

PITHAPUR RAJAH'S GOVT COLLEGE (A),
KAKINADA

(Re- Accredited by NAAC with A Grade)
Kakinada, AP – 533002

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES

B.Sc. (Honours) ZOOLOGY (Single Major System)

2024-2025



CHOICE BASED CREDIT SYSTEM

Convened on 01-05-2024

B.Sc. Honours - ZOOLOGY
(Single Major)
2024-2025

**DEPARTMENT OF COLLEGIATE EDUCATION GOVERNMENT OF
ANDHRA PRADESH**

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

Rc.No.1/ A.C/BOS/2023-24

Dt.29 Aug 2023

Sub: P.R.G.C[A] – Academic Cell - **Conduct of BOS Meetings for the Academic Year 2023-24**

– Guidelines issued - Regarding.

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

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

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

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

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

Besides, the students shall have social consciousness, regard for constitutional provisions, right perspective on

environmental protection, awareness on gender equity, health and hygiene, Yoga and wellness, college social responsibility, culture, and values, etc., to mention a few.

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

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

ORDER:

In the light of the above mandate and responsibilities prescribed by institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, need to customize, design and re-orient their academic

and research administration in tune with the policies of above bodies, our institution is no exception

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

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

The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2023-24 both for U.G and P.G courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
 - Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula 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, resource utilization by staff and students, etc.,
 - Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.
 - All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.
 - The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate (hard copies) to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the completion of BOS meeting and besides hosting the soft copy in the college website within the period stipulated.
 - Each Chairman of BOS, shall get the rough draft of the curricula verified and approved by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity and commensurate with the stated vision and mission of the college among the departments.
 - The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.
 - The Academic Coordinator and IQAC coordinator conducted a meeting with the Chairmen, BOS on 28 August 2023 and explain the structure of curricula, uniformity other modalities.
 - The Controller of Examinations of the institution shall fund the BOS meetings from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially, he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course (If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.500/-
-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III)

Following contents shall be presented in the BOS document in order

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

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

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

S. No	Subject	Semester	Title of the Course (Paper)	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation)	Experiential learning component	Scope (Skill/ employability/ entrepreneurship)
1	Zoology	I	Introduction to Classical Biology	Animal cell	Knowledge	Shall be shown Microscope	

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

CIA structure for Single Major system

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

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

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



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

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

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M
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CIA structure for 3 Major system

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


Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M
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CIA structure for 3 Major system for Honors programs (2020-21AB)

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

Assignment- 10M	Seminar- 5M	Quiz -5M
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1. Percentage of syllabus changes in each paper
2. Measure outcome attainment learning levels of students through direct and indirect methodology and mapping COs and POs
3. Text & Reference Books
4. e-content links.



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

PRINCIPAL

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

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

R.C.No.12A/A.C./BOS/2024-2025,Dated:29.05.2024.

SUB: P.R. Government College (A), Kakinada- UG Boards of studies (BOS)-Program/Course-B.Sc../ Zoology, Nomination of numbers—Orders issued

REF: 1.UGC Guidelines for Autonomous colleges-2018.

ORDER:The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG Boards of Studies in Zoology for framing the syllabi in **Zoology** subject for the all semesters duly following the norms of the UGC Autonomous guidelines.

S.No	Name of the Nominee	Designation
1	Sri. B. Chakravarthi	Chairman & Lecturer In charge, Department of zoology & Aqaculture
2	Dr. M. Tejo Murthy	University Nominee, PVKN Govt. College(A), chittor.
3.	Dr. P. Ramaneswari	Subject Expert: I, Department of zoology ,Dean Research Cell, Adikavi nannaya University, Rajamahendravaram
4.	Smt. M. Vasantha Lakshmi	Subject Expert: II, Lecturer In charge Department of zoology, ASD Govt. college (A), kakinada
5.	Dr. P.Rama Mohan Rao	Representative from Industry, Aqua Industry Consultant
8.	Dr. P. Kiran Kumar	Member
9.	Dr. B. Elia	Member
10	Sri.T.Venkateswara Rao	Member
11.	Y. Gowthami	Member
12.	P.Vijaya Chandrika	Member
13	B. Devi	Member
15.	T. Sushma	Member
16.	M. Sowmya	Member
17	R.Sunitha	Member
18	D.R. Manjula	Member
19	O.V. Yellari	Member
20.	V.Lakshmi narasamma	Alumni Student Member B.Sc B.Z.C
21.	R.Sahithi	Student Member I B.Sc B.Z.C

The above members are requested to attend the BoS meeting on - 05 -2024 and share their valuable reviews,and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders andNational 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.
- Coordinate research, teaching, extension and other activities in the Department of the college.


