.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)

NAAC 'A' GRADE

KAKINADA

BOARD OF STUDIES

DEPARTMENT OF MICROBIOLOGY

2024-25

(CHOICE BASED CREDIT SYSTEM)

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

Rc.No.2/A.C/BOS/2024-25 Dt.23 Apr 2024

Sub: P.R.G.C[A] – Academic Cell - **Conduct of BOS Meetings for the Academic Year 2024-25** – Guidelines issued - Regarding.

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.

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Further, the NEP-2020 recommended that the HEIs shall embark upon rolling out 21st century students capable of facing challenges, adaptive to changes, creative and innovative, well rounded students equipped with inventive and creative skills, out-of-box thinking skills, problem solving skills, employability skills,etc., that translate them into leaders and potential entrepreneurs. Hence, the policy recommended internships/ apprenticeships embedded programs. Further, the policy laid much emphasis on rolling out environmentally conscious, value driven, constitution-respecting and socially responsible citizens too.

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, integrating IT into teaching-learning and help students experience and prescribed a wide range of participative and experiential learning experiences 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, collaborations, consultancies, community outreach strategies and encouraged HEIs to be distinctive and unique in practices.

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.

Further, the A.P State Council of Higher Education, in the Post Graduation eco-system has come out with a revised curricular frame work from the Academic Year 2024-25 incorporating Skill Enhancement Courses, Open Online Courses, Indian Knowledge System, projects works in VI semester, besides new credit structure (APSCHE's curricular frame enclosed).

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 **29 Apr 2024**. 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 2024-25, if any, number of certificate courses, their frequency, Bloom 's- Taxonomy based evaluation system for effective learning outcomes as per the Annexure – I. In the light of the above mandate and responsibilities prescribed by institution's vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, to meet the expectations of industries, students, Government and in tune with the APSCHE's revised and new P.G Curricular framework we need to customize, design and re-orient our academic and research administration.

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 in the Third week of April 2024. 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.

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 75% for I & II mid-term examinations 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 2024-25, if any, number of certificate courses, their frequency, Bloom 's- Taxonomy based evaluation system for effective learning outcomes as per the Annexure – I.

Pre-BoS activity:

1. The Chairmen shall send the curricula designed for AY 2023-24 to the Industrialists, Alumni, parents and seniorsubject experts and get feed back and input on the quality of the syllabi, extra-curricular activities, student-centric activities by 6 April 2024.
2. The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2024-25 both for U.G (I to VIII semesters)and P.G(I to IV Semesters) courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
- It is mandatory to change the syllabus every year for a maximum of 20% .
- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curriculaand invite 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.
- **The Subject experts should be preferably a Doctorate with more than 10 years of teaching experience. He should have experience in designing industry related, market and job oriented curriculum.**
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, resource utilization by staff and 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 coordinators will conduct a meeting with the Chairmen, BOS on 25

April 2024 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.5000/-)
- 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).

The chairmen of BOS are instructed to take suggestions from Industrialist (Part of Pre BOS)who is not in the previous BOS as member from industrialist category regarding the change in syllabus for the papers in BOS 2023-24 and proposal for new courses for the Academic year 2024-25 keeping in view of the future job opportunities .

S.No	Title of the Paper	Feedback or suggestions on the curriculum designed during 2023-24 BoS(Whether industry oriented/ relevant for equipping skills for 21st century students)	Proposal of New Courses for 2024-25	Justification

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 andLab 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 andscope of that topic for skill/ employability/ entrepreneurship opportunities in the following table incorporated

S. No	Subject	Semester	Title of the Course (Paper)	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation	Experiential learning component	Scope (Skill/ employabi ity/ entreprenu ership)
1	III	Botany	Plant Physiology	Plant Cell	Knowledge	Shall be shown Microscope	
2	III	History	Tourism	Tourism management	Applicatio n	Apprenticeship	Employabilit y

1. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in the Proforma given in Annexure – I.
2. Attendance of Members present with signatures in the tabular form.

3. List of Examiners & Paper setters (Minimum 20 members list)
4. 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.
5. Each student (2024-25 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 tobe 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 isto 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.

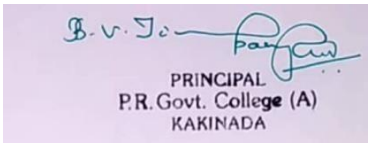
Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

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

1. Percentage of syllabus changes in each paper
2. Measure outcome attainment learning levels of students through direct and indirect methodology and mapping COs and POs
3. Text & Reference Books
4. e-content links.



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

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.	G.P. Chakravarthi	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.	Dr. B.Lakshmi	Subject expert, KSN Women's degree college Ananthapur
5.	Dr. L. Madhava	Industrial nominee, Chaturmuka Diagnostic centre
6.	B. Adilakshmi	Alumni, Microbiologist, SIFT, Kakinada
7.	V.Ramya	Member
8.	M. Tejaswaini, T. Jayasree B.Sc Microbiology	Student nominee
9.	S. Sri Lakshmi, N. Kiran kumar B.Sc Microbiology	Student nominee

The above members are requested to attend the BOS Meeting on 0**1-05-2024** 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

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

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 Biofertilizers

Agenda

1. Action taken report (ATR) of the A.Y.2023-24
2. Introduction of B.Sc Microbiology- Major and B.Sc Microbiology Minors w.e.f the academic year 2024-25 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 2024-25, Any other with the permission of the chair.

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

year		Semester	Title of the course	Course type	Hrs/ Week	Max.Marks (SEE)	Marks in CIA	credits
1	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**
			Introduction to Microbiology	**Lab**	**2**	**50**	**-**	**1**
	4		Bacteriology and Virology	**Theory**	**3**	**50**	**50**	**3**
			Bacteriology and Virology	**Lab**	**2**	**50**	**-**	**1**
2	5	III	Eukaryotic microorganisms	**Theory**	**3**	**50**	**50**	**3**
			Eukaryotic microorganisms	**Lab**	**2**	**50**	**-**	**1**
	6		Biomolecules & Enzymology	**Theory**	**3**	**50**	**50**	**3**
			Biomolecules & Enzymology	**Lab**	**2**	**50**	**-**	**1**
	7		Microbial and Analytical Techniques	**Theory**	**3**	**50**	**50**	**3**
			Microbial and Analytical Techniques	**Lab**	**2**	**50**	**-**	**1**
	8		Microbial Physiology and Metabolism	**Theory**	**3**	**50**	**50**	**3**
			Microbial Physiology and Metabolism	**Lab**	**2**	**50**	**-**	**3**
	9	IV	Molecular Biology and Microbial Genetics	**Theory**	**3**	**50**	**50**	**3**
			Molecular Biology and Microbial Genetics	**Lab**	**2**	**50**	**-**	**1**
	10		Microbial Physiology and Metabolism	**Theory**	**3**	**50**	**50**	**3**
			Microbial Physiology and Metabolism	**Lab**	**2**	**50**	**-**	**1**
	11		r DNA technology, Biostatistics&Bioinformatics	**Theory**	**3**	**50**	**50**	**3**
			r DNA technology, Biostatistics&Bioinformatics	**Lab**	**2**	**50**	**-**	**1**
3	12		**Paper – 6A** - Food, Agriculture and Environmental Microbiology	**Theory**	**3**	**50**	**50**	**4**
	13		Food, Agriculture and Environmental Microbiology Practicals	**Lab**	**2**	**50**	**--**	**1**
	14		**Paper – 7A** - Management of	**Theory**	**3**	**50**	**50**	**4**

			Human Microbial Diseases and Diagnosis					
	15		Management of Human Microbial Diseases and Diagnosis Practicals	**Lab**	**2**	**50**	**--**	**1**
			(Or)					
	16		**Paper – 6B** - Microbial Biotechnology and r – DNA Technology	**Theory**	**3**	**50**	**50**	**4**
3	17	**V**	Microbial Biotechnology and r – DNA Technology Lab	**Lab**	**2**	**50**	**-**	**1**
	18		**Paper – 7B** - Biostatistics and Bioinformatics	**Theory**	**3**	**50**	**50**	**4**
	19		Biostatistics and Bioinformatics Lab	**Lab**	**2**	**50**	**--**	**1**
			(Or)					
	20		**Paper – 6C** - Microbial Quality Control Instrumentation and Techniques	**Theory**	**3**	**50**	**50**	**4**
	21		Microbial Quality Control Instrumentation and Techniques Lab	**Lab**	**2**	**50**	**--**	**1**
3	22	**V**	**Paper – 7C** - Drug Design, Discovery and Itellectual Property Rights (IPR)	**Theory**	**3**	**50**	**50**	**4**
	23		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 bepartially 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**

P.R.GOVT.COLLEGE (AUTONOMOUS)
2024-25, XXIV 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 the 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 CBCS system for the third-year students.

