PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

DEPARTMENT OF ZOOLOGY

5th BOARD OF STUDIES

M.Sc., Zoology Syllabus

2024-2025

(23-11-2024)

Index

PROCEEDINGS OF THE PRINCIPAL,
PITHAPUR RAJAH's GOVT.COLLEGE [A]: KAKINADA

Present: Dr. B.V. TIRUPANYAM, Ph.D.

Dt.:23/11/24

Rc.No.12A/A.C/BOS/2024-2025

Sub: P.R .G .C [A]–Academic Cell–**Conduct of BOS Meetings for the Academic Year 2024-2025-MSc Zoology-**Guidelines issued-Regarding.

Ref:1. Minutes of IQAC meeting dated 18 September 2022

2. Resolutions adopted in Staff Council Meeting held on 04 Dec 2023

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

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

The HEIs are also, as per the Revised Accreditation Frame work [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by in graining quality in teaching-learning process by facilitating the students experience a wide

range of participative and experiential learning strategies including field trips, conferences, integration of technology, community service programmes, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programmes, gender equity programmes etc.

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

The NIRF prescribes quality research, infrastructure augmentation, placement and progression to higher education, employability skills leading to enhanced public perception about the college among the public.

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, our institution needs to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our institution is no exception.

Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments and their Chairmen are requested to prepare curricular and extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality and a 21stcentury student capable of facing challenges, adaptive to changes, creative and innovative.

Further, the BOS chairmen are requested to make necessary arrangements for the conduct of the meetings separately between 11 October 2022 and 15 October 2022 duly incorporating above mandate as agenda in the meeting. The SOP prescribing mandatory 20% changes in the existing curricula and other benchmarks has been attached here with

for reference as **Annexure–I.**

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 and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks. 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 2022-23, if any, number of certificate courses, their frequency, Bloom's-Taxonomy based evaluation system for effective learning outcomes as per the Annexure-I The Chairmen are, therefore, requested to

- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and 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.
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning, experiences 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 of 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 to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the commencement of the examination.

- Each Chairman of BOS, shall get the rough draft of the curricula verified by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity among the departments
- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.
- The Academic Coordinator and IQAC coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 and explain the structure of curricular, uniformity the modalities.
- The Controller of Examinations of the institution shall fund the BOS meeting expenditure from the available funds on the condition of reimbursement afterreceivingautonomousfundsfromUGC.InitiallyheshallpayRs.5,000/- uniformly as an advance to each Chairman towards each course (If BOS meeting s for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses xRs.500/-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

BOS document should contain the following contents in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: Its hall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Lab in case of science subjects.
6. Resolutions adopted in the meeting with detailed discussion that took place

during the meeting (Activities and Benchmarking as per Annexure–I).

7. Attend of each theory paper each topic shall be mapped as per the Blooms taxonomy and scope of that topic for skill/employability/ Entrepreneurship opportunities in the following table in corporate.

8. Each BOS Chairman shall, immediately after syllabus ,tabulate the changes made in the syllabus/paper along with justification , in the Pro forma given in Annexure–I.

9. Each BOS Chairman shall, immediately after syllabus ,tabulate the changes made in the syllabus/paper along with justification , in the Pro forma given in Annexure–I.

10. Tables how Members present with signatures.

11. List of Examiners & Paper setters

12. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical)

13. Each BOS Chairman shall, immediately after syllabus ,tabulate the changes made in the syllabus/paper along with justification , in the Pro forma given in Annexure–I.

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	I	Tools and Techniques for biology	4	75	25	4

o	Subject	Sem	Title of the Course	Topic	Parameter as per Blooms taxonomy (Knowledge/ Applica tion /Creativity/Inno vation	Experiential learning component	Scope (Skill/employ ability/ entrepreneur ship)
1	Zoology	I	Molecular Cell Biology	Animal Cell	Knowledge	Shall be shown Microscope	

14. Each BOS Chairman shall, immediately after syllabus ,tabulate

the changes made in the syllabus/paper along with justification , in the Pro forma given in Annexure–I.

15. Tables how Members present with signatures.
16. List of Examiners & Paper setters
17. Syllabus for each course (both theory & Practical incase of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50marks) for each course.
18. PO attainment data (CO-PO mapping)

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

Enclosures : Annexure I,II&III

Copy to:

Lecturers-in-Charge (BOS Chairmen) of all the departments
Academic Coordinator
IQAC coordinator
Controller of
Examinations Office

PROCEEDINGS OF THE PRINCIPAL, P.R. GOVERNMENT COLLEGE (A), KAKINADA-A.P

Present: Dr.B.V.Tirupanyam,M.Sc;Ph.D.

R.C.No.1/A.C./BOS/2024-2025,Dated:20.11.2024

SUB: P.R .Government College(A),Kakinada-PG Board of Studies(BOS)-Program/Course- Nomination of Members-Orders issued.

REF: 1.UGC Guidelines of for AutonomousColleges-2018.

ORDERS: **The Principal, P.R.Government College(A),Kakinada is pleased to constitute PG Boards of Studies in** -ZOOLOGY-for framing the syllabi in respective Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1	Sri .B. Chakravarthi	Chairman &Lecturer In-charge, Department of Zoology& Aquaculture
2	Dr.A.MattaReddy	University Nominee, Associate Professor Dept.of Zoology Adikavi Nannaya University
3	Dr.SamuelDevidRaj	Subject ExpertI, Prof. In Zoology,Principal GDC, Porumamilla
4	Dr.J.ChandraShekaraRao	Subject Expert– II, Assistant Professor in Zoology SRK Govt Degree College Yanam,UT-Puducherry
5	Dr. D.Rajendra Prasad	Business Manager, Devi Sea Foods Ltd.East Godavari
6	Dr.P.KiranKumar	P.G Co-ordinator
7 8 9 10 11 12	Dr.B.Elia V.Satya Varalakshmi T.Venkateswara Rao T.Sushma G.Sowmya Baby Y.Gowthami	Member MemberMember Member Member Member Member
13	P.V.Chandrika	Member
14	B. Devi	Member
15	M.Sowmya	Member
16	R.Sunitha	Member
15	V.Lakshmi Narasamma	StudentAlumniMember
16	N.Rikhitha Sai Lakshmi	StudentMember
17	B. Vandhana	StudentMember

The above members are requested to attend the BOS meeting on 23- 11 -2024 and share their valuable reviews, suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stakeholders and National requirement for consideration and approval of the IQAC and Academic Council.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Coordinator search teaching, extension and other activities in the Department of the college.

ACADEMICCELL

(Certificate to be issued by the University Nominee /Subject Expert/Member of BOS)

Department Name: M.Sc., Zoology /Aquaculture/ B. Voc Commercial Aquaculture

Name of the BOS Member: Dr. A. Matta Reddy.

(University Nominee/Subject Expert /Industrialist/Member)

I certify that the syllabus submitted by the…….
Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

ACADEMICCELL

(Certificate to be is used by the University Nominee/Subject Expert/Member of BOS)

Department Name: M.Sc., Zoology/Aquaculture/ B. Voc Commercial Aquaculture

Name of the BOS Member: Dr. Samuel David Raj.

(University Nominee/Subject Expert/ Industrialist /Member)

I certify that the syllabus submitted by the..... Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

Signature with Date

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS),KAKINADA
KAKINADA533001-ANDHRAPRADESH
***An AUTONOMOUS and NAAC Accredited Institution*(B++Grade-2.98 CGPA)**
(Affiliated to ADIKAVI NANNAYA UNIVERSITY, Rajamahendravaram.)

ACADEMICCELL

(Certificate to be issued by the University Nominee /Subject Expert/ Member of BOS)

DepartmentName:M.Sc.,Zoology/Aquaculture/B.VocCommercialAquaculture Name

of the BOS Member: Dr. J. Chandra Shekara Rao.

(University Nominee/Subject Expert/Industrialist/Member)

I certify that the syllabus submitted by the.....Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

Signature with Date

PITHAPURRAJAH'SGOVERNMENTCOLLEGE(AUTONOMOUS),KAKINADA
INADA533001-ANDHRAPRADESH
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(Affiliated to ADIKAVI NANNAYA UNIVERSITY ,Rajamahendravarm.)

ACADEMICCELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

DepartmentName:M.Sc.,Zoology/Aquaculture/B.VocCommercialAquacultureName of

the BOS Member: Dr. P. Ram Mohan.

(University Nominee /Subject Expert /Industrialist/Member)

I certify that the syllabus submitted by the.....Department is verified by me and I recommend the following suggestions:

1.

2.

3.

4.

5.

The syllabus is approved with the above suggested modification

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

PG DEPARTMENT OF ZOOLOGY

V-BOARD OF STUDIES MEETING 2024-25

Time:11:00
Date:23-11-2024

Venue: ***Department of Zoology***

The IV BOARD OF STUDIES Meeting of M.Sc. Zoology took place at on In the Department of Zoology P.R. Govt. College,(A)Kakinada for theyear2024-2024.

The following members attended.

S.No	Name and affiliation	Designation	Signature
01	B.Chakravarthi Lecturer in charge Dept of zoology P.R. Govt College (A)Kakinada.	Lecture in-charge	
02	Dr.A.Matta Reddy Associate Professor Dept.of Zoology Adikavi Nannaya University	Vice-Chancellor's Nominee	
03	Dr.Samuel Devid Raj Prof. in Zoology Principal GDC, Poruma milla	Subject Expert	
04	Dr.J .Chandra Shekara Rao Assistant Professor in Zoology SRK Govt Degree CollegeYanam UT- Puducherry	Subject Expert	
05	Dr.D.Rajendra Prasad	Business Manager, Devi Sea Foods Ltd	
06	Dr.Kiran kumar Pappu	P.G. Co-ordinator	

07	Dr.B.Elia	Member	
08	V.Satya Varalakshmi		
09	T.Venkateswara Rao	Member	
10	T.Sushma	Member	
11	G.Sowmya Baby	Member	
12	Y.Gowthami	Member	
13	P.V.Chandrika	Member	
14	B.Devi	Member	
15	M.Sowmya	Member	
16	R.Sunitha	Member	
17	V.Lakshmi Narsamma	Student Alumini member	
18	N.Rikhitha Sai Lakshmi	Student member	
19	B.Vandana	Student member	

DEPARTMENTAL STAFF	MEMBER
1. B. Chakravarthi Lecturer in-Charge Dept. of Zoology P.R. Govt College (A) Kakinada	Member
2. Dr. Kiran Kumar Pappu Member Lecturer in Zoology P.G Co-ordinator P.R. Govt College (A)Kakinada	
3. B. Elia Lecturer in zoology P.R. Govt College (A)Kakinada	Member
4. V. Satya Varalakshmi Lecturer in Zoology P.R. Govt College (A)Kakinada	Member
5. T. Venkateswara Rao Lecturer in Zoology P.R.GovtCollege (A)Kakinada	Member
6. T. Sushma Lecturer in Zoology (Guest) P.R. Govt College (A)Kakinada	Member
9. G.Sowmya Baby Lecturer in Zoology(Guest) P.R .Govt College (A) Kakinada	Member
7. P.VijayaChandrika Lecturer in Zoology (Guest) P.R. Govt College (A)Kakinada	Member
8. Y.Gowthami Lecturer in Zoology (Guest) P.R. Govt College (A)Kakinada	Member
9. B.Devi Lecturer in Zoology (Guest) P.R. Govt College (A)Kakinada	Member
10. M.Sowmya Lecturer in Zoology (Guest) P.R. Govt College (A)Kakinada	Member
11. R.Sunitha Lecturer in Zoology (Guest) P.R. Govt College (A)Kakinada	Member

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

DEPARTMENT OF ZOOLOGY & AQUACULTURE

Consolidated Report of Board of Studies for the Year 2024-2025

The Board of Studies Meeting in the Department of zoology was convened on 23-11-2024 at11 AM under the Chairmanship of Sri B.Chakravarthi, Lecturer in charge, Department of Zoology &Aquaculture. The following members are present

S. No	Name of the Person	Designation	Signature
1	Sri. B. Chakravarthi	Chairman & Lecturer Incharge. Department of Zoology&Aquaculture	
2	Dr. A. Matta Reddy	University Nominee, Associate Professor Dept. of Zoology Adikavi Nannaya University	
3	Dr. Samuel David Raj	Subject Expert- I, Prof. in Zoology,Principal, Porumamilla	
4	Dr. J .Chandra Shekara Rao	Subject Expert– II, Assistant Professor in Zoology SRK Govt Degree College Yanam,UT-Puducherry	
5	Dr . D.Rajendhra prasad	Business Manager, Devi Sea Foods Ltd.East Godavari	

Date :23-11-2024

Signature of the Chairperson

VISION:

To contribute its might for holistic and quality human capital formation for modern economy with focus on developing employment opportunity – enhancing skilling ecosystem, through integration of research, value system and technology into teaching–learning process.

MISSION:

1. To provide conducive and outcome-based skill development environment in the institution to brighten prospects for progression to higher education, employment opportunities in Government and Private agencies, for personal growth and enhanced productivity and economic growth.
2. To collaborate with coaching centers or skill development institutions for skill development.
3. Todevelopsystemsforqualityenhancementinlearningbystudentthroughpromotion of ICT integration into learning, deployment of learning resources at the doorsteps of students for optimum utilization.
4. Designing and implementing student-centric, inquisitive, practical-rich and research based curriculum
5. Curricula, including project works, problem-solving & applications oriented TLPs, fieldtrips, etc., that facilitate experiential and participative learning.
6. To strengthen research and development and create new research knowledge through intense research, collaborations ,knowledge and technology transfer
7. To foster innovation among students through trainings and forging collaborations without side organizations
8. To turn each student into a wholesome personality through initiatives in Community Service, Gender equity initiatives, Environment protection, personality development, transferable skills, understanding constitution and its spirit and their role in nation building.
9. To inculcate scientific temper in young minds to foster human values

AGENDA FOR BOARD OF STUDIES MEETING

2024-2025

Agenda I: To discuss regarding the changes to be made in the theory and practical syllabus.