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KAKINADA

New Pattern
2023-2024 Admitted Batch onwards
Single major System

B.Sc (Honours) with Single Major																								
Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr) <i>Lang</i>			Multi Disny' (2 Cr)			Skill Enhanceme nt Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total		
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr
Sem 1	2*	10	8				2	8	6	1	2	2	2	6	4							7	26	20
Sem 2	2	10	8	1	3+2	4	2	8	6				2	6	4							7	29	22
Community Service Project of 180 hours with 4 Credits.																								
Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																								
Sem 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24
Sem 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits.																								
Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																								
Sem 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26
Sem 6	Semester Internship/Apprenticeship/OJT with 12 Credits.																							
Student is eligible for Exit Option-3 with the award of Degree in respetive major																								
IKS#																								
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
Sem 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0	47		160
20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship																								
C Courses H Hours Cr Credits OOTC Open Online Transdisciplinary																								
IKS# Indian Knowledge Systems - Audit Course																								

Old Pattern V Semester
PITHAPURRAJAH'S GOVERNMENT COLLEGE(A) KAKINADA
DEPARTMENT OF ZOOLOGY
BOARD OF STUDIES MEETING 202425
CHOICE BASED CREDIT SYSTEM
(2022-23 admitted batch onwards)

YEAR	SEM	PAPER	TITLE	MARKS (100)		CREDITS
				MID	END	
I	I		Animal Diversity-I Biology of Non- Chordates	50	50	04
			Practical-I		50	01
	II		Animal Diversity-II Biology of Chordates	50	50	04
			Practical-II		50	01
II	III	III	Cell biology, Genetics, Molecular Biology & Evolution	50	50	04
			Practical-III		50	01
	IV		Physiology, Cellular Metabolism & Embryology	50	50	04
			Practical-IV		50	01
			Immunology & Animal Biotechnology	50	50	04
			Practical-V		50	01
			Sustainable Aquaculture Management	60	40	04
			Practical		50	01
III	V	6A	Post- Harvest Technology of Fish and Fisheries	60	40	04
			Practical		50	01
	VI	7A	Apprenticeship		50	01



ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Programme: B.Sc. Honours in Zoology (Major)

w.e.f. AY 2023-24

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Introduction to Classical Biology	3+2	4
	I	2	Introduction to Applied Biology	3+2	4
	II	3	Animal Diversity-I Biology of Non-Chordates	3	3
			Animal Diversity-I Biology of Non-Chordates Practical Course	2	1
	II	4	Cell and Molecular Biology	3	3
			Cell and Molecular Biology Practical Course	2	1
II	III	5	Animal Diversity-II Biology of Chordates	3	3
			Animal Diversity-II Biology of Chordates Practical Course	2	1
		6	Principles of Genetics	3	3
			Principles of Genetics Practical Course	2	1
		7	Animal Biotechnology	3	3
			Animal Biotechnology Practical Course	2	1
	8	Evolution and Zoogeography	3	3	
		Evolution and Zoogeography Practical course	2	1	
	IV	9	Embryology	3	3
			Embryology Practical Course	2	1
		10	Animal Physiology: Life Sustaining Systems	3	3
			Animal Physiology: Life Sustaining Systems Practical Course	2	1
		11	Immunology	3	3
			Immunology Practical Course	2	1

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits		
III	V	12	Poultry Management-I (Poultry Farming)	3	3		
			Poultry Management-I (Poultry Farming) Practical Course	2	1		
		13	Poultry Management-II (Poultry Production and Management)	3	3		
			Poultry Management-II (Poultry Production and Management) Practical Course	2	1		
		14 A	Sustainable Aquaculture Management	3	3		
			Sustainable Aquaculture Management Practical Course	2	1		
		OR					
		14 B	Live Stock Management- I (Biology of Dairy Animals)	3	3		
			Live Stock Management- I (Biology of Dairy Animals) Practical Course	2	1		
		15 A	Post-Harvest Technology of Fish and Fisheries	3	3		
			Post-Harvest Technology of Fish and Fisheries Practical Course	2	1		
		OR					
		15 B	Live Stock Management-II (Dairy Production and Management)	3	3		
			Live Stock Management-II (Dairy Production and Management) Practical Course	2	1		
	VI	Internship					
	VII	Courses will be available in due course of time					
	VIII	Courses will be available in due course of time					

