

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE
(AUTONOMOUS)
NAAC A GRADE
KAKINADA**



XXII-BOARD OF STUDIES

**DEPARTMENT OF
MICROBIOLOGY
2022-23
(CHOICE BASED CREDIT SYSTEM)**

PROCEEDING OF THE PRINCIPAL,P.R.GOVERNMENT COLLEGE (A),KAKINADA.AP.

Present:-Dr.B.V.Tirupanyam,M.Sc.,Ph.d

R.C.No.12A/A.C/BOS/2022 -23, Dated 24-09-2022

Sub:- P.R.Govt.College (A) ,Kakinada U.G.Boards of Studies(BOS) Program/Course-
B.Sc Microbiology, Nomination of Members –Orders Issued

Ref:- 1.U.G.C Guidelines of for Autonomous Colleges 2018


ORDER:-

The Principal P.R. Government College (A), Kakinada is pleased to constitute U.G.Boards of Studies in Microbiology for framing the Syllabi in Microbiology Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

1	Dr.B.Lakshmi Head of the Department	Chairman
2	Dr. A. Aruna	University nominee, SRR & CVR college, Vijayawada.
3	D. Jayasree	Subject Expert, A.S.D Women Government College, Kakinada
4	S. V. Ramana	Industrial nominee , Microbiologist & Chemist, Water sample analysis, Kakinada Municipal corporation
5.	B. Adilakshmi	Alumni, Microbiologist, SIFT, Kakinada
5	G.N.V. Satish	Member
6	Mahalakshmi I. B.Sc Microbiology	Student nominee
7	M. Pavan sai II B.Sc Microbiology	Student nominee

The above members are requested to attend the BOS Meeting on **05 -11-2022** and share their valuable views and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the College, interest of the stake holder and National requirement for consideration and approval of the IQAC and Academic Council.
- Suggest methodologies for innovative teaching and evaluation Techniques
- Suggest the panel of names to the Academic council for appointment of Examiners
- Coordinate research, teaching, extension and other activities in the Department of the College


PRINCIPAL
P.R. Govt. College (A)
KAKINADA

Vision and mission of

Department of Microbiology

HISTORY:

P.R.Govt, Degree College, (Autonomous) was established in 1884 by Pithapuram Maharaja, Sri R.V.KM.SURYARAO BAHADUR MAHARAJ.

After the college opted for Autonomous system in 2001, the department has started the restructured course in Microbiology with Botany combination from 2002 - 2003.

Till 2019 department of Microbiology is under the Headship of Biotechnology and then the Department of Microbiology was established as a separate department from 2021.

VISION:

Our vision is to impart knowlwdge in the field of Microbiology and equip students with practical skills relevant to the industry and self-employment needs.

MISSION:

To provide quality laboratory facilities which are on par with the industry standards.

To encourage all the students who enrolle the course to take up Microbiology as their future carrier option .

To attain 100% success rate in the examination.

Agenda

1. Action taken report (ATR) of the A.Y.2021-22
2. Revised-common program structure and semester wise curriculum.
3. Adoption of regulations on scheme of examination and marks/grading system.
4. Engaging of 7th hour of time table
5. Streamlining of regularity in attendance to follow the benchmark of **75% attendance** to appear in the Examinations without the payment of fine.
6. Value added courses viz. add on courses and skill development courses to be conducted by the department during the academic year 2022-23.
7. Collaboration with industry and third party sector organization in view of industrial internship.
8. Make students access to ICT infrastructure for enhanced quality in higher education.
9. Remedial coaching for slow learners and project/ research work for advanced learners
10. Allocation of extra credits for extracurricular activities.
11. List of equipment/software requirement for each lab/practical of **Semester-V**.
12. Conduct of parent teacher meeting.
13. Panel of Question papers setters and Examiners
14. Action plan for the academic year 2022-23.
15. Departmental budget proposal for the academic year 2022-23
16. Any other with the permission of the chair.

Action Taken Report

The appropriate actions taken by the department of Microbiology as per the suggestions given by the members of Board of Studies and other administrators in the meeting held on 22nd November 2021.

Suggestions	Action Taken
Introduce any certificate course	As suggested by the BOS committee members the certificate course will be started
To plan any industrial visit to the students	Students were taken for Water purification plant, Kakinada Municipal Corporation

P.R.GOVERNMENT COLLEGE(A)
KAKINADA.
DEPARTMENT OF MICROBIOLOGY
ALLOCATION OF CREDITS

S.No	Semester	Title of the course	Course type	Hrs/Week	Max.Marks (SEE)	Marks in CIA	credits
1	I	Paper – I - Introduction to Microbiology and Microbial Diversity	Theory	4	50	50	4
2		Introduction to Microbiology and Microbial Diversity Practicals	Lab	2	50	-	1
3	II	Paper – II - Microbial Physiology and Biochemistry	Theory	4	50	50	4
4		Microbial Physiology and Biochemistry Practicals	Lab	2	50	-	1
5	III	Paper – III - Molecular Biology and Microbial Genetics	Theory	4	50	50	4
6		Molecular Biology and Microbial Genetics Practicals	Lab	2	50	-	1
7	IV	Paper – IV - Immunology And Medical Microbiology	Theory	3	50	50	4
8		Immunology And Medical Microbiology Practicals	Lab	2	50	-	1
9		Paper – V - Microbial Ecology and Industrial Microbiology	Theory	3	50	50	4
10		Microbial Ecology and Industrial Microbiology Practicals	Lab	2	50	-	1
11	V	Paper – 6A - Food, Agriculture and Environmental Microbiology	Theory	3	60	40	4
12		Food, Agriculture and Environmental Microbiology Practicals	Lab	2	35	15	1
13		Paper – 7A - Management of Human Microbial Diseases and Diagnosis	Theory	3	60	40	4
14		Management of Human Microbial Diseases and Diagnosis Practicals	Lab	2	35	15	1
(Or)							
15	V	Paper – 6B - Microbial Biotechnology and r – DNA Technology	Theory	3	60	40	4
16		Microbial Biotechnology and r – DNA Technology Lab	Lab	2	35	15	1
17		Paper – 7B - Biostatistics and Bioinformatics	Theory	3	60	40	4
18		Biostatistics and Bioinformatics Lab	Lab	2	35	15	1
(Or)							
19	V	Paper – 6C - Microbial Quality Control Instrumentation and Techniques	Theory	3	60	40	4
20		Microbial Quality Control Instrumentation and Techniques Lab	Lab	2	35	15	1
21		Paper – 7C - Drug Design, Discovery and Intellectual Property Rights (IPR)	Theory	3	60	40	4
22		Drug Design, Discovery and Intellectual Property Rights (IPR) Lab	Lab	2	35	15	1

Note 1: For Semester–V, for the domain subject **MICROBIOLOGY**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSICHE Guidelines.

➤ **First internship (After 1st Year Examinations):** Community Service Project. To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).

➤ **Credit For Course: 04**

➤ **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).

➤ **Credit For Course: 04**

➤ **Third internship/Project work (6th Semester Period):**

During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).

