/ Disinfectants/ Laboratory equipment)

(Identification- 1 Mark, Comments- 2 Marks)

V. Viva-voce 10 Marks

QUESTION PAPER FOR PRACTICAL EXAMINATION

FIRST SEMESTER

PRACTICAL-I: FUNDAMENTALS OF MICROBIOLOGYAND MICROBIAL DIVERSITY

Duration: 3 hours **Max. Marks: 40**

1. **Stain the given material A by……method. Write the principle and procedure. Leave the preparation for evaluation. 08 Marks**

2. **Identify the materials B and C with labeled diagrams and reasons. 2x4=08 Marks**

3. **Measure the size of the microbial cell D using stage and ocular Micrometer. 05 Marks**

4. **Write critical notes on E, F and G. 3x3=09 Marks**
5. **Viva-voce 10 Marks**

SCHEME OF PRACTICAL EXAMINATION

SECOND SEMESTER

PRACTICAL-II: MICROBIAL PHYSIOLOGY AND MICROBIAL GENETICS

Duration: 3 hours **Max. Marks: 40**

I. Demonstrate or perform the experiment A giving principle and procedure. Record the result. 08 Marks

(Serial dilution / Pour plate / Spread plate / Streak plate / Point inoculation / Measurement of growth by cell number using haemocytometer)

(Demonstration-4 Marks, Principle and Procedure- 3 Marks and Result-1 Mark)

II. Perform / demonstrate the experiment B giving principle and procedure. Record the result. 08 Marks

(Demonstration of bacterial conjugation by plate mating method / UV survival curve of bacteria / Gradient plate method)

(Demonstration-4 Marks, Principle and Procedure- 3 Marks and Result-1 Mark)

III. Conduct the experiment C. Record and interpret the result. 05 Marks

(Effect of temperature / pH / salt / carbon source on microbial growth / Study of colony characteristics /Microscopic examination of root nodules for bacteroids / Demonstration of lactosefermentation)

(Performance- 2 Marks, Principle and Procedure- 2 Marks and Result-1 Mark)

IV. Write critical notes on D, E and F. 3x3=09 Marks

(Culture media, Griffith experiment, Hershey and Chase experiment, plasmid, transformation, conjugation and transduction in bacteria, life cycle of *Neurospora*, transposable elements and result of the experiments)

(Identification- 1 Mark, Comments- 2 Marks)

V. Viva-voce 10 Marks

QUESTION PAPER PATTERN OF PRACTICAL EXAMINATION

SECOND SEMESTER

PRACTICAL-II: MICROBIAL PHYSIOLOGY AND MICROBIAL GENETICS

Duration: 3 hours **Max. Marks: 40**

1. **Demonstrate or perform the experiment A giving principle and procedure. Record the result.** **08 Marks**

2. **Perform / demonstrate the experiment B giving principle and procedure. Record the result.** **08 Marks**

3. **Conduct the experiment C. Record and interpret the result.** **05 Marks**

4. **Write critical notes on D, E and F.** **3x3=09 Marks**

5. **Viva-voce** **10 Marks**

THEORY EXAMINATION QUESTION PAPER PATTERN FOR MAJOR SUBJECTS

(Semesters I –VI)

B.Sc. Degree Examination; 2024-25

(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: MICROBIOLOGY

Paper:

Paper Code:

Time: 3 Hours **Max. Marks: 80**

Instructions to candidates:

1) All sections are compulsory
2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

1. Answer **all** the following questions: **(2×10=20)**

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

SECTION-B

Answer any **SIX** of the following: **(5×6=30)**

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

SECTION -C

Answer **Any Three** of the following: **(10×3=30)**

10. From Unit-I
11. From Unit-II
12. From Unit-III
13. From Unit-IV

THEORY EXAMINATION QUESTION PAPER PATTERN FOR ELECTIVE/OPTIONAL PAPERS

(Semesters III &IV)

B.Sc. Degree Examination; 2024-25

(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: MICROBIOLOGY

Paper –ELECTIVE/OPTIONAL III&IV:

Paper Code:

Time: 2 Hours **Max. Marks: 40**

Instructions to candidates:

1) All sections are compulsory
2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

Answer **all** the following questions: **(2×5=10)**

1.
2.
3.
4.
5.

SECTION-B

Answer any **SIX** of the following: **(5×6=30)**

6.
7.
8.
9.
10.
11.
12.
13.

___