Agenda II: To discuss the percentage of implementation of internal, external marks

Agenda III : To discuss either to consider the average percentage or best of one regarding the mid Sem I&II

Agenda IV : To discuss the matters related to semester end and practical end examinations

Agenda V: To discuss the patterns of the model paper to be implemented

Agenda VI : To discuss the total theory and practical have to be allotted to each paper

Agenda VII : To discuss Weightage of questions from each module and Percentage of choice to be given in the question Paper

Agenda VIII : To discuss the percentage of marks to be bifurcated for internal and external examination assessment regarding practical examinations

Agenda IX: To discuss on issue related to blue print

Agenda X: To discuss about arrangement of training programmes / internships hands on training or any other curriculum enrichment programmes

Resolution

The members present have discussed the syllabi and model question papers (Theory and Practical) related to I, II, III&IV semesters in M.SC Zoology and made the following Resolutions.

Resolution I: Resolved to adopt the theory and practical syllabus prescribed by affiliating university Adikavi Nannaya University, Rajamahendravaram this is the first batch.

Resolution II: Resolved to implement 75% external and 25% internal marks for both theory and practical's from the academic year 2024-25 for I, II, III & IV semesters.

Resolution III: Resolved to conduct mid-I and mid-II for each semester and its average marks are considered.

Resolution IV: Resolved to conduct semester end practical examinations, with external examiners.

Resolution V: Resolved to follow Adikavi Nannaya University M.Sc. zoology model question paper pattern for the conduct of internal mid exams and semester end exams.

Resolution VI: It is resolved to engage 4 to 5 hours per week for each theory paper & 3hrs for each practical.

Resolution VII: Resolved that the Semester End Examination question paper comprises of Two sections –Section A & B, section A consists of 4 questions one question from each unit of syllabus with internal choice 'a' or 'b'. Section-B consists of 8 short questions two from each unit of the syllabus, with internal choice out of which only 5 are to be attempted

Resolution VIII: Resolved that each practical will be evaluated for a total of 50marks

Resolution IX: Resolved to include Blue Prints for model question papers for all semesters.

Resolution X: Resolved to conduct training programmes or internship to enrich the curriculum

Chairperson
Board of Studies
Dept. of Zoology

P. R. GOVTCOLEGE(A), KAKINADA

P.G–ACTION PLAN 2024-2025

DEPARTMENT OF ZOOLOGY & Aquaculture

S. No	Activity planned	Dates/ Period	Outcomes/ Objectives	Remarks
1	rganization of free Medical Camp for all staff of the Institution	24th June 2024	Faculty welfare, Outreach ctivity in collaboration with top class medical organizations	A detailed Budget estimate including cademic and on- Academic activities is prepared and submitted
2	MOOCS enrolment for students	4th week of June 2024	o procure additional credits and to gain knowledge	
3	Field Trip to M.Sc Zoology students	4th week of July	Experiential learning	
4	World Mosquito day	20 Aug 24	Out reach activity on Mosquito born diseases	
5	Mid exams	27Aug – 31Aug		
6	Student seminars Career guidance program	Sep-2024	Mandatory for every student	
7	Wild life week celebration II Mid Exams	Ist week of Oct 24 4 Oct to 18 Oct 24		
8	Observation of World Aids Day	1 Dec 2024	Awareness programme on HIV-AIDS	

9	Industrial visits or study tours	Dec-24	Curriculum enrichment and employability	
10	One day workshop for students in laboratory specimen examination and preservation tech	January 2-3, 2025	To provide practical skill to students	
11	Work shop on Hematological Techniques	Jan-25	Skill development Programme	
12	ational Science Day Training to Biology Teachers	Feb 28th	xtending Knowledge and skill to enhance eaching capabilities of Biology teachers	
13	Student study Projects for Final year students.	Mar-25	Compulsory assessment programme	

Tentative Budget Estimation for 2024-2025

1. Field trips- Rs.50,000

2.Guestlectures-Rs.10,000

3.NationalSeminar–Rs.1,25,000

5.Purchase of Consumable items for Practicals

Rs.50,000

Total Rs.2,35,000

PG Co-ordinator

Lecturer in Charge

Department of

Zoology& Aquaculture

M.Sc. Zoology Program Structure

Code	Title of the paper	Total Marks	Internal exam marks	Sem end exam marks	Credits	Teaching Hours/ Week
	I Year **I SEMESTER**					
I	TOOLS AND TECHNIQUES FOR BIOLOGY	100	25	75	4	4
II	BIOSYSTEMATICS, BIODIVERSITY AND EVOLUTION	100	**25**	**75**	4	4
III	BIOMOLECULES	100	25	75	4	4
IV	MOLECULAR CELL BIOLOGY	100	25	75	4	4
	PRACTICALS					
I	TOOLS AND TECHNIQUES FOR BIOLOGY LAB	50	12	38	2	3
II	BIOSYSTEMATICS, BIODIVERSITY AND EVOLUTION LAB	50	**12**	**38**	2	3
III	BIOMOLECULES LAB	50	12	38	2	3
IV	MOLECULAR CELL BIOLOGY LAB	50	12	38	2	3
	II SEMESTER					
I	BIOSTATISTICS & BIO-INFORMATICS	100	25	75	4	4
II	ANIMAL PHYSIOLOGY	100	25	75	4	4
III	IMMUNOLOGY	100	25	75	4	4
IV	MOLECULAR BIOLOGY	100	25	75	4	4
	PRACTICALS					
I	BIOSTATISTICS & BIO-INFORMATICSLAB	50	12	38	2	3
II	ANIMAL PHYSIOLOGY LAB	50	12	38	2	3
III	IMMUNOLOGY LAB	50	12	38	2	3
IV	MOLECULAR BIOLOGY LAB	50	12	38	2	3

II Year

III SEMESTER

I	APPLIED ZOOLOGY	100	25	75	4	4
II	DEVELOPMENTAL BIOLOGY	100	25	75	4	4
III	METABOLIC CELL FUNCTIONS & REGULATION	100	25	75	4	4
IV	PRINCIPLES OF ECOLOGY	100	25	75	4	4
	PRACTICALS					
I	APPLIED ZOOLOGY LAB	50	12	38	2	3
II	DEVELOPMENTAL BIOLOGY	50	12	38	2	3
III	METABOLIC CELL FUNCTIONS & REGULATION LAB	50	**12**	**38**	2	3
IV	PRINCIPLES OF ECOLOGY LAB	50	12	38	2	3
	IV SEMESTER					
I	NEUROBIOLOGY & ANIMAL BEHAVIOUR	100	25	75	4	4
II	ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY	100	25	75	4	4
III	AQUACULTURE	100	25	75	4	4
IV	ANIMAL BIOTECHNOLOGY & BIO-ETHICS	100	25	75	4	4
	PRACTICALS					
I	NEURO-BIOLOGY & ANIMALBEHAVIOUR LAB	50	12	38	2	3
II	ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY LAB	50	12	38	2	3
III	AQUACULTURE LAB	50	12	38	2	3
IV	ANIMAL BIOTECHNOLOGY & BIO-ETHICS LAB	50	12	38	2	3
V	PROJECT-COMPREHENSIVE VIVA-VOICE	100			4	

M.Sc. ZOOLOGY
SEMESTER – END EXAMINATION
Theory Model Question Paper Pattern

Time: 3 hrs Max. Marks: 75.

Section-A

Answer all questions. Each question carries 15 marks. 4x15=60

Q1. Unit-1
a or b
Q2. Unit-2
a or b
Q3. Unit-3
a or b
Q4. Unit-4
a or b

Section-B. 5x3=15 05

Q5 . It contains 8 short questions with at least two from each unit, carrying 3 marks.
5 questions are to be answered.

PROGRAMME OUTCOMES

- M.Sc. ZOOLOGY is a fascinating programme that provides a platform to the students to learn not only about the diversity of but also about the chemical and physical structure of biological cells, tissues, organs, organisms and their physiology.
- Create deep sense of understanding about human health, conservation of nature and natural resources
- Students can easily understand the concept of origin of life, Evolution, basic genetics, blood group inheritance, embryonic development and stem cell technology etc., through this programme.
- Course like Molecular Biology and Neuro-Biology attracts the attention of students to emerge as good research scholars

After completing M.Sc Zoology programme students can get of employment opportunities in various fields such as agriculture, aquaculture, and pharmaceutical either in private or government sectors. This programme enables students to establish their own business in the areas like aquaculture and Sericulture etc., Students can also pursue either PhD or they may appear for NET or SET to enter into college or university as faculty.

PITHAPURRAJAH'SGOVERNMENTCOLLEGE (A), KAKINADA

PG DEPARTMENT OF ZOOLOGY

PG DEPARTMENT OF ZOOLOGY
LIST OF EXAMINERS

S.No	Name of the Examiners	Subject	Name of the College
01	Prof.G.Mani	Zoology	Andhra University, Visakhapatnam
02	D.K.Rama Rao	Zoology	VSK.College, Visakhapatnam
03	Dr.R.RamachandraRao	Zoology	GDC, Rajam
04	K.Sujatha	Zoology	GDC(W),Srikakulam
05	N.Suneetha	Zoology	SRR&CVRGDC(A)
06	M.VijayaKumar	Zoology	GDCKaikuluru
07	Dr.G Vijaya Prathap	Zoology	Dr.VSKGDC (A)
08	A. Arjunaappa rao	Zoology	GDC,Yalamanchala
09	Dr.SamuelDevidRaj	Zoology	GDC.porumavilla (principal)
10	Dr.R.PraveenDathu	Zoology	GDC,Thiruvuru
11	Dr.V.Sandhya	Zoology	GDC,kaikaluru
12	Dr.Y.PoliNaidu	Zoology	GDC,Srikakulam
13	Dr.P.John kiran	Zoology	GDC,Nakkapalli
14	Dr.PJaya	Zoology	Dr.V.S.K(A)Vizag
15	Dr.P. R Vani	Zoology	GDCVijayanagaram
16	Dr.N.Sreenivas	Zoology	GDC,Ramachandrapuram
17	Dr.G.Sithamma	Zoology	Dr.KVR(W),Karnool
18	Sri.k.DurgaRao	Zoology	GDC(A),Rajahmandry
19	Dr. K.Sree latha	Zoology	Dr.SRK Govt Arts college, Yanam

20	Dr.K.Lakshmi Kanthama	Zoology	SVKP and DrK.S.Raju Arts and Science College Penugonda
21	U.D.V.P.PullaRao	Zoology	SVKP and Dr.K.S.Raju Arts and Science College
22	Dr.ChandrashekarRao	Zoology	SRKGovtDegreeCollege Ya namUT-Puducherry
23	K.Babu	Zoology	GDC,Rajamahendravaram

Lecturer –in -charge-PG Dept of Zoology

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A),KAKINADA

PG DEPARTMENT OF ZOOLOGY

LIST OF QUESTION PAPER SETTERS

DEPARTMENT OF ZOOLOGY

S.N	Name of the Examiners	Subject	Name of the College
01	Dr.SamuelDevidRaj	Zoology	GDC, porumavilla
02	Dr.P.RVani	Zoology	GDCVijayanagaram
03	Dr.Y.PoliNaidu	Zoology	GDC,Srikakulam
04	Dr. P. John Kiran	Zoology	GDC, Nakkapalli
05	Dr.N.Sreenivas	Zoology	GDC,Ramachandrapuram
06	Dr.PJaya	Zoology	Dr.VSKCollege(A),Vizag.
07	Dr.G.Mani	Zoology	AndhraUniversity,Visakhapatnam
08	D.K. RamaRao	Zoology	Dr.VSK(A)Visakhapatnam
09	Dr. K.Lakshmi Kanthama	Zoology	SKRCollege(W),Rajahmandri
10	Dr.GVijayaPrathap	Zoology	Dr.VSKGDC(A)Visakhapatnam
11	A.ArjunApparao	Zoology	GDC,Yalamanchala
12	Dr.PraveenDathu	Zoology	GDC,Thiruvuru
13	Dr.VSandhya	Zoology	GDC,kaikaluru
14	Dr.G.SithFracmma	Zoology	Dr.KVR(W)Karnool
15	U.D.V.P.PullaRao	Zoology	SVKP&Dr.K.SRaju ArtsAndScience College
16	Dr.ChandrashekaraRao	Zoology	SRKGovtDegreeCollegeYanam UT-Puducherry

Lecturer-in-charge-PG Dept of Zoology

I SEMESTER

TOOLS AND TECHNIQUES FOR BIOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

1. The course aims to provide an understanding of basic concepts of instrumentation such as microscopy, spectrophotometry, spectroscopy, NMR , centrifugation, cell fractionation and homogenation.
2. It enables the students gain the skills in techniques of pH measurement , Chromatography and autoradiography.
3. Students will acquire the skills in bioassay, microbial assay and microbiological culture Techniques.

After completing this course the students can get absorbed as experts as biomedical designers and various marketing positions for pharmaceutical industries.

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on tools technique and research biology.
- Understand Principles and uses of analytical instruments.
- EMPLOYIBILITY OPPORTUNITY IN LABS

UNIT-I

Assay-Definition, Biological & Chemical assay. Microscopy-Principles and applications of light, dark field, phase contrast, fluorescence, transmission, electron, scanning electron microscopes. Different fixation and staining techniques for EM. Freeze-etch, freeze-fracture methods for EM, Image processing methods in microscopy. pH meter: Operation of pH electrodes, Principles and applications of Ion-selective and gas sensing electrodes, Oxygen electrodes.