➤ **Credit For Course: 12**

**P.R. GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
DEPARTMENT OF MICROBIOLOGY**

PROGRAM OUTCOMES

Aim and objectives of UG program BSc Microbiology

- PO1:** Graduates will acquire adequate knowledge and leadership skills for a successful career
- PO2:** Graduates will be able to analyze and solve biology based problems.
- PO3:** Graduates will cooperate with each other to solve problems with creative thinking.
- PO4:** Graduates will acquire practical skills- plan & execute experimental techniques independently as well as to analyse & interpret data.
- PO5:** Graduates will effectively be able to manage resources & time.
- PO6:** Graduates will be able to learn independently and develop critical thinking.
- PO7:** Graduates will accomplish ability to communicate effectively and able to understand ethical responsibility.
- PO8:** Graduates will get adequate knowledge to use information & communication technology.
- PO9:** Graduates will carry on to learn and to adapt in a world of constantly evolving technology.

**P.R. GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
DEPARTMENT OF MICROBIOLOGY**

PROGRAM SPECIFIC OUTCOMES

Microbiology students who graduate with a Bachelor of Science with Microbiology will

PSO1: Acquire knowledge on fundamentals of Microbiology

PSO2: Understand details of bacterial, fungal, algal and viral morphology and physiology.

PSO3: Competently be able to cultivate and characterize bacterial and fungal forms.

PSO4: Grasp the fundamental concepts of immunity and the contribution of organs and cells in the development of immune response.

PSO5: Gain insight into the various aspects of microbial genetics.

PSO6: Be proficient on cloning vectors and rDNA technology.

PSO7: Assimilate technical skills on microbial genetics and molecular biology.

PSO8: Realize the application-oriented aspects of Microbiology.

PSO9: Understand the concepts and development of microbial diseases in animals & plants.

PSO10: Realize the principles of prevention and treatment of microbial diseases.

P.R.GOV.T.COLLEGE (AUTONOMOUS) KAKINADA.
2022-23, XXII BOARD OF STUDIES MEETING.
DEPARTMENT OF Microbiology

The members present have discussed the syllabi and model question papers (Theory and Practical) related to I to VI semesters in Microbiology and made the following Resolutions.

Resolution I: Resolved to Continue CBCS System as instructed by Commissioner of Collegiate Education(CCE), Amaravati.

Resolution II: Resolved to continue 50% external and 50% internal marks for both theory and practical's for first year and second year for the academic year 2022- 23.

Resolution III: Resolved to split 50 marks of theory internal as 25 marks for mid exams and 25 marks for co-curricular activities (project / seminar / assignment / quiz / group discussion).

Resolution IV: Resolved to continue 60% external and 40% internal marks for both theory and practical's for final year for the academic year 2022- 23.

Resolution V: Resolved to split 40 marks of theory internal as 20 marks for mid exams and 20 marks for co-curricular activities (seminar/assignment/quiz/group discussion).

Resolution VI: Resolved to implicate CSP (Community service project) by the end of I Year, second internship after second year and OJT in the sixth semester as prescribed by APSCHE.

Resolution VII: Resolved to adapt 7th hour time table as prescribed by the APCCE.

Resolution VIII: Resolved to follow the benchmark of 75% attendance to appear in the Examinations without the payment of fine.

Resolution IX: Resolve to adapt skill enhancement course – Elective papers 6A/7A or 6B/7B in the V semester.

Resolution X: Resolved to continue the same paper setters and examiners for all the semesters.

Resolution XI: Resolved to continue certificate course in diagnostics techniques and one Value added course by Microbiology department.

Resolution XII: Resolve to continue Remedial coaching for slow learners and Project for Advanced learners

B. Lakshmi

**Chairperson
Board of Studies**

**P.R. GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
DEPARTMENT OF MICROBIOLOGY**









XXII-BOARD OF STUDIES MEETING 2022- 23
CHOICE BASED CREDIT SYSTEM

Time: 10.30 AM.

Date: 05.11.2022

Venue: Department of MICROBIOLOGY

The XXII BOARD OF STUDIES Meeting of the Department of Microbiology took place 10.30 AM on 05.11.2022 in the Department of Microbiology P.R. Govt. College, (A) Kakinada for the year 2022-23. The following members attended.

SI No	Name and affiliation	Designation	Signature
01	Dr. B. Lakshmi Lecturer in-charge Dept of Microbiology P R College(Autonomous) KAKINADA.	Chairperson	
02	Dr. A. Aruna Asst. Professor Dept. of Microbiology SRR & CVR college, Vijayawada	University Nominee	
03	Smt.D. Jayasree Asst. Professor Dept. of Microbiology A.S.D College for Women's KAKINADA	Subject Expert	
04	Sri S.V. Ramana Microbiologist & Chemist, Water sample analysis, Kakinada Municipal corporation	Industrial nominee / Research expert	
05	B. Adilakshmi Student Alumni	Student Alumni	
06	G.N.V.Satish Guest Lecturer	Member	
07	M. Pavan sai II B.Sc Microbiology	Student Member	
08	Mahalakshmi I. B.Sc Microbiology	Student Member	

P.R. GOVT. COLLEGE (A), KAKINADA

TENTATIVE ACTION PLAN

DEPARTMENT OF MICROBIOLOGY

Sl.	MONTH & YEAR	ACTIVITY	Tentative Date
01	Nov - 2022	Commencement of I semester Class work	1 st week of Nov
		Commencement of III semester Class work	3 rd week of Nov
02	Dec - 2022	National level Seminar	4 th Week of Dec
03	Jan -2023	Guest Lecture	3 rd week of Jan
04	Jan -2023	Commencement of V Semester class work	3 rd week of Jan
05	Feb- 2023	Industrial tour / Academic Visit	2 nd week of Feb
06	Mar - 2023	Pre Final Exam to I Sem and III Sem students	3 rd week of Mar
07	Jun - 2023	Commencement of certificate course	3 rd week of June
08	July - 2023	Workshop on Bioinformatics	4 th week of July
09	Aug - 2023	Value added course	3 rd week of Aug



Dr. D. Aruna
University Nominee



Dr. B. Lakshmi
Lecturer In-Charge

P.R. GOVERNMENT COLLEGE (A), KAKINADA

BSc	MICROBIOLOGY (Semester: I)	Credits : 4
MBT: I	Introduction To Microbiology And Microbial Diversity	Hrs/Wk: 4

Aim and objectives of Course

To understand History & Development of Microbiology, Microscopy, staining and sterilization techniques, Ultra-structure of cell, Different methods of microbial characterization To study nature of viruses, viral classification, cultivation of viruses and Type study of TMV & HIV

Course outcomes

Up on completion of the course students able to

1. Explain relationship and apply appropriate terminology relating to the structure, Genetics, metabolism and ecology of prokaryotic microorganisms, Algae, viruses and Fungi.
2. Students will get basics and importance of Microbiology.
3. Demonstrate appropriate laboratory skill and techniques related to isolation, staining, identification and control of microorganisms.

UNIT-I: History of Microbiology & Place of Microorganisms in the living world

History of Microbiology in the context of contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch.

Importance and applications of microbiology.

