PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)

NAAC 'A' GRADE

KAKINADA

BOARD OF STUDIES

DEPARTMENT OF MICROBIOLOGY

2023-24

(CHOICE BASED CREDIT SYSTEM)

PROCEEDINGS OF THE PRINCIPAL, PITHAPUR RAJAH's GOVT. COLLEGE [A]:: KAKINADA
Present: Dr. B.V. TIRUPANYAM, Ph.D.

Rc.No.1/ A.C/BOS/2023-24 **Dt.29 Aug2023**

Sub: P.R.G.C[A] – Academic Cell - **Conduct of BOS Meetings for the Academic Year2023-24** – Guidelines issued - Regarding.

Ref: Resolutions adopted in 25th Staff Council Meeting held on 29 Aug 2023

The Autonomous colleges are, as per its vision, mission, stated objectives and core values, mandated to design and develop their own outcome -based curricula keeping in view the societal, local and global industry requirements, employability and industry – ready and transferable skills duly prescribing Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) and suitable learning outcome assessment management system through robust and transparent evaluation system to measure their attainment levels by the students.

The Sustained Developmental Goals (SDG-4) of UNEP recommended assurance of quality to students in HEIs promoting creativity, critical thinking and collaborative skills, while building curiosity, courage, resilience and gender equality among students.

Further, the NEP-2020 recommended that the HEIs shall equip students with such skills that translate them into leaders and potential entrepreneurs too besides credit transfer mechanism through ABC (Academic Bank of Credits).

The HEIs are also, as per the Revised Accreditation Framework [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by ingraining quality in teaching- learning process by facilitating the students experience a wide range of participative and experiential learning strategies including field trips, conferences, integration of technology, community service programmes, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programmes, gender equity programmes, etc.

Besides, the students shall have social consciousness, regard for constitutional provisions, right perspective on environmental protection, awareness on gender equity, health and hygiene, Yoga and wellness, college social responsibility, culture and values, etc., to mention a few.

Further, the Ministry of India, GoI, through NIRF, prescribes quality research, infrastructure augmentation, enhanced placement and progression to higher education, equipment of employability skills leading to enhanced public perception about the college among the public.

Our institution has, from AY 2022-23, has devised its new vision and mission along with objectives and core values necessitating design and re-orientation of its academic administration in tune with them.

ORDER:

In the light of the above mandate and responsibilities prescribed by institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, need to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our insitution is no exception.

Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments are requested to make necessary arrangements for the conduct of the meetings on **31 August 2023**. They are further requested to prepare curricula and extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality and a 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning; in design of curriculum (with 20% change) and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks (As per SOP given in **Annexure – I)**. Further, as the regular attendance of students to the classes is a deciding factor in enhancement of quality in learning, a minimum attendance of 60% for I mid-term examination, 75% for II mid-term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS. The Chairmen are also requested to approve the new programmes to be introduced for 2023-24, if any, number of certificate courses, their frequency, Bloom 's- Taxonomy based evaluation system for effective learning outcomes as per the Annexure – I.

The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2023-24 both for U.G and P.G courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula andinvite suggestions and changes to be made.
- Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc. A soft copy shall be communicated well in advance to the members to have an idea on the matters.
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, resource utilization by staff ad students, etc.,
- Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.
- All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.
- The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate (hard copies) to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the completion of BOS meeting and besides hosting the soft copy in the college website within the period stipulated.
- Each Chairman of BOS, shall get the rough draft of the curricula verified and approved by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity and commensurate with the stated vision and mission of the college among the departments.
- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC

coordinator will be the additional coordinator.

- The Academic Coordinator and IQAC coordinator conducted a meeting with the Chairmen, BOS on 28 August 2023 and explain the structure of curricula, uniformity other modalities.
- The Controller of Examinations of the institution shall fund the BOS meetings from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially, he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course (If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.500/-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

Following contents shall be presented in the BOS document in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Lab incase of science subjects

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	III	Optics	4	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting (Activities and Bench marking as per Annexure –I)
7. At the end of each theory paper, each topic shall be mapped as per the Blooms taxonomy and scope of that topic for skill/ employability/ entrepreneurship opportunities in the following tableincorporated

S. No	Subject	Semester	Title of the Course (Paper)	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation	Experiential learning component	Scope (Skill/ employability/ entrepreneurship)
1	III	Botany	Plant Physiology	Plant Cell	Knowledge	Shall be shown Microscope	
2	III	History	Tourism	Tourism management	Application	Apprenticeship	Employability

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made inthe syllabus/paper along with justification, in the Proforma given in Annexure – I.
9. Attendance of Members present with signatures in the tabular form.
10. List of Examiners & Paper setters
11. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50marks) for each course with structure.
12. Each student (2023-24 AB) has to complete one MOOCS course from SWAYAM in any subject per year which is mandatory.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from any unit with more syllabus weightage

For I mid examination to be conducted in offline mode, Question paper is to begiven as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each.
- The remaining 25 marks for CIA are allocated as per the following structure.

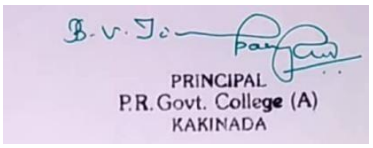
Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system for Honors programmes (2020-21AB)

- Out of 40 marks for CIA, 20 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **Two essay** questions for ten marks each out of three questions, **four short** answer questions with five marks each out of six questions.
- The remaining 20 marks for CIA are allocated as per the following structure.

Assignment- 10M	Seminar- 5M	Quiz -5M

13. Percentage of syllabus changes in each paper
14. Measure outcome attainment learning levels of students through direct and indirect methodology and mapping COs and POs
15. Text & Reference Books
16. e-content links.



PRINCIPAL
Pithapur Rajah's **Government Autonomous College Kakinad**

Composition of BOS

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	Chairman, Head of the Department
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
	G.N.V. Satish	Member
6.	Md. Khaza Zakriya, Ch. Mahalakshmi II B.Sc Microbiology	Student nominee
7.	M. Tejaswaini, T. JayasreeI B.Sc Microbiology	Student nominee

The above members are requested to attend the BOS Meeting on **31 -08-2023** 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 holders 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.K M.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 knowledge 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 enroll the course to take up Microbiology as their future carrier option .

To attain 100% success rate in the examination.

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 5th November 2022.