UNIT-II

Centrifugation -Basic principles of centrifugation, types of centrifuges, applications of preparative and analytical ultracentrifuges. Principles and applications of sedimentation, lyophilization. Chromatography: Principles and applications of gel-filtration, ion-exchange and affinity chromatography;TLC, GC & HPLC. Electrophoresis–Principle instrumentation and applications

UNIT-III

Properties of electromagnetic radiations; Principles, instrumentation and applications of UV, visible, infrared, NMR spectroscopy; Spectro fluorimetry and mass spectrometry. X- ray diffraction, Incorporation of radio-isotopes in biological tissues and cells. Radio-labeling techniques: Detection and measurement of different types of radio-isotopes used in biology, Molecular imaging of radio-active material, safety guidelines.

UNIT- IV

Microbiological Techniques: Media preparation & sterilization, Inoculation & Growth monitoring, Biochemical Mutants & their uses, Microbial assays.

PCR–Basic principle, Instrumentation and applications of PCR

Suggested Reading Material:

1. Introduction to Instrumental Analysis. Robert Braun. McGraw Hill International Editions
2. A Biologist Guide to Principles and Techniques of Practical Biochemistry. K. Wilson & K.H.Goulding, ELBS Edn.

M.Sc Zoology
I Semester Model Question Paper:
Paper–I Tools and Techniques for Biology

Time: 3hours **Max.Marks:75**
Answer ALL questions.

I. All questions carry equal marks 4X15=60

Section-A

1. a)What is an assay? Explain different types of assays.

(OR)

b) Write the principle and types of microscopy and elaborate on dark field microscopy.

2. a) Describe the principle and applications of centrifuges with an emphasis on ultra centrifuge.

(OR)

b) Describe various types of chromatographic techniques to separate molecules.

3. a) Describe the principle and applications of spectrophotometer.

(OR)

b) What is auto radiography? Give an account on its biological applications.

4. a) Describe the process of inoculation and growth monitoring.

(OR)

b) Explain in detail about microbial assays.

Section-B

II. Answer any FIVE of the following: 5X3=15

1. pH meter.
2. Biochemical mutants and their uses.
3. TLC.
4. Spectrofluorimetry.
5. Density gradient centrifugation.
6. Treatment of substrate surfaces.
7. Oxygen electrode.
8. Radioactive counter.

BLUEPRINT FOR QUESTION PAPER SETTER

Time: 3Hrs **MaxMarks:75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. Of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the form at given in the above table.

I SEMESTER LAB SYLLABUS

PAPER-I: TOOLS AND TECHNIQUES FOR BIOLOGY

1. Spectrophotometer –Estimation of bimolecular
2. Centrifugation–Demonstration and working
3. Separation Techniques-Paper chromatography
4. Electrophoresis–Demonstration and usage
5. PH Meter–Preparation of Phosphate buffer Preparation
6. Microscope–
    a) Demonstration of oil immersion–WBC&RBC
    b) Preparation of tissue for SEM &TEM procedure

I SEMESTER PAPER-I: TOOLS AND TECHNIQUES FOR BIOLOGY SEMESTER ENDEXAMINATION MODEL PAPER

1.	Major Experiment	12Marks
2.	Minor Experiment	10Marks
3.	Principle/Working model	06Marks
4.	Viva Voce	05Marks
5.	Record	05Marks
6.	Total	38Marks
7.	Lab internal	12Marks
	Grand Total	50Marks

PG DEPARTMENT OF ZOOLOGY

I SEMESTER

PAPER-II: BIOSYSTEMATICS, BIODIVERSITYANDEVOLUTION

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	**4**	**25**	**75**	**100**

Course outcomes:

In this course the students is introduced to the fundamental and principles of taxonomy , ICZN and theories of biological classification, basis of variation of life on earth , origin of life , hierarchal organization in the evolution of life based on various theories and understandings the role of different factors in the evolution of life . The mechanism of origin of the species are explained to the students to get an understanding that many of the species that inhabit the earth today are different from that which inhabited it in the past.

The Learning outcomes:

By the completion of this course student can able to

- Get knowledge on biosystematics and natural resource management
- Analyze diversity of animals.
- Understand the Origin of basic biomolecules
- Understand the concept of living kingdom
- Identify different animal species

UNIT–I **15Hrs**

Biosystematics-Definition and basic concepts. Importance and applications of biosystematics. Material Basis of Biosystematics. Biological classification-Theories and objectives. Procedures in taxonomy - Taxonomic collections. taxonomic keys. Types of taxonomy-Conventional types, Cyto-taxonmy. Chemotaxonomy and Molecular taxonomy .Concept of Zoological Nomenclature.

UNIT–II **15Hrs**

Origin of basic biological molecules. Abiotic synthesis of organic monomers and polymers. Concept of Oparin and Haldane. Experiment of Miller. Evolutionary time scale Eras, Periods and epochs. Origin and diversification of eukaryotes-Origin of cells and first organisms. Evolution of eukaryotic cell from prokaryotes. Evolution of eukaryotic genomes. Duplication and divergence. Molecular divergences, molecular clocks and molecular drive. Phylogenetics-Molecular tools in phylogeny.

UNIT–III **15Hrs**

Universal common ancestor and tree of life–three domain concepts of living kingdom. Hierarchical components of bio-diversity. Evolutionary relationships among taxa. Concepts of species. Species category, subspecies and other infraspecific categories. Hierarchy of categories. Speciation-Genetics of speciation, modes of speciation, Patterns and mechanisms of reproductive isolation. Allopatry, sympatry, Convergent evolution, Sexual selection, Co-evolution.

UNIT–IV **15Hrs**

Concepts of evolution – An overview of evolutionary biology, & theories of organic evolution. Concepts of Neutral Evolution, Population genetics- Populations, gene pool, Gene frequency; Hardy Weinberg law. Concepts and rate of change in gene frequency through Natural selection,

mutation, migration and random genetic drift. Phylogenetic gradualism, punctuated equilibrium and origin of higher categories

Suggested Reading Material:

M.Kato.The Biology of Biodiversity, Springer.

J.C.Avice. Molecular Markers. Natural History and Evolution, Chapman &Hall, New York.

E.O.Wilson.Biodiversity, AcademicPress, Washington.

G.G.Simpson.Principles of Animal Taxonomy. Oxford IBHPub.Co.

E.Mayr. Elements of Taxonomy.

E.O.Wilson.The Diversity of Life(The College Edition),W.W.Northern & Co.Dobzhansky, Th.Genetics and origin of species, Surjeet Publication, Delhi

Dobzhansky,Th.,F.J.Ayala,G.L.,StebbensandJ.M.ValentineEvolution,SurjeetPublication,Delhi

Futuyama, D.J.EvolutionaryBiology, SuinuerAssociates, INC, Publishers,

DunderlandHartl.D.L.A.PrimerofpopulationGenetics, SinauerAssociates, INCMassachusetts.

Jha, A.P.Genes and Evolution, John Publication, New Delhi

King, M.Species Evolution-the role of chromosomal change. The Cambridge University Press, Cambridge.

Strikberger, M.W. Evolution, Jones and Bartett Publishers, Boston

LondonTandonRK.1999.Biodiversity, Taxonomy&Ecology.PrithipalsinghScientific Publishers, Jodhpur.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

PG DEPARTMENT OF ZOOLOGY

M.Sc ZOOLOGY

I Semester Model Question Paper:

Paper–II Biosystematics, Biodiversity & Evolution

Time: 3hours **Max.Marks:75**

Answer ALL questions. All questions carry equal marks **4X15=60**

Section-A

1. a)Define Biosystematics. Explain in detail the importance and applications of Biosystematics

(OR)

b) Discuss about the different taxonomic procedures.

2. a) Discuss in detail about the origin of basic biological molecules.

(OR)

b) Explain about the evolution of eukaryotic genome

3. a)What is the three domain concept of living kingdom. Discuss.

(OR)

b) What is Speciation. Explain the mechanism involved in speciation.

4. a)Discuss in detail about the theories of Organic Evolution.

(OR)

b) What is Hardy Weinberg Law. Discuss.

Section-B

Answer any FIVE of the following **5X3=15**

5. Chemotaxonomy
6. ICZN.
7. Molecular Clocks.
8. Eras.
9. Subspecies.
10. Hierarchy of categories.
11. Punctuated equilibrium.
12. Gene pool.

BLUEPRINT FOR QUESTION PAPER SETTER

Time: 3Hrs **MaxMarks: 75**

UNIT NO.	ESSAY QUESTIONS 15MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No .of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

I SEMESTER LAB SYLLABUS

PAPER II: Biosystematics, Biodiversity and Evolution Lab

1. Invertebrate and Vertebrate Phyla
2. Types of Speciation-Models/Charts
3. Problems on Hardy-Weinberg law
4. Random genetic drift causing change in gene frequency-Practical demonstration.
5. 5.RecentstudiesinEvolution-Examples

I SEMESTER
PAPER-II: Biosystematics, Biodiversity and Evolution Lab
Semester End Examination Model paper

8. Major Problem		10Marks
9. Minor Specimens/Charts/Models		06Marks
10.Spottes	4*3	12Marks
11.VivaVoce		05Marks
12.Record		05Marks
Total		38Marks
Lab internal		12Marks
Grand Total		50Marks

PAPER-III: BIOMOLECULES

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

The course provides knowledge to the students about the basis aspects of carbohydrates, lipids and proteins including classification , structure and physiochemical properties etc, the course enables the students to understand the key aspects of proteins such as proteins purification, characterization and biological properties of proteins. Similarly it provides an overview of Importance properties of carbohydrates and lipids their derivatives and their biological role .It also provides the knowledge to the students about the nucleic acids including DNA and RNA their structure, function and denaturation and denaturation kinetics . The theoretical and practical knowledge gained in this course will provides students to work with various aspects of biomolecules in pharma and biotech industries at different levels.

Learning outcomes:

By the completion of this course student can able to

- Understand the structure, Classification of Proteins, carbohydrates, lipids and nucleic acids

UNIT–I **15Hrs**

Chemical foundations of biology, Aminoacids–classification,Physicochemical properties,Peptide bond, Proteins – classification, Physicochemical properties, structural organization of proteins, primary structure, secondary structure, tertiary structure, quaternary structure, Conformation of proteins (Ramachandran plot)-domains, motifs and folds .Denaturation& renaturation of proteins.

UNIT–II **15Hrs**

Carbohydrates: Definition and classification of carbohydrates, nomenclature, Reaction of Mono-saccharides, Acid derivatives of Mono-saccharides, amino-sugars, Oligosaccharides, structure and properties, Chemistry and biological roles of homo and hetero-polysaccharides, peptidoglycan, glycolsaminoglycans, glycoprotein and other glycoconjugates.

UNIT–III **15Hrs**

Classification of Lipids & Fatty acids and their physicochemical properties, characterization of fats and oil; Structure, properties and biological roles of triacylglycerol, phospholipids, sphingolipids, Gangliosides, Prostaglandins, Thromboxanes, Leukotrienes and steroids.

UNIT–IV **15Hrs**

Nucleic acids – nitrogen bases, nucleosides, nucleotides, physicochemical properties of nucleic acids, cleavage of nucleic acids by enzymatic and non-enzymatic methods, chemical synthesis of DNA; Nucleic acid sequencing, chromatin structure, Three dimensional structure of DNA; Types of RNA, Structure of RNAs–Secondary and Tertiary structure; DNA denaturation and renaturation.

Suggested Reading Material:

1. Nelson.D.L, Cox.M.M.Lehninger's Principle of Biochemistry. Freeman.

2. Murray.R.K, Granner .D.K,Mayes. P.A,Rodwell. V.W.Harper's Biochemistry, McGraw-Hill.

3. Fundamentals of Biochemistry by Donald Voet.

4. Textbook of Biochemistry West, E.S., Todd, Mason&Vanbruggen, Macmillian&Co. Biochemistry, Lubert Stryer.

M.ScZoology
I Semester Model Question Paper
Paper –III Biomolecules

Time: 3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) Describe the structure, classification and properties of amino acids.
(OR)
b) Explain about structural characterization of proteins.

2. a) Write about the classification, structure, properties and functions of mono-saccharides.
(OR)
b) Explain about polysaccharides and their occurrence in nature.

3. a) Discuss about the classification, structures, properties and biological functions of fatty acids.
(OR)
b) Explain about phospholipids, sphingolipids, prostaglandins, and steroids with their biological role.

4. a) Explain about the structure, types and physicochemical properties of Nucleic acids. (OR)
b) Write in detail about RNA and its functions.

Section-B

Answer any FIVE of the following
5X3=15

1. Peptide bond.
2. Glyco proteins.
3. Fatty acids.
4. Chitin.
5. Ramachandran plot.
6. Leukotrienes.
7. mRNA.
8. Denaturation of DNA.

BLUEPRINT FOR QUESTION PAPER SETTER

MaxMarks: 75 **Time: 3Hrs**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Ofwhich75Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

I SEMESTER SYLLABUS
PAPER-III: Biomolecules lab:

1. Estimation of glycine by formal titration
2. Estimation of proteins by Lowry and Biuret methods
3. Analysis and identification of mono-saccharides
4. Estimation of maltose by DNS method
5. Determination of Iodine value of oils
6. Estimation of Cholesterol
7. TLC of Amino acids

I SEMESTER
PAPER-III: Biomolecules lab
Semester End examination Model paper

8. Major Experiment		12Marks
9. Minor Experiment		10Marks
10. Identification tests	2*3	06Marks
11.VivaVoce		05Marks
12.Record		05Marks
13. Total		38Marks
14. Lab internal		12Marks

Grand Total 50Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

PG DEPARTMENT OF ZOOLOGY

I SEMESTER

PAPER-IV: MOLECULAR CELL BIOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

The course aims to imports to the students the fundamental courses which deals with the ' THE CELL' the structural and foundational unit of life , its types , salient features, cellular components and their functions from basic to higher order .i.e., from multicellular organisms point of view. It helps the students in applying the knowledge in combating the entry of harmful organisms like bacteria , viruses and parasites. Studying the basic concepts of cell biology and cellular functioning would help the students in understanding the other courses like immunology and developmental biology. In p racticals one would learn the experimental models in cell biology and microscopy and basic instruments of biology and preparation of buffers, fractionation of sub cellular components , osmoregulation of cell and mitosis etc.