Classification of Microorganisms- Haeckel's three Kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese

UNIT-II: Prokaryotic microorganisms

No. of hours: 12

Ultra-structure of Prokaryotic cell- Cell Wall, Cell Membrane, Cytoplasm, Nucleoid, Plasmid, Inclusion Bodies, Flagella Pili, Capsule, Endospore

General characteristics of Bacteria (Size, shape, arrangement, reproduction)

General characteristics of Rickettsia, Mycoplasmas, Cyanobacteria, Archaea

UNIT-III: Viruses and Eukaryotic microorganisms

No. of hours: 12

General characteristics of viruses, Cultivation of Viruses (in brief)

Morphology, Structure and replication of TMV and Lambda Bacteriophage

Fungi - Habitat, nutrition, vegetative structure and modes of reproduction; outline classification

Algae - Habitat, thallus organization, photosynthetic pigments, storage forms of food, reproduction.

Protozoa – Habitat, cell structure, nutrition, locomotion, excretion, reproduction, encystment, outline classification

UNIT-IV: Isolation and Culture of Bacteria and Fungi

No. of hours: 12

Growth media- Natural, synthetic and semi synthetic media. Selective, Enrichment, and Differential media

Pure culture techniques - dilution-plating, Streak-plate, Spread-plate, Pour-Plate and micromanipulator.

Preservation of microbial cultures - sub culturing, overlaying cultures with mineral oils,

lyophilization, sand cultures, storage at low temperature.

UNIT-V: Principles of Microscopy, Sterilization and Disinfection No. of hours: 12

Principles of microscopy - Bright field and Electron microscopy (SEM and TEM).

Staining Techniques - Simple and Differential staining techniques (Gram staining, Spore staining).

Sterilization and disinfection techniques –

Physical methods - autoclave, hot- air oven, pressure cooker, laminar air flow, filtersterilization, Radiation methods - UV rays, Gamma rays.

Chemical methods - alcohols, aldehydes, fumigants, phenols, halogens and hypochlorites

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	1	2	3	2	1	3	1	2
CO2	3	2	3	3	2	3	3	2	2	3	2	2
CO3	2	3	2	2	3	3	2	3	2	2	3	2
CO4	3	2	3	3	2	2	3	2	2	1	2	3

PRACTICAL SYLLABUS

MBP- I: Introduction To Microbiology And Microbial Diversity

1. Microbiology Good Laboratory Practices and Biosafety.
2. Preparation of culture media for cultivation of bacteria- Nutrient broth & Nutrient agar
3. Preparation of culture media for cultivation of fungi – Sabourauds agar
4. Sterilization of medium using Autoclave
5. Sterilization of glassware using Hot Air Oven
6. Light compound microscope and its handling
7. Microscopic observation of bacteria (Gram +ve bacilli and cocci, Gram -ve bacilli), Algae and Fungi.
Simple staining
Gram's staining
8. Hanging-drop method & temporary wet mount (TWM) for observation of living microorganisms.
9. Isolation of pure cultures of bacteria by serial dilution and Streak/Spread/Pour Plate Method.
10. Preservation of bacterial cultures by Serial subculturing & Slant Preparation with mineral oil overlay.
11. Observation of electron micrographs of bacterial cells

Recommended Text Books & Reference books:

- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, TataMcGraw Hill Publishing Co., Ltd., New Delhi.
- Dube, R.C. and Maheswari, D.K. (2000) General Microbiology. S Chand, New Delhi. Edition), Himalaya Publishing House, Mumbai.
- Power, C.B. and Dagainawala, H.F. (1986). General Microbiology Vol I & II
- Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCBMcGrawHill, New York.
- Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rd Edition, Sri Padmavathi Publications, Hyderabad.
- Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
- Stanier, R. Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
- Microbiology Edited by Prescott
- Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
- Gopal Reddy *et al.*, Laboratory Experiments in Microbiology

P.R. GOVERNMENT COLLEGE (A): KAKINADA
I B.Sc - Microbiology / I Semester End (W.E.F. 2021-2022)
Paper-I Introduction To Microbiology And Microbial Diversity
w.e.f. 2021-2022 ADMITTED BATCH

BLUE PRINT

PART-I

Answer any three questions by attempting at least one question form each section

SECTION - A

3 X 10 = 30 Marks

1. Essay question from UNIT- I
2. Essay question from UNIT- II
3. Essay question from UNIT- III

SECTION - B

4. Essay question from UNIT- IV
5. Essay question from UNIT- V
6. Essay question from any one of the five Units based on its weightage in the Syllabus.

PART - II

Answer any Four Questions from the following

4 X 5 = 20 Marks

7. Short answer question from UNIT - I
8. Short answer question from UNIT - II
9. Short answer question from UNIT - III
10. Short answer question from UNIT - IV
11. Short answer question from UNIT - V
12. Short answer question from any one of the five Units based on its weightage in the Syllabus.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc - Microbiology / I Semester End (W.E.F. 2021-2022)

Introduction to Microbiology and Microbial Diversity

Time: 2 Hrs.

Max.Marks:5

PART-A

Answer any **Three** questions by attempting at least one question each section

Section – A

3 x 10 = 30M

1. Write the importance and applications of Microbiology.
2. Describe the ultrastructure of prokaryotic cell.
3. Write an essay on general characteristics of Fungi.

Section – B

4. What is a Pure culture? Give a detailed explanation of bacterial pure culture techniques.
5. Describe the working and principle of Bright field microscopy.
6. Write an essay on chemical methods of sterilization.

PART - B

Answer any **Four** of the following questions

4 x 5 = 20M

7. Koch Postulates
8. Archaea
9. TMV
10. Differential medium
11. Lyophilization
12. Spore staining

**P R GOVERNMENT COLLEGE (AUTONOMOUS),
KAKINADA
I B.Sc., Microbiology - Practical
Examinations Paper I model at the end of
I Semester (w.e.f. 2020-2021)
Introduction to Microbiology and microbial diversity
(MB1209P) Time: 1½ Hrs.Max. Marks: 25**

1. Identify the given organism 'A' by Gram staining technique. 15 M
Scheme for valuation:
Preparation of slide (07M) + Description (5M) + Result (3M)
2. Record + Viva voce 5+5 = 10 M

Total = 25 M

25 MARKS FOR CIA

P.R. GOVERNMENT COLLEGE (A), KAKINADA

BSc	MICROBIOLOGY (Semester: II)	Credits: 4
MBT: II	Microbial Physiology And Biochemistry	Hrs/Wk: 4

Aim and objectives of Course

To understand DNA, RNA, Protein structure and synthesis. DNA damage, mutations and repair. Gene transfer methods.

Learning outcomes of Course

1. This Course provides Understanding of biomolecular synthesis and control will help in further study
2. Develop knowledge on microbial genetics and molecular biology

UNIT – I: BIOMOLECULES

12 Hrs

Outline classification and general Properties of carbohydrates

(monosaccharides-Glucose, disaccharides-Sucrose and polysaccharides-Starch).

General characteristics of amino acids and proteins.

Structure of nitrogenous bases, nucleotides, nucleic acids.

Fatty acids (saturated and unsaturated). Lipids (sphingolipids, sterols and phospholipids).

UNIT – II: INSTRUMENTATION TECHNIQUES

08 Hrs

Principle and applications of - Calorimetry

Chromatography (paper, thin-layer and affinity chromatography)

Spectrophotometry (UV & visible). Centrifugation

Agarose Gel Electrophoresis

UNIT – III: BASICS OF ENZYMOLOGY

12 Hrs

Properties and classification of Enzymes. Bio catalysis- induced fit and lock and key models.