Resolution IV: Resolve to offer Microbiology minor from the academic year 2023-24

Resolution V: Resolved to continue 50% external and 50% internal marks for theory for all semesters from the academic year 2024-25. 50 marks are allotted for practicals.

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.

New Courses Introduced For all the Programs offered By Department of Microbiology During the year 2024-2025

S. No.	Title of the New course Introduced	Program in which it is Introduced	Introduced in I/II/III YR
1.	Eukaryotic microorganisms	Microbiology Major	II
2.	Biomolecules & Enzymology	Microbiology Major	II
3.	Microbial and Analytical Techniques	Microbiology Major	II
4.	Cell Biology and Genetics	Microbiology Major	II
5.	Molecular Biology and Microbial Genetics	Microbiology Major	II
6.	Microbial Physiology and Metabolism	Microbiology Major	II
7.	r DNA technology, Biostatistics& Bioinformatics	Microbiology Major	II

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.GOVERNMENT COLLEGE(A)
KAKINADA.
DEPARTMNENT OF MICROBIOLOGY
BUDGET ESTIMATION FOR THE ACADEMIC YEAR – 2024-25

S.NO	NAME OF THE DEPARTMENT	BUDGET ESTIMATION	TOTAL AMOUNT
1	MICROBIOLOGY	Guest Faculty – 14,400 × 10months	1,44,000
2		Lab equipment	
		Consumable	30,000.00
		Non – Consumable	2,00,000.00
3		Seminar	1,00,000.00
4		Guest Lecture	10,000.00
5		Field Trip / Tour	50,000.00
6		AMC for Lab	50,000.00
7		Certificate Course	30,000.00
8		Seed Money	1,00,000.00
9		Furniture	1,00,000.00
10		Stationary	10,000.00
11		Computers and peripherals	65,000.00
12		Books	30,000.00

Dr. D.Aruna
University Nominee

G.P.Chakravarthi
Head of Department

P.R. GOVT. COLLEGE (A), KAKINADA								
DEPARTMENT OF MICROBIOLOGY								
BOS CHANGES - AY 2024-25								
Name of the Department	**S.No.**	**Semester, Program**	**Paper Number & Paper Title**	**Titles of Topics deleted**	**Topics to be added during BOSmeeting August 2024**	**Percentage of changes made insyllabus**	**Justification per each topic added**	**Justification per each topic deleted**
MICROBIOLOGY	1	SEM-II	Course-4 Bacteriology & virology	lambda, TMV and Adeno Viruses	-	-	-	**These topics are repitative**

Pithapur Rajah's College (A), Kakinada

Department of Microbiology

BOS 2024-25 Minutes

The BOS meeting of Microbiology course is held on 1-05-2024 at Department of Microbiology, 11:00 am onwards. The BOS committee members have actively participated in the discussion and following points were focused:

- The third and fourth semester syllabus of Microbiology major course is discussed and the university nominee Dr. A. Aruna suggested to remove some repeated topics in course-4 of second semester.
- She also suggested to teach the common topics of first semester at the basic level to all the life science students.

- The industrial nominee Dr. Lakshmi Madhav suggested to include the advance in microscopy techniques including Florescence and confocal microscope on advancing diagnostic techniques as additional knowledge.
- He also expressed his willingness to offer internships and minor projects to the students in Chaturmuka laboratory.
- The subject expert Smt. D. Jayasree discussed on the changes made in the semester papers and gave some valid inputs
- It resolved to follow the single major system from the academic year 2024-25 as a part of Honors programme.
- It is resolved to follow Microbiology as a minor subject for other streams.
- The third and fourth 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 third-year students without any change.
- 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.

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

BOARD OF STUDIES MEETING 2024- 25

CHOICE BASED CREDIT SYSTEM

Time: 11 AM. **Date: 1-05-2024**

Venue: ***Department of MICROBIOLOGY***

The BOARD OF STUDIES Meeting of the Department of Microbiology took place at 11am 1-05-2024 in the Department of Microbiology P.R. Govt. College, (A) Kakinada for the year 2024-25. The following members attended.

Sl No	Name and affiliation	Designation	Signature
01	G.P.Chakravarthi Head of Department 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	Dr. B.Lakshmi KSN Women's degree college Ananthapur	Subject Expert	
05	Dr. Lakshmi Madhav Industrial nominee, Chaturmuka Diagnostic centre	Industrial nominee / Research expert	
06	V. RAMYA	member	

07	B. Adilakshmi Student Alumni	Student Alumni	
08	Tejaswaini II B.Sc Microbiology	Student Member	
09	Srilakshmi I. B.Sc Microbiology	Student Member	

P.R Government College (A), NAAC A

BOS Meeting 2024-2025

Microbiology

List of paper setters & Examiners

S.No	Name of the lecturer	Papers	College
1.	Dr. B. Lakshmi Lecturer in Microbiology	All	Asst. professor Department of Microbiology KSN Women's Degree college, Anantapur
2.	Smt. D. Jayasree, Lecturer in Microbiology	All	Head, Department of Microbiology A.S.D. Govt. College (A), Kakinada 8121000338 jayasreed@gcrjy.ac.in
3.	B. Preethi Chandrakala Lecturer in Microbiology	All	Rajeev Gandhi Institute of Sciences, Kakinada
4.	Smt. T. Sony	All	Head of the Department of Microbiology, Govt. College (A) – Rajamahendravaram. Mob: 8328032673
5.	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

6.	Dr. D. Aruna Lecturer in Microbiology	All	SRR & CVR Government college Vijayawada 9490040657 kopuriarunadl@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

V. Ramya

Members

Chairman

1)University Nominee:

2) Subject Expert:

D. Nagasree

B. Lakshmi

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 society

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 any unit 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

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 any unit 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

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. 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 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 microbiology day
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 discuss scientific 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 any unit 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

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, HIV

3. Replication of Polio, Influenza

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 any unit 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

MICROBIOLOGY: MINOR

w.e.f 2024-25 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

MINOR - 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

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 any unit 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 thestudents, 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 / ruralcommunity 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 systematicprogramme 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 andcontinuous 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 anindividual 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. Signature of Project Mentor	Name of the Student	Class & Year of Study Signature of Nominated faculty	Register Number	Project Log (20)	Project Implementation Signature of HOD/In-Charge (30)	Project Report (25)	Presentation (25)	Total (100)

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III SEMESTER

COURSE 5: - EUKARYOTIC MICROORGANISMS

credits -_3

Learning outcomes of Course

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

1. Understand the characteristics, classification, andreproductive mechanisms of fungi, algae, and protozoa.
2. Recognize the importance of fungi in biotechnology, including theirroles in food production, medicine, and agriculture.
3. Comprehend the significance of algae in various industries,the environment, and as a source of food.
4. Identify pathogenic protozoa and understand their impact on humanhealth and the environment

UNIT- I: FUNGI **No. of hours: 9**

1. Habitat, distribution, nutritional requirements, fungal cell ultra-structure, fungal wall, Outline classification of Fungi
2. Reproduction in different fungal groups- Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes
3. Heterokaryosis, heterothallism and parasexual mechanism.
4. Fungal dimorphism (Candida albicans)