AGENDA FOR BOARD OF STUDIES MEETING -2024-2025

1. Approval of Single major system for UG B.Sc. Hounours (Zoology) SEM I , II, III & IV
2. Approval of Syllabus for all the Semesters and implementation of Choice Based Credit System
3. Model question papers, Blue Print Panel of paper setters and examiners.
4. Methodologies of Teaching – Learning and Evaluation.
5. Implementation of newly introduced Skill Enhancement Courses (SEC's) in Zoology & Aquaculture Technology by APSICHE through affiliating University for the fifth semester and select one pair of courses based on the choice of majority of the stakeholders.
6. Action plan 2024-2025
7. Conduct of guest lectures, field visits, assigning of project works etc.
8. Additional inputs and changes in the curriculum.
9. Continuation of Certificate course entitled Certificate Course on Biodiversity and Conservation Biology
10. Implementation of Community Service Project and Internship and apprenticeship Programmes introduced from 2020-2021 admitted batch.
11. Continuous Internal Assessment pattern (CIA) introduced by APCCE
12. Designing and conduct of workshops and seminars
13. Arrangement of skill development, training programmes and MOUs.
15. Conduct of Bridge Course and Remedial Coaching.
16. 75% attendance compulsory for Mid and Sem End Exams.
17. Course outcome Assessment manual as per UGC norms and Blooms taxonomy

18. Approval of new courses introduced in the academic year 2023-24

19. Any other proposal with the permission of the Chair.

Discussion:

The members of BOS have discussed all the points of Agenda extensively and approved with following suggestions which are incorporated in the resolutions.

Dr. B.V. Tirupanyam, Principal has suggested to start consultancy services to generate funds at the Department level and advised to construct a model fish tank or aquarium to have experiential learning by students.

Dr. P. Ram Mohan Rao has suggested to trim the syllabus where ever possible as the syllabus particularly for HOC and SECs is very vast and advised faculty to tie up with industries and central institutes in and around Kakinada.

Smt. M. Vasantha Lakshmi has suggested to conduct Internships subject related if possible

Sri. M. Phaneendra has suggested to choose courses like poultry and ornamental fishery if possible

PITHAPUR RAJAH'S GOVT COLLEGE (A), KAKINADA

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES MEETING (2024-25) CONVENED ON 1ST May 2024

Resolutions

The members, Board of Studies, Zoology met through online and offline on **1ST May 2024** at 11.00 AM to discuss the agenda points and to approve the course structure, Theory and Practical syllabus, Blue Print, Model question papers, Additional inputs in the Curriculum, Study Projects, Co-curricular and extracurricular activities of Department, Skill Development Courses and Certificate Course offered by the Department, Internship programmes, Continuous Internal Assessment pattern (CIA) and Semester End examination Pattern.

The following resolutions are made.

Resolution-1

1. It is resolved to adapt Single major system for UG B.Sc Honours **Zoology** from the academic year 2023-24 as per the Guidelines of APSHE.
2. It is resolved to follow the syllabus as well as Choice Based Credit System introduced by UGC/APSHE through Adikavi Nannaya University, Rajamahendravaram for I, II-III- & IV-Year students from the academic year 2023-24.

Resolution-2

Resolved to approve the panel of Examiners and Question paper setters, Model papers and blue print for all Semesters

Resolution-3

Resolved to implement 50 % external and 50% internal marks for theory from the academic year 2021-22, 2023-2024 admitted batches, and 60% - 40 % for 2020-2021 admitted batch as mentioned below.

Internal Assessment 50 M							Ext'l Assessment
I Mid	II Mid	Project	Viva	Seminar	Assignment	Clean & Green	50M (2023 admitted Batch)
25M	25M	10	03	05	05	02	
I Mid	II Mid	Project	Seminar	Assignment etc,	Total		50 M (2021 admitted batch)
25M	25 M	10M	5M	10M	50M		
25M	25M		5M	10M	40M		60 M (2020 admitted batch)

Resolution-4

Resolved to split 50 marks of theory internal as 25 marks for mid exams and 10 marks for project 3 marks for viva, 5 marks for assignment, 2 marks for clean and green activity.