Coenzymes and Cofactors. Factors affecting catalytic activity of enzymes.

Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive.

UNIT – IV: NUTRITION AND GROWTH OF MICROBES

14 Hrs

Microbial Nutrition –Nutritional requirements and uptake of nutrients by cells.

Nutritional groups of microorganisms- autotrophs, heterotrophs, and mixotrophs.

Growth media- synthetic, complex, selective, enrichment and differential media.

Microbial Growth- different phases of growth in batch cultures, Synchronous, continuous, biphasic growth. Factors influencing microbial growth.

Methods for measuring microbial growth – Direct microscopy, viable count estimates, turbidometry and biomass.

UNIT – V: METABOLISM

12 Hrs

Aerobic respiration - Glycolysis, HMP path way, ED path way, TCA cycle,

Electron transport, oxidative and substrate level phosphorylation.

Anaerobic respiration (Nitrate).

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	1	2	3	2	1	3	1	2
CO2	3	2	3	3	2	3	3	2	2	3	2	2

P.R. GOVERNMENT COLLEGE (A), KAKINADA
I B.Sc – II Semester - Microbiology Practical Syllabus
(w.e.f. 2021-2022)

Introduction to Microbial
Biochemistry and Metabolism
(Course: MB2209P)

Total Hrs. of Practical's: 30 @ 2 h / Week

Total Credits: 01

PRACTICAL SYLLABUS

1. Qualitative Analysis of Carbohydrates
2. Qualitative Analysis of Amino acids
3. Colorimetric estimation DNA by diphenylamine method
4. Colorimetric estimation of proteins by Biuret/Lowry method
5. Paper chromatographic separation of sugars / amino acids
6. Preparation of different media- Synthetic and Complex Media
7. Setting and observation of Winogradsky column.
8. Estimation of CFU count by spread plate method/pour plate method.
9. Bacterial growth curve.
10. Factors affecting bacterial growth – pH.
11. Factors affecting bacterial growth – Temperature.
12. Factors affecting bacterial growth –Salts

SUGGESTED READINGS:

1. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2nd Edition, CBS Publishers and Distributors, New Delhi.
2. Prescott, M.J., Harley, J.P. and Klein, D.A. (2010). Microbiology. 5th Edition, WCB McGrawHill, New York.
3. Reddy, S.R. and Reddy, S.M. (2004). Microbial Physiology, Scientific Publishers, Jodhpur, India.
4. Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A student Companion. I.K. International Pvt. Ltd. India Pvt. Ltd., New Delhi.
5. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H. Freeman Voet, D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.
6. Willey MJ, Sherwood, LM & Woolverton C J (2013)

Prescott, Harley and Klein's Microbiology by 9th Ed.,
McGraw Hill

P.R. GOVERNMENT COLLEGE (A): KAKINADA

I B.Sc - Microbiology / II Semester End (W.E.F. 2021-2022)

Paper-II Introduction to Microbial Biochemistry and Metabolism

w.e.f. 2021-2022 ADMITTED BATCH

BLUE PRINT

PART-I

Answer any three questions by attempting at least one question from each section

SECTION - A

3 X 10 = 30 Marks

13. Essay question from UNIT- I
14. Essay question from UNIT- II
15. Essay question from UNIT- III

SECTION - B

16. Essay question from UNIT- IV
17. Essay question from UNIT- V
18. Essay question from any one of the five Units based on its weightage in the Syllabus.

PART - II

Answer any Four Questions from the following

4 X 5 = 20 Marks

19. Short answer question from UNIT - I
20. Short answer question from UNIT - II
21. Short answer question from UNIT - III
22. Short answer question from UNIT - IV
23. Short answer question from UNIT - V
24. Short answer question from any one of the five Units based on its weightage in the Syllabus.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I B.Sc - Microbiology /II Semester End (W.E.F. 2021-2022)

Introduction to Microbial Biochemistry and Metabolism

Time: 2 Hrs.

Max.Marks:5

PART-A

Answer any **Three** questions by attempting at least one question each section

Section – A

3 x 10 = 30M

1. Write an essay on general characteristics of carbohydrates.
2. Write in detail about the principle and applications of colorimetry.
3. Discuss the properties and classification of Enzymes.

Section – B

4. Explain in detail about nutritional groups of microorganisms.
5. Write an essay on Glycolysis
6. Write about the general characteristics of amino acids.

PART - B

Answer any **Four** of the following questions

4 x 5 = 20M

7. Phospholipids
8. Paper chromatography
9. Cofactors
10. Factors influencing microbial growth
11. ED path way
12. Substrate level phosphorylation

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

I B.Sc., Microbiology - Practical

Examinations Paper I Model at the end of

II Semester (w.e.f. 2021-2022)

Introduction to Microbial Biochemistry and Metabolism (MB2209P)

Time: 1½ Hrs.Max. Marks: 25

1. Qualitative analysis of chemical 'A'. 15 M

Scheme for valuation:

Conduct of experiment (07M) + procedure (5M) + Result (3M)

2. Record + Viva voce 5 +5 = 10 M

TOTAL = 25 M

25 MARKS FOR CIA

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

BSc	MICROBIOLOGY (Semester: III)	Credits: 4
MBT: III	Molecular Biology And Microbial Genetics	Hrs/Week: 4

Aim and objectives of Course

To understand different biomolecules, analytical techniques, bacterial nutrition, growth and metabolism

Course outcomes

Up on completion of this course students should be able to:

1. Explain working principle and applications of Colorimetry, Chromatography, Spectrophotometry, Centrifugation and Gel Electrophoresis.
2. Knowledge on Microbial nutrition, bacterial growth, metabolism and Respiration.
3. The student will get first-hand experience on separation methods

UNIT- I: Nucleic acids

No. of hours: 12

DNA and RNA - Role in heredity-The central dogma Watson and Crick model of DNA
Types of RNA, structure, and functions Organization of DNA in prokaryotes

UNIT- II : Genetic material and replication

No. of hours: 12

Experiments which established DNA as genetic material RNA as genetic material
Mechanism of DNA Replication in Prokaryotes
Proof of semi conservative mechanism of replication (Meselson - Stahl Experiment)

UNIT- III: Gene expression and regulation

No. of hours: 12

Concept of gene - Muton, recon and cistron. Genetic code
Protein synthesis - Transcription and translation in Prokaryotes Regulation of gene expression
in bacteria - *lac* operon

UNIT- IV: Mutations, damage and repair

No. of hours: 12

Outlines of DNA damage and repair mechanism Mutations - spontaneous and induced
Chromosomal aberrations - deletions, inversions, tandem duplications, insertions Point
mutations- base pair changes, frame shifts
Mutagens - Physical and Chemical mutagens
Bacterial recombination - Transformation, Conjugation, Transduction (Generalized and
specialized transductions)

UNIT- V: Genetic engineering**No. of hours: 12**

Basic principles of genetic engineering. Restriction endonucleases, DNA ligases.

Vectors – plasmids (pBR322), Cosmids, Phagemids, lambda phage vector, M 13 vectors.

Outlines of gene cloning methods.

Polymerase chain reaction. Genomic and cDNA libraries.