UNIT- II : IMPORTANCE OF FUNGI **No. of hours: 9**

1. Role of fungi in biotechnology: food, medicine and pharmaceutical industry (baking, brewing, antibiotics, alcohols, enzymes, organic acids, and pharmaceuticals)
2. Beneficial Role of fungi in Agriculture: Biofertilizers, Myco toxins; Biologicalcontrol (Myco fungicides, Myco herbicides, Myco insecticides).
3. Mushrooms and its cultivation. (White button, Milky and Oyster)
4. Fungi as plant and animal pathogens (Cercospora, Puccinia, Candida,Aspergillus)

UNIT- III: ALGAE **No. of hours: 9**

1. Algae- occurrence, thallus organization, algae cell ultra-structure, pigments,flagella, eyespot food reserves, outline classification
2. Vegetative, asexual and sexual reproduction in Algae
3. Photosynthetic apparatus, and outline of Photosynthesis in Algae

UNIT- IV: Importance and cultivation of Algae **No. of hours: 9**

1. Importance of algae in agriculture, industry, environment and food withexamples.
2. Algal culture techniques- Indoor, Outdoor, Closed, Open, Batch, continuous,Fed batch
3. Culture media and growth parameters for algal cultivation (Spirulina)

UNIT- V: Protozoa **No. of hours: 9**

1. General characteristics with special reference to Amoeba, Paramecium
2. Pathogenic Protozoa- Plasmodium, Leishmania and Giardia
3. Importance of protozoa (in waste management, soil fertility, industry and scientific study)
4. Culturing protozoans from natural sources of water, pond water, Chalkley's solution
5. Haplobiontic (Nemalion), Haplontic (Chlamydomonas), Diplontic (Cladophora), Diplobiontic (Polysiphonia) and Diplohaplontic (Cladophora) life cycles.

Recommended Text Books &Reference books:

1.Alexopoulus, C.J., Mims,C.W. and Blackwel, M, Introductory Mycology.John Wiley,New York.

2. Mehrotra, R.S. and K.R.Aneja An Introduction to Mycology. New AgeInternational press, New Delhi
3. Webster, J. Introduction to fungi. Cambridge University Press. Cambridge, U.K. (1985).
4. Bessey E.A. Morphology and Taxonomy of fungi. Vikas Publishing House Pvt.Ltd.,New Delhi.
5. Jhon Webster and R W S Weber. Introduction to Fungi. Cambridge UniversityPress2007.
6. A. V. S. S. .Sambamurty. A Textbook of Algae. I.K. International PublishingHouse

Pvt.Limited, 2010

7. H.D. Kumar and H.N. Singh.A Textbook on Algae (Macmillan international collegeedition)

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

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

COURSE 5: - EUKARYOTIC MICROORGANISMS

CREDITS: 1

PRACTICAL SYLLABUS

1. Preparation of Potato Dextrose Medium.
2. Isolation and identification of pathogenic and non-pathogenic fungi
3. Study of host-pathogen interaction.
4. Study of the vegetative and reproductive structures of followinggenera through temporary and permanent slides: *Mucor*,*Saccharomyces*, *Penicillium*, *Agaricus* and *Alternaria*
5. Purification and preservation of pure cultures of common algae and fungi.

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

SEMESTER -III

Course: 5 EUKARYOTIC MICROORGANISMS

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

PART-I

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

1. **Habitat, distribution, nutritional requirements, fungal cell ultra-structure, fungal wall, Outline classification of Fungi**
2. **Beneficial Role of fungi in Agriculture**
3. **General characteristics of fungi**

Section –II

4. Culture media and growth parameters for algal cultivation (Spirulina)
5. Pathogenic Protozoa- Plasmodium, Leishmania and Giardia
6. Diplohaplontic life cycles of Cladophora

Part – II

Answer any Four Questions from the following 4 X 5 = 20 Marks

1. Vegetative, asexual and sexual reproduction in Algae
2. Mushrooms and its cultivation
3. Fungal dimorphism (Candida albicans)
4. Importance of algae in agriculture, industry, environment and food
5. Haplontic (Chlamydomonas)
6. Algal culture techniques(any two)

P.R. GOVERNMENT COLLEGE (A): KAKINADA

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

COURSE 5: - EUKARYOTIC MICROORGANISMS

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

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 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

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)

COURSE 5: - EUKARYOTIC MICROORGANISMS

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

III SEMESTER

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

credits -_3

I. Course Outcomes:

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

1. Understand the classification and properties of carbohydrates, including monosaccharides, disaccharides, polysaccharides, and sugar derivatives.
2. Gain knowledge of lipids and fatty acids, including their classification, structures, functions, and their role in cell signaling and metabolism.
3. Comprehend the structure and functions of amino acids and proteins, including their primary, secondary, tertiary, and quaternary structures.
4. Learn about the structure and functions of nucleic acids, including DNA and RNA, as well as the concept of base composition and nucleic acid- protein interactions. They will also be introduced to the role of vitamins in metabolism.
5. Understand the structure of enzymes, enzyme classification, and mechanisms of action. They will also learn about the factors influencing enzyme activity and various types of enzyme inhibition.

UNIT-I: Carbohydrates No. of hours: 9

1. General characters and outline classification of Carbohydrates
2. Monosaccharides- Glucose, fructose, ribose; Stereo isomerism of monosaccharides, epimers, mutarotation and anomers of glucose
3. Disaccharides- concept of reducing and non-reducing sugars;Sucrose, Lactose
4. Polysaccharides- Storage -Starch, glycogen, Structural-Cellulose peptidoglycan and chitin
5. Sugar derivatives- glucosamine.

UNIT-II: Lipids and fatty acids No. of hours: 9

1.Definition and classification of lipids. Structure and properties of lipids. Importance of lipids in biological systems.

2. Introduction to fatty acids: definition, structure, and nomenclature. Saturated and unsaturated fatty acids.

3. Triglycerides: structure, function, and metabolism. Phospholipids: structure, function, and role in cell membranes. Steroids: structure, biosynthesis, and physiological roles. Waxes: structure, functions, andapplications.

UNIT-III: Amino acids and Proteins. No. of hours:9

1. Biochemical structure and notation of standard protein amino acids
2. General characteristics of amino acids and proteins.
3. Primary, secondary, tertiary, and quaternary structures of Protein
4. Nonprotein amino acids: Gramicidin, beta-alanine, D-alanine, andD- glutamic acid.

UNIT-IV: Nucleic acids and Vitamins No. of hours:9

1. Structure and functions of DNA and RNA.
2. Base composition. A+T and G+C rich genomes. Basic concept ofnucleic acids protein interactions.
3. Concept and types of vitamins and their role in metabolism.

UNIT-V: Enzymes No. of hours: 9

1. Structure of enzyme, Apoenzyme and cofactors, prosthetic group- TPP, coenzyme -NAD, metal cofactors; Definitions of terms – enzymeunit, specific activity and turnover number
2. Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.
3. Effect of pH and temperature on enzyme activity.
4. Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.

RECOMMENDED TEXT BOOKS:

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiologyand Metabolism, W.C. Brown Publications,Iowa, USA.
2. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles ofBiochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.
3. Sashidhara Rao, B. and Deshpande, V. (2007). ExperimentalBiochemistry: A student Companion. I.K. International Pvt. Ltd.
4. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A shortcourse, 2nd ed., W.H.Freeman
5. Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wileyand Sons
6. White, D. (1995). The Physiology and Biochemistry of Prokaryotes,Oxford University Press, New York

P. R. GOVERNMENT COLLEGE (A), KAKINADA

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

CREDITS: 1

PRACTICAL SYLLABUS

1. Qualitative tests for sugars
2. Qualitative Analysis of Aminoacids.
3. Colorimetric estimation DNA by diphenylamine method.
4. Colorimetric estimation of proteins by Biuret/Lowry method

P.R. GOVERNMENT COLLEGE (A): KAKINADA
COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

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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

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.

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

SEMESTER -III

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

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

PART-I

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

1. General characters and outline classification of Carbohydrates
2. Phospholipids: structure, function, and role in cell membranes.
3. Primary, secondary, tertiary and quaternary structures of Protein

Section –II

4. Structure and functions of DNA and RNA
5. Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.
6. Lock and key hypothesis, and Induced Fit hypothesis.