After completing the course the students will get an opportunity to work as a SCIENTIST IN LIFE SCIENCES INDUSTRIES for developing molecular biology assays .

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on Molecular cell biology.
- Understand cell and cell signalling.
- Recognize cell cycle.
- Analyze genetic code for different amino acids

UNIT–I **15Hrs**

Introduction: Experimental system in Cell Biology Biomembranes Molecular composition and arrangement, functional consequences Transport across cell membrane: diffusion, active transport, pumps, uniports, symports and antiports Membrane potential Co-transport by symporters or antiporters Transport across epithelia: Transport of macromolecules

UNIT–II **15Hrs**

Cytoskeleton Microfilaments and microtubules –structure and dynamics Microtubules and Mitosis Cilia and flagella Cell movement intracellular transport , role of kinesin and dynein, signal transduction mechanisms

UNIT–III **15Hrs**

Cell-Cell Signaling Cell surface receptors, Second messenger system, MAP kinase pathways, Apoptosis: Definition, mechanism and significance, Cell-Cell adhesion and communication, Ca++ dependent homo-phillic cell-cell adhesion, Ca++ independent homophillic adhesion, Gap junctions and connections, Integrins, Collagen

UNIT–IV **15Hrs**

Cell cycle Cyclines and cyclin dependent kinases Regulation of CDK-cycline activity Genome organization Hierarchy in organization Chromosomal organization of genes and non-coding DNA Mobile DNA Morphological and functional elements of eukaryotic chromosomes Intracellular protein traffic Protein synthesis on free and bound polysomes Uptake into ER Membrane proteins, Golgi sorting,post-translational modifications Biogenesis of mitochondria and nuclei Trafficking mechanisms

Suggested Reading Material:

1. MolecularCellBiology,J.Darnell.H.LodishandD.Baltimore,Scie ntific American Book INC,USA.
2. 2.MolecularBiologyoftheCell,B.Alberts,D.Bray,J. Lewis, M.Raff, K.RobertsandJ.D.Watson Garland Publishing INC, NewYork.

M.Sc Zoology
I Semester Model Question Paper
Paper–IV Molecular Cell Biology

Time: 3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Describe in detail about the transport across the cell membrane.
(OR)
b) Explain the transport of macromolecules across the epithelial layer.

2. a)Explain the role of cytoskeletal elements in defining the structure of a cell.
(OR)
b) Enumerate the role of cytoskeletal elements in mitosis.

3. a)Write in detail about cell adhesion and communication mechanisms.
(OR)
b) Elaborate on the second messenger system in cell signaling.

4. a)Cyclines and cyclin dependent kinases regulate cell cycle ,Justify.
(OR)
b) Describe various post-translational mechanisms in protein synthesis.

Section-B

II. Answer any FIVE of the following

5X3=15

1. Membrane potential.
2. Cilia and flagella.
3. Integrins and collagen.
4. Chromosomal organization of genes.
5. Mobile DNA.
6. Symportes and antiport
7. Microtubules.
8. Apoptosis.

BLUEPRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Quest ions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Ofwhich75Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

I SEMESTER SYLLABUS

PAPER-IV: Molecular cell Biology lab

1. Light microscopic examination of tissues
2. Preparation of different cell–types Hepatic parenchymal cells, adipocytes, macrophages, neuronal cells, epithelial cells
3. Stages of Mitosis and Meiosis
4. Squash preparation
5. Sub-cellular fractionation–separation of macromolecules

I SEMESTER
PAPER-IV: Molecular cell Biology lab
Semester End examination Model Paper

15.	Major Experiment		10Marks
16.	Minor Identification of stages of cell division		06Marks
17.	Spotters	4*3	12Marks
18.	Viva Voce		05Marks
19.	Record		05Marks
20.	Total		38Marks
21.	Lab internal		12Marks

Grand Total 50Marks

Particulars of changes in the syllabus

S.NO	Existing title of the paper	Revised title of the paper and the syllabus in cooperated
1	**Paper–I** Tools and techniques for biology Unit-II Unit-IV	1) Electrophoresis – Principle instrumentation and applications 2) Basic principle, Instrumentation and applications of PCR
2	**Paper–III** Biomolecules Unit-I	Physicochemical properties of amino acids and proteins

II SEMESTER

PAPER-I: BIOSTATISTICS & BIOINFORMATICS

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

In this course students are introduced to the subject of biostatistics he / she understood the scope of biostatistics and applications of biostatistics. The topics of sampling, different measures of statistics , the importance of study by hypothesis testing, Importance of computers in handling the data together with the fundamental aspects of the computer help the students to learn design the study either laboratory or field , realises the importance of data, the it is treated is depending upon the nature of the study The students by use of this technology can create and compute (visual form) the data to interpret the summary of the data whether quantitative or qualitative . Bioinformatics components introduces the students to the history, scope and importance and the role of internet in bioinformatics. The other topics are different types of biological databases and introduction to the basics of sequence alignment and analysis.

After completing this course the students can get an opportunity to work as bioinformaticians in research labs and bioinformatics companies .

LEARNING OUTCOMES:

completion of this course student can able to

- Get knowledge on basics concept on statistics.
- Understand sampling.
- Analyze the process of measures of central tendency
- Create different types of graphs
- Understand basic concepts of computer.

UNIT–I **15Hrs**

Biostatistics- Introduction and Scope of biostatistics, Sampling. Primary and Secondary data, Frequency distribution, Graphic representation of data- bar diagram, histograms, pie diagram, frequency polygon and Ogive. Measures of central tendency- mean, median, mode. Measures of Dispersion-variance, standard deviation, coefficient of variation

UNIT–II **15Hrs**

Probability and probability distributions-definition of probability - Bernoulli, binomial, Poisson and

normal distributions; Correlation and regression Tests of Significance - hypothesis, critical region and error probabilities, t- test, chi-square test for independence, one way and two- way analysis of variance.

UNIT–III **15Hrs**

Basic components of computers–hardware (CPU, input, output, storage devices), Software (operating systems), Application software; Introduction to MS-EXCEL. Use of in-built statistical functions for computations of mean, SD, correlation, regression coefficients, Use of bar diagram, histogram, scatter plots, Graphical tools in EXCEL for presentation of data; Introduction to MS-WORD, word processor- editing, copying, moving, formatting, table insertion, drawing flow charts etc; Introduction to Power Point, image and data handling.

UNIT–IV **15Hrs**

Bio-informatics –Introduction, History, Internet, Knowledge. Review of relevant definitions in molecular biology. Biological Databases –introduction. Examples of databases together with steps involved in use and interpretation of results). Sequence alignment. Phylogenetic analysis with the program PHYLIP, Introduction to computational genomics and proteomics

Suggested Reading Material:

1. Batschelet,E.,IntroductiontoMathematicsforLifeScientists.Springer-Verlag,Berling.
2. PrinciplesofBiostatistics,PaganoM.,Gauvreau,K,(2000),DuxburyPress,USA
3. Murray,J.D.MathematicalBiology.Springer–Verlag,Berlin.
4. T.K. Attwood & D.J. Parry-Smith 1999. Introduction to Bioinformatics. PearsonEducationAsia.
5. StephenMisener&S.A.Krawez2000.Bioinformatics:MethodsandProtocol.
6. Bioinformatics: Sequence and Genome Analysis, Mount,D.W.(2ndEd.,2001),Cold Spring Harbor Laboratory Press,New York,USA
7. BioinformaticsforDummies,ClaverieJ.M.,NotredameC.,(2ndEd.,2007),WileyPublis hing,Inc.,NewYork,USA
8. Sokal,R.R.&F.J.Rohlf.Biometry. Freeman,SanFrancisco.
9. Snedecor,G.W.andW.G.Cochran,Statisticalmethodsforenvironmentalbiologists.John WileySons, New York.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

PG DEPARTMENT OF ZOOLOGY

M.Sc Zoology

II Semester Model Question Paper

Paper–I Biostatistics and Bio-informatics

Time: 3hour **Max. Marks:75**

I. Answer ALL questions.

All questions carry equal marks **4X15=60**

Section-A

1. a) What is Sampling.Discuss the various methods of samplings.

(OR)

b) Discuss in detail about the Measures of Central tendency.

2. a)Explain in detail about the bivariate analysis.

(OR)

b) What is test of significance. Discuss in detail.

3. a) Describe about the Basic components of the Computer.
4. (OR)

b) Explain the use of MS excel in for data presentation.

5. a)What are biological data bases? Explain.

(OR)

b) Discuss in detail about sequence alignments.

Section-B

II. Answer any FIVE of the following **5X3=15**

1. Frequency distribution.
2. Ogive.
3. Poisson distribution.
4. Chi-square test.
5. MS word.
6. Power point.
7. Genomics.
8. Phylogenetic analysis.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

PG DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNIT NO.	**ESSAY QUESTIONS 15 MARKS**	**SHORT ANSWER QUESTIONS 3 MARKS**	**MARKS ALLOTED TO THE UNIT**
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08 Of which 4 to be answered**	**08 Of which 5 to be answered**	**144 Marks including choice. Of which 75Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

IISEMESTER
PRACTICALS PAPER-I:
Biostatistics & Bioinformatics lab:

1. Sampling and Frequency distribution
2. Graphical presentation of the data
3. Measures of Central Tendency– Mean, median and mode
4. Measures of Dispersion–Standard deviation and Coefficient of variation
5. Correlation and Regression
6. Nucleic acid and protein databases.
7. Retrieval and analysis of DNA or protein sequence from NCBI
8. Sequence Alignment in excel sheet for data processing.

II SEMESTER
PAPER-I:Biostatistics & Bioinformatics lab
Semester End Examination Model paper

22. Major Problem	12Marks
23. Minor Problem	10Marks
24. Graphical presentation of data	06Marks
25. Viva Voce	05Marks
26. Record	05Marks
27. Total	38Marks
28. Lab internal	12Marks
Grand Total	50Marks

II SEMESTER

PAPER-II: ANIMAL PHYSIOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

Animal physiology course will enable the students to gain the knowledge about the human body structure and function of some organs like heart, lungs , kidneys etc. This course focuses on some physiochemical properties and parameters like thermoregulation **,** osmoregulation and physiological adaptation environments like freshwater and brackish water and marine water. The components of the course on respiratory system, excretory system and circulatory system , the awareness about the receptors physiology enables them to take care of their receptor organs and their functions. Sensory physiology focuses on the photoreceptors , auditory and chemical and mechanoreceptors Which provides the knowledge about the function of receptor cells present on sensory organs . Yoga and meditation provides the knowledge on how to gain good health physically and mentally.

After completing this course the students will have an opportunity to work as Research fellows/ associate positions in DB founded project institution like NDRI and NIAB , pharma companies and teaching at UG/PG levels

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on general and comparative physiology.
- Understand different concepts of osmoregulation thermoregulation homeothermic poikilothermic nature of animals.
- Compare different physiological processes in different animals.
- Generalize Physiological adaptations of animals to different environments

UNIT–I **15Hrs**

Muscle: Molecular Structure and properties of Muscle and muscle contraction ,Sliding filament theory

Blood and Circulation – Blood corpuscles, haemopoiesis and formed elements, plasma function,blood volume, blood volume regulation, Blood groups, Haemoglobin, immunity, haemostasis ,factors affecting blood coagulation

Nerve impulses , Synaptic transmission & Neurotransmitters, **Nervous system :** Neurons,action potential, gross-neuro anatomy of the brain and spinal cord,central and peripheral nervous system, neural control of muscle tone and posture

UNIT–II **15Hrs**

Thermoregulation: Comfort zone, body temperature- Physical, chemical, neural regulation, acclimatization

Osmoregulation in aquatic and terrestrial Environments mechanism of ionic regulation
Stress Physiology: Responses to biotic and abiotic factors: Light, temperature, salts

UNIT–III **15Hrs**

Digestion: absorption, energy balance of BMR

Respiratory system - comparison of respiration in different species, anatomical considerations, transport of gasses, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Excretory System: Comparative physiology of excretion, Kidney, Urine formation, Urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized Tissue ECG-its principle and significance, heart as a pump, blood pressure.

UNIT–IV **15Hrs**

Sensory physiology: Photoreceptors, Auditory, Chemoreceptor, Mechano-receptors

Physiological Adaptation: Marine environment, shores, Estuaries
Fresh water and Terrestrial environment Role of Yoga and
meditation on Health.

Suggested Reading Material:

1) Eckert,R.AnimalPhysiology:MechanismsandadaptationW.H.FreemanandCompany,New York
2) Hochackka,P.W.andSomero,G.N.Biochemicaladaptation,Princeton, N.J.
3) Hoar,W.S.GeneralandcomparativeAnimalphysiologyprenticeHallofIndia.
4) SchimdtNeisen,Animalphysiology,AdaptationandEnvironment,Cambridge.
5) Stamd,F.L.Physiology:Aregulatorysystemsapproach,MacmillanpublishingCo., NewYork.
6) Punmer,L.PracticalBiochemistry,TataMcGraw-Hill.
7) Prosser,C.L.andBrown.ComparativeAnimalphysiology.
8) Wilson,K.andWalker,j.Practical Biochemistry.
9) Willmer,PIGSoneand1.Johnson,Environmentalphysiology,BlackWellScience,Oxford, U.K.944p
10) Newell,R.C.(ed)1976.Adaptationtoenvironment,Essaysonthephysiologyofmarineanimals.Butterworths,London,UK539pp
11) Townsend,C.RandP.Callow,physiologicalEcologyAnevolutionaryapproachresourceuse, BlackwellSci.publication,Oxford,UK.