General account on application of genetic engineering in industry, agriculture, and medicine

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	3	3	3	2	1	2	1	3
CO2	3	2	3	3	2	3	2	2	1	2	1	3
CO3	3	2	2	2	3	3	3	1	2	2	1	3

**P R GOVERNMENT COLLEGE
(AUTONOMOUS), KAKINADA**

II year B.Sc., Program III Semester End Practical Syllabus

MBP- 3209 MICROBIAL GENETICS AND MOLECULAR BIOLOGY

TOTAL HOURS: 48

CREDITS: 2

PRACTICAL SYLLABUS

1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS - PAGE).
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology - Ultra centrifuge, Transilluminator, PCR

Recommended Text Books & Reference books:

- Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi. Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
- Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
- Lewin, B. (2000). Genes VIII. Oxford University Press, England.
- Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.
- Ram Reddy, S., Venkateswarlu, K. and Krishna Reddy, V. (2007) A text Book of Molecular Biotechnology. Himalaya Publishers, Hyderabad.
- Sinnott E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 th Edition. McGraw Hill, New York.
- Smith, J.E. (1996). Biotechnology, Cambridge University Press.
- Snyder, L. and Champness, W. (1997). Molecular Genetics of Bacteria. ASM press,
- Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.
- Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution

P.R. GOVERNMENT COLLEGE (A): KAKINADA
II B.Sc - Microbiology / III Semester End (W.E.F. 2021-2022)
Paper-III MICROBIAL GENETICS AND MOLECULAR BIOLOGY
w.e.f. 2021-2022 ADMITTED BATCH

BLUE PRINT

PART-I

Answer any three questions by attempting at least one question form each section

SECTION - A

3 X 10 = 30 Marks

- 25. Essay question from UNIT- I
- 26. Essay question from UNIT- II
- 27. Essay question from UNIT- III

SECTION - B

- 28. Essay question from UNIT- IV
- 29. Essay question from UNIT- V
- 30. Essay question from any one of the five Units based on its weightage in the Syllabus.

PART - II

Answer any Four Questions from the following

4 X 5 = 20 Marks

- 31. Short answer question from UNIT - I
- 32. Short answer question from UNIT - II
- 33. Short answer question from UNIT - III
- 34. Short answer question from UNIT - IV
- 35. Short answer question from UNIT - V
- 36. Short answer question from any one of the five Units based on its weightage in the Syllabus.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc - Microbiology /III Semester End (W.E.F. 2021-2022)

Molecular Biology and Microbial Genetics

Time: 2 Hrs.

Max.Marks:50

PART-A

Answer any **Three** questions by attempting at least one question each section

Section – A

3 x 10 = 30M

1. Describe Watson and Krick model of DNA
2. Explain the proof of semi conservative replication of DNA (Meselson & Stahl experiment).
3. Explain important steps in Protein Synthesis with a diagram.

Section – B

4. Explain different types of chromosomal aberrations & point mutations
5. What are the application of genetic engineering in Agriculture ,Medicine &Industry.
6. Explain the functioning of lac operon.

PART - B

Answer any **Four** of the following questions

4 x 5 = 20M

7. Central dogma
8. RNA as Genetic material
9. Muton,Recon, Cistron
10. Genetic code
11. Conjugation in bacteria
12. pBR322

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

I B.Sc., Microbiology - Practical

Examinations Paper I Model at the end of

III Semester (w.e.f. 2021-2022)

Molecular Biology and Microbial Genetics (MB3209P)

Time: 1½ Hrs.

Max. Marks: 25

1. Qualitative analysis of chemical 'A'. 15 M

Scheme for valuation:

Conduct of experiment (07M) + procedure (5M) + Result (3M)

2. Record + Viva voce 5 + 5 = 10 M

TOTAL = 25 M

25 MARKS FOR CIA

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

BSc	MICROBIOLOGY (Semester: IV)	Credits: 4
MBT: IV	Immunology And Medical Microbiology	Hrs/Wk: 3

Aim and objectives of Course

- To study types of immunity, immune organs, cells, antibodies and antigen-antibody interactions.
- To learn diagnostic and pathogenesis of various diseases. Antimicrobial defense and different toxins and vaccines.

Learning outcomes of Course

Up on completion of the course students able to

1. Explain No-specific body defence and the immune response
2. Develop knowledge on disease transmission and control
3. Demonstrate on collection and handling of laboratory specimens
4. Develop an information making personal health decision in regard to infectious diseases.
5. Student can safeguard himself & society and can work diagnostics and hospitals.

UNIT – I: IMMUNOLOGY BASICS

12H

Types of immunity – innate and acquired

Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen and lymph nodes.

Cells of immune system.

Properties and Functions of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils.

Components of Complement system

UNIT – II: ANTIGEN & ANTIBODIES

12H

Antigens – types, chemical nature, antigenic determinants, happens. Factors affecting antigenicity.

Antibodies – basic structure, types, properties and functions of immunoglobulin's. Types of antigen-antibody reactions - Agglutinations,

Precipitation, Neutralization, complement fixation.

Labeled antibody based techniques – ELISA, RIA and Immunofluorescence.

Monoclonal antibodies – production and applications.

UNIT – III: MICROBIOLOGY CONCEPTS

12

Normal flora of human body.

Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence and opportunistic infection, General account on nosocomial infection.

General principles of diagnostic microbiology- collection, transport and processing of clinical samples.

General methods of laboratory diagnosis - cultural, biochemical, serological and molecular methods.

UNIT – IV: MICROBIOLOGY- APPLICATIONS

12

Antibacterial Agents- Penicillin, Streptomycin and Tetracycline. Antifungal agents – Amphotericin B, Griseofulvin

Antiviral substances - Amantadine and Acyclovir Tests for antimicrobial susceptibility.

Brief account on antibiotic resistance in bacteria - Methicillin-resistant Staphylococcus aureus (MRSA).

Vaccines – Natural and recombinant.

UNIT – V: MICROBES AND DISEASES

12

General account on microbial diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control

Bacterial diseases – Tuberculosis

Fungal diseases – Candidiasis. Protozoal diseases – Malaria. Viral Diseases - Hepatitis- A, Ebola, MERS

RECOMMENDED TEXT BOOKS:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
3. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
4. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

REFERENCE BOOKS:

1. Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
2. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw

HillMicrobiology. 4th edition. Elsevier Publication.

3. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein'sMicrobiology. 9th edition. McGraw Hill HigherEducation.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	3	2	3	2	3	3	3
CO2	3	2	3	3	2	3	3	2	3	1	1	1	3
CO3	3	2	2	2	3	2	2	3	2	3	1	1	3
CO4	2	3	2	3	2	3	1	2	1	2	3	3	2
CO5	3	2	3	3	2	3	3	2	3	1	1	1	3

P. R. GOVERNMENT COLLEGE (A), KAKINADA
II year B.Sc., Program III Semester End Practical Syllabus
MBP- 4209P IMMUNOLOGY AND MEDICAL MICROBIOLOGY

TOTAL HOURS: 48

CREDITS: 2

PRACTICAL SYLLABUS

1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Estimation of blood hemoglobin.
4. Total Leukocyte Count of the given blood sample.
5. Differential Leukocyte Count of the given blood sample.
6. Immunodiffusion by Ouchterlony method.
7. Identify bacteria (E. coli, Pseudomonas, Staphylococcus, Bacillus) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests
8. Isolation of bacterial flora of skin by swab method.
9. Antibacterial sensitivity by Kirby-Bauer method
10. Study of various stages of malaria parasite in RBCs using permanent mounts.