PART - II

Answer any Four Questions from the following 4 X 5 = 20 Marks

1. Disaccharides- Sucrose
2. Steroids: structure, biosynthesis, and physiological roles
3. General characteristics of amino acids and proteins
4. types of vitamins and their role in metabolism
5. Effect of pH and temperature on enzyme activity
6. Explain the terms Apoenzyme, Holoenzyme, cofactors, prosthetic group and coenzyme.

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 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

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COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

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

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III SEMESTER

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES

credits -_3

I . Course Outcomes:

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

1. Understand the principles and applications of microscopy techniques, including bright field microscopy and electron microscopy (SEM and TEM), as well as staining techniques.
2. Know various sterilization and disinfection techniques, including physical methods (dry heat, moist heat, filtration, radiation) and chemical methods (disinfectants, alcohols, aldehydes, fumigants, phenols, halogens, heavy metals).
3. Perform pure culture isolation, maintenance and preservation of cultures, cultivation of anaerobic bacteria, and accessing viable non-culturable bacteria (VNBC).
4. Understand the principles and applications of spectrophotometry and chromatography techniques, including UV-visible spectrophotometry, colorimetry, turbidometry, paper chromatography, and column chromatography.
5. Gain knowledge of centrifugation principles and applications, electrophoretic techniques (agarose and SDS polyacrylamide gel), and the principles and applications of radioisotopes.

Unit -1: Microscopy No. of Hours: 9hrs

1 Microscopy: Principle, mechanism and applications of Bright fieldmicroscope.

2 Principle, mechanism and applications of electron microscope (SEMand TEM). Micrometry.

3 Staining Techniques – Simple, negative and Differential stainingtechniques (Gram staining, spore staining, Acid fast staining).

Unit-2: Sterilization and disinfection techniques No. of Hours: 9hrs

1.Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Virucide, Bacteriostatic and Bactericidal agent.

Physical methods of microbial control: Dry heat-Incineration, Hot air oven; Moistheat- Pressure cooker, autoclave; Filter sterilization- laminar air flow, Membrane filter;Radiation methods – UV rays, Gamma rays.

2 Chemical methods of microbial control: disinfectants, types and mode of action-alcohols, aldehydes, fumigants, phenols, halogens and heavy metals.

Unit -3: Microbiological techniques No. of Hours:9hrs

1 Pure culture isolation: Streaking, serial dilution and plating methods, micromanipulator; cultivation.

2 Maintenance and preservation/stocking of pure cultures: sub culturing, overlaying cultures with mineral oils, lyophilization, sand cultures, storage at low temperature, Culture collection centers(MTCC, ATCC, DSMZ);

3 Cultivation of anaerobic bacteria; Accessing Viable non-culturable bacteria (VNBC). Buffers in culture medium. Cultivation of fungi, Actinomycetes, yeasts.

Unit-4: Spectrophotometry & Chromatography No. of Hours: 9

1 Spectroscopy – Principles, laws of light absorption, Instrumentation and applications of UV-visible spectrophotometer. Colorimetry and turbidometry.

2 Chromatography: Principles and applications of paper chromatography (Ascending, Descending and 2-D), Thin layer chromatography.

3 Principle and applications of column chromatography (Partition, adsorption, ionexchange, exclusion and affinity chromatography). Column packing and fraction collection.

Unit - 5: Centrifugation, Electrophoresis & Radio isotopes No. of Hours:9

1 Centrifugation-Principles, types and applications.

2 Electrophoretic technique (agarose and SDS polyacrylamide gel) its Components, working principle and applications

3 Radioisotopes– characters and applications of radioisotopes, principle ofautoradiography.

References:

1. Pelczar M., Chan E.C.S. and Krieg, N.R. Microbiology. Tata Mc Grew HillPublishing Co. Ltd., New Delhi.
2. Stainier R.V., Ingraham, J.L., Wheelis, M.L. and Painter P.R. The Microbial World.Printice-Hall of India (Pvt.) Ltd., New Delhi
3. Wilson& Walker. Principles and Techniques in Practical B i o c h e m i s t r y . 5th EditionCambridge University Press (2000).
4. Murphy D.B. Fundamental of Light Microscopy & Electron Imaging.1st Edition.Wiley Liss. (2001).
5. K L Ghatak. Techniques and Methods In Biology PHI Publication (2011)
6. Pranav Kumar. Fundamentals and Techniques of Biophysics and Molecular Biology(2016)
7. Aurora Blair. Laboratory Techniques & Experiments in Biology.Intelliz Press
8. D.T Plummer. An Introduction to Practical Biochemistry. McGraw Hill Publication1987
9. Beckner, W.M., Kleinsmith L.J and Hardin J. The world of cell. IV editionBenjamin /Cummings (2000)

III SEMESTER

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES

credits -_1

1. Study of bright field, dark field and phase contrast, Electron microscopemicrographs to visualize microbial cells.
2. Simple staining & Negative staining.
3. Gram's staining.
4. Sterilization of medium using Autoclave, Sterilization of glassware using Hot AirOven.
5. Isolation of pure cultures of bacteria by streaking method.
6. Isolation of bacteria from natural habitat by spread and pour plate method (usingserial dilution method)
7. Separation of monosaccharides/amino acids by paper/thinlayer chromatography.
8. Demonstration of column packing in gel filtration chromatography.
9. Determination of absorption max for an aromatic amino acid.
10. Separation of bacterial cells (cell pellet) from broth culture by using a laboratoryscale centrifuge.
11. Separation of DNA fragments by Agarose gel electrophoresis.

P.R. GOVERNMENT COLLEGE (A): KAKINADA
COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES

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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

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.

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

SEMESTER –III

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES

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

PART-I

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

1. Principle, mechanism and applications of electron microscope
2. Physical and Chemical methods of microbial control
3. Pure culture isolation

Section -II

4. Spectroscopy – Principles, laws of light absorption, Instrumentation and applications
5. Electrophoretic technique; its Components, working principle and applications
6. Chromatography: Principles and applications

PART - II

Answer any Four Questions from the following 4 X 5 = 20 Marks

1. Staining Techniques – Simple, negative and Differential stainingtechniques
2. Explain the terms- Bacteriostatic and Bactericidal agent
3. preservation of pure cultures
4. Principle and applications of column chromatography
5. Centrifugation-Principles, types and applications.
6. principle ofautoradiography

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 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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES

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

COURSE 8: - CELL BIOLOGY AND GENETICS

credits -_3

I. Course Outcomes:

By the Completion of the course the learner should able to–

1. Understand cell theory, cell organelles, the cell cycle, and the role of thecytoskeleton.
2. Students will comprehend the structure and functions of the cell membrane, nuclear envelope, and nucleolus, as well as gain basic knowledge of cancer development.
3. Learn about protein sorting, intracellular signal transduction pathways, programmed cell death, stem cells, and specialized chromosomes.
4. Gain knowledge of Mendelian genetics, including mono-hybrid and dihybrid crosses, inheritance patterns, and allele frequencies.
5. Understand the concepts of linkage, crossing over, the Hardy-Weinberg Law, natural selection, genetic drift, and the mechanisms of sex determination and inheritance.

Unit 1 Hours : 09

1. Cell theory and cell organelles (Mitochondria, Chloroplasts,Lysosomes, Glyoxysomes and Peroxisomes, Golgi apparatus and ER).
2. Cell cycle and its regulation.
3. Cytoskeleton: Structure and organization of actin, myosin and intermediatefilaments, microtubules, and their role.

Unit 2 Hours : 09

1. Structure and functions Cell membrane, proton pumps associated (Na-K, Cacalmodulin etc. and their distribution), phagocytosis, pinocytosis, exocytosis.
2. Nuclear envelope, structure of nuclear pore complex, nuclear lamina, transportacross nuclear membrane, Nucleolus.
3. Elementary knowledge of development and causes of cancer; Oncogenes andsuppressor genes,

Unit 3 Hours : 09

1. Protein sorting and Transport Intracellular signal transduction pathways (GPCR ,ERK Pathway, mTOR Signaling)
2. Programmed Cell Death; Stem cells.
3. Specialized chromosomes (polytene, lampbrush)

UNIT 4 Hours : 09

1. Mendalien Genetics , Mono hybrid and Dihybrid cross , Law of dominance, Law of

segregation and Independent assortment.