Resolution-5

It is resolved to adopt newly introduced Skill Enhancement Courses (SEC's) in Zoology for the academic year 2022-2023 by APSCHE through affiliating University. It is also resolved to choose first pair consisting of 6A & 7A from Skill Enhancement Courses (SEC's) for V Semester for the academic year 2022-2023 as detailed below.

6A	Sustainable Aquaculture Management
	Sustainable Aquaculture Management Lab
7A	Post-Harvest Technology of Fish and Fisheries
	Postharvest Technology of Fish and Fisheries Lab

Resolution-6

Resolved to implement the Action plan proposed for the Academic year 2024-2025

Resolution VI:

Resolved to introduce SDC/ LSC as prescribed by the APSCHE. Department of Zoology anchoring the Environmental Science, Poultry farming and Health and Hygiene in the semesters applicable

Resolution-7

Resolved to offer choice-based Skill Development Courses by Department of Zoology entitled Health and Hygiene as SD course in III Semester as prescribed by APSCHE / AKNU and CCE

Resolution-8

It is resolved to follow the existing Syllabus prescribed by APSCHE & Adikavi Nannaya University for 2022-23 admitted batche for IV & V semesters with the following additional inputs and changes in the curriculum within the frame work of Autonomy.

Resolution-9

It is resolved to offer a Certificate Course entitled **Water Quality Assessment** for II & III Year students. Also resolved to conduct a certificate course in Biodiversity and conservation Biology in the academic year 2024-25.

Resolution-10

Resolved to implement the SOP given by APSCHE through Adikavi Nannaya University regarding I Phase of Internship (Community Service Project) between 1st and 2nd year, II Phase of Internship between 2nd and 3rd year and III phase of internship during entire 6th Semester from 2020-2021 admitted batch onwards.

Resolved to approve assessment process for I, II and III Internships in following manner.

First internship (Community Service Project) will be taken up after the I year II semester end examinations or the summer vacation in the intervening 1st and 2nd years of study. The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightage shall be:

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

Second Internship shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years or after the II-year IV semester end examinations. There will be only internal evaluation for this internship. The assessment is to be conducted for 100 marks and the credits assigned are 4. The marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightage shall be:

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

Third internship shall be for the entire 5th/6th Semester, the student shall undergo **Apprenticeship / Internship / On the Job Training**. The assessment for the V / VI Semester long apprenticeship is for **200 marks and credits assigned are 12**. The assessment for this internship / on the job training will be both internal and external assessment. The internal assessment will be for 25% of marks which will be continuous and the assessment by the industry / enterprise / organization where the student does his/her internship will be indicated in grades. The Project Presentation is to be made by the student after he/she reports back to the College. Grading given by the Company / Business unit / Enterprise where the student has undergone the training and these grades shall be converted into marks on the scale followed by the University.

The weightage shall be:

Internal Assessment Component	Max. Marks	Marks Awarded
Project Log	10	
Project Implementation	20	
Project Report	10	
Presentation	10	
TOTAL	50	
External Assessment Component	Max. Marks	Marks Awarded

Performance Assessment by the Evaluation Committee, converting the grades awarded by the industry, enterprise, etc	100	
External Viva Voce	50	
Total	150	
Grand Total	200	

Resolution-11

It is resolved to implement 100% external assessment for Skill Development Courses and 100% internal assessment for Certificate Course and resolved to follow the standard operating procedures given by APSICHE through Adikavi Nannaya University for the evaluation of CSP/Short term Internship/ Apprenticeship (Annexure II)

Resolution-12

Resolved to arrange Bridge Course for the newly admitted students and remedial classes for slow learners/ Extracurricular/Co-Curricular activities has to be conducted in the 7th hour as instructed by CCE

Resolution-13

It is resolved to make 75% of attendance compulsory for all the students to appear for MID and Sem End exams

Resolution-14

It is resolved to conduct Co- curricular activities like Student Seminars, quiz programmes, elocution, debate, Group discussion, Extension Activities, Study Projects and field trips and to encourage experiential learning and student participation in extracurricular activities of the college.

Resolution-15

Resolved to conduct Student and Staff Exchange Programmes with ASD Government College for Women(A), Kakinada, GDC Ravulapalem, GDC Vidavaluru, Silver jubilee Government College, Kurnool as a part of fulfilling the norms of MoU.