REFERENCE BOOKS

- ❖ Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
- ❖ Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Immunology. 8th edition, University Press Publication
- ❖ Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
- ❖ Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
- ❖ Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
- ❖ Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

P.R. GOVERNMENT COLLEGE (A): KAKINADA
II B.Sc - Microbiology / IV Semester End (W.E.F. 2021-2022)
Paper-4 IMMUNOLOGY AND MEDICALMICROBIOLOGY
w.e.f. 2021-2022 ADMITTED BATCH

BLUE PRINT

PART-I

Answer any three questions by attempting at least one question form each section

SECTION - A

3 X 10 = 30 Marks

- 37. Essay question from UNIT- I
- 38. Essay question from UNIT- II
- 39. Essay question from UNIT- III

SECTION - B

- 40. Essay question from UNIT- IV
- 41. Essay question from UNIT- V
- 42. Essay question from any one of the five Units based on its weightage in the Syllabus.

PART - II

Answer any Four Questions from the following

4 X 5 = 20 Marks

- 43. Short answer question from UNIT - I
- 44. Short answer question from UNIT - II
- 45. Short answer question from UNIT - III
- 46. Short answer question from UNIT - IV
- 47. Short answer question from UNIT - V
- 48. Short answer question from any one of the five Units based on its weightage in the Syllabus.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

**II B.Sc - Microbiology /IV Semester End (W.E.F. 2021-2022)
Paper-4 IMMUNOLOGY AND MEDICALMICROBIOLOGY**

Time: 2 Hrs.

Max.Marks:50

PART-A

Answer any **Three** questions by attempting at least one question each section

Section – A

3 x 10 = 30M

1. Explain types of immunity
2. Explain antibody structure and types
3. Write a note on collection and transportation of clinical samples

Section – B

4. Briefly describe about antibacterial substances with its mode of action.
5. Explain causal organism, pathogenesis, epidemiology, prevention and control of tuberculosis.
6. Write structure and functions of cells of immune system.

PART - B

Answer any **Four** of the following questions

4 x 5 = 20M

7. Thymus
8. Factors affecting antigenicity
9. Applications of Monoclonal antibodies
10. General account on nosocomial infection
11. MRSA
12. Candidiasis

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Microbiology - Practical

Examinations Paper 4 Model at the end of

IV Semester (w.e.f. 2021-2022)

IMMUNOLOGY AND MEDICAL MICROBIOLOGY (MB4209P)

Time: 1½ Hrs.

Max. Marks: 25

1. Qualitative analysis of chemical 'A'. 15 M

Scheme for valuation:

Conduct of experiment (07M) + procedure (5M) + Result (3M)

2. Record + Viva voce 5 + 5 = 10 M

TOTAL = 25 M

25 MARKS FOR CIA

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

BSc	MICROBIOLOGY (Semester: IV)	Credits: 4
MBT: V	Microbial Ecology And Industrial Microbiology	Hrs/Wk: 3

Aim and objectives of Course

1. To study role of microorganisms in nutrient cycling, microorganism in waste treatment and degradation of xenobiotics
2. To determine the potability of drinking water
3. To study concepts of screening and strain improvement, media, Fermentation, assays with examples of industrially important processes

Course outcomes

Up on completion of the course students able to

1. Understand fundamental concept in soil microbial diversity, basic concept of biogeochemical cycles and plant growth promotion and plant diseases
2. Understands the role of microorganisms in treatment of solid and liquid waste.
3. Acquire knowledge on application of microorganisms in agro – environmental fields.
4. Get basic information design of fermenter, fermentation processes and Single cell proteins.
5. Self-reliance in the industrial application of Microbiology in life and industry.
6. Entrepreneurship can be established with the gained knowledge.

UNIT - I: Microbial Ecology

No. of hours: 12

Role of microorganisms in Biogeochemical cycles (Carbon, nitrogen, phosphorus)

Microbe-microbe interactions - Synergism, mutualism, commensalism, antagonism, competition, parasitism, predation

Plant- Microbe interactions - Plant growth promoting Microorganism

UNIT - II : Microorganisms in Environment

No. of hours: 12

Microbes in waste management- solid and liquid waste (aerobic and anaerobic)

Microbes in degradation of Xenobiotics

Microbes in drinking water- detection of potability by (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique

Microbes in food - intrinsic and extrinsic parameters that affect microbial growth in food

UNIT - III: Industrial Microbiology

No. of hours: 12

Industrial important Microorganisms- Yeasts & Moulds , Bacteria , Actinomycetes .

Screening techniques. Strain improvement techniques.

UNIT -IV: Fermentation processes**No. of hours: 12**

Design of fermenter (for control of pH, temperature, dissolved oxygen, foaming and aeration)

Types of fermentation processes - solid state, liquid state, batch, fed-batch, continuous.

Fermentation media (Carbon source, nitrogen source, minerals, vitamins & growth factors,

Buffers, Precursors, Antifoam agents, water, oxygen)

Examples of Crude media; molasses, corn- steep liquor, sulphite waste liquor, whey.

Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT - V: Microbial Productions**No. of hours: 12**

Microbial production of Industrial products: Citric acid, Ethanol, Penicillin, Glutamic acid, vitamin B12, Amylase, Yogurt

Microbial cells as food- SCP

Additional Input: Determination of quality of different water samples by MPN method and Mushroom cultivation

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	3	2	3	2	3	3	3
CO2	3	2	3	3	2	3	3	2	3	1	1	1	3
CO3	3	2	2	2	3	2	2	3	2	3	1	1	3
CO4	2	3	2	3	2	3	1	2	1	2	3	3	2
CO5	3	2	3	3	2	3	3	2	3	1	1	1	3
CO6	2	3	2	3	2	3	1	2	1	2	3	3	2

MBP - V: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Total hours: 30

Credits: 1

1. Microbial fermentation for the production and estimation of ethanol
2. Isolation of amylase producing microorganisms from soil
3. Isolation of food spoilage microorganisms from spoiled food sample.
4. MPN test
5. Demonstration of fermenter
6. Production of wine from grapes
7. Growth curve and kinetics of any two industrially important microorganisms.
8. Microbial fermentation for the production and estimation of citric acid
9. Preparation of yoghurt.
10. Crowded plate technique
11. Isolation of microorganism from soil
12. Isolation of microorganism from different water samples

Recommended Text Books & Reference books:

- Benjamin/Cummings Science Publishing, USA
- Barton LL & Northup DE (2011). **Microbial Ecology**. 1st edition, WileyBlackwell, USA
- Campbell RE. (1983). **Microbial Ecology**. Blackwell Scientific Publication, Oxford, England.
- Lynch JM & Hobbie JE. (1988). **Microorganisms in Action: Concepts & Application in Microbial Ecology**. Blackwell Scientific Publication, U.K.
- Madigan MT, Martinko JM and Parker J. (2014). **Brock Biology of Microorganisms**. 14th edition. Pearson/ Benjamin Cummings
- Maier RM, Pepper IL and Gerba CP. (2009). **Environmental Microbiology**. 2nd edition, Academic Press
- Martin A. (1977). **An Introduction to Soil Microbiology**. 2nd edition. John Wiley & Sons Inc. New York & London.
- Adams MR and Moss MO. (1995). **Food Microbiology**. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
- Banwart JM. (1987). **Basic Food Microbiology**. 1st edition. CBS Publishers and Distributors, Delhi, India.
- Casida LE. (1991). **Industrial Microbiology**. 1st edition. Wiley Eastern Limited.
- Crueger W and Crueger A. (2000). **Biotechnology: A textbook of Industrial Microbiology**. 2nd Edition. Panima Publishing Company, New Delhi
- Frazier WC and Westhoff DC. (1992). **Food Microbiology**. 3rd edition. TataMcGraw-Hill Publishing Company Ltd, New Delhi, India.