2. Chromosome theory of inheritance, Pedigree analysis, Incomplete dominanceand co-dominance,
3. Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Allele frequencies, Genotypefrequencies.

Unit – 5 Hours : 09

1. Linkage and Crossing over, Molecular mechanism of crossing over. Recombinationfrequency as a measure of linkage intensity,
2. Hardy-Weinberg Law, role of natural selection, Genetic drift. Speciation
3. Sex determination – Sex linked inheritance, extra chromosomal Inheritance

III. References:

1. A.J.F Griffiths, S. R Wessler, S. B Carroll & J. Doebley, An Introduction to GeneticAnalysis,. 10th Ed., W.H. Freeman & Company (New York) 2010

   Geoffrey M. Cooper and Robert E. Hausman - The cell a molecular approach
2. Bruce Alberts , Rebecca Heald, et al. Molecular Biology Of The Cell
3. Arnold Berk (Author), Chris A. Kaiser (Author), Harvey Lodish (Author), Angelika Amon (Author), Molecular Cell Biology.
4. Benjamin Lewin Genes
5. Eldon John Gardner, Michael J. Simmons, D. Peter Snustad Principles of Genetics
6. Karp G, John Wiley Cell Biology
7. Jane B. Reece (Author), Martha R. Taylor (Author), Eric J. Simon (Author),Jean L. Dickey , Campbell Biology: Concepts and Connections
8. Veer Bala Rastogi, Genetics B D Singh, Genetics

III SEMESTER

COURSE 8: - CELL BIOLOGY AND GENETICS

credits -_1

1. Cell counting and Viability
2. Mitosis from onion root tips
3. Meiosis of onion root tips
4. Study of ultrastructure of cell (Plasma membrane, Nucleus, Nuclear Pore Complex,Chloroplast, Mitochondrion, Golgi bodies, Lysosomes, SER and RER)
5. Identification and study of types of cancer, cancer cells by permanent slides/photographs.
6. Study of Linkage, recombination, gene mapping using marker-based data fromDrosophila.
7. Demonstration of DNA fingerprinting.
8. Pedigree chart analysis.

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COURSE 8: - CELL BIOLOGY AND GENETICS

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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

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.

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

SEMESTER –III

COURSE 8: - CELL BIOLOGY AND GENETICS

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

PART-I

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**

1. Structure and organization of actin, myosin and intermediatefilaments, microtubules, and their role.
2. Structure and functions Cell membrane
3. Programmed Cell Death

Section –II

4. Mendelian law of genetics- Law of dominance, Law of segregation and Independent assortment.
5. Linkage and Crossing over
6. Protein sorting and Transport Intracellular signal transduction pathways

PART - II

Answer any Four Questions from the following **4 X 5 = 20 Marks**

1. Cell theory

2. transportacross the nuclear membrane

3. Specialized chromosomes (polytene, lampbrush)

4. Incomplete dominanceand co-dominance,

5. Hardy-Weinberg Law

6. Epistasis

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 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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

COURSE 8: - CELL BIOLOGY AND GENETICS

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

III SEMESTER

MINOR COURSE II: - BIOMOLECULES AND ENZYMOLOGY

credits -_3

II. Course Outcomes:

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

2. Understand the classification and properties of carbohydrates, including monosaccharides, disaccharides, polysaccharides, and sugar derivatives.
3. Gain knowledge of lipids and fatty acids, including their classification, structures, functions, and their role in cell signaling and metabolism.
4. Comprehend the structure and functions of amino acids and proteins, including their primary, secondary, tertiary, and quaternary structures.
5. Learn about the structure and functions of nucleic acids, including DNA and RNA, as well as the concept of base composition and nucleic acid- protein interactions. They will also be introduced to the role of vitamins in metabolism.
6. Understand the structure of enzymes, enzyme classification, and mechanismsof action. They will also learn about the factors influencing enzyme activity and various types of enzyme inhibition.

UNIT-I: Carbohydrates No. of hours: 9

1. General characters and outline classification of Carbohydrates
2. Monosaccharides- Glucose, fructose, ribose; Stereo isomerism of monosaccharides, epimers, mutarotation and anomers of glucose
3. Disaccharides- concept of reducing and non-reducing sugars;Sucrose, Lactose
4. Polysaccharides- Storage -Starch, glycogen, Structural-Cellulose peptidoglycan and chitin
5. Sugar derivatives- glucosamine.

UNIT-II: Lipids and fatty acids No. ofhours: 9

1. Definition and classification of lipids. Structure and properties of lipids. Importance of lipids in biological systems.

2.Introduction to fatty acids: definition, structure, and nomenclature. Saturated and unsaturated fatty acids.

3.Triglycerides: structure, function, and metabolism. Phospholipids: structure, function, and role in cell membranes. Steroids: structure, biosynthesis, and physiological roles.Waxes: structure, functions, andapplications.

UNIT-III: Amino acids and Proteins. No. of hours:9

1.Biochemical structure and notation of standard protein amino acids

2.General characteristics of amino acids and proteins.

3.Primary, secondary, tertiary and quaternary structures of Protein

4.Non protein amino acids: Gramicidin, beta-alanine, D-alanine andD- glutamic acid.

UNIT-IV: Nucleic acids and Vitamins No. of hours:9

1Structure and functions of DNA and RNA.

2.Base composition. A+T and G+C rich genomes. Basic concept ofnucleic acids protein interactions.

3.Concept and types of vitamins and their role in metabolism.

UNIT-V: Enzymes No. of hours: 9

1.Structure of enzyme, Apoenzyme and cofactors, prosthetic group- TPP, coenzyme - NAD, metal cofactors; Definitions of terms – enzymeunit, specific activity and turnover number

2.Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.

3.Effect of pH and temperature on enzyme activity.

4.Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.

RECOMMENDED TEXT BOOKS:

1.Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications,Iowa, USA.

2.Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles ofBiochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.

3.Sashidhara Rao, B. and Deshpande, V. (2007). ExperimentalBiochemistry: A student Companion. I.K. International Pvt. Ltd.

4.Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A shortcourse, 2nd ed., W.H.Freeman

5.Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wileyand Sons

6.White, D. (1995). The Physiology and Biochemistry of Prokaryotes,Oxford University Press, New York

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COURSE 3: - BIOMOLECULES AND ENZYMOLOGY

CREDITS: 1

PRACTICAL SYLLABUS

1. Qualitative tests for sugars
2. Qualitative Analysis of Aminoacids.
3. Colorimetric estimation DNA by diphenylamine method.
4. Colorimetric estimation of proteins by Biuret/Lowry method

P.R. GOVERNMENT COLLEGE (A): KAKINADA
COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

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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

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

7. **Answer any Four Questions from the following** **4 X 5 = 20 Marks**
8. Short answer question from UNIT - I
9. Short answer question from UNIT - II
10. Short answer question from UNIT - III
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - V
13. Short answer question from any one of the five Units based on its weightagein the Syllabus.

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

SEMESTER -III

MINOR: - BIOMOLECULES AND ENZYMOLOGY

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

PART-I

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**

1. General characters and outline classification of Carbohydrates
2. Phospholipids: structure, function, and role in cell membranes.
3. Primary, secondary, tertiary and quaternary structures of Protein

Section –II

4. Structure and functions of DNA and RNA
5. Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.
6. Lock and key hypothesis, and Induced Fit hypothesis.

PART - II

Answer any Four Questions from the following 4 X 5 = 20 Marks

1. Disaccharides- Sucrose
2. Steroids: structure, biosynthesis, and physiological roles
3. General characteristics of amino acids and proteins
4. types of vitamins and their role in metabolism
5. Effect of pH and temperature on enzyme activity
6. Explain the terms Apoenzyme, Holoenzyme, cofactors, prosthetic group and coenzyme

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 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

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COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

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

1. Major Experiment 20M
2. Minor Experiment 10M
3. Spotters 2 x 5 = 10M

a. I

b. II

c. III

d. IV

e. V

4. 4. Record 5M
5. 5. Viva 5M

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IV SEMESTER

COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

credits -_3

I. Course Outcomes:

By the Completion of the course the learner should able to–

1. Understand the nature of genetic material, its organization in prokaryotes and eukaryotes,and the role of DNA and RNA.
2. Explain the process of DNA replication in prokaryotes and the involvement of enzymes andfactors.
3. Recognize the characteristics, types, and applications of extra chromosomal geneticelements such as plasmids and transposons.
4. Differentiate between classical and modern concepts of genes, understand gene structure,and the process of transcription.
5. Comprehend the genetic code, translation process, and regulation of gene expression inbacteria.