Suggestions	Action Taken
To conduct any student centric seminar/webinar	A National webinar is organized on Undergraduate research focusing on the employability and entrepreneur opportunities in Microbiology
To plan any industrial visit to the students	Students were taken for Samalkota Biofertilizer unit
Introduce any certificate course	As suggested by the BOS committee members the certificate course will be started on Bioinformatics

Agenda

1. Action taken report (ATR) of the A.Y.2022-23
2. Introduction of B.Sc Microbiology- Major and B.Sc Microbiology Minors w.e.f the academic year 2023-24 as per the directions given by APSCHE and Council of Higher education, A.P.
3. Model question papers, Assignments question for each course as part of continuous internal assessment & blue prints for each course.
4. Panel of Question Paper Setters & Examiners.
5. SEE: CIA evaluation
6. Proposal for Extension Activities like Community Service / Field Trips/ Study tours/Student Study projects/Industrial Visits/ Extension Lectures / Green Initiatives for the students
7. Enrolling students in SWAYAM / MOOC courses of Microbiology & IPRs
8. Streamlining of regularity in attendance to follow the benchmark of **75% attendance** to appear in the Examinations without the payment of fine and **90% attendance** for Practicals
9. Collaboration with industry and third-party sector organization in view of industrial internship.
10. Make students access to ICT infrastructure for enhanced quality in higher education.
11. Remedial coaching for slow learners and project/ research work for advanced learners
12. Allocation of extra credits for extracurricular activities.
13. Conduct of parent teacher meeting.
14. Panel of Question papersetters and Examiners
15. Action plan for the academic year 2023-24, Any other with the permission of the chair.

P.R. GOVERNMENT COLLEGE(A)
KAKINADA.
DEPARTMNENT 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	Introduction to Classical Biology	**Theory**	5	50	50	4
2		Introduction to Applied Biology	**Lab**	5	50	50	4
3	II	Introduction to Microbiology	**Theory**	3	50	50	3
4		Introduction to Microbiology	**Lab**	2	50	-	1
		Bacteriology and Virology	**Theory**	3	50	50	3
		Bacteriology and Virology	**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	50	50	4
12		Food, Agriculture and Environmental Microbiology Practicals	**Lab**	2	50	--	1
13		**Paper – 7A** - Management of Human Microbial Diseases and Diagnosis	**Theory**	3	50	50	4
14		Management of Human Microbial Diseases and Diagnosis Practicals	**Lab**	2	50	--	1
		(Or)					
15	V	**Paper – 6B** - Microbial Biotechnology and r – DNA Technology	**Theory**	3	50	50	4
16		Microbial Biotechnology and r – DNA Technology Lab	**Lab**	2	50	-	1
17		**Paper – 7B** - Biostatistics and Bioinformatics	**Theory**	3	50	50	4
18		Biostatistics and Bioinformatics Lab	**Lab**	2	50	--	1
		(Or)					
19	V	**Paper – 6C** - Microbial Quality Control Instrumentation and Techniques	**Theory**	3	50	50	4
20		Microbial Quality Control Instrumentation and Techniques Lab	**Lab**	2	50	--	1
21		**Paper – 7C** - Drug Design, Discovery and Itellectual Property Rights (IPR)	**Theory**	3	50	50	4
22		Drug Design, Discovery and Itellectual Property Rights (IPR) Lab	**Lab**	2	50	--	1

Note 1: For Semester–V, for the domain subject **MICROBIOLOGY**, any one of the threepairs 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 prioritybasis).

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 APSCHE 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**

Pithapur Rajah's College (A), Kakinada

Department of Microbiology

BOS 2023-24 Minutes

The BOS meeting of Microbiology course is held on 31-08-23 at Department of Microbiology, 10:30 am onwards. The BOS committee members have actively participated in the discussion and following points were focused:

- The first and second semester syllabus of Microbiology major course is discussed and the university nominee Dr. A. Aruna suggested to remove some repeated topics in Paper-2 of first semester and Paper-3 of second semester.
- She also suggested to teach the common topics of first semester at the basic level to all the life science students.
- University nominee also suggested to appoint a guest faculty, as the workload is going to be increased in the coming semesters.
- The industrial nominee Sri S.V. Ramana suggested to include the advance methods of water sample analysis besides the standard conventional methods followed in the laboratory.
- He also expressed his willingness to offer internships and minor projects to the students in the water analysis laboratory.
- The subject expert Smt. D. Jayasree discussed on the changes made in the semester papers and gave some valid inputs like retaining certain topics like PCR and to include certain topics like DNA finger Printing.
- It resolved to adapt the single major system from the academic year 2023-24 as a part of Honors programme.
- It is resolved to offer Microbiology as a minor subject for other streams.
- The first and second semester syllabus of Microbiology major course proposed by APSCHE was discussed and resolve to adapt it without any modification.
- It is Resolved to follow three major system for the second the third-year students.
- The BOS members discussed and approved the UGC prescribed outcome attainment measurement methodology for assessing learning levels of students
- The BOS members have also approved the departmental action plan and suggested to include a workshop.

B. Lakshmi

P.R. GOVT. COLLEGE (AUTONOMOUS) KAKINADA.
2023-24, 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 implement the Four-year honours degree programme in Microbiology from this academic year 2023-24.

Resolution II: Resolved to implement the single major system prescribed by APSCHE in the four years honours degree programme.

Resolution III: Resolved to follow three major system for the second the third-year students.

Resolution IV: Resolve to offer Microbiology minor from this academic year.

Resolution V: Resolved to continue 50% external and 50% internal marks for both theory and practicals for all semesters from the academic year 2023-24.

Resolution VI: For the 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.

Resolution VII: Resolved to conduct I mid examination in offline mode at college level and II mid examination is conducted in online mode at department level.

Resolution VIII: Resolved to follow the question paper pattern and CIA as per the structure given in the proceedings

Resolution IX: 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 X: It is mandatory that each student has to complete one MOOCS course from SWAYAM per year.

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

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

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

Resolution XIV: Resolved to offer certificate course in Bioinformatics by Microbiology department.

Resolution XV: 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

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 analyze & 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 Microbiologywill

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 cellsin 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. GOVT. COLLEGE (A), KAKINADA								
DEPARTMENT OF MICROBIOLOGY								
BOS CHANGES - AY 2023-24								
Name of the Department	**S.No.**	**Semester, Program**	**Paper Number & Paper Title**	**Titles of Topics deleted**	**Topics to be added during BOSmeeting August 2023**	**Percentage of changes made insyllabus**	**Justification per each topic added**	**Justification per each topic deleted**
MICROBIOLOGY	1	SEM-II	Paper-3 Introduction to Microbiolgy	Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.	-	-	-	**These topics are studied by the students in first semester**
MICROBIOLOGY	2	SEM – III B.Sc Microbiology	Paper – III Molecular Biology and Microbial Genetics	-	1. DNA finger printing	15%	This is a basic and important technique that student needs to know	The topic is discussed in detail in IV semester
MICROBIOLOGY	3	SEM – IV B.Sc Microbiology	Paper – IV Immunology And Medical Microbiology	1. DNA Probes 2. Immunofluorescence 3. Brief account on antibiotic resistance in bacteria	1. MRSA	15%	This is important to know the role of MRSA in infection	The topics are studied by the student in detail in V Semester

MICROBIOLOGY	4	SEM – IV B.Sc Microbiology	Paper – V Microbial Ecology and Industrial Microbiology	1. Plant pathogens 2. Intrinsic and extrinsic parameters that affect microbial growth in food	-	-		1. The topic is repetitive and the student is studying in V Semester. 2. The topic was not related for those which are included in the chapter.
MICROBIOLOGY	5	SEM – V B.Sc Microbiology	Paper – VI A Food, Agriculture and Environmental Microbiology	1. Production of Yogurt 2. Single cell proteins 3. Microbial Transformation of Carbon, Nitrogen and Phosphorous.	1. Yakult 2. Sauerkraut	15%	These are also important probiotic foods that a student needs to know its application in daily life	1 & 2 - The topic is repetitive and the student has studied in IV Semester Paper – V 3,4 & 5 - The topic is repetitive and

								the student is studied in IV Semester Paper – V
MICROBIOLOGY	5	SEM – V B.Sc Microbiology	Paper – VII A Management of Human Microbial Diseases and Diagnosis	---	1. Mechanisms of Drug resistance	10%	Understanding the mechanism will make the topic more effective and applicative	