M.ScZoology
II Semester Model Question
Paper Paper-II Animal Physiology

Time:3hours **Max. Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a) Write briefly molecular structure and properties of muscle, Add note on sliding filament theory.

(OR)

b) Write about haemopoiesis, Haemoglobin, and haemostasis. Add note on factors affecting blood coagulation.

2. a)Write about osmoregulation in aquatic Environments.

(OR)

b) Write about response to biotic and abiotic factors.

3. a)Write about the comparative physiology of excretion, Urine formation, Urine concentration, and waste elimination.

(OR)

b) Write about comparative anatomy of heart structure, myogenic heart. Add a note on blood pressure.

4. a)Write about photo-receptors, Auditory, Mechano-receptors.

(OR)

b) Explain freshwater and terrestrial environment.

Section-B

II. Answer any FIVE of the following

5X3=15

1. Synaptic transmission & Neuro-transmitters.
2. Neural control of muscle tone and posture.
3. Yoga and meditation.
4. Chemo receptor.
5. Acclimatization.
6. Micturition.
7. BMR.
8. ECG.

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Quest ions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

II SEMESTER PRACTICALS

PAPER-II: Animal Physiology lab:

1. Digestive enzymes
2. Effect of body size vs oxygen consumption
3. Oxygen consumption vs temperature
4. Osmotic regulation
5. Ion concentration measurements
6. Spotters
7. Dissection-Pituitary gland of fish
8. Dissection-Nervous system of prawn.

II SEMESTERPAPER-II:
Animal Physiology lab
Semester end examination Model paper

29.MajorDissections		12Marks
30.MinorExperiment		10Marks
31.Spottes	2*3	06Marks
32.VivaVoce		05Marks
33.Record		05Marks
34. Total		38Marks
35. Lab internal		12Marks

Grand Total 50Marks

IISEMESTER

PAPER-III: IMMUNOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

Dealing With the concept of immunity it's classification properties and mechanism to immunological tolerance, explains the defence system developed in the in an Organism, lines of defence, physical or chemical and weather response to the immunogenicity elicited by the immunogens either by numeral or cell mediated immunity it elucidated how the immune system produces antibodies against the antigens coming from foreign, harmful organisms, the students would learn about the structure, types of antibodies and Ag-Ab interactions and forces involved during the interactions they will also learn about the efficiency of an Ab towards an Ag by studying affinity, bonus effects etc the course also deals with the organs which produce the cells involved in immune response and how the Ags are presented to the immune response cells etc it also deals with the immunological assays whose principles lies in Ag-Ab interactions finally it helps the students to know about the immunological tolerance which generally comes with the transplantation of organs in medical field the practical include blood grouping various test for assessment of typhoid through widal test ,confirmation of pregnancy through his H CG test which are based on the Ag-Ab interactions this is a course which gives employability skills required for the research and diagnostic (Rand N)labs

After completion of this course students get jobs in national institute of immunology as scientists and industries engaged in development of molecular diagnostics

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of immunology
- Differentiate innate and acquired immunity.
- Understand the concept of antigen -antibody interaction.
- Understand the concept of Immunological tests

UNIT–I **15Hrs**

Immunity-innate and acquired, innate immune mechanisms, acute phase reactants, properties of acquired immunity

Immunogens and antigens- Properties, factors governing immunogenicity, haptens, epitopes size and identification.Adjuvants-properties and mechanism of action.

Immunoglobulins-structure, isotypes, allotypes and idiotypes. Functions of antibody in relation to structure

UNIT –II **15 Hrs.**

Antigen-antibody interactions-affinity of antibody, avidity, bonus effect, classical precipitin reaction, antigen-binding site of antibody, forces involved in antigen-antibody complex formation.

Lymphoid tissue- primary and secondary lymphoid organs, structure and cellular organization. Lymphocyte traffic.

Cells involved in the immune response- T cells, B cells, CD antigens, neutrophils, eosinophils

and natural killer cells.

Antigen presentation–pathways of antigen processing and presentation of intracellular and extracellular antigens.

UNIT–III **15Hrs**

Antibody response - Primary and secondary antibody response, antibody response to haptens, enumeration of antibody-forming cells, T-dependent and T-independent antigens. **Macrophage-** role in immune response and activation.

Cell mediated immunity- helper, cytotoxic, suppressor T cells. *Invivo* and *invitro* assays for assessment of cell-mediated immunity

Complement-classical and alternative pathways of activation. Regulation of complement activation and functions.

Antigen-receptors-On T and B cells. Generation of receptor diversity.

Hyper sensitivity-types of hyper sensitivity and mechanism of reaction

UNIT–IV **15Hrs**

Development of immune system- T cell ontogeny in thymus, thymic hormones, cell development. **Immunological tolerance -** pathways of tolerance and mechanisms of tolerance in T and Bcells. **Immunological tests-**Immuno diffusion,immune electrophoresis, immunofluorescence, radio-immuno assay and enzyme- linked immune-sorbent assay.

Suggested reading Material:

1. Immunology and Immuno-pathology by Stewart.
2. CellularandMolecularImmunologybyAbulK.Abbas*et.al*.
3. Textbook of Immunology by Barret.
4. Essential Immunology by Roitt, Brostoff, Male, Harcourt Brace &Company (5^{th}Ed),Mosby(6^{th}Ed).
5. ImmunologybyKuby,RichardA.Goldsby,Thomas,J.Kindl,BarbaraA.Osbome,Free man&Company,Mosbypublishers.
6. Immunobiology–TheimmunesysteminHealth diseasebyJanewayandTravers.
7. Immunology– AnintroductionbyTizard.
8. Text bookofImmunologybyUnaniandBenacerraf.
9. Fundamentals ofImmunologybyPaul.
10. Immunology– Ashort coursebyBenjaini,SunshineandLesrowitz.

M.ScZoology
II Semester Model Question Paper
Paper – III Immunology

Time:3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)What is innate immunity? Describe various innate immune mechanisms.
(OR)
b) Describe the structure and functions of various types of immune-globulins.

2. a)Write an essay on antigen-antibody interactions.
(OR)
b) What are the cells involved in immune response? Describe their role.

3. a)Elucidate the mechanisms of antibody response to antigens.
(OR)
b) Write about Classical and alternative activation of complement.

4. a)What is immune tolerance? Elucidate the mechanisms of tolerance in T and B cells.
(OR)
b) Write an essay on immune-logical tests used in molecular and diagnostic laboratories.

Section-B

II. Answer any FIVE of the following: **5X3=15**

1. Acquired immunity.
2. Haptens.
3. Lymphocyte traffic.
4. Antigen presenting cells.
5. Cytotoxic T-cells.
6. Antigen receptors.
7. ELISA.
8. Thymic hormones.

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNITNO.	**ESSAYQUESTIONS 15 MARKS**	**SHORT ANSWERQUESTIONS 3 MARKS**	**MARKS ALLOTEDTOTHEUNIT**
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Quest ions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

II SEMESTER PRACTICALS
PAPER-III: Immunology lab:

1. Blood grouping

2. Widal test for detection of typhoid bacteria
3. VDRL Test
4. SRID
5. Ouchterlony DID
6. Immuno electrophoresis
7. Blood clotting time and bleeding time.
8. RIA-Demonstration
9. ELISA-Demonstration

PAPER-III: Immunology lab Semester End Examination Model Paper

36.	Major Experiment	12Marks
37.	Minor Experiment	10Marks
38.	Skill Experiment	06Marks
39.	Viva Voce	05Marks
40.	Record	05Marks
41.	Total	38Marks
42.	Lab internal	12Marks

Grand Total 50Marks

IISEMESTER

PAPER-IV: MOLECULAR BIOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course Outcomes: The course aims to provide to the students on:

1. In-depth knowledge of biochemical and molecular processes that occur
2. in the cell including the central dogma
3. Understanding the genome organization, DNA replication and repair, and
4. the process of regulated expression of DNA to produce functional proteins.
5. Understanding genetic recombinations, antisense technology and molecular mapping of genome.

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of molecular biology.
- Differentiate the structure of DNA and RNA.
- Understand molecular mechanisms of DNA repairing system.
- Understand molecular mechanisms of translation, translation

UNIT–I **15Hrs**

History and scope of Molecular Biology
DNA Structure and Replication Prokaryotic
and Eukaryotic DNA Replication
Mechanism of DNA Replication
Enzymes and accessory proteins involved in DNA Replication

UNIT–II **15Hrs**

Transcription
- Prokaryotic Transcription
- Eukaryotic Transcription
- RNA Polymerases

Post-transcriptional modifications in RNA
- Splicing Cap formation Tail formation Nuclear Export of mRNA

UNIT–III **15Hrs**

Translation Genetic Code
- Prokaryotic and eukaryotic Translation
- Mechanisms of initiation, elongation and termination
- Regulation of translation

Antisense and Ribozyme technology
- Molecular mechanisms of antisense molecules

Inhibition of splicing, polyadenylation and translation

UNIT–IV **15Hrs**

Recombination and Repair Holiday junction, gene targeting and gene disruption Rec A and other Recombinases DNA repair mechanisms Molecular mapping of genome Genetic and physical maps Physical mapping and map-based cloning Southern fluorescence in-situ hybridization(FISH) for genome analysis.

Suggested Reading Material:

1. J.D.Watson,N.H.Hopkins,J.W.Roberts,J.A.SteitzandA.M.Weiner.Molecularbiolog yofGene.TheBenjamin/CummingsPub.Co.Inc.,California.
2. Alberts,B.,D.Bray,J.Lewis,M.Raff,K.RobertsandJ.D.Watson.MolecularBiologyoftheCe ll.GarlandPublishingInc.,New York.
3. BenjaminLewin,GeneIV,OxfordUniversityPress,U.K.
4. Meyers, R.A. (Eds.) Molecular Biology and Biotechnology : A comprehensive deskreference. VCHPublishersInc.,New York.
5. Sambrook, J.,E.F.FritchandT. Maniatis.Molecular cloning:ALaboratoryManual.ColdSpringHarbor LaboratoryPress,NewYork.
6. Daber, P.D. Introduction to practical Molecular Biology.John Wiley & Sons Ltd., NewYork.
7. Brown,T.a.(Eds.).Molecular BiologyLabFax.BiosScientificPublishersLtd.,Oxford.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKI NADA
PG DEPARTMENT OF ZOOLOGY

II Semester Model Question Paper
Pape r-IV Molecular Biology

Time:3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Explain the prokaryotic and eukaryotic DNA replication.
(OR)
b) Explain the mechanics of DNA replication.

2. a)Explain the post transcription in prokaryote and eukaryotic transcription.
(OR)
b) Explain the post-transcriptional modifications in RNA.

3. a)Explain the mechanisms of prokaryotic and eukaryotic translation.
(OR)
b) Explain the molecular mechanism of the anti-sense molecules and add a note on inhibition of splicing.

4. a)Write about gene targeting and DNA repair.
(OR)
b) Explain the types of mapping and molecular mapping of genome.

Section-B

II. Answer any FIVE of the following **5X3=15**

1. Enzymes involved in DNA replication.
2. RNA polymerases.
3. Genetic code.
4. FISH.
5. Necessary proteins involved in DNA replication.
6. Genetic map.
7. Cap formation in post-translational modifications.
8. Structure of DNA.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
PG DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

MaxMarks:75

Time:3Hrs

UNIT NO.	ESSAY QUE STIONS 15 MARKS	SHORT ANSWER QUEST IONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

PG DEPARTMENT OF ZOOLOGY

II SEMESTER PRACTICALS

PAPER-IV: Molecular Biology Lab

1. Estimation of DNA (Colori-metric method)
2. Estimation of RNA in tissue(Colori-metric method)
3. Fulgen reaction method for DNA localization
4. Localization of RNA by methyl green pyronin–'Y'
5. SDS PAGE of serum proteins.
6. Testing purity of DNA

PAPER-IV: Molecular Biology Lab Semester End examination Model paper

1.	Major Experiment :	12Marks
2.	Minor Experiment	10Marks
3.	Explanation of the Principle of Experiment	06Marks
4.	Viva Voce	05Marks
5.	Record	05Marks
6.	Total	38Marks
	Lab internal Marks	12Marks
	Grand Total	**50Marks**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)

KAKINADA

PG DEPARTMENT OF ZOOLOGY

Paper I : Applied zoology

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course Outcome: The course aims to impart to the students, the knowledge of:

Fermentation process and Industrial uses of fermenters in various aspects. Vitamins, antibiotics, amino acids and beverages. Animal breeding of cattle and poultry. Knowledge of artificial insemination and preservation of endangered species in germ plasm Production of transgenic animals and their applications. Molecular pharming, animal cloning, animal models for studying diseases and disorders. Bioremediation enlightens students about waste treatment, biomass and energy production from waste, bioleaching, water pollution and its control. Microbiological approach will enable the students to acquire knowledge of waste water treatment, bio fertilizers, sea weed fertilizers, Mycorrhizal bio fertilizers, bacterial fertilizers, Bio pesticides usage in agriculture. Applied biology students can placed in Microbiological, Biomedical, Pharmacy, Medicine, Clinical Research, Agriculture, Dairy Industry, Water purification industry and other national research lab**s.**

UNIT-I **15Hrs**

Microbial fermentations: Batch, continuous culture techniques, Design, operation, principle and types of fermenters and biosensors. Industrial production of chemicals- solvents (alcohol), acids (citric, lactic), antibiotics (penicillin and streptomycin), Vitamins (Riboflavin and VitaminB12), amino acids (lysine and glutamic acid), Single Cell Protein (SCP).