Unit - 1: DNA/RNA as genetic material, Replication of DNA No. ofHours:9

1 Experimental evidences that established DNA and RNA as genetic material.Genome organization in prokaryotes and eukaryotes.

2 Replication of DNA in prokaryotes.: Bidirectional and unidirectional replication,Semiconservative replication, Proof of Semiconservative replication (Messelson – Stahl Experiment). Mechanism of DNA Replication in Prokaryotes: step by step process, Enzymes and factors involved in replication- Primase, Helicase, Gyrase, DNA polymerases, DNA ligase, SSB proteins.

3 Extra chromosomal genetic elements: General characters, types and applicationsof Plasmids and transposons.

Unit - 2: Concept of gene, Transcription No. of Hours:9

1. Classical Concept of gene: Muton, Recon and Cistron; One gene-one enzyme and one gene - one polypeptide and One gene – One Product hypotheses.
2. Modern concept of gene: Definition of gene; Open reading frame; structural, constitutive and regulatory genes; uninterrupted genes, Split genes- concept of introns and exons.
3. Protein synthesis in Prokaryotes: Transcription- Definition, difference from replication, promoter, RNA Polymerase, mechanism of transcription. RNA splicing in eukaryotes;

Unit - 3: Translation and regulation of gene expression No. of Hours:9

Protein synthesis in Prokaryotes

3.1 Genetic code: Salient features, Wobble hypothesis.

3.2 Translation- Charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation, elongation and termination of polypeptides. Inhibitors of protein synthesis.

3.3 Regulation of gene expression in bacteria – lac operon

Unit - 4: Mutations and DNA repair No. of Hours:9

4.1 Mutations: Definition and types of Mutations (Spontaneous and induced, Somaticand germline); Physical and chemical mutagens;

4.2 Molecular basis of mutations (base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions); Functional mutants (loss and gain of functionmutants); Uses of mutations.

4.3 Outlines of DNA repair mechanisms: Direct repair, Excision repair, MismatchRepair, Recombination Repair, SOS Repair.

Unit - 5: Genetic recombination in bacteria No. of Hours:9

5.1 Conjugation - discovery, F-factor, F+ & Hfr, mechanism ofconjugation,applications of conjugation;

5.2 Transformation- Discovery, mechanism of transformation, Competence Factorsaffecting transformation and application of transformation.

5.3 Transduction- discovery, mechanism and types of transduction.

III. References

Text books:

1. James D. Watson Tania A. Baker, Stephen P. Bell Alexander Gann, Michael Levine, Richard Losick, 2013, Molecular Biology of the Gene, 5th Edition, PearsonEdu Publishers.
2. Roger Y. Stanier, Edward A. Adelberg, John L. Ingraham, 1977, General Microbiology 5th edition, London Macmillan.
3. David Freifelder1986 Molecular Biology 3rd edition, Jones & Bartlett Publishers
4. T.A. Brown, Gene cloning and DNA analysis- An Introduction, 4thedition
5. Bernard R. Glick and Jack. J. Pasternak, Molecular Biotechnology. 3rd edition
6. David Freifelder.Essentials of molecular biology.Jones and Bartlett Publishers,1998

IV SEMESTER

COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

credits -1

1. Isolation of genomic DNA from E. coli
2. Estimation of DNA using UV spectrophotometer (A260measurement).
3. Problems related to DNA and RNA characteristics, Transcription and Translation.
4. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
5. Problems related to DNA and RNA characteristics, Transcription and Translation.
6. Induction of mutations in bacteria by UV light.
7. Study of different conformations of plasmid DNA through agarose gel electrophoresis.
8. Demonstration of bacterial transformation
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR
10. Study of different types of DNA and RNA using micrographs and model / schematic
11. representations
12. Study of semi-conservative replication of DNA through micrographs / schematic
13. Representations

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COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

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

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.

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

SEMESTER –IV

COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

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

PART-I

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**

1. Mechanism of DNA Replication in Prokaryotes
2. Transcription
3. Translation

Section –II

4. Molecular basis of mutations
5. Transformation
6. Genetic code: Salient features, Wobble hypothesis

PART-II

1. Plasmids and transposons
2. Muton, Recon and Cistron
3. Regulation of gene expression in bacteria – lac operon
4. Direct repair, Excision repair
5. Transduction
6. Spontaneous and induced Mutations

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 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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

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. 4. Record 5M
5. 5. Viva 5M

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IV SEMESTER

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

credits -_3

I. Course Outcomes:

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

1. Understand the nutritional requirements of microorganisms and the different methods of nutrient uptake. They will also gain knowledge of different nutritional groups and types of growth media used for microbial cultivation.
2. Comprehend microbial growth, including the definition of growth, generation time, and the different phases of growth. They will also learn about factors influencing microbial growth and methods for measuring it.
3. Gain knowledge of thermodynamics in biological systems, including concepts offree energy enthalpy, and entropy. They will also learn about ATP structure and properties, oxidation-reduction reactions, and carbohydrate breakdown pathways.
4. Understand microbial respiration, including aerobic and anaerobic respiration, chemoautotrophy and fermentative modes.
5. Differentiate the processes of oxygenic and anoxygenic photosynthesis.

UNIT I: Microbial Nutrition **No. of hours: 9**

1. Nutritional requirements of Microorganisms
2. Methods of uptake of nutrients by cells- Primary and secondary active transport,concept of uniport, symport and antiport Group translocation; Iron uptake
3. Nutritional groups of microorganisms-based on C, energy and electron. sources
4. Growth media - synthetic, nonsynthetic, selective, enrichment and differentialmedia.

UNIT II: Microbial Growth No. of hours:9

1. Microbial Growth- Definitions of growth, generation time and specific growth rate;different phases of growth in batch cultures;
2. Synchronous, continuous, biphasic growth.
3. Factors influencing microbial growth

Methods for measuring microbial growth - Direct microscopy, viable countestimates, turbidometry and biomass.

UNIT III: Thermodynamics; Breakdown of Carbohydrates No.of hours: 9

1. Thermodynamics in biological systems - Concept of free energy, Enthalpy, Standard FreeEnergy change of reaction, Entropy. First and Second law of Thermodynamics. Open andClosed system.
2. Structure and properties of ATP, Standard Free energy change of hydrolysis of ATP andother high energy compounds. Biological oxidation-reduction reactions. Structure and Function of NAD and FAD.
3. Breakdown of carbohydrates· Glycolytic pathways- EMP, HMP shunt/pentose phosphatepathway and ED; TCA cycle.

UNIT IV: Microbial Respiration and Fermentation No. of hours: 9

1. Aerobic respiration - ETS and oxidative phosphorylation
2. Anaerobic respiration, chemoautotrophy - oxidation of inorganic compounds - N, S,Fe and H.
3. Fermentative modes in microorganisms with special reference to alcoholic, Lacticacid fermentations

UNIT V: Bacterial Photosynthesis No. of hours:9

1. Photosynthetic pigments, Photosynthetic apparatus in prokaryotes
2. Outline of oxygenic photosynthesis in bacteria
3. Outline of anoxygenic photosynthesis in bacteria

IV References:

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. BrownPublications,Iowa, USA.
2. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2nd Edition, CBS Publishers and Distributors, New Delhi.
3. Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A studentCompanion. I.K. International Pvt. Ltd.
4. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
5. Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
6. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, OxfordUniversity Press, New York.

IV SEMESTER

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

credits -1

1. Effect of Temperature on bacterial growth 2.Effect of pH on bacterial growth
2. Colony count in Plates
3. Study and plot the growth curve of E. coli by turbidometric and standard plate countmethods
4. Observation and identification of permanent slides of cyanobacteria

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COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM
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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

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.