B. Lakshmi

Dr. B. Lakshmi

Lecturer In-Charge

New Courses Introduced For all the Programs offered By Department of Microbiology During the year 2023-2024

S.No.	Title of the New course Introduced	Program in which it is Introduced	Introduced in I/II/III YR
1.	Introduction to Classical Biology	Microbiology Major	I
2.	Introduction to Applied Biology	Microbiology Major	I
3.	Introduction to Microbiology	Microbiology Major	I
4.	Bacteriology and Virology	Microbiology Major	I
5.	Biomolecules & Enzymology	Microbiology Minor	I

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

BOARD OF STUDIES MEETING 2022- 23

CHOICE BASED CREDIT SYSTEM

Time: 10.30 AM. **Date: 31.08.2023**

Venue: ***Department of MICROBIOLOGY***

The BOARD OF STUDIES Meeting of the Department of Microbiology took place 10.30 AM on 31.08.2023 in the Department of Microbiology P.R. Govt. College, (A) Kakinada for the year 2023-24. The following members attended.

Sl 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 2023 - 24

Name of the Department: Microbiology

Name of the HOD: Dr. B. Lakshmi

S. No	Month & Year	Activity Planned	Tentative Date	Remarks, If Any
1.	**September 2023**	**International Microbiology Day**	**September 17th**	**September 2023**
2.	**October 2023**	**Commencement of Certificate Course**	**1st week of October**	**October 2023**
3.	**November 2023**	**National level Work shop (Theme will be decided after confirmation from resource person)**	**3rd week of November**	**November 2023**
4.	**December 2023**	**Industrial visit / educational tour**	**3rd week of December**	**December 2023**
5.	**January 2023**	**Community extension /Outreach Program**	**4th week of January**	**January 2023**
6.	**February 2024**	**National science day celebrations**	**4th week of February**	**February 2024**
7.	**March 2024**	**National Level Seminar**	**4th week of March**	**March 2024**
8.	**April 2024**	**Bio fest (Inter collegiate competitions for Life science students)**	**3rd week of April**	**April 2024**
9.	**June 2024**	**World Biotechnology Day celebrations**	**June 16th**	**June 2024**

Dr. A. Aruna
University Nominee

Dr. B. Lakshmi
Dept. Of Microbiology

Pithapur Rajah's Government College (A), NAAC A

BOS Meeting 2023-2024
Microbiology
List of paper setters & Examiners

S.No	Name of the lecturer	Papers	College
1.	Smt. D. Jayasree, Lecturer in Microbiology	All	Head, Department of Microbiology A.S.D. Govt. College (A), Kakinada 8121000338 jayasreed@gcrjy.ac.in
2.	B. Preethi Chandrakala Lecturer in Microbiology	All	Rajeev Gandhi Institute of Sciences, Kakinada
3.	Smt. T. Sony	All	Head of the Department of Microbiology, Govt. College (A) – Rajamahendravaram. Mob: 8328032673
4.	Dr. A. Padmavathi Lecturer in Microbiology	All	Head Department of Microbiology Ch.S.D.St. Theresa's College For Women(A), Eluru, West Godavari (Dist.) Mob: 9440581035 Padmaanduri20@gmail.com
5.	Dr. D. Aruna Lecturer in Microbiology	All	SRR & CVR Government college Vijayawada 9490040657 kopuriarunadl@gmail.com
6.	Dr. K. Prakash Narayana Reddy Lecturer in Microbiology	All	Dr. V.S. Krishna Government Degree College (A), Maddilapalem, Visakhapatnam- 530013 Mobile: 9482357349 prakashreddy.369@gmail.com
7.	Dr. T. Varalakshmi Lecturer in Microbiology	All	Visakha Government Degree College For Women, Visakhapatnam, Mob: 8639452669, varunmicro@gmail.com

8.	Dr. PALLAVI Lecturer in Microbiology	All	GDC ANANTAPUR 9491233355 pallavi.pavan2003@gmail.com
9.	Dr.CH. MADHAVI Lecturer in Microbiology	All	GDC ANATAPUR 9908658952 chavalimadhulatha@gmail.com

B. Lakshmi

Members **Chairman**

1)University Nominee:

2) Subject Expert:

P.R. GOVERNMENT COLLEGE (A), KAKINADA

BSc	MICROBIOLOGY (Semester: I)	**Credits: 4**
MBT: I	**INTRODUCTION TO CLASSICAL BIOLOGY**	**Hrs/Wk: 5**

Learning Objective

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

Course outcomes

Up on completion of the course students able to

1. Learn the principles of classification and preservation of biodiversity
2. Understand the plant anatomical, physiological and reproductive processes.
3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
5. Comprehend the chemical principles in shaping and driving the macromolecules and life processes.

Unit 1: Introduction to systematics, taxonomy and ecology.

1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.

1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.

1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.

1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

2.1. The classification of plant kingdom.

2.2. Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).

2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.

2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

3.1. The classification of Kingdom Animalia and Chordata.

3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders

3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)

3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Unit 4: Cell biology, Genetics and Evolution

4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.

4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.

4.3. Central Dogma of Molecular Biology.

4.4. Origin of life

Unit 5: Essentials of chemistry

5.1. Definition and scope of chemistry, applications of chemistry in daily life.

5.2. Branches of chemistry

5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogen bonds.

5.4. Green chemistry

Unit 5: Biostatistics and Bioinformatics

5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.

5.2. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.

5.3. Introduction, Genomics, Proteomics, types of Biological data, biological databases-NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment

5.4. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.
2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers, New Delhi, India.
3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
6. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
8. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.
9. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.

ACTIVITIES:

1. Make a display chart of life cycle of nonflowering plants.
2. Make a display chart of life cycle of flowering plants.
3. Study of stomata
4. Activity to prove that chlorophyll is essential for photosynthesis
5. Study of pollen grains.
6. Observation of pollen germination.
7. Ikebana.
8. Differentiate between edible and poisonous mushrooms.
9. Visit a nearby mushroom cultivation unit and know the economics of mushroom cultivation.
10. Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell
11. Visit to Zoology Lab and observe different types of preservation of specimens
12. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter, Electronic Weighing Balance, Laminar Air Flow
13. Visit to Zoo / Sericulture / Apiculture / Aquaculture unit
14. List out different hormonal, genetic and physiological disorders from the societ

COMMON QUESTION PAPERPATTERN TO BE FOLLOWED FOR 2021-22AB, 2022-23AB AND 2023-24AB (FOR CORE SUBJECTS)

SEMESTER -I

Course: 1 INTRODUCTION TO CLASSICAL BIOLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

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

Part - 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.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

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.
13. Short answer question from any one of the five Units based on its weightage in the Syllabus

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
  - I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from anyunit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paper is to begiven as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1 M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

Semester – 1

Course: 2 **INTRODUCTION TO APPLIED BIOLOGY**

Hours/Week: 5 **Credits: 4**

Learning objectives

The student will be able to learn the foundations and principles of microbiology, immunology, biochemistry, biotechnology, analytical tools, quantitative methods, and bioinformatics.