Resolution-15

It is resolved to take Feedback on Curriculum design and development from Students, Alumni, Teachers, Parents, and industry at the end of the semester.

Resolution-16

Resolved to calculate outcome attainment as per the manual of UGC (Annexure I) and Blooms taxonomy and also resolved to approve action plan for 2023-24 AY.

Resolution-17

Resolved that the chairman, BOS is authorized to take up necessary amendments, changes, additions, and others as and when required as per the instructions of the University, APSCHE and other exigencies in consultation with the controller of examinations if necessary.

Resolution-18

It is resolved to introduce the following new courses in—B.Sc. (Honours) Zoology, from the AY 2024-25 as per the curriculum given by APSCHE for III and IV semesters

S.No	CourseCode	Title of the new course	Programmes in which it is introduced
1	ZICB23	Introduction to Classical Biology	B.Sc. (Honours) Zoology/SEMI
2	ZIAB23	Introduction to Applied Biology	B.Sc. (Honours) Zoology/ SEMI
3	ZPBS23	Principles Of Biological Sciences (MDC)	B.A/B.Com/(Honours)SEMI
4	ZBNC23	Animal Diversity-I Biology of Non-Chordates	B.Sc. (Honours) Zoology/ SEMII
5	ZCMB23	Cell and Molecular Biology	B.Sc. (Honours) Zoology/ SEMII
6			
7			

P.R. GOVT COLEGE (A), KAKINADA
ACTION PLAN 2024-25


DEPARTMENT OF ZOOLOGY & AQUACULTURE

July- 2024	Guest lectures to be organized by all Regular faculty Field Trip to B. Voc students	3 rd week of July 2024 4 th week of July	
August- 2024	National Conference I Bridge course to I Sem students I Student seminars BOS for newly introduced Zoology Single major and Honors programme	4 th August 2024 2 nd week of August 3 rd week of Aug-2024 4 th week of Aug-2024	
September 2024	Student Seminars	Ist week of September	
	Training to B.Voc students at SIFT, Kakinada	3 rd Week of September	
	Field trip	4 th Week of September	
October 2024	Wild Life week celebrations Certificate course on Biodiversity and conservation Biology	First week of October October 2024	
November 2024	1. Extension activity in Rural high Schools 2. Guest Lecture by Fisheries experts	3 rd Week of November 4 th Week of November	
December 2024	HIV-AIDS awareness programme	1 st week of December 2024	

		Field visits, Industrial visits One day workshop for students in laboratory specimen examination and preservation tech.	2 rd week of December	
January 2025				
	Hands-on training to B.Voc students at CIFE, Kakinada	2 nd week of Jan-2025		
	Field Visit to III-year BZC students	Third week of Jan-2025		
February 2025	Work shop on Hematological Techniques National Science Day	4 th week of February 2025 28 th February		
March 2025	Practical exams Student Projects for Final year students.	1-13 March 3 rd week of March		

Tentative Budget Estimate for 2024-2025

1. Field trips	-	Rs.50,000
2. Guest lectures	-	Rs.10,000
3. Internships Programmes for CZAC & B Voc		Rs.75,000
4. National Seminar	-	Rs. 1,25,000
5. Purchase of Consumable items for Practicals	-	Rs. 50,000
6. BOS Meetings	-	Rs. 30,000
Total		Rs. 3,40,000

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-I			
Course Code	TITLE OF THE COURSE COURSE 1: INTRODUCTION TO CLASSICAL BIOLOGY				
Teaching	Hours Allocated: 60 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	5	1	-	3

Course Objectives:

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

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	1. Learn the principles of classification and preservation of biodiversity
CO2	2. Understand the plant anatomical, physiological and reproductive processes.
CO3	3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
CO4	4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
CO5	5. Comprehend the chemical principles in shaping and driving the macromolecules and life processes.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus

Unit 1: Introduction to systematics, taxonomy and ecology.