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

SEMESTER –IV

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

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

PART-I

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**

1. Growth media
2. Microbial Growth and different phases of growth curve
3. TCA cycle

Section –II

4. ETS and oxidative phosphorylation
5. Photosynthetic pigments, Photosynthetic apparatus in prokaryotes
6. Structure and properties of ATP, NAD and FAD.

PART-II

1. Nutritional requirements of Microorganisms
2. Synchronous, continuous, biphasic growth
3. EMP cycle
4. Lacticacid fermentations
5. oxygenic photosynthesis in bacteria
6. concept of uniport, symport and antiport Group translocation

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 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

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COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

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. 4. Record 5M
5. 5. Viva 5M

6. P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

IV SEMESTER

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

credits -_3

I. Course Outcomes:

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

1. Learn the principles and techniques of genetic engineering, including g restrictionendonucleases, and DNA transformation.
2. Understand the use of vectors and the basics of polymerase chain reacti also explore theapplications of genetic engineering in industry, agr medicine.
3. Gain knowledge of blotting techniques, DNA labeling, DNA sequenc basics of intellectualproperty rights.
4. Learn about bioinformatic resources, sequence databases, sequence align use of biostatisticsin data analysis.
5. Develop skills in measuring central tendency and dispersion, understand types of data, andutilizing biostatistical software for analysis and data pr

UNIT- I: Recombinant DNA Technology No. of Hours: 9

1. Basic principles of genetic engineering. Steps in gene cloning.
2. Restriction endonucleases- applications of Type II restriction enzymes in geneticengineering; DNA polymerases and ligases;Use of linkers and adaptors
3. Vectors – Cosmid , Bacteriophages , BAC, YAC
4. Transformation of DNA by Chemical method, Electroporation.

UNIT- II: Applications of r-DNA technology No. of Hours: 9

1. Genomic and C-DNA Libraries, RFLP, RAPD,
2. Basics of Polymerase chain Reaction
3. Application of genetic engineering in industry, agriculture and medicine, HybirdomaTechnology.

UNIT- III: Techniques in genetic engineering and IPR No. of Hours: 9

1. Blotting Techniques.
2. Labeling of DNA, DNA foot printing.
3. DNA Sequencing-Sanger's method
4. Outlines of Intellectual property Rights (Patents,Trademark,Copyright)

UNIT- IV:Bioinformatics No. of Hours: 9

1. Bioinformatic resources : NCBI, EBI, DDBJ, PUBMED, BIOMED.
2. Sequence Databases – GENBANK, BLAST, FASTA, ExPasy, PDB, NDB, UNIPROT –SWISS PROT.

3. Sequence alignment – Sequence homology, pairwise sequence alignment, automatedDNA sequencing, ChIP.

UNIT- V:Biostatistics No. of Hours: 9

1. Measurement of central tendency : MEAN , MEDIAN, MODE.
2. Measurement of dispersion : RANGE, MEAN DEVIATION ,STANDARD DEVIATION.
3. Use of Biostatistic softwares.
4. Sample and population ; Types of Data , methods of Data presentation.

References

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications.Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley- Blackwell. 3.Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomicsand Bioinformatics. II Edition. Benjamin Cummings. Crueger W, Crueger A (1990)

   Biotechnology: A text Book of Industrial Microbiology 2nd edition Sinauerassociates,Inc.
3. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology andBiotechnology, 2nd Edition, ASM Press.
4. Glazer AN and Nikaido H (2007) Microbial Biotechnology, 2nd edition, CambridgeUniversity Press Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press Gupta PK (2009) Elements of Biotechnology2nd edition, Rastogi Publications
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7. Stanbury PF, Whitaker A, Hall SJ (1995) Principles of Fermentation Technology 2ndedition., Elsevier Science
8. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins.Current Opinion in Biotechnology, 12, 195–201.

IV SEMESTER

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

credits -1

1. Isolation of plasmid DNA by Agarose gel Electrophoresis.
2. Preparation of Recombinant vector by using T4 DNA Ligase.
3. To Understand the concept of DNA fingerprinting by Random Ampilification ofPolymorphic DNA.
4. Nucleic acid and protein databases.
5. Sequence alignment
6. Sequence homology and Gene annotation.

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COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

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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

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.

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

SEMESTER –IV

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

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

PART-I

Section -I

1. Basic principles of genetic engineering. Steps in gene cloning
2. Basics of Polymerase chain Reaction
3. DNA Sequencing-Sanger's method

Section –II

4. Sequence alignment – Sequence homology, pairwise sequence alignment, automatedDNA sequencing, ChIP
5. MEAN , MEDIAN, MODE
6. Blotting Techniques

PART-II

7. BAC, YAC - vectors
8. RFLP, RAPD
9. Outlines of Intellectual property Rights
10. BLAST
11. methods of Data presentation
12. Transformation of DNA by Electroporation

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 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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

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

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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

IV SEMESTER

MINOR COURSE 3: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS(MINOR)

credits -_3

II. Course Outcomes:

By the Completion of the course the learner should able to

1. Understand the nature of genetic material, its organization in prokaryotes and eukaryotes,and the role of DNA and RNA.
2. Explain the process of DNA replication in prokaryotes and the involvement of enzymes andfactors.
3. Recognize the characteristics, types, and applications of extra chromosomal geneticelements such as plasmids and transposons.
4. Differentiate between classical and modern concepts of genes, understand gene structure,and the process of transcription.
5. Comprehend the genetic code, translation process, and regulation of gene expression inbacteria.

Unit - 1: DNA/RNA as genetic material, Replication of DNA No. ofHours:9

1. Experimental evidences that established DNA and RNA as genetic material.Genome organization in prokaryotes and eukaryotes.
2. Replication of DNA in prokaryotes.: Bidirectional and unidirectional replication,Semiconservative replication, Proof of Semiconservative replication (Messelson – Stahl Experiment). Mechanism of DNA Replication in Prokaryotes: step by step process, Enzymes and factors involved in replication- Primase, Helicase, Gyrase, DNA polymerases, DNA ligase, SSB proteins.
3. Extra chromosomal genetic elements: General characters, types and applicationsof Plasmids and transposons.

Unit - 2: Concept of gene, Transcription No. of Hours:9

1. Classical Concept of gene: Muton, Recon and Cistron; One gene-one enzyme andone gene - one polypeptide and One gene – One Product hypotheses.
2. Modern concept of gene: Definition of gene; Open reading frame; structural, constitutive and regulatory genes; uninterrupted genes, Split genes- concept of introns and exons.
3. Protein synthesis in Prokaryotes: Transcription- Definition, difference from replication, promoter, RNA Polymerase, mechanism of transcription. RNA splicing in eukaryotes;

Unit - 3: Translation and regulation of gene expression No. of Hours:9

Protein synthesis in Prokaryotes

1. Genetic code: Salient features, Wobble hypothesis.

2. Translation- Charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation, elongation and termination of polypeptides. Inhibitors of protein synthesis.
3. Regulation of gene expression in bacteria – lac operon

Unit - 4: Mutations and DNA repair No. of Hours:9

1. Mutations: Definition and types of Mutations (Spontaneous and induced, Somaticand germline); Physical and chemical mutagens;
2. Molecular basis of mutations (base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions); Functional mutants (loss and gain of functionmutants); Uses of mutations.
3. Outlines of DNA repair mechanisms: Direct repair, Excision repair, MismatchRepair, Recombination Repair, SOS Repair.

Unit - 5: Genetic recombination in bacteria No. of Hours:9

1. Conjugation - discovery, F-factor, F+ & Hfr, mechanism ofconjugation,applications of conjugation;
2. Transformation- Discovery, mechanism of transformation, Competence Factorsaffecting transformation and application of transformation.
3. Transduction- discovery, mechanism and types of transduction.