Learning Outcomes

1. Learn the history, ultrastructure, diversity and importance of microorganisms.
2. Understand the structure and functions of macromolecules.
3. Knowledge on biotechnology principles and its applications in food and medicine.
4. Outline the techniques, tools and their uses in diagnosis and therapy.
5. Demonstrate the bioinformatics and statistical tools in comprehending the complex biological data.

Unit 1: Essentials of Microbiology and Immunology

1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.

1.2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi, Archaea and Virus.

1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.

1.4. Immune system – Immunity, types of immunity, cells and organs of immune system.

Unit 2: Essentials of Biochemistry

2.1. Biomolecules I – Carbohydrates, Lipids.

2.2. Biomolecules II – Amino acids & Proteins.

2.3. Biomolecules III – Nucleic acids -DNA and RNA.

2.4. Basics of Metabolism – Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

3.1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.

3.2. Environmental Biotechnology – Bioremediation and Biofuels, Biofertilizers and Biopesticides.

3.3. Genetic engineering – Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.

3.4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salt tolerance). Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology – Applications

4.1. Applications in forensics – PCR and DNA fingerprinting

4.2. Immunological techniques – Immunoblotting and ELISA.

4.3. Monoclonal antibodies – Applications in diagnosis and therapy.

4.4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

5.5. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.

5.6. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.

5.7. Introduction, Genomics, Proteomics, types of Biological data, biological databases-NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment

5.8. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

REFERENCES

1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr., E.C.S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R.C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.
7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt. ltd., Kolkata.
8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.
9. Arthur M. Lesk. Introduction to Bioinformatics. 5th Edition. Oxford publishers.
10. AP Kulkarni, 2020. Basics of Biostatistics. 2nd Edition. CBS publishers.

ACTIVITIES

1. Identification of given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganism from pond water.
4. Visit to a microbiology industry or biotech company.
5. Visit to a waste water treatment plant.
6. Retrieving a DNA or protein sequence of a gene'
7. Performing a BLAST analysis for DNA and protein.
8. Problems on biostatistics.
9. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.
10. Demonstration on basic biotechnology lab equipment.
11. Preparation of 3D models of genetic engineering techniques.
12. Preparation of 3D models of transgenic plants and animals.

[**NOTE**: In the colleges where there is availability of faculty for microbiology and biotechnology, those chapters need to be handled by microbiology and biotechnology faculty. In other colleges, the above topics shall be dealt by Botany and Zoology faculty]

COMMON QUESTION PAPERPATTERN TO BE FOLLOWED FOR 2021-22AB, 2022-23AB AND 2023-24AB (FOR CORE SUBJECTS)

SEMESTER -I

Course: 2 INTRODUCTION TO APPLIED BIOLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

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

Part - 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.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

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.
13. Short answer question from any one of the five Units based on its weightage in the Syllabus.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
  - I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from anyunit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paper is to begiven as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question(5 M)	Objective Questions(1 M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

II SEMESTER
COURSE 3: - INTRODUCTION TO MICROBIOLOGY

Credits 3

Course Outcomes:

On successful completion of the course, the students will be able to

1. Understand the historical significance of microbiology and the contributions of key scientists.
2. Recognize the classification of microorganisms and their place in the living world.
3. Comprehend the scope and applications of microbiology, including the origin of microbial life and the distinction between eukaryotic and prokaryotic cells.
4. Describe the characteristics of bacteria, archaea, fungi, algae, and protozoa.
5. Describe viruses, including their nature, composition, and diversity in structure.
6. Develop practical skills in aseptic techniques, growth media preparation, isolation methods, and the identification of bacteria and fungi.

Unit - 1: History of Microbiology **No. of Hours: 10**

1. Discovery of Microscope and microbial world by Anton von Leeuwenhoek; Aseptic techniques with reference to Charak Samhita, Sushruta Samhita and Ignaz Philipp Semmelweis

2. Golden era of Microbiology- Refutation of abiogenesis; Germ theory of Disease; Discovery of vaccination; Discovery of penicillin

3. Major contributions of Scientists: Ivanowsky, Martinus Beijerinck and Sergei Winogradsky

Unit - 2: Place of Microorganisms in the living world **No. of Hrs:10**

1. Haeckel's three Kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese

2. Definition and scope of Microbiology; Applications of Microbiology; Diverse groups of Microorganisms

3. Origin of microbial life on earth- Timeline, Miller's Experiment, endosymbiosis (cyanobacteria), distinguishing features of eukaryotic and prokaryotic cell

Unit - 3: Prokaryotic microorganisms and Viruses No. of Hrs:10

3.1. General characteristics of Bacteria (Morphology, metabolic diversity and reproduction).
3.2. General characteristics of Archaea differentiating them from Bacteria
3.3. General characteristics of viruses (Nature, composition, size, host specificity, diversity in structure)

Unit - 4: Eukaryotic microorganisms No. of Hours: 10

4.1. Fungi - Habitat, nutrition, vegetative structure and modes of reproduction;
4.2. Algae- Habitat, thallus organization, photosynthetic pigments, storage forms of food, reproduction.
4.3. Protozoa–Habitat, cell structure, nutrition, locomotion, excretion, reproduction, encystment.

Unit - 5: Growing Microbes in Lab: Five I's No. of Hours:05

5.1. Inoculation-Aseptic methods of introducing inoculum to growth media; Composition of basic growth media, solid and liquid

5.2. Incubation and Isolation- Ambient temperature for growth of microorganisms; Concept of Pure culture, mixed culture and contaminated culture

5.3. Inspection and Identification - Observation of colour, size and shape of colonies; Wet mount and simple staining of bacteria and fungi

References:

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. Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCB McGraw Hill, New York.
4. Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rd Edition, Sri Padmavathi Publications, Hyderabad.
5. Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
6. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
7. Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
8. Gopal Reddy et al., Laboratory Experiments in Microbiology

II SEMESTER

COURSE 3: - INTRODUCTION TO MICROBIOLOGY

credits -_1

1. Good Laboratory Practices and Biosafety
2. Compound Light microscope -Parts and its handling
3. Microscopic observation of bacteria, Algae and Fungi and protozoa
4. Observation of electron micrographs of viruses (Lambda, T4, TMV, HIV, SARS CoV-2, Polio)
5. Laboratory equipment -Working principles of Autoclave, Hot air oven, Laminar airflow chamber

Co-Curricular Activities:

1. Establish a Microbiology Club where students can come together to discuss and explore various topics related to microbiology.
2. Organizing microbiology-themed events like microbiologyday
3. Poster presentations, oral presentations, and Q&A sessions.
4. Field Trips to Microbiology-related Sites
5. Establish a Microbiology Journal Club where students can review and discussscientific articles related to microbiology.