P.R. GOVERNMENT COLLEGE (A): KAKINADA
II B.Sc - Microbiology / IV Semester End (W.E.F. 2021-2022)
Paper-5 Microbial Ecology And Industrial Microbiology
w.e.f. 2021-2022 ADMITTED BATCH

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PART-I

Answer any three questions by attempting at least one question form each section

SECTION - A

3 X 10 = 30 Marks

- 49. Essay question from UNIT- I
- 50. Essay question from UNIT- II
- 51. Essay question from UNIT- III

SECTION - B

- 52. Essay question from UNIT- IV
- 53. Essay question from UNIT- V
- 54. Essay question from any one of the five Units based on its weightage in the Syllabus.

PART - II

Answer any Four Questions from the following

4 X 5 = 20 Marks

- 55. Short answer question from UNIT - I
- 56. Short answer question from UNIT - II
- 57. Short answer question from UNIT - III
- 58. Short answer question from UNIT - IV
- 59. Short answer question from UNIT - V
- 60. Short answer question from any one of the five Units based on its weightage in the Syllabus.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

**II B.Sc - Microbiology /IV Semester End (W.E.F. 2021-2022)
Paper-5 Microbial Ecology And Industrial Microbiology**

Time: 2 Hrs.

Max.Marks:50

PART-A

Answer any **Three** questions by attempting at least one question each section

Section – A

3 x 10 = 30M

13. Write an essay on Microbial interactions
14. Explain methods to detect the potability of drinking water
15. Write about screening and strain improvement of industrially important microbes

Section – B

16. Explain the design of a fermentor with a neat labeled diagram
17. Write an essay on production of Penicillin.
18. Write an essay on Plant growth promoting microorganisms.

PART - B

Answer any **Four** of the following questions

4 x 5 = 20M

19. Carbon cycle
20. Activated sludge process
21. *Actinomycetes*
22. Solid state fermentation
23. SCP
24. Fermentation media

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Microbiology - Practical

Examinations Paper 5 Model at the end of

IV Semester (w.e.f. 2021-2022)

Microbial Ecology And Industrial Microbiology

Time: 1½ Hrs.

Max. Marks: 25

1. Qualitative analysis of chemical 'A'. 15 M

Scheme for valuation:

Conduct of experiment (07M) + procedure (5M) + Result (3M)

2. Record + Viva voce 5 +5 = 10 M

TOTAL = 25 M

25 MARKS FOR CIA

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

BSc	Semester: V (Skill Enhancement Course- Elective)	Credits: 2
MB T A1 A- PAIR-6A	Food, Agriculture And Environmental Microbiology	Total hours 40

III BSc Microbiology Syllabus (w.e.f:2020-2021A.B)

Aim and objectives of Course

To provide knowledge on important microbes in food, Agriculture and Environmental Microbiology

Course outcomes

Up on completion of the course students able to

CO1: Demonstrate with the wide diversity of microbes and their spoilage food, food intoxication and food born infections

CO2: Able to understand principles of food preservation, fermented foods and microbes as food.

CO3: The student will acquire knowledge on application of microorganisms in agro – environmental fields

CO4: Get fundamental concepts in principles of plant disease control and industrial application of Microbiology

CO5: The student will have fundamental concepts in soil microbiology and soil water and aerobic microbial diversity and microbial interactions. Basic concepts in treatment of drinking water. Understands the role of microorganisms in treatment of solid and liquid waste.

UNIT - 1

No. of Hours: 8

Intrinsic and extrinsic parameters that affect microbial growth in food

Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods. Food intoxication (botulism).

Food-borne diseases (salmonellosis) and their detection.

UNIT - II

No. of Hours: 8

Principles of food preservation - Physical and chemical methods. Fermented Dairy foods – cheese

Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw). Probiotics and their benefits.

UNIT – III**No. of Hours: 8**

Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur.

Biological nitrogen fixation.

Microflora of Rhizosphere and Philosopher microflora, microbes in composting.

Importance of mycorrhizal inoculums, types of mycorrhizae associated plants, mass inoculums. Production of VAM, field applications of Ectomycorrhizae.

UNIT – IV**No. of Hours: 8**

Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of Plant diseases.

Plant – Microbe interactions.

Diseases caused by bacteria and fungi to various commercial crops: groundnut rust & Citrus canker and food crops: **Rice Blast** (*Pyriculariaoryzae*) Bacterial blight of rice (*Oryza sativa* and *O. glaberrima*)

UNIT – V**No. of Hours: 12**

Terrestrial Environment: Soil profile and soil microflora. Aquatic Environment: Microflora of fresh water and marine habitats. Atmosphere: Aeromicroflora and dispersal of microbes. Extremophiles. Concept of Biodegradation, Biogas production, Biodegradable plastics.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	3	2	3	2	3	3	3
CO2	3	2	3	3	2	3	3	2	3	1	1	1	3
CO3	3	2	2	2	3	2	2	3	2	3	1	1	3
CO4	2	3	2	3	2	3	1	2	1	2	3	3	2
CO5	3	2	3	3	2	3	3	2	3	1	1	1	3

MBP – FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

Total hours: 40

Credits: 2

1. Isolation of bacteria and fungi spoiled bread / fruits / vegetables
2. Preparation of yogurt / dahi
3. Determination of microbiological quality of milk sample by MBRT
4. Enumeration of bacteria, fungi and actinomycetes from soil
5. Enumeration and identification of rhizosphere micro flora
6. Isolation of rhizobium from root nodules.
7. Isolation of azatobacter from soil.
8. Observation description of any three bacterial and fungal plant diseases
9. Staining and observation of VAM.
10. Analysis of soil - pH, Moisture content and water holding capacity.
11. Study of air flora by petriplate exposure method.
12. Analysis of potable water: SPC, Presumptive, confirmed and completed test, determination of coli form count in water by MPN.
13. Determination of Biological Oxygen Demand (BOD) of waste water samples.

Suggested Readings

- Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition, Benjamin/Cummings Science Publishing, USA
- Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, WileyBlackwell, USA
- Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
- Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.
- Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings.
- Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.
- Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.
- Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York.
- Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg
- Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.
- Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.
- Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

**III B.Sc., Microbiology – Practical
Examinations Paper 6A Model at the end of V
Semester (w.e.f. 2020-2021)
Food, Agriculture And Environmental Microbiology**

Time: 2 Hrs.

Max. Marks: 35

- 1. Major Experiment- ‘A’** **10 M**
Scheme for valuation:
Conduct of experiment (05M) + procedure (3M) +Result (2M)
- 2. Major Experiment- ‘B’** **05 M**
Scheme for valuation:
Principle (2M) + Description (3M)
- 3. Identify and write notes on the following** **5 x 2 = 10 M**
C-
D-
E-
F-
G-
Scheme for valuation:
Identification (1M) + Reasons (2M)
- 4. Record + Viva voce** **6 +4 = 10 M**

TOTAL = 35 M

15 MARKS FOR CIA

MODEL BLUE PRINT FOR THE QUESTION PAPER SETTER COURSE

Food, Agriculture And Environmental Microbiology

Module No.	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Module
UNIT – I	1	2	1	22
UNIT – II	1	2	1	22
UNIT – III	1	1	1	17
UNIT – IV	1	2	1	22
UNIT – V	1	1	1	17
Total marks allotted to all questions including choice =				100

Note: Question paper setters are requested to adhere strictly to the above blue print while preparing the said paper

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc - Microbiology /V Semester End (W.E.F. 2021-2022)

Paper-6A Food, Agriculture And Environmental

Time: 2½ hours

Max.Marks:60

SECTION – A

Answer all the following questions

5 X 2 = 10 M

1. Botulism
2. Cheese
3. VAM
4. Rice Blight
5. Dispersal of Microbes

SECTION – B

Answer any FOUR questions

4X 5 = 20 M

1. Canned Foods
2. SCP
3. Spoilage of Eggs
4. Yogurt
5. VAM
6. Rhizosphere
7. Bio fertilizers
8. Poly hydroxyl butyrate

SECTION – C

Answer ANY THREE of the following Questions. Draw labeled diagrams wherever necessary

3 X 10 = 30 M

1. Write a note on salmonellosis and their detection methods.
2. Write in detail about food preservation methods.
3. Explain symbiotic nitrogen fixation.
4. Explain plant and microbe interactions.
5. Methods to detect portability of water samples.

P . R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III BSc Microbiology Syllabus (w.e.f:2020-2021A.B)

BSc	Semester: V (Skill Enhancement Course- Elective)	Credits: 2
MB T A2 A- PAIR: 7A	Management Of Human Microbial Diseases And Diagnosis	Total hours 36

Aim and objectives of Course

To realize the principles of prevention and treatment of microbial diseases and tounderstand the concepts and development of microbial diseases in animals

Course outcomes

Up on completion of the course students able to

CO1: Develop knowledge and skills on microbiological laboratory skills for identification of pathogens

CO2: Students will demonstrate the collection of clinical samples

CO3: Students will get knowledge on staining techniques

CO4: Students able to perform diagnostic techniques

CO5: To understand drug resistance

UNIT – I

No. of Hours: 8

Definition and concept of health, disease, infection, and pathogen. Bacterial Diseases:

Cholera, Pneumonia, and Dysentery.

Viral Diseases: Poliomyelitis & Chicken pox Fungal diseases: Dermatormycosis and Athletes foot.

UNIT- II

No. of hours: 8

Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) and precautions required.

Method of transport of clinical samples to laboratory and storage.

UNIT- III

No. of hours: 8

Mechanism of bacterial pathogenicity, colonization and growth, virulence, virulence factors, exotoxins, enterotoxins, endotoxins and neurotoxins.

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis,

Giemsa-stained thin blood film for malaria.

Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, Mac Conkey agar. Distinct colony properties of various bacterial pathogens.

UNIT- IV**No. of hours: 6**

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes.

Diagnosis of Typhoid, Dengue and HIV, Swine flu.

UNIT- V**No. of hours: 6**

Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method. Problems of drug resistance and drug sensitivity.

Drug resistance in bacteria.

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	3	2	3	2	3	3	3
CO2	3	2	3	3	2	3	3	2	3	1	1	1	3
CO3	3	2	2	2	3	2	2	3	2	3	1	1	3
CO4	2	3	2	3	2	3	1	2	1	2	3	3	2
CO5	3	2	3	3	2	3	3	2	3	1	1	1	3

**MB P A2: MANAGEMENT OF HUMAN MICROBIAL DISEASES AND
DIAGNOSIS TOTAL HOURS: 40 Credits: 2**

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum). Receipts, Labelling, recording and dispatching clinical specimens.
2. Physical, Chemical & microscopic examination of clinical samples – urine, stool, puss, sputum.
3. Isolation and identification of following pathogens from clinical samples: *E.coli*, *Salmonella* and *Pseudomonas*.
4. Demonstration of permanent slides of the following parasites:
 - a) *Entamoeba histolytica*
 - b) *Ascaris* spp.
 - c) *Plasmodium* spp.
 - d) *Mycobacterium tuberculosis* & *Mycobacterium leprae*
5. Estimation of haemoglobin (Acid haematin and cyan methanoglobin method).
6. ESR and PCV determination.
7. Immuno hematology: Blood group typing by slide test & tube for ABO & Rh systems.
8. Isolation of bacteria in pure culture and Antibiotic sensitivity.

SUGGESTED READING

- Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
- Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.
- Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.
- Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

**III B.Sc., Microbiology – Practical
Examinations Paper 7A Model at the end of V
Semester (w.e.f. 2020-2021)**

Management Of Human Microbial Diseases And Diagnosis

Time: 2 Hrs.

Max. Marks: 35

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- 1. Major Experiment- ‘A’** **10 M**
Scheme for valuation:
Conduct of experiment (05M) + procedure (3M) +Result (2M)
- 2. Major Experiment- ‘B’** **05 M**
Scheme for valuation:
Principle (2M) + Description (3M)
- 3. Identify and write notes on the following** **5 x 2 = 10 M**
C-
D-
E-
F-
G-
Scheme for valuation:
Identification (1M) + Reasons (2M)
- 4. Record + Viva voce** **6 +4 = 10 M**

15 MARKS FOR CIA

TOTAL = 35 M

MODEL BLUE PRINT FOR THE QUESTION PAPER SETTER COURSE

Food, Agriculture And Environmental Microbiology

Module No.	Very Short Answer Questions	Short Answer Questions	Essay Questions	Marks allotted to the Module
UNIT – I	1	2	1	22
UNIT – II	1	2	1	22
UNIT – III	1	1	1	17
UNIT – IV	1	2	1	22
UNIT – V	1	1	1	17
Total marks allotted to all questions including choice =				100

Note: Question paper setters are requested to adhere strictly to the above blue print while preparing the said paper

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc - Microbiology /V Semester End (W.E.F. 2021-2022)

Paper-7A Management Of Human Microbial Diseases And Diagnosis

Time: 2½ hours

Max.Marks:60

SECTION – A

Answer all the following questions

5 X 2 = 10 M

1. Poliomyelitis
2. Mac Conkey agar
3. Ziehl-Neelson staining
4. PCR
5. Drug resistance in bacteria.

SECTION – B

Answer any FOUR questions

4X 5 = 20 M

6. Cholera
7. Ziehl-Neelson staining
8. Mac Conkey agar
9. Transport media
10. MIC
11. WIDAL test
12. Athletes foot
13. Methods for collection of urine

SECTION – C

Answer ANY THREE of the following Questions. Draw labeled diagrams

wherever necessary

3 X 10 = 30 M

14. Write causal organism, mode of transmission, pathogenesis, treatment and control of Cholera
15. Explain methods for collection of clinical samples
16. Describe Preparation and use of Chocolate agar and Lowenstein-Jensen media
17. Explain serological methods
18. Explain serial double dilution method for determination of MIC of drug