UNIT-II **15Hrs**

Animal Breeding: Principles, Structure of livestock breeding – poultry, sheep and cattle. Marker - assisted selection. Artificial insemination (AI) techniques, *in vitro* fertilization. Preservation of endangered species .Germ plasm bank.

UNIT-III **15Hrs**

Production of transgenic animals and their applications: mice, sheep and fish. Molecular farming and animal cloning. Somatic cell nuclear transfer in humans–Legal and ethical aspects. Potential applications of transgenic animals – Animal models for diseases and disorders.

UNIT-IV **15Hrs**

Bioremediation - solid and liquid waste treatment. Biomass and energy production from waste. Bioleaching– Microbial recovery of metals and acid mine drainage. Water pollution and its control. Microbiological approach of waste water treatment.

Biofertilizers – Blue green algal fertilizers – Azolla, Anabaena, symbiotic association. Seaweed fertilizers. Mycorrhizal biofertilizers, bacterial fertilizers. Biopesticides in agricultural production.

Suggested Reading Material:

1. FermentationTechnology,Standury(Pergmanpress)

2. IndustrialMicrobiology,L.E.Casida,JR.NewAgeInternational.

3. IndustrialMicrobiologybyPresscotand Dunn.

4. BiotechnologybyBDSingh(Kalyani).

5. Plant Biotechnology by A. Slater, N.W. Scott and M.R. Fowler (Oxford University press).BiotechnologyinAgriculturebySwaminathan,M.S(Mc. MilllanIndiaLtd).

6. Biotechnology and its applications to Agriculture, by Copping LG and P.Rodgers (BritishCropProjection).

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKI NADA
PG DEPARTMENT OF ZOOLOGY
M.Sc Zoology –
III Semester Model Question Paper
Paper-I: Applied Zoology

Time:3hour **Max.Marks:75**

Answer ALL questions.

All questions carry equal marks Section-A

1.a)What are fermenters? Write about principle and types of fermenters.

OR)

b)Explain in detail about the industrial production of pencillin and riboflavin

2. a)Explain in detail about the industrial production of pencillin and riboflavin

(OR)

b) Explain artificial insemination technique.

3. a)Elucidate on breeding of animals through artificial insemination.

(OR)

b) Describe the production of transgenic animals and their applications in health and disease

4. a)Explain the mechanism of recovery of metals and acid-mines from drainage using bioresources

.(OR)

b)Discuss in detail on the need and usage of bio- pesticides in agricultural production.

Section-B

Answer any FIVE of the following:
5X3=15

a) Germ plasm bank.
b) Molecular cloning.
c) Bio-remediation.
d) Single cell protein.
e) Recombinant vector antigens.
f) Somatic cell nuclear transfer.
g) Anabaena.
h) Marker-assisted technology.

BLUE PRINT FOR QUESTION PAPER SETTER

MaxMarks: 75

Time:3Hrs

UNIT NO.	**ESSAY QUE STIONS** **15 MARKS**	**SHORT ANSWER QUEST IONS** **3 MARKS**	**MARKS ALLOTED TO THE UNIT**
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No .of Quest ions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including Choice. Of which75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

Applied Zoology lab:

1. Production of protease/amylase by batch fermentation.
2. Selective isolation of Actinomycetes from soil samples
3. Microbial growth curve.
4. Production of alcohol by S.cerevisiae and its estimation.
5. Production of streptomycin by fermentation.
6. Production of citric acid by A.niger.
7. Production of red wine from grapes.
8. Determination of suspended solids in industrial effluents.
9. Removal of color of the industrial effluents by biological methods.
10. Reduction of pollution load in effluents by biological methods (laboratory models).

III SEMESTERPAPER-I: Applied Zoology lab

SEMESTER END EXAMINATION MODEL PAPER

1.	Major Experiment	12Marks
2.	Minor Experiment	10Marks
3.	Biological methods for pollution reduction	06Marks
4.	Viva Voce	05Marks
5.	Record	05Marks
6.	Total	38Marks
7.	Lab internal	12 Marks

Grand Total 50Marks

KAKINADA

PG DEPARTMENT OF ZOOLOGY

III SEMESTER

PAPER-II:DEVELOPMENTAL BIOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course Outcome: This course helps the student to understand how a single celled zygote though appears to be normal like any other, could give rise to an entirely new organism. It's all about knowing how an organism is initiated, constructed and survives before the formation of respective organs. By studying this course, the student would come to know that developmental biology integrates many other branches of biology such as, cell biology, biochemistry, genetics, molecular biology. physiology, ecology, evolution etc. The student would also know the difference between growth and development. The student will also understand the location and specification of organs, i.e the forelimbs are developed at the upper region of thorax and not vice-versa, their growth with respect to the entire organism i.e the length of the limb is generally proportional to the size of the organism. Also, the parts of a forelimb are arranged in axial manner. It also discusses the gene expression and its regulation at different levels answering the mystery that though all cells have the same genetic background yet their fate is unique. All these would help in understanding and doing further research in medical field and birth defects such as malformations, disruptions etc. Study of developmental biology can then be applied in understanding stem cell technology and regeneration of organs. The practicals include the role of hormones and minerals in the development of an organism, thus elucidating their significance in development.

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts on developmental biology
- Analyze the process of gametogenesis.
- Understand gene regulation.

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UNIT–I **15Hrs**

Gametogenesis, Fertilization and Cleavage:
Introduction to animal development, pattern of embryonic development, Fertilization (species specific recognition of egg and sperm in sea urchin, acrosome reactions, fast and slow block to polyspermy); oogenesis & Spermatogenesis. Cleavage (patterns, molecular mechanism of cleavage)

UNIT–II **15Hrs**

Early embryonic Development:
Gastrulation(frog,chick)Neurulation(EstablishmentofneuraltubeTissuearchitectureofCNS, cerebral organization, differentiation of neural tube, neurons and neural crest cells);Specification of cell fate and cellular basis of morphogenesis, Autonomous development, Regulative development, Syncytial development.

UNIT–III **15Hrs**

Organogenesis:
Mechanism of cellular differentiation – Ectoderm (CNS and Epidermis), Mesoderm (Chorda Mesoderm, paraxial, intermediate and lateral plate mesoderm) and Endoderm(digestive tube and its derivatives), Cell-cell communication, Development during organ formation: introduction and competence, paracrine and other factors (the inducer molecules), Signal transduction cascades. Birth defects-Malformations & Disruptions.

UNIT–IV **15Hrs**

Gene expression during development:
Establishment of body axes. Anterior-posterior polarity-role of maternal effector, segmentation and homeotic selector genes, Dorso-Ventral polarity. Differential gene expression during animal development, Differential gene transcription, Selective nuclear RNA processing and mRNA translation. Differential protein modification. Regeneration of organs.

Suggested Reading Material

1. ScottF.Gilbert.DevelopmentalBiology,LatestEdition,SinauerAssociates,Inc.,Publi shersSunderland,Massachusetts,USA
2. L.WolpertRosaBeddingtonThomas M.JessellPeterLawrenceElliotM.MeyerozitzandJimSmith(2002) PrinciplesofDevelopmentLatesEditionOxfordUniversityPress.
3. JMWSlack(2005)EssentialDevelopmentalBiologyLatestEditionBlackwellPublishingAust ralia.
4. MacE.HadleyEndocrinologySixthEditionPrenticehallInternational,Inc.Arizona(ForSectio n9).
5. MedicalImplicationsofDevelopmentalBiology

M.ScZoology
III Semester Model Question Paper;
PAPER– II DEVELOPMENTALBIOLOGY

Time:3hour **Max. Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Describe in detail about the process of fertilization

(OR)

b) Write an account on molecular mechanism of cleavage and cleavage patterns.

2. a)Give a detailed account on chick gastrulation.

(OR)

b) What is neurulation. Explain the process of neurulation with an example.

3. a)Explain the mechanism of cellular differentiation of ectoderm into CNS & Epidermis.

(OR)

b)How does cell to cell communication help in organ formation during development?

4. a)How does differential gene expression occurs during animal development.

(OR)

- Write about selective nuclear RNA processing and mRNA translation.

Section-B

Answer any FIVE of the following **5X3=15**

a) Blocking of polyspermy.

b) Regulative development.

c) Endoderm derivatives.

d) Homeotic selector genes.

e) Structure of sperm.

f) Autonomous development.

g) Signal transduction cascades.

h) Regeneration of organs.

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNITNO.	**ESSAYQUESTIONS** **15 MARKS**	**SHORT ANSWERQUESTIONS** **3 MARKS**	**MARKS ALLOTEDTOTHEUNIT**
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08** **Of which 4 To be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which75Marksto be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

KAKINADA

PG DEPARTMENT OF ZOOLOGY

III SEMESTER LAB

SYLLABUSPAPER- II:

DEVELOPMENTAL BIOLOGY

1. Estimation of shell calcium during the development of chick and its role
2. Estimation of phosphorous during the development of chick
3. Observation of spermatozoa invertebrates
4. Effect of Iodine in the metamorphosis of frog.
5. Effects of Thyroxine in the metamorphosis of frog.
6. Preparation of sperm smear from goat testis
7. Observation of slides: Cleavage, Morula, Blastula, Gastrula
8. Neurulation slides: Neural plate, Neural fold, Neural tube.
9. Incubation of egg in natural method.

I SEMESTER PAPER-II: Developmental Biology

Lab Semester End Examination Model paper

8.	Major Experiment		10Marks
9.	Minor Experiment		06Marks
10.	Slides	4x3	12Marks
11.	Viva Voce		05Marks
12.	Record		05Marks
13.	Total		38Marks
14.	Lab internal		12Marks

Grand Total 50Marks

PAPER-III:METABOLIC CELL FUNCTIONS & REGULATION

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course Outcome: The course aims to:

1. Impart the knowledge of the complexity of metabolic pathways and cross-talk between different pathways to achieve cellular homeostasis.
2. Gain knowledge on enzymology and understanding the influence of different factors on enzyme Kinetics
3. Provide on understanding of energy metabolism and high energy compounds, storage and utilization of biological energy and metabolic engineering.

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of cell function and regulation
- Understand the basic principles of thermodynamics.
- Classify different types of enzymes.
- Generalize the process of immobilization process.

UNIT–I 15Hrs

Thermodynamic principles and steady- state conditions of living organisms
Organization and methods to study metabolism Degradation of glucose, palmitic acid, phenylalanine

UNIT–II 15Hrs

Energy metabolism and high energy compounds
Redox potentials Mitochondrial electron
transport chain Oxidative phosphorylation
Storage and utilization of biological energy
Biosynthesis of Urea, Glucose, Glycogen, Oleic acid and prostaglandins

UNIT–III 15Hrs

Nature of Enzymes
Classification and nomenclature of enzymes
Kinetic analysis of enzyme catalyzed reactions
Metabolic profile of adipose ,neural ,hepatic and muscle tissues

UNIT–IV 15Hrs

Metabolic Engineering Immobilized

enzymes and their applications **Suggested**

Reading Material:

1. Voet,D.andJ.G.Voet.Bioche mistry.J.Wiley&Sons2. Foster,R.L.Natureof

Enzymology3.Lodishet.al.MolecularCellBiology4.AnnualReviewsofBiochemistry5. GarettandGrisham.Biochemistry.

III Semester Model Question Paper
Paper–III METABOLIC CELL FUNCTIONS & REGULATION

Time:3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks 4X15=60

Section-A

1. a)Describe the thermodynamic principles suitable for living organisms.

(OR)

b)Write notes on degradation of glucose.

2. a)Explain the electron transport chain in mitochondria

(OR)

b)Explain the biosynthesis of prostaglandins.

3. a)Write an account on classification and nomenclature of enzymes.

(OR)

b)Discuss on the metabolic profile of neural tissue.

4. a)Explain the process of immobilization of enzymes?

(OR)

b)What is metabolic engineering? Elaborate.

Section-B

II Answer any FIVE of the following

5X3=15

a) Methods to study metabolism.

b) Oxidative phosphorylation.

c) Kinetic analysis of enzymes.

d) Metabolic profile of adipose.

e) Degradation of palmitic acid.

f) Storage of biological energy.

g) Metabolic profile of tissue.

h) Applications of immobilized enzymes.

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNITNO.	**ESSAYQUESTIONS** **15 MARKS**	**SHORT ANSWERQUESTIONS** **3 MARKS**	**MARKS ALLOTEDTOTHEUNIT**
UNIT – I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No .of Questions	**08** **Of which 4 To be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which75Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

III SEMESTER SYLLABUS
PAPER III:
METABOLIC CELL FUNCTIONS & REGULATION LAB

1. Enzyme kinetics
2. De-hydrogenase assay
3. Lactic acid estimation
4. Proteins, glucose and Lipid estimations
5. DNA,RNA estimation
6. Transaminases

III SEMESTER
PAPER-III: Metabolic cell function and regulations lab
Semester End examination Model paper

15.MajorExperiment	12Marks
16.MinorExperiment	10Marks
17.Principle/ working model	06Marks
18.VivaVoce	05Marks
19.Record	05Marks
20. Total	38Marks
21. Lab internal	12Marks
Grand Total	50 Marks

Particulars of changes in the syllabus

S.NO	Existing title of the paper	Syllabus incooperated
1	**Developmental BiologyUnit–I** **Practicals**	• Fertilization (species specific recognition of egg and sperm in seaurchin. • Spermatogenesis • Incubation of egg in natural method.

III SEMESTER

PAPER-IV: PRINCIPLES OF ECOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course Outcome:

The student is introduced to the core principles of ecology, focusing on the structure and functions of the aquatic, ecosystems, the significance of the abiotic and biotic component, the food chains, the food web, energy transfer in the ecosystems together with factors responsible for the stability of the ecosystems.
It also includes the basics of population ecology which includes the population dynamics and the factors affecting the populations abundance and nature of existence a of the populations. Further the course focusses on the drivers of change in the ecosystems and also the management of the natural resources.
The student understands the ecological principles. He is equipped with field based skills, analysing the ecological data and also can be able to write scientific reports.