- 1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.
- 1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.
- 1.3. Ecology – Concept of ecosystem, Biodiversity, and conservation.
- 1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

- 2.1. The classification of plant kingdom.
- 2.2. Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
- 2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
- 2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

- 3.1. The classification of Kingdom Animalia and Chordata.
- 3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders
- 3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)
- 3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Activities:

- Visit to Zoology Lab and observe different types of preservation of specimens
- List out different hormonal, genetic and physiological disorders from the society

Unit 4: Cell biology, Genetics and Evolution

- 4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.
- 4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.
- 4.3. Central Dogma of Molecular Biology.
- 4.4. Origin of life

Activities:

- Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell.
- Hands-on experience of various equipment – Microscopes
- Visit to Zoo / Sericulture / Apiculture / Aquaculture unit

Unit 5: Essentials of chemistry

- 5.1. Definition and scope of chemistry, applications of chemistry in daily life.
- 5.2. Branches of chemistry
- 5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogen bond
- 5.4. Green chemistry

ADDITIONAL INPUTS:

1. Scope of Biology - For better understanding of importance of Biology in other sciences.
2. Branches of Biology - For systematic study of living things.

3. Microscopy

4. Slide preparation

5. Specimen Collection

1. Reference books:

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

Web Links:

1. <https://www.ignfa.gov.in/document/biodiversity-cell-ntfp-related-issues4.pdf>.
2. <https://www.fao.org/3/cb5353en/cb5353en.pdf>
3. [https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Introductory_Biology_\(CK-12\)/04%3A_Molecular_Biology/4.01%3A_Central_Dogma_of_Molecular_Biology](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Introductory_Biology_(CK-12)/04%3A_Molecular_Biology/4.01%3A_Central_Dogma_of_Molecular_Biology)

CO-PO Mapping:

(1: Slight [Low];
Correlation)

2: Moderate[Medium];

3: Substantial[High],

'-' : No

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

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY

I SEMESTER ZOOLOGY - PAPER - I

COURSE I: Introduction to Classical Biology
BLUE PRINT

Time: 2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	1	1
V	2 Out of 6, 3 questions should be answered 3X10=30M	2 Out of 7, 4 questions should be answered 4X5=20M

**COMMON QUESTION PAPER PATTERN TO BE FOLLOWED (From 2021-22AB, 2022-23AB
AND 2023-24AB FOR CORE SUBJECTS)**
**PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA DEPARTMENT
OF ZOOLOGY**
SEMESTER - I
INTRODUCTION TO CLASSICAL BIOLOGY

Time: 2 1/2 Hours

Max Marks: 50M

Section -I

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

Part – A

1. Define Biodiversity. Write methods of conservation of biodiversity.
2. Give an account of Classification of Plant Kingdom
3. Describe any 5 animal Hormones and their functions


Part - B

4. Explain ultrastructure of Eukaryotic cell
5. Write an essay on the scope and applications of Chemistry in daily life
6. Write an essay on apiculture

Section II

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

7. Systematics
8. Pollination
9. Fertilization
10. Sericulture
11. DNA
12. Chemical bonding
13. Green Chemistry

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-I			
Course Code	TITLE OF THE COURSE COURSE 2: INTRODUCTION TO APPLIED BIOLOGY				
Teaching	Hours Allocated: 60 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	3	1	-	3

Course Objectives:

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

On Completion of the course, the students will be able to-

CO1	Learn the history, ultrastructure, diversity and importance of microorganisms.
CO2	Understand the structure and functions of macromolecules.
CO3	Knowledge on biotechnology principles and its applications in food and medicine.
CO4	Outline the techniques, tools and their uses in diagnosis and therapy.
CO5	Demonstrate the bioinformatics and statistical tools in comprehending the complex biological data.

Skill Development		Employability		Entrepreneurship	
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Syllabus Unit 1: Essentials of Microbiology and Immunology

- 1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
- 1.2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi, Archaea and Virus.
- 1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.
- 1.4. Immune system – Immunity, types of immunity, cells, and organs of immune system.

Unit 2: Essentials of Biochemistry

- 2.1. Biomolecules I – Carbohydrates, Lipids.
- 2.2. Biomolecules II – Amino acids & Proteins.

- 2.3. Biomolecules III – Nucleic acids -DNA and RNA.
- 2.4. Basics of Metabolism – Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

- 3.1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
- 3.2. Environmental Biotechnology – Bioremediation and Biofuels, Biofertilizers and Biopesticides.
- 3.3. Genetic engineering – Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.
- 3.4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salt tolerance). Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology – Applications

- 4.1. Applications in forensics – PCR and DNA fingerprinting
- 4.2. Immunological techniques – Immunoblotting and ELISA.
- 4.3. Monoclonal antibodies – Applications in diagnosis and therapy.
- 4.4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