IV. References

Text books:

1. James D. Watson Tania A. Baker, Stephen P. Bell Alexander Gann, Michael Levine, Richard Losick, 2013, Molecular Biology of the Gene, 5th Edition, PearsonEdu Publishers.
2. Roger Y. Stanier, Edward A. Adelberg, John L. Ingraham, 1977, General Microbiology 5th edition, London Macmillan.
3. David Freifelder1986 Molecular Biology 3rd edition, Jones & Bartlett Publishers
4. T.A. Brown, Gene cloning and DNA analysis- An Introduction, 4thedition
5. Bernard R. Glick and Jack. J. Pasternak, Molecular Biotechnology. 3rdedition
6. David Freifelder.Essentials of molecular biology.Jones and Bartlett Publishers,1998

IV SEMESTER

MINOR : MOLECULAR BIOLOGY AND MICROBIAL GENETICS

credits -1

1. Isolation of genomic DNA from E. coli
2. Estimation of DNA using UV spectrophotometer (A260measurement).
3. Problems related to DNA and RNA characteristics, Transcription and Translation.
4. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
5. Problems related to DNA and RNA characteristics, Transcription and Translation.
6. Induction of mutations in bacteria by UV light.
7. Study of different conformations of plasmid DNA through agarose gel electrophoresis.
8. Demonstration of bacterial transformation
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR
10. Study of different types of DNA and RNA using micrographs and model / schematic
11. representations
12. Study of semi-conservative replication of DNA through micrographs / schematic
13. Representations

P.R. GOVERNMENT COLLEGE (A): KAKINADA
COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

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

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

7. **Answer any Four Questions from the following** **4 X 5 = 20 Marks**
8. Short answer question from UNIT - I
9. Short answer question from UNIT - II
10. Short answer question from UNIT - III
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - V
13. Short answer question from any one of the five Units based on its weightagein the Syllabus.

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

SEMESTER –IV
MOLECULAR BIOLOGY AND MICROBIAL GENETICS

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

PART-I

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**

1. Mechanism of DNA Replication in Prokaryotes
2. Transcription
3. Translation

Section –II

4. Molecular basis of mutations
5. Transformation
6. Genetic code: Salient features, Wobble hypothesis

PART-II

7. Plasmids and transposons
8. Muton, Recon and Cistron
9. Regulation of gene expression in bacteria – lac operon
10. Direct repair, Excision repair
11. Transduction
12. Spontaneous and induced Mutations

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 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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

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

4. Major Experiment 20M
5. Minor Experiment 10M
6. 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

IV SEMESTER

MINOR COURSE 4: - MICROBIAL PHYSIOLOGY AND METABOLISM(MINOR)

credits -_3

I. Course Outcomes:

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

1) Understand the nutritional requirements of microorganisms and the different methods of nutrient uptake. They will also gain knowledge of different nutritional groups and types of growth media used for microbial cultivation.
2) Comprehend microbial growth, including the definition of growth, generation time, and the different phases of growth. They will also learn about factors influencing microbial growth and methods for measuring it.
3) Gain knowledge of thermodynamics in biological systems, including concepts offree energy, enthalpy, and entropy. They will also learn about ATP structure and properties, oxidation-reduction reactions, and carbohydrate breakdown pathways.
4) Understand microbial respiration, including aerobic and anaerobic respiration, chemoautotrophy, and fermentative modes.
5) Differentiate the processes of oxygenic and anoxygenic photosynthesis.

UNIT I: Microbial Nutrition - No. of hours: 9

1) Nutritional requirements of Microorganisms
2) Methods of uptake of nutrients by cells- Primary and secondary active transport,concept of uniport, symport and antiport Group translocation; Iron uptake
3) Nutritional groups of microorganisms-based on C, energy and electron. sources
4) Growth media - synthetic, nonsynthetic, selective, enrichment and differentialmedia.

UNIT II: Microbial Growth - No. of hours:9

1) Microbial Growth- Definitions of growth, generation time and specific growth rate;different phases of growth in batch cultures;
2) Synchronous, continuous, biphasic growth.
3) Factors influencing microbial growth
4) Methods for measuring microbial growth - Direct microscopy, viable countestimates, turbidometry and biomass.

UNIT III: Thermodynamics; Breakdown of Carbohydrates No.of hours: 9

1) Thermodynamics in biological systems - Concept of free energy, Enthalpy, Standard FreeEnergy change of reaction, Entropy. First and Second law of Thermodynamics. Open andClosed system.
2) Structure and properties of ATP, Standard Free energy change of hydrolysis of ATP andother high energy compounds. Biological oxidation-reduction reactions. Structure and Function of NAD and FAD.
3) Breakdown of carbohydrates· Glycolytic pathways- EMP, HMP shunt/pentose phosphatepathway and ED; TCA cycle.

UNIT IV: Microbial Respiration and Fermentation No. of hours: 9

1) Aerobic respiration - ETS and oxidative phosphorylation
2) Anaerobic respiration, chemoautotrophy - oxidation of inorganic compounds - N, S,Fe and H.
3) Fermentative modes in microorganisms with special reference to alcoholic, Lacticacid fermentations

UNIT V: Bacterial Photosynthesis No. of hours:9

1) Photosynthetic pigments, Photosynthetic apparatus in prokaryotes
2) Outline of oxygenic photosynthesis in bacteria
3) Outline of anoxygenic photosynthesis in bacteria

V References:

1) Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. BrownPublications,Iowa, USA.
2) Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2nd Edition, CBS Publishers and Distributors, New Delhi.
3) Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A studentCompanion. I.K. International Pvt. Ltd.
4) Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed.,W.H.Freeman
5) Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
6) White, D. (1995). The Physiology and Biochemistry of Prokaryotes, OxfordUniversity Press, New York.

IV SEMESTER

MINOR: - MICROBIAL PHYSIOLOGY AND METABOLISM

credits -1

1. Effect of Temperature on bacterial growth, 2.Effect of pH on bacterial growth
2. Colony count in Plates
3. Study and plot the growth curve of E. coli by turbidometric and standard plate countmethods
4. Observation and identification of permanent slides of cyanobacteria

P.R. GOVERNMENT COLLEGE (A): KAKINADA
COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

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

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

7. **Answer any Four Questions from the following** **4 X 5 = 20 Marks**
8. Short answer question from UNIT - I
9. Short answer question from UNIT - II
10. Short answer question from UNIT - III
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - V
13. Short answer question from any one of the five Units based on its weightagein the Syllabus

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

SEMESTER –IV
MICROBIAL PHYSIOLOGY AND METABOLISM

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

PART-I

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**

1. Growth media
2. Microbial Growth and different phases of growth curve
3. TCA cycle

Section –II

4. ETS and oxidative phosphorylation
5. Photosynthetic pigments, Photosynthetic apparatus in prokaryotes
6. Structure and properties of ATP, NAD and FAD.

PART-II

7. Nutritional requirements of Microorganisms
8. Synchronous, continuous, biphasic growth
9. EMP cycle
10. Lacticacid fermentations
11. oxygenic photosynthesis in bacteria
12. concept of uniport, symport and antiport Group translocation

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 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

P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

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

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 application of Microbiology

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

UNIT – 1 **No. of Hours: 8**

Intrinsic and extrinsic parameters that affect microbial growth in food

Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods

Food intoxication (botulism).

Food-borne diseases (salmonellosis) and their detection.

UNIT – II **No. of Hours: 8**

Principles of food preservation - Physical and chemical methods.Fermented Dairy foods – cheese, 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, massinoculums. 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 offresh 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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7. Major Experiment 20M
8. Minor Experiment 10M
9. 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

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

Paper-6A Food, Agriculture And Environmental

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PART-A

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 -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

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

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

P . R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

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

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

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

7AManagement of Human Microbial Diseases and Diagnosis

BLUE PRINT

PART-A

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 -B

7. **Answer any Four Questions from the following** **4 X 5 = 20 Marks**
8. Short answer question from UNIT - I
9. Short answer question from UNIT - II
10. Short answer question from UNIT - III
11. Short answer question from UNIT - IV
12. Short answer question from UNIT - V
13. Short answer question from any one of the five Units based on its weightagein the Syllabus

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. Athletes foot
8. Transport of clinical samples
9. Ziehl-Neilson staining
10. Diagnosis of Typhoid
11. Disc Diffusion method
12. Mac Conkey Agar

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 thecompletion 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**