Learning outcomes:

By the completion of this course student enable to

- Get knowledge on basics concepts of ecology.
- Understand Inter-specific relationships
- Generalize different bio geo -chemical cycles

UNIT–I **15Hrs**

Introduction to Ecology, Environmental concepts, Ecosystem structure and function-Biotic and Abiotic environments. Habitat and Ecological Niche. Dynamics of ecosystem- energy flow, food chain, foodweb, Ecological pyramids .Concepts of primary productivity.Mineralcycling.

UNIT–II **15Hrs**

Population Ecology- Characteristics of population. Population growth. Growth models. Optimal yield. Life histories strategies (r and K Selection).Intraspecific and Inter specific interactions.
Concept of metapopulation. Population Demography and life tables- mortality, natality, age structure, fecundity, netre productive rate,

UNIT–III **15Hrs**

Evolutionary ecology. Community ecology- Nature of communities. community structure and attributes. Community composition. Concept of Ecological succession. Patterns of biodiversity,Latitudinalandaltitudinalgradients:TheoryofIslandbiogeography.
Bio-geographical of the world. Biogeographic zones of India and faunal diversity. Hotspots the world & in India.

UNIT–IV

Environmental stress- environment pollution. Major drivers of bio-diversity change. Bio-diversity status, Monitoring and documentation. Biodiversity conservation-Threats, major approaches to management. IUCN classification of wild life. Indian case studies on conservation/ management strategy. Concepts of sustainable development.

15Hrs

Suggested Reading Material:

1. Begon,M.,J.L.HarperandC.R.Townsend.Ecology,Individuals,PopulationsandCom munities.BlackwellScience,Oxford,UK.
2. Koromondy,E.J.Conceptsofecology.PrenticeHall,NewDelhi.
3. Clarke,G.L.ElementsofEcology,JohnWiley&Sons,NewYork.
4. Odum,E.P.FundamentalsofEcology.W.B.Saunders,Philadelphia.
5. Krebs,C.J.Ecology.Harper &Row,NewYork.
6. ChapmanJLandReissMJ.1995.EcologyPrinciplesandApplication. CambridgeUniversityPress.
7. TrivedyRK,GoelandTrisa.1997.PracticalmethodsinEcology&EnvironmentalScience.
8. AgarwalKC.1998.Biodiversity.India.
9. PeggyI.Fieldler andPererM.Kareiva.1997.ConservationBiology

PG DEPARTMENT OF ZOOLOGY

M.Sc Zoology
III Semester Model Question Paper
PAPER– IV PRINCIPLES OF ECOLOGY

Time:3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Write in detail about the abiotic component of the ecosystem.
(OR)
b) Explain the Concept of Primary Productivity.

2. a)Discuss about the Population growth.
(OR)
b) Explain about the different types of species interactions

3. a) What is an Ecological Community. Explain in detail about the structure and form of the Community
(OR)
b) Discuss about the biogeographic realms of the world.

4. a)Discuss in detail about the major drivers responsible for environmental stress.
(OR)
b) What is biodiversity conservation? Discuss.

Section-B

II Answer any FIVE of the following **5X3=15**

a) Food chain
b) Ecological Pyramids
c) Metapopulation
d) Optimal yield
e) Ecological Successsion.
f) Hotspots
g) Sustainable development
h) IUCN.

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNIT NO.	ESSAY QUE STIONS 15 MARKS	SHORT ANSWER QUEST IONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

IIISEMESTER

SYLLABUSPAPER-IV:PRINCIPLESOFECOLOGY

1. Ecosystem-structure and function-demonstration.
2. Populations interactions.
3. Local fauna-Identification. Conservation activities for any
4. Enumeration of Plankton.
5. Estimation of Population-Plant/Animal sps by quadrant method
6. Diversity indices-Abundance, dominance and Diversity
7. Creation of Lifetables

III SEMESTER

PAPER-IV: Principles of Ecology lab

Semester End examination Model Paper

22. Major Experiment		10 Marks
23. Minor Experiment	06Marks	
24. Creation of lifetable		12 Marks
25. Viva Voce		05Marks
26. Record		05Marks
27. Total		38Marks
28. Lab internal		12Marks
Grand Total		50Marks

IV SEMESTER

PAPER-I: NEUROBIOLOGY & ANIMAL BEHAVIOUR

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

COURSE OUTCOMES :

While studying Developmental biology, the students would understand that the first formed organ system during development is the nervous system. Nervous system is one of the communicating systems in our body which is faster. The course enables the students understand that this is the only system which responds to external environmental cues and accordingly co-ordinates the internal physiological activities.This course deals with structural organization and functional anatomy of the brain, the cell types that make up the nervous system, properties of neuron, information flow within a neuron and neural communication, the messengers involved in communication. In addition to this, students would also learn about the abstract functioning of brain, the cognition which discusses on the way we perceive, think and memorize. This course makes the learners more inquisitive such as, though neural connections and communication is stereotyped, yet actions are sensory & motor of various kinds and different perceptions, how communication between neurons modified by experience etc. Finally, this course tells the learner to 'Know Thyself.

UNIT–I **15Hrs**

Introduction to Neurobiology: Organization of the Brain: Functional Anatomy of the brain. Systems neurobiology – Visual systems, Hearing systems. Neurons, astrocytes, oligodendroglia, Schwaan cells, microglia, ependymal cells, neuroglial cell interaction

UNIT–II **15Hrs**

Neuron: Passive and membrane properties, information flow in neurons, compartments, spike initiation zone. Neuron–
Excitability,conductivity,Membranepotentials(Resting&Action),Single neuron recording, Patch-clamp recording, Nerve Impulse, Refractory period, The Nernst equation and Goldman equation.

UNIT–III **15Hrs**

Signaling and Channels: Ionand Voltage-gated Channels. Sodium, Potassium & Calcium channels structure and function.
Neural Communication: Synapses- Electrical and Chemical synapses, Nerve-muscle synapse and signaling, Neurotransmitters (synthesis, storage and function), post-synaptic action of neuro-transmitters, neuro-transmitter gated ionic channels; Dale’s principle drugs affecting their activities, ionotropic and metabotropic receptors. Synaptic Integration, Synaptic Plasticity.

UNIT–IV **15Hrs**

Cognitive Neuroscience: Nerve cells and their network, Role of limbic System incognition, Cognitive skills, Learning and memory- Conditioning, habituation, insight learning, association learning. Imprinting–case studies of animal models

Suggested Reading Material:

1. FundamentalNeurosciencebyHaines,DuaneE.,ChurchillLivingston,NewYork.
2. PrinciplesofNeuralSciencebyKandelEric,JamesH.[6],andThomasJessel; 4thed. McGraw-Hill.
3. Basic Neurochemistry: Molecular, Cellular and Medical Aspects, by George M.D.Siegel, R. Wayne Albers, Scott Brdy, Donald M. D. Price; Seventh Edition; ElsevierAcademicPress.
4. FoundationsofNeurobiologybyFredDelcomyn,N.Y.Freeman.
5. TheNeuron:CellandMolecular Biology3edbyIrwinB.Levitan,LeonardK.Kaczmarek, (2002), Oxford UniversityPress.
6. Neuroscience (Book with CD-ROM) 3ed by Dale Purves, George J. Augustine, DavidFitzpatrick, William C. Hall, Lawrence C. Katz, Anthony-Samuel LaMantia, Jomes O.McNamara, S. MarkWilliams(2004)SinauerAssoc.,
7. Fundamental Neuroscience, 2ed by Larry R. Squire, Floyd E. Bloom, Susan K.McConnell, James L. Roberts (Editor), Nicholas C. Spitzer, Michael J. Zigmond(2002)Academic Press.

An IntroductiontoAnimalBehaviour,5thEdition by AubreyManning and Marian Stamp Dawkins.

PG DEPARTMENT OF ZOOLOGY

M.Sc. Zoology IV Semester Model
Question Paper
Paper–I NEUROBIOLOGY &ANIMAL BEHAVIOUR

Time:3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

- a)Describe in detail the flow of information in neurons

(OR)

b) Derive Nernst equation

- a)What is Action potential. Explain the propagation of action potential across the neuron.

(OR)

b) Discuss the types of channels involved in signaling

- a)Write an account on Catecholamine synthesis, release and uptake

(OR)

b) Write an account on organization of the brain.

- a)Discuss the behavior in insects with examples.

(OR)

b) What are cognitive skills. Explain different types of learning with examples

Section-B

II. Answer any FIVE of the following
5X3=15

a) Neuro-glial cell interaction
b) Metabotropic receptors.
c) Cerebellum
d) Imprinting.
e) Structure of neuron
f) Sodium channel
g) Temporallabe.
h) Memory

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BLUEPRINT FOR QUESTION PAPER SETTER

MaxMarks:75 **Time:3Hrs**

UNIT NO.	ESSAY QUE STIONS 15 MARKS	SHORT ANSWER QUEST IONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT – I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Ofwhich75Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
PG DEPARTMENT OF ZOOLOGY
IV SEMESTER PRACTICALS
PAPER-I: Neurobiology and Animal Behaviour lab

1. An introduction to animal behaviour – Animal Psychology – Classification of behavioural patterns
2. Perception of the environment–Examples
3. communication– Examples from invertebrates and vertebrates (Terrestrial, Aerial, Aquatic habitats)
4. Ecological aspects – Food selection, optimal for aging, prey and predator, Host Parasite relations
5. Social behaviour–Aggregations– Examples from fishes, birds and mammals, social organization-insects
6. Reproductive behaviour–mating systems, sexual selection, parental care
7. Biological rhythms–examples–migration of fish, turtle and bird.

IV SEMESTER PAPER-I:
Neurobiology & Animal Behaviour lab Semester End Examination Model paper

29.	Major	12Marks
30.	Minor	10Marks
31.	Behavioral patterns	06Marks
32.	Viva Voce	05Marks
33.	Record	05Marks
34.	Total	38Marks
35.	Lab internal	12Marks

Grand Total 50 Marks

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

PG DEPARTMENT OF ZOOLOGY

IV SEMESTER

PAPER-II: ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes::

Impart knowledge on the basic components of culture media and the conditions required to grow and maintain stem cells and other animal cells in culture and further evolution of cell health, viability and functional properties. Provide an understanding of cancer biology and hybridoma technology and production of different types of vaccines. Impart the knowledge of the basic concepts in stem cells, biology, methods to generate stem cells , maintenance, differentiation and their uses in regenerative..

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of Stem cells
- Understand Hybridoma technology
- Understand the cancer biology
- Know the Clinical applications of stem cell therapy

UNIT–I **15Hrs**

Introduction to cell and tissue culture, Components of cell culture: cell types and cell-lines, different substrates, Preparation of cell-lines: viral and chemical induction; maintenance of cell-lines. Types of culture processes.

Cancer Biology: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor gene s, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

UNIT–II **15 Hrs**

Hybridoma technology: methods of cell fusion, hybrid selection, cloning and invitro & in-vivo methods of hybridoma propagation, production and characterization of monoclonal antibodies and their applications. Vaccines: Conventional, peptide and recombinant vaccines . Production and characterization of recombinant chimeric & multimeric antibodies, immuno-adhesins & immuno-toxins and their uses, Principle of diagnostic kit development.

UNIT– III **15hrs**

The biology of stem cells: Overview; types of stem cells-embryonic stem cells, fetal tissue stem cells, adult stem cells; human & animal cloning. Isolation and propagation of embryonic stem cells. Differentiation of adult stem cells, Stem cell plasticity: self-renewal potential; differentiation versus stem cell renewal; trans differentiation. Yamanaka factors, Induced pleuri-potent stemcells,Ex-vivo-expansion of haemopoetic cells for the production of blood cells and their products.

UNIT– IV **15 Hrs**

Stem cell assays and protocols: Isolation of defined stem cell populations; sources of progenitor cells, cytokine and chemotherapy approaches to mobilization of progenitor cells; flow cytometric techniques.

Clinical applications of stem cell therapy: neuro degenerative diseases, tissue systems failures diabetes, cardio-myopathy, kidney failure, liver failure, hemophilia, lymphoma and leukemic

Malignancies requiring stem cell therapy.

Suggested Reading Material:

1. Cultureofanimalcells;amanualofbasictechnique,5thed.Freshney,R.Ian.Wiley-Liss.
2. HandbookofstemcellsVolume1and2EdsRobertLanzaandothersElsevierAcademicPress.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA
PG DEPARTMENT OF ZOOLOGY
M.ScZoology
IV Semester Model Question
Paper
Paper-II ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY

Time:3hours **Max. Marks:75**

I. Answer ALL questions .
All questions carry equal marks **4X15=60**

Section-A

1.a)What is Cell Culture? Explain in detail about various Components of cell Culture ?