- 5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.
- 5.2. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.
- 5.3. Introduction, Genomics, Proteomics, types of Biological data, biological databases- NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment
- 5.4. **Accessing** Nucleic Acid and Protein databases, NCBI Genome Workbench

ADDITIONAL INPUTS

1. Contribution of Yerrapragada Subba Rao to Microbiology
2. Vaccines
3. Life cell bank - stem cell therapy

ACTIVITIES

1. Identification of given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganism from pond water.
4. Visit to a waste water treatment plant.
5. Retrieving a DNA or protein sequence of a gene'

6. Performing a BLAST analysis for DNA and protein.
7. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.

Reference books:

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

Web Links:

1. <https://microbiologynote.com/dna-fingerprinting-definition-steps-methods-applications/>
2. <https://egyankosh.ac.in/bitstream/123456789/41406/1/Unit-4.pdf>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY

I SEMESTER ZOOLOGY - PAPER - II

COURSE II: Introduction to Applied Biology
BLUE PRINT

Time: 2 1/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	1	1
V	1 Out of 6, 3 questions should be answered 3X10=30M	2 Out of 7, 4 questions should be answered 4X5=20M

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

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

SEMESTER – I

Introduction to Applied Biology

Time: 2 1/2 Hours

Max Marks: 50M

Section -I

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

Part – A

1. Write an essay on applications of microorganisms in food and industry.
2. Describe the classification of carbohydrates.
3. Explain the scope and benefits of environmental biotechnology


Part - B

4. Write an essay on the application of DNA finger printing in forensics
5. Describe the Measures of dispersion
6. Write an essay on transgenic organisms.

Section II

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

7. Edward Jenner
8. Proteins
9. Restriction enzymes
10. PBR 322
11. PCR
12. Genomics
13. Sequence alignment

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-I			
Course Code	TITLE OF THE COURSE Multidisciplinary Courses PRINCIPLES OF BIOLOGICAL SCIENCES				
Teaching	Hours Allocated: 30 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	3	1	-	3

Learning Objectives: By the end of this course the learner can:

1. Acquire logic to evaluate fundamental biological concepts at various levels of biological organisation including the molecular, cellular, organismal and systems levels.
 2. Communicate fundamental biological knowledge between tiers of biological organisation.
 3. Apply common biological principles across all levels of biological organization.

Learning Outcomes: On completion of this course students will be able to:

1. Understand the relationship between structure and function at all levels.
2. Recognise the mechanisms underlying biological evolution, its patterns, and its significance as biology's overarching unifying principle.
3. Understand the contributions of biology to the resolution of medical, ethical, social, and environmental concerns in human affairs.

UNIT-I Diversity of Life

- 1.1 Introduction to Biology, Branches of Biology, Basic Principles of Biology
- 1.2 Biological Classification-Two kingdom and Five kingdom classification, Viruses, Viroid's and Lichens
- 1.3 Diversity in the living world, Taxonomic categories, Taxonomic aids
- 1.4 Plant organization-The form, structure and function of plant vegetative and reproductive organs, Classification of Plant Kingdom,
- 1.5 Basis of Animal Classification, Classification of Animal Kingdom

UNIT-II Biomolecules and metabolism

- 2.1 Ultra structure of cell and Cell organelles (Structure and Functions), Plant cell vs Animal cell
- 2.2 Plant Physiology: Photosynthesis, Respiration, Transportation, Mechanisms of

Nitrogenfixation.

- 2.3 Plant growth and development, physiology of flowering.
- 2.4 Human Physiology: Digestion, Respiration, Circulation
- 2.5 Male and female reproductive organs, gametogenesis, fertilization.

UNIT-III Principles of Biology

- 3.1 Genetics: Mendel's laws of inheritance, Genetic disorders- Colour blindness, Sickle cellanaemia.
- 3.2 Evolution: Geological time scale for evolution of plants and vertebrates, Origin andevolution of plants and man
- 3.3 Common Human Diseases: causing organism, prevention and treatment- malaria, dengue,AIDS, cancer, corona.
- 3.4 Common Plant Diseases: causing organism, prevention and treatment- Black spot, Leafspots, Powdery mildew, Blight, Canker.
- 3.5 Biotechnology: Tools and process of recombinant DNA technology, Applications ofbiotechnology in agriculture, food industry, medicine and transgenic animals.

Text Books

1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi.
2. Kotpal, R.L.2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).
3. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolutionand Ecology. S. Chand publishers, New Delhi, India.