COMMON QUESTION PAPERPATTERN TO BE FOLLOWED FOR 2021-22AB, 2022-23AB AND 2023-24AB (FOR CORE SUBJECTS)

SEMESTER -II

Course: 3 INTRODUCTION TO MICROBIOLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

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

Part - 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.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

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.
13. Short answer question from any one of the five Units based on its weightage in the Syllabus.

SEMESTER -II
Course: 3 INTRODUCTION TO MICROBIOLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

1. Describe about Golden era of Microbiology.
2. Write an essay on scope and applications of Microbiology.
3. Distinguish general characteristics of Archae from Bacteria.

Part - B

4. Explain general characteristics of Viruses.
5. Define Growth media. Explain different types and composition of growth media.
6. Explain general characteristics of Fungi.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. Louis Pasteur
8. Carl Woese classification
9. Archae
10. Thallus organization
11. Wet mount technique
12. Simple staining
13. Winogradsky

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
  - I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from anyunit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paper is to begiven as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1 M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

II SEMESTER

COURSE 4: - BACTERIOLOGY AND VIROLOGY

Credits -_3

I. Learning Outcomes:

On successful completion of the course, the students will be able to

1. Understand the concept of prokaryotic diversity and taxonomy.
2. Identify and describe the salient features of various bacterial groups
3. Comprehend the discovery, nature, and definition of viruses.
4. Describe the replication processes of specific viruses
5. Comprehend the concept of oncogenic viruses, and role of viruses in the ecosystem.

Unit -1: Bacterial Taxonomy and Ultrastructure No. of Hrs: 9

1. Introduction to prokaryotic diversity and taxonomy. Types of classification-Numerical and Phylogenetic
2. Introduction to Bergy's manual of Systematic Bacteriology
3. Non-Culturables and Metagenomics
4. Ultrastructure of a Bacterial Cell-Invariable components -cell wall, Structure and /Functions of cell membrane, cytoplasm, nucleoid; Variable components- plasmid, inclusion bodies, flagella (structure and arrangement), pili, capsule, endospore.

Unit - 2: Type studies of Bacteria and Archae No. of Hours:9

1. Salient features of:

a) Photosynthetic bacteria - Purple bacteria, Green bacteria and *Anabaena*

b) Gliding bacteria - Myxobacteria and Cytophaga group

c) Filamentous -Actinomycetes

d) Spore forming bacteria - Bacillus and Clostridia

e) Miscellaneous - Mycoplasma, Rickettsia, Chlamydia

2. Salient features of Fermentative bacteria, Sulphur bacteria, Nitrogen fixing bacteria
3. Salient features of Extremophiles- Methanogens and halobacteria.

Unit - 3: General Properties and Classification of Viruses No. of Hrs:9

1. Discovery of viruses, Nature and definition of viruses, general properties
2. Hierarchy of ICTV nomenclature

3. Outline of Baltimore system of classification.
4. Cultivation of Viruses, Virus Purification and Assay.

Unit - 4: Replication of Viruses **No. of Hours:9**

1. General features of Viral Replication
2. Replication of T4, lambda, TMV, HIV
3. Replication of Polio, Influenza, Adeno Viruses

Unit - 5: Pathogenic and other Viruses **No. of Hours:**9

1. Defective Viruses- viroids, virusoids, satellite viruses and Prions.
2. Emergence of Viral Pathogens, Introduction to Oncogenic viruses, Concept of Oncogenes and Protooncogenes
3. Role of viruses in Ecosystems; Applications in Biotechnology

COURSE 4: - BACTERIOLOGY AND VIROLOGY credits -1

1. Study of bacteria by colony observation and staining-simple, gram
2. Observation of motility and capsule
3. Isolation of bacteria using Winogradsky column and observation
4. Study of viruses (Bacteriophage, TMV and HIV) using micrographs
5. Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique.
6. Studying isolation and propagation of animal viruses by chick embryo technique.
7. Study of cytopathic effects of viruses using photographs.
8. Perform local lesion technique for assaying plant viruses.

Co-Curricular Activities:

1. Invite guest speakers, to provide insights into the latest advancements and emerging trends in bacteriology and virology.

2. Conduct laboratory workshops that allow students to gain hands-on experience in bacterial culture techniques

3. Case Study Competitions: Organize case study competitions where students can work in teams to analyze and solve hypothetical cases related to bacteriology and virology

4. Arrange field trips to microbiology research facilities, such as government labs, industrial settings, or healthcare institutions

References:

1. Prescott, M.J.,Harley,J.P.andKlein,D.A.Microbiology. 5th Edition WCB Mc GrawHill, New York, (2002).
2. Tortora, G.J., Funke ,B.R. and Case, C.L. Microbiology : An Introduction. Pearson Education, Singapore, (2004).
3. Alcomo,I.E.FundamentalsofMicrobiology.VIEdition, JonesandBartlettPublishers.Sudbury.Massachusetts, (2001).
4. BlackJ.G.Microbiology-Principlesand Explorations.JohnWiley&SonsInc.NewYork, (2002).
5. Tom Besty,D.C Jim Koegh.Microbiology Demystified McGRAW-HILL.
6. Christopher Burrell Colin Howard Frederick Murphy. Fenner and White's MedicalVirology 5th Edition.Academic Press

COMMON QUESTION PAPERPATTERN TO BE FOLLOWED FOR 2021-22AB, 2022-23AB AND 2023-24AB (FOR CORE SUBJECTS)

SEMESTER -II

Course: 4 BACTERIOLOGY AND VIROLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

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

Part - 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.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

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.
13. Short answer question from any one of the five Units based on its weightage in the Syllabus

SEMESTER -II

Course: 4 BACTERIOLOGY AND VIROLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks. **3 X 10 = 30M**

Part – A

1. Describe Ultrastructure of Bacterial cell.
2. Describe the Salient features of Spore forming bacteria.
3. Explain the Baltimore system of classification.

Part - B

4. Give a detailed account of replication of HIV.
5. Explain the role of viruses in Ecosystem and Biotechnology.
6. Give a detailed account of replication of Poliovirus.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. Non culturables
8. Actinomycetes
9. Cultivation of Viruses
10. TMV
11. Oncogenes and Protooncogenes
12. Nitrogen fixing bacteria.
13. Viroids, Satellite virus, Prions

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
  - I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from anyunit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paper is to begiven as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1 M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

MICROBIOLOGY: MINOR

w.e.f 2023-24 AY

COURSE STRUCTURE

Year	Semester	Course	Title	Hr/ week	credits
I	II	1	Introduction to Microbiology	3	3
			Introduction to Microbiology	2	1
II	III	2	Biomolecules & Enzymology	3	3
			Biomolecules & Enzymology	2	1
	IV	3	Molecular Biology and Microbial Genetics	3	3
			Molecular Biology and Microbial Genetics	2	1
		4	Microbial Physiology and Metabolism	3	3
			Microbial Physiology and Metabolism	2	1
III	V	5	Immunology & Medical Microbiology	3	3
			Immunology & Medical Microbiology	2	1
		6	Applied Microbiology	3	3
			Applied Microbiology	2	1

II SEMESTER

COURSE 1: - INTRODUCTION TO MICROBIOLOGY

credits -_3

I. Course Outcomes:

On successful completion of the course, the students will be able to

1. Understand the historical significance of microbiology and the contributions of key scientists.
2. Recognize the classification of microorganisms and their place in the living world.
3. Comprehend the scope and applications of microbiology, including the origin of microbial life and the distinction between eukaryotic and prokaryotic cells.
4. Describe the characteristics of bacteria, archaea, fungi, algae, and protozoa.
5. Describe viruses, including their nature, composition, and diversity in structure.
6. Develop practical skills in aseptic techniques, growth media preparation, isolation methods, and the identification of bacteria and fungi.

Unit - 1: History of Microbiology No. of Hours: 10

1. Discovery of Microscope and microbial world by Anton von Leeuwenhoek; Aseptic techniques with reference to Charak Samhita, Sushruta Samhita and Ignaz Philipp Semmelweis

2. Golden era of Microbiology- Refutation of abiogenesis; Germ theory of Disease; Discovery of vaccination; Discovery of penicillin

3. Major contributions of Scientists: Edward Jenner, Louis Pasteur, Robert Koch, Joseph Lister, Ivanowsky, Martinus Beijerinck and Sergei Winogradsky

Unit - 2: Place of Microorganisms in the living world No. of Hours:10

1. Haeckel's three Kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese

2. Definition and scope of Microbiology; Applications of Microbiology; Diverse groups of Microorganisms

3. Origin of microbial life on earth- Timeline, Miller's Experiment, endosymbiosis (cyanobacteria), distinguishing features of eukaryotic and prokaryotic cell

Unit - 3: Prokaryotic microorganisms and Viruses No. of Hours:10

1. General characteristics of Bacteria (Morphology, metabolic diversity and reproduction)
2. General characteristics of Archaea differentiating them from Bacteria
3. General characteristics of viruses (Nature, composition, size, host specificity, diversity in structure)

Unit - 4: Eukaryotic microorganisms No. of Hours: 10

1. Fungi - Habitat, nutrition, vegetative structure and modes of reproduction;
2. Algae- Habitat, thallus organization, photosynthetic pigments, storage forms of food, reproduction.
3. Protozoa–Habitat, cell structure, nutrition, locomotion, excretion, reproduction, encystment.

Unit - 5: Growing Microbes in Lab: Five I's No. of Hours:05

1. Inoculation-Aseptic methods of introducing inoculum to growth media; Composition of basic growth media, solid and liquid
2. Incubation and Isolation- Ambient temperature for growth of microorganisms; Concept of Pure culture, mixed culture and contaminated culture
3. Inspection and Identification - Observation of colour, size and shape of colonies; Wet mount and simple staining of bacteria and fungi

III. Skill Outcomes:

1. Implement safety protocols, handling hazardous materials, and practicing personal protective measures.
2. Identify microscope parts, adjusting focus and diaphragm, and accurately observing and documenting microscopic images.
3. Prepare smears, identifying different microorganisms, and interpreting microscopic characteristics.
4. Analyze electron micrographs, identifying virus types, and describing their morphology and size.
5. Operate Autoclave, Hot Air Oven, and Laminar Air Flow Chamber for sterilization and decontamination purposes.

SEMESTER- I

COURSE 1: - INTRODUCTION TO MICROBIOLOGY

credits -_1

1. Good Laboratory Practices and Biosafety
2. Compound Light microscope -Parts and its handling
3. Microscopic observation of bacteria, Algae and Fungi and protozoa
4. Observation of electron micrographs of viruses (Lambda, T4, TMV, HIV, SARSCoV-2, Polio)
5. Laboratory equipment -Working principles of Autoclave, Hot air oven, Laminarairflow chamber

IV. References:

1. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5thEdition, 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. Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5thEdition, WCB McGraw Hill, New York.
4. Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rdEdition, Sri Padmavathi Publications, Hyderabad.
5. Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
6. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology,5th Ed.,Prentice Hall of India Pvt. Ltd., New Delhi.
7. Jaya Babu (2006). Practical Manual on Microbial Metabolisms andGeneral Microbiology. Kalyani Publishers, New Delhi.
8. Gopal Reddy et al., Laboratory Experiments in Microbiology

v. Co-Curricular Activities:

1. Establish a Microbiology Club where students can come together to discuss andexplore various topics related to microbiology.

4. Organizing microbiology-themed events like microbiologyday 3 Poster presentations, oral presentations, and Q&A sessions. Field Trips to Microbiology-related Sites

5. Establish a Microbiology Journal Club where students can review and discussscientific articles related to microbiology.

SEMESTER -II (Minor)
Course: I INTRODUCTION TO MICROBIOLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part. Each question carries 10 Marks. 3 X 10 = 30M

Part – A

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

Part - 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.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

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.
13. Short answer question from any one of the five Units based on its weightage in the Syllabus

SEMESTER -II (Minor)
Course: I INTRODUCTION TO MICROBIOLOGY

Time: 2 Hours **Max Marks: 50M**

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part. Each question carries 10 Marks. 3 X 10 = 30M

Part – A

1. Describe about Golden era of Microbiology.
2. Write an essay on scope and applications of Microbiology.
3. Distinguish general characteristics of Archae from Bacteria.

Part - B

4. Explain general characteristics of Viruses.
5. Define Growth media. Explain different types and composition of growth media.
6. Explain general characteristics of Fungi.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. Louis Pasteur
8. Carl Woese classification
9. Archae
10. Thallus organization
11. Wet mount technique
12. Simple staining
13. Winogradsky

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
  - I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions to be given for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	2	1
4	IV	0	2	1+ one question from anyunit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paper is to be given as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1 M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

Community Service Project

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

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Assessment methodology for Internships / On the Job Training / Apprenticeship under the revised CBCS (2020 – 21 onwards)

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.

Learning outcomes:

- To facilitate an understanding of the issues that confronts the vulnerable /marginalized sections of the society.
- To initiate team processes with the student groups for societal change.
- To provide students an opportunity to familiarize themselves with urban / rural community they live in.
- To enable students to engage in the development of the community.
- To plan activities based on the focused groups.
- To know the ways of transforming the society through systematic programme implementation.

Assessment Model:

There will be only internal evaluation for this internship. Each faculty member is to be assigned with 10 t0 15 students depending upon availability of the faculty members. The faculty member will act as a faculty-mentor for the group and is in- charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.

The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities. The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvementin the assigned work.

While grading the student's performance, using the student's project log, the following should be taken into account -

a. The individual student's effort and commitment.
b. The originality and quality of the work produced by the individual student.
c. The student's integration and co-operation with the work assigned.
d. The completeness of the logbook.

The assessment for the ***Community Service Project implementation*** shall include the following components and based on the entries of Project Log and Project Report:

a. Orientation to the community development
b. Conducting a baseline assessment of development needs
c. Number and Quality of Awareness Programmes organised on beneficiaryprogrammes and improvement in quality of life, environment and social consciousness, motivation and leadership, personality development,etc.
d. Number Quality and Duration of Intervention/service Programmes (Prevention or promotion programs that aim to promote behavioural change in defined community contexts to address social problems) organised.
e. Followup Programmes suggested (Referral Services, Bringing Community Participation)
f. Developing short and mid-term action plans in consultation with local leadership and local government officers.

The **Project Report** should contain

a) Introduction, scope, objectives, and methodology
b) Project specifications (area / background of the work assigned).
c) Problems identified.
d) Analyses of the problems
e) Community awareness programmes conducted w.r.t the problems and their outcomes.
f) Intervention/service programmes taken up
g) Short-term and long term action plan for implementation
h) Recommendations and conclusions.
i) References

The **Project Presentation** is to be made by the student after he/she reports back to theCollege. The components for assessment are –

a. assessing the involvement in the project
b. presentation skills
c. final outcome of the project as evinced by the student.

For Example:

II MPC-EM

S.No.	Name of the Student	Class & Year of Study	Register Number	Project Log	Project Implementation	Project Report	Presentation	Total
				(20)	(30)	(25)	(25)	(100)

Signature of Project Mentor | Signature of Nominated faculty | Signature of HOD/In-Charge

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

BSc	MICROBIOLOGY (Semester: III)	Credits: 4
MBT: III	Molecular Biology And Microbial Genetics	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: Nucleic acids **No. of hours: 12**

1.1DNA and RNA - Role in heredity

1.2. The central dogmaWatson 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- II: 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 andspecialized 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, DNA Finger Printing.

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

Additional input: Genomic and cDNA libraries

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 andBartlett Publishers, London.
- Ram Reddy, S., Venkateshwarlu, K. and Krishna Reddy, V. (2007) A text Book ofMolecular Biotechnology. Himalaya Publishers, Hyderabad.
- Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 thEdition. 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 (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. Problems related to DNA and RNA characteristics, Transcription and Translation.
7. Induction of mutations in bacteria by UV light.
8. Instrumentation in molecular biology - Ultra centrifuge, Transilluminator, PCR

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**

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 theSyllabus.

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 weightagein 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

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each.

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory-3M	Assignment-5M	Seminar- 5M	Clean & green and Attendance- 2M

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II 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: 3 Hrs. **Max. Marks: 50 M**

1. Major Experiment	20M
2. Minor Experiment	10M
3. Spotters	2 x 5 = 10M
1) I	
2) II	
3) III	
4) IV	
5)V	
4. Record	5M
5. Viva	5M

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 specific body defense and the immune response
2. Develop knowledge on disease transmission and control
3. Demonstrate on collection and handling of laboratory specimens
4. Develop information making personal health decision in regard to infectious diseases.
5. Student can safeguard him & 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, haptens. Factors affecting antigenicity.

Antibodies – basic structure, types, properties and functions of immunoglobulins. Types of antigen-antibody reactions - Agglutinations, Precipitation, Neutralization, complementfixation.

Labeled antibody-based techniques – ELISA, RIA and Immunofluorescence. Monoclonalantibodies – production and applications.

UNIT – III: MICROBIOLOGY CONCEPTS **12H**

Normal flora of human body.

Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence andopportunistic infection,

General account on nosocomial infection.

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

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

UNIT – IV: MICROBIOLGY- APPLICATIONS **12H**

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 Staphylococcusaureus (MRSA).

Vaccines – Natural and recombinant.

UNIT – V: MICROBES AND DISEASES **12H**

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 ofMicrobiology. 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. 26thedition. McGraw Hill Microbiology. 4th edition. Elsevier Publication.
3. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein'sMicrobiology. 9th edition. McGraw Hill HigherEducation.

P. R. GOVERNMENT COLLEGE (A), KAKINADA

II-year B.Sc., Program III Semester End Practical Syllabus MBP- 4209P

IMMUNOLOGY AND MEDICALMICROBIOLOGY

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.

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**

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 theSyllabus.

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 weightagein 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. Explain causal organism, pathogenesis, epidemiology, prevention andcontrol of tuberculosis.

Section – B

4. Explain methods for identification of clinical samples by serological tests?
5. Briefly describe about antibacterial substances with its mode of action.
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

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each.

- The remaining 25 marks for CIA are allocated as per the following structure.

Project- 10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

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: 3 Hrs. **Max. Marks: 50 M**

1. Major Experiment 20M
2. Minor Experiment 10M
3. Spotters 2 x 5 = 10M
   1) I
   2) II
   3) III
   4) IV
   5)V

4. Record 5M
5. Viva 5M

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 fecal coliforms (b) Membranefilter technique

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

Recommended Text Books &Reference books:

- Benjamin/Cummings Science Publishing, USA
- Barton LL & Northup DE (2011). **Microbial Ecology**. 1st edition, Wiley Blackwell, 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. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.

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

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**

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

a. 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 theSyllabus.

a. PART - II

b. **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 weightagein 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**

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

i. Section – B

4. Explain the design of a fermenter with a neat labeled diagram
5. Write an essay on production of Penicillin.
6. Write an essay on Plant growth promoting microorganisms.

a. PART - B

7. Answer any **Four** of the following questions **4 x 5 = 20M**
8. Carbon cycle
9. Activated sludge process
10. *Actinomycetes*
11. Solid state fermentation
12. SCP
13. Fermentation media

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each.

- The remaining 25 marks for CIA are allocated as per the following structure.

Project- 10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

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: 2 Hrs. **Max. Marks: 50M**

1. Major Experiment 20M
2. Minor Experiment 10M
3. Spotters 2 x 5 = 10M
   1) I
   2) II
   3) III
   4) IV
   5)V

4. Record 5M
5. Viva 5M

Second Internship

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

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Assessment methodology for Internships / On the Job Training / Apprenticeship under the revised CBCS (2020 – 21 onwards)

Second Internship (After 2nd year examinations): Apprenticeship / Internship / On the job training / In-house Project / Off-site Project

To make the students employable, an Apprenticeship / Internship / On the job training / In-house Project / Off-site Project shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years.

Learning outcomes

- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function towards future .
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the future job.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job followinggraduation from college.
- Acquire additional skills required for world of work.

Assessment Model

There will be only internal evaluation for this internship. Each faculty member is to be assigned with 10 t0 15 students depending upon availability of the faculty members. The faculty member will act as a faculty-mentor for the group and is in- charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.

The assessment is to be conducted for 100 marks and the credits assigned are 4. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightings shall be:

Project Log	20%
Project Implementation	30%
Project report	25%,
Presentation	25%

Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities. The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

While grading the student's performance, using the student's project log, the followingshould be taken into account -

a. The individual student's effort and commitment.
b. The originality and quality of the work produced by the individual student.
c. The student's integration and co-operation with the work assigned.
d. The completeness of the logbook.

The assessment for Project Implementation during ***second internship / Project Work / On the Job Training / Apprenticeship*** shall include the following components and based on the entries of Project Log and Project Report:

a. Involvement in the work assigned
b. Regularity in the work assigned
c. New knowledge acquired
d. New skill acquired

The Project Report should contain

a. Introduction.
b. Project specifications (area / background of the work assigned).
c. Problems taken up.
d. Analysis of the problem.
e. Recommendations and conclusions.

The Project Presentation is to be made by the student after he/she reports back to theCollege. The components for assessment are –

a. assessing the involvement in the project
b. presentation skills
c. final outcome of the project as evinced by the student.

For Example:

II MPC-EM

S.No.	Name of the Student	Class & Year of Study	Register Number	ProjectLog	Project Implementation	Project Report	Presentation	Total
				(20)	(30)	(25)	(25)	(100)

Signature of Project Mentor **Signature of Nominated faculty** **Signature of HOD/ In-Charge**

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 A1 A- PAIR-6A	Food, Agriculture And Environmental Microbiology	Total hours 40

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 asfood.

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

CO4: Get fundamental concepts in principles of plant disease control an industrial applicationof Microbiology

CO5: The student will have fundamental concepts in soil microbiology and soil water and aeromicrobial 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, Yakult, Sauerkraut

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 sulphur.

Biological nitrogen fixation.

Microflora of Rhizosphere and Philosphere 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.

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 ofMicroorganisms. 14th edition. Pearson/ Benjamin Cummings.
- Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2ndedition, Academic Press.
- Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. JohnWiley & 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. CambridgeUniversity Press,Cambridge, England.
- Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBHPublishing Co. New Delhi.
- Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott'sMicrobiology. 9th edition. McGraw Hill Higher Education.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc., Microbiology – Practical Examinations Paper

Model at the end of V Semester

6A Food, Agriculture and Environmental Microbiology

Time: 2 Hrs. **Max. Marks: 50**

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1. Major Experiment 20M
2. Minor Experiment 10M
3. Spotters 2 x 5 = 10M
   1) I
   2) II
   3) III
   4) IV
   5)V

4. Record 5M
5. Viva 5M

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: 2hrs **Max.Marks:50**

PART-A

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

Section – A **3 x 10 = 30M**

1. Write a note on salmonellosis and their detection methods.
2. Write in detail about food preservation methods.
3. Explain symbiotic nitrogen fixation.

Section – B

4. Explain plant and microbe interactions.
5. Write an essay on microflora of fresh water and marine habitats.
6. What are the Intrinsic parameters affecting microbial growth in food.

PART - B

Answer any **Four** of the following questions **4 x 5 = 20M**

7. Canned Foods
8. Edible Mushrooms
9. VAM
10. Rice Blast
11. Biogas
12. Soil profile

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, two **short** answer questions with five marks each out of four questions and five objective questions with one mark each.

- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

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 hrs 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 ofpathogens

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 understr33and 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: Dermatomycosis 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-Jensenmedium, Mac Conkey agar. Distinct colony properties of various bacterial pathogens.

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

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid-basedmethods - 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- Mechanisms of Drug resistance (Briefly).

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 2ndedition, Elsevier India Pvt Ltd.
- Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby.

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, Salmonellaand Psedumonas.*
4. Demonstration of permanent slides of the following parasites:
    a) *Entamoeba histolytica*
    b) *Ascarisspps.*
    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.

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc., Microbiology – Practical Examinations Paper

7A Model at the end of V Semester

Management of Human Microbial Diseases and Diagnosis

Time: 2 Hrs. **Max. Marks: 50**

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1. Major Experiment 20M
2. Minor Experiment 10M
3. Spotters 2 x 5 = 10M
   1) I
   2) II
   3) III
   4) IV
   5)V

4. Record 5M
5. Viva 5M

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc - Microbiology /V Semester End

Paper-7A Management of Human Microbial Diseases and Diagnosis

Time: 2hrs **Max.Marks:50**

PART-A

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

Section – A **3 x 10 = 30M**

1. Write causal organism, mode of transmission, pathogenesis, treatment and control of Cholera
2. Explain methods for collection of clinical samples
3. Describe Preparation and use of Chocolate agar and Lowenstein-Jensen media

Section – B

4. Explain serological methods
5. Explain serial double dilution method for determination of MIC of drug
6. What is Drug Resistance? Explain different drug resistance mechanisms.

PART - B

Answer any **Four** of the following questions **4 x 5 = 20M**

7. Canned Foods
8. Edible Mushrooms
9. VAM
10. Rice Blast
11. Biogas
12. Soil profile

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, two **short** answer questions with five marks each out of four questions and five objective questions with one mark each.
- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

Apprenticeship/ On the Job Training

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

ANDHRA PRADESH STATE COUNCIL OF HIGHEREDUCATION

Assessment methodology for Internships / On the Job Training /Apprenticeship under the revised CBCS (2020 – 21 onwards)

Third internship/Apprenticeship (5th/6th Semester period):

During the entire 5th /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.

Learning outcomes

- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function towards future .
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the future job.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job followinggraduation from college.
- Acquire additional skills required for world of work.

Assessment model for the semester long apprenticeship / on the job training /internships during the V/VI Semester:

The assessment for the V / VI Semester long apprenticeship is for 200 marks and credits assigned are 12.

A monthly report is to be submitted to the teacher guide online within 15 days after the completion of the every month upto four months. The last two months of internship period shall be used for preparation of final project report simultaneously undergoing on the job training / internship / apprenticeship.

The assessment for this internship / on the job training will be both internal and external assessment. The internal assessment will be for 25% of marks which will be continuous and the assessment by the industry / enterprise / organization where the student does his/her internship will be indicated in grades. This assessment is to be conducted by a responsible person (General

Manager / HR Manager / Head of the Division) in consultation with the supervisor under whom the internship was done.

The components of internal assessment during *this* ***third internship / Project Work / On the Job Training / Apprenticeship*** shall include the following components and based on the entries of Project Log and Project Report:

a. Involvement in the work assigned
b. Regularity in the work assigned
c. New knowledge acquired
d. New skill acquired

The Project Report should contain

a. Introduction.
b. Project specifications (area / background of the work assigned).
c. Problems taken up.
d. Analysis of the problem.
e. Recommendations and conclusions.

The Project Presentation is to be made by the student after he/she reports back tothe College. The components for assessment are –

a. assessing the involvement in the project
b. presentation skills
c. final outcome of the project as evinced by the student.

There shall be a final evaluation committee comprising of Principal, Teacher Guide, Internal Expert and External Expert nominated by the affiliating University. The final evaluation committee shall consider the following for evaluation –

A. Monthly Reports submitted by the student

B. Final Project Report

C. Grading given by the Company / Business unit / Enterprise where the student has undergone the training. The grades shall be converted into marks on the scale followed by the University.

To evaluate and award marks, the Committee conducts viva voce examination at the college.

Example:

Name of the Student:	
Class & Year of Study	
Registered Number	
Internal Assessment Component	**Max. Marks**
1. Project Log	10
2. Project Implementation	20
3. Project Report	10
4. Presentation	10
TOTAL	**50**
External Assessment Component	**Max. Marks**
Performance Assessmentby the Evaluation Committee, converting the grades awarded by the industry, enterprise, etc.	**100**
External Viva Voce	**50**
GRAND TOTAL	**200**