(OR)

b) Explain in detail about virus induced Cancer

2.a)Give an account on the production of monoclonal antibodies and their

applications

(OR)

b)Define Vaccine? Explain in detail about Conventional, peptide and Recombinant Vaccines

3. a)Describe in detail about types of stem cells and their applications

(OR)

b)Write an essay on animal cloning and their types

4.a)Explain in detail about the chemotherapy approaches to mobilization Of progenitor cells

(OR)

b) Discuss about Various Clinical applications involved in tissues systems Failure stem cell therapy

Section-B

II Answer any FIVE of the following **5X3=15**

a) Tumor suppressor genes

b) Metastasis

c) Immuno adhesins & Immunotoxins

d) Induced pluripotent stem cells

e) Yamanaka Factor

f) stem cell plasticity

g) Stem cell assay

h) Flow cytometry techniques

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA

PG DEPARTMENT OF ZOOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time:3Hrs **MaxMarks:75**

UNIT NO.	ESSAY QUE STIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Questions	**08** **Of which 4 To be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice. Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

IV SEMESTER
PRACTICALS

PAPER-II:
ANIMAL CELL CULTURE & STEM CELL TECHNOLOGY LAB

1. Preparation of animal cell culture media
2. Preparation of single cell suspension from spleen and thymus
3. Viable cell counting.
4. Primary culture demonstration
5. Sub-culture preparations
6. Cell preparation for storage.
7. Cell preparation for feeding

IV SEMESTER
PAPER-II:
Animal cell culture & Stem cell Technology lab Semester end examination Model paper

1.	Major Experiment	12Marks
2.	Minor Experiment	10 Marks
3.	Cell preparation	06Marks
4.	Viva Voce	05Marks
5.	Record	05Marks
6.	Total	38Marks
7.	Lab internal	12Marks

Grand Total 50 Marks

IVSEMESTER

PAPER-III:AQUACULTURE

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes:

This course gives the knowledge required for both academic and professional work. It gives the necessary principles of aquaculture i.e. construction, management and operational facilities. The knowledge areas includes design and construction of necessary physical infrastructural facilities, the systems and types of aquaculture, species of cultivable Importance and their culture practices, role and Importance of nutrition and water quality management and impact of aquaculture on the environment, social economic aspects. The practical aspects fulfil the necessary basic technical skills like analysis of water quality, aqua feed, identification of important culture species, visits of fish farms and hatcheries. The student is ready for employability, also can take-up entrepreneurship or identify the local and global challenges in aquaculture and take up research career.

After completing of this course the students will get an opportunity to work in aquaculture industries as hatchery managers and techniques, moreover they can start aqua hubs on their own.

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of Aquaculture
- Understand fish seed resources
- Identify different cultivable fish resources.
- Generalize hatchery management
- Differentiate different types of culture practices

EXTRA CURRICULAR ACTIVITTY

Field visit to shrimp farm/hatchery.

UNIT–I **15Hrs**

Aquaculture- History, General Principles. Types of culture systems and economics of different kinds of aquaculture and productivity of culture ponds. Biological characteristics of aquaculture species. Fish seed Resources and Transportation - Fish seed technology – natural collection, bundh breeding, induced breeding, cryo-preservation of gametes. Transport of finfish and shellfish- transport of eggs, fry, fingerlings and adults. Induced breeding. Fish hatchery.

UNIT–II **15Hrs**

Construction of fish fresh water & brackish water farms. Pond preparation- and management.- Pre-stocking and post stocking. Integrated fish farming. Indian Major carp culture, cat fishes, murrels and prawn culture. Ornamental fish culture Handling and Principles of fish Processing and Preservation

UNIT–III

Principles of fish nutrition- nutritional requirements of commercially important finfish and shellfish, feed types, feeding techniques and Feed management, role of probiotics in nutrition.
Shell fish hatchery construction and management. Role of genetics in aquaculture– gynogenesis, androgenesis, tri-ploidy, tetra-ploidy, hybridization, sex reversal and breeding, production of transgenic fish, impact of GMOs on aquatic biodiversity Chanos chanos. Lates calcarifer. Litopenaeus vannamei.

UNIT–IV **15Hrs**

Water quality management in aquaculture. Overview of fish diseases in fish and shell fish culture- common fish pathogens, routes of pathogen entry in fish, methods of colonization and spread of pathogens, immune - evasion mechanisms of fish pathogens. General principles of Molluscan culture. Pearl Oyster culture. Seaweeds culture. Environmental impact of aquaculture- aquacultural wastes and future developments in waste minimization, environmental consequences of hyper-nutrification

Suggested Reading Material:

1. Pillay,T.V.R.1990.Aquaculture–PrinciplesandPractices.FishingNewsBooksSurvey,U.K.
2. Jhingran,V.G.1993.FishandfisheriesofIndia.HindustanPublishingCorporation(India), NewDelhi.
3. RavishankarPiska,1999.FisheriesandAquaculture.LahariPublications,Hyderabad.
4. Santanam,R.,Ramanathan,N.andJegatheesan,G.1990.CoastalAquacultureinIndia.CBSPublishers&Distributors,Delhi.
5. Bardach,J.E.,Ryther,J.H.andMcLarney, W.O. 1972.Aquaculture.JohnWiley&SonsInc.,USA.
6. Ghosh,S..,Palanisamy, K.andPathak,S.C.1994.ShrimpandFreshwaterHatcheryPublicRelationsDivision,NationalBankforAgricultureandRuralDevelopment,Bombay.
7. Fishponds in Farming Systems, Zijpp, V. D., Verreth, J. A. J., Tri, L. Q., van Mensvoort, M. E.F.,Bosma,R.H.,andBeveridge,M.C.M.,WageningenAcademicPublishers,Netherlands
8. AquacultureandFisheriesBiotechnologyGeneticApproaches,Dunham, R.A.,CABIPublishing,USA

IV Semester Model Question Paper
Paper-III Aquaculture

Time:3hours **Max.Marks:75**

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Explain the criteria involved for the construction of fish farms.
(OR)
b) Write about the preparation and management of different types of ponds in fish farms

2. a)What are the different fish seed resources? Add a note on their transportation.
(OR)
b) Discuss about carp culture

3. a)Discuss about fish nutrition
(OR)
b) Explain crab culture.

4. a)Discuss about the shrimp hatchery construction and its management
(OR)
b) Explain the water quality management in brackish water farms

Section-B

II Answer any FIVE of the following: **5X3=15**

a) Biological criteria for selection of aquaculture species.
b) Integrated fish farming.
c) Milkfish culture.
d) Feed management.
e) Pearl oyster culture.
f) Preparation and management of nursery ponds.
g) Composite Fish Culture.
h) Cage culture and pen culture.

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Time:3Hrs **MaxMarks:75**

UNIT NO.	**ESSAY QUESTIONS** **15 MARKS**	**SHORT ANSWER QUESTIONS** **3 MARKS**	**MARKS ALLOTED TO THE UNIT**
UNIT– I	02	02	36
UNIT– II	02	02	36
UNIT–III	02	02	36
UNIT– IV	02	02	36
Total No. of Quest ions	**08** **Of which 4 to be answered**	**08** **Of which 5 to be answered**	**144** **Marks including choice.** **Of which 75 Marks to be answered**

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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IV SEMESTER PRACTICALS
PAPER-III: AQUACULTURE

1. Spotters: cultivable species of finfish, shellfish and ornamental based on the theory
2. Analysis of water : Turbidity ,pH, Dissolved oxygen, Alkalinity etc.
3. Primary productivity, Estimation by Light and Dark bottle method
4. Dissecting out the pituitary gland and preparing the extract
5. Identification of types of feeds
6. Feed analysis-Bio-chemical constituents
7. Visits to aquaculture farms, finfish and shellfish hatcheries

PAPER-III: Aquaculture lab Semester End Examination Model Paper

8.	Major Experiment	12Marks
9.	Minor Experiment	10Marks
10.	Spotters4*3	06Marks
11.	Viva Voce	05Marks
12.	Record	05Marks
13.	Total	38Marks
14.	Lab internal	12Marks

Grand Total 50Marks

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KAKI NADA

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IV SEMESTER

PAPER-IV: ANIMAL BIO-TECHNOLOGY & BIO-ETHICS

Teaching hours per week	Credits	Internal Marks	External marks	Maximum marks
4	4	25	75	100

Course outcomes :

The course on animal biotechnology includes various topics like recombinant DNA technology: restriction endonucleases, restriction maps, cloning vectors which are important to work in laboratories design and preparation of DNA and RNA probes for hybridization, southern and northern blotting, DNA sequencing provides information about the diseases and therapy. Bar coding in animals helps in classification of animals. The knowledge in good practices, good manufacturing practices, laboratory accreditation enables students to get placed in research laboratories. The students will know about the socioeconomic and legal levels of containment that are required to carry out research work and apply patents etc and grab the employment in the field of biomedical, pharmacy , medicine, clinical research .

After completing this course the students can get jobs in animal husbandry, poultry sector, dairy industries as research associates, senior research fellows, junior research fellows, project assistant in institute like National Dairy Research Institute (NDRI) and National Institute Of Animal Biotechnology (NIAB).

Learning outcomes:

By the completion of this course student can able to

- Get knowledge on basics concepts of principles of biotechnology.
- Understand recombinant DNA technology.
- Application of PCR in biotechnology and genetic engineering.
- EMPLOYIBILILY OPPURTUNITY IN LABS.

UNIT–I **15Hrs**

Introduction to Animal Biotechnology, Recombinant DNA technology: Restriction endonucleases, Restriction maps, isolation of gene fragments using restriction endonucleasesandmechanicalshearing;Cloningvectors-Isolationandpropertiesofplasmids, bacterio-phage cosmids, Ti plasmid (binary vector), expression vectors, viral vectors, YAC, BAC, phagemids and vectors used for cloning in mammalian cells, Hosts - Prokaryotic: E.coli, B.subtilis, Eukaryotic: Yeast and mammalian cell lines; Ligation of fragments

UNIT–II **15Hrs**

Gene transfer techniques: Biological and artificial delivery system, Cloning strategies, shot gun experiments, isolation of poly mRNA, synthesis of cDNA, cDNA cloning in bacteria; Genomic and cDNA libraries, Identification of recombinants - structural and functional analysis of recombinants; Design and preparation of DNA and RNA probes for hybridization, Southern and Northern blotting

UNIT–III **15Hrs**

DNA sequencing methods: Maxam and Gilbert's chemical and Sanger's chain termination methods, auto-mated DNA sequencing, Base calling and sequencing accuracy. Introduction to

next generation sequencing(NGS).DNA finger printing.
PCR amplification and diagnosis-Applications in forensic medicine. Genetic diseases.
Gene therapy-Types and use of rDNA constructs for gene therapy.

UNIT–IV **15Hrs**

Bioethics: Introduction–causes of unethical acts, ignorance of laws, policies and procedures, recognition, friendship, personal gains. Professional ethics – professional conduct. Ethical decision making, ethical dilemmas. Teaching ethical values to scientists, good laboratory practices, good manufacturing practices, laboratory accreditation.
Socio-economic and legal impacts of biotechnology, national and international guidelines, experimental protocols approval, levels of containment. IPP,IPR

Suggested Reading Material:

1. Principles of Gene manipulation: An Introduction to genetic Engineering. R.V.Old and S.B.Primrose(Blackwell Scientific Publications).
2. Biotechnology by B.D.Singh (Kalyani).
3. MolecularBiologyandBiotechnologybyMeyers,RA,AcomprehensiveDeskreference(VCHPublishers).
4. BiotechnologybyU.Satyanarayana(Books&Allied(P)Ltd).
5. BioethicsandBiosafetyinBiotechnologybyV. SreeKrishna, NewAgeInternational

IV Semester Model Question Paper
Paper-IVANIMAL BIO-TECHNOLOGY&BIO-ETHICS

Time: 3hours

Max.Marks:75

I. Answer ALL questions.
All questions carry equal marks **4X15=60**

Section-A

1. a)Write about the tools used in rDNA technology with examples
(OR)
b) Describe different types of vectors used for cloning in mammalian cells

2. a) What is gene transfer? Write the mechanism of gene delivery systems
(OR)
b) What is hybridization? Explain the design and preparation of probes used for hybridization.

3. a) Enumerate the methods of DNA sequencing and add a note on next generation sequencing.
(OR)
b) Discuss the role of DNA finger printing in forensic science

4. a)Define bio-ethics. Discuss the need to follow the policies and laws in scientific field.

(OR)
b) Write an account on good laboratory practices.

Section-B

II. Answer any FIVE of the following **5X3=15**

a) Mechanical shearing.

b) cDNA library

c) Automated DNA sequencing.

d) Un-ethical acts.

e) Ti-plasmid.

f) Northern blotting)Gene therapy.

h)Laboratory accreditation

BLUE PRINT FOR QUESTION PAPER SETTER

MaxMarks:75 **Time:3Hrs**

UNIT NO.	ESSAY QUESTIONS 15 MARKS	SHORT ANSWER QUESTIONS 3 MARKS	MARKS ALLOTED TO THE UNIT
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IV SEMESTER PRACTICALS

PAPER-IV:ANIMAL BIOTECHNOLOGY &BIO-ETHICS

1. Isolation of genomic DNA
2. Agarose gel electrophoresis of genomic DNA.
3. Purification of bovine serum IgG by ammonium sulphate precipitation
4. Western Blotting of proteins.
5. Southern Blotting(Demonstration)
6. PCR diagnosis of white spot syndrome virus, monodon-baculo virus, haemoto-poetic necrosis virus-Demonstration
7. Intellectual property and India: comprehensive-filing patents, Trademarks.
8. Online patent search.
9. Online patent register and application status.
10. WIPO online data base search

PAPER IV: Semester End examination Model paper
Animal Biotechnology and Bio-ethics Lab:

1.	Major Experiment :	12Marks
2.	Minor Experiment	10Marks
3.	Explanation of the Principle of Experiment	06 Marks
4.	Viva Voce	05Marks
5.	Record	05Marks
6.	Total	38Marks

Lab internal Marks 12Marks

Grand Total **50Marks**

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Particulars of changes in the syllabus

S.NO	Existing title of the paper	Syllabus Inco-operated
1	**Paper – III** **Aquaculture** **Unit–II**	Handling and Principles of fish Processing and Preservation

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PROJECT- COMPREHENSIVEVIVA-VOICE

Summer vacation project

1. **Duration of the project–3 months**

   2months–fieldwork

   1month–Project preparation and drafting

2. **External valuation**

3. **Total marks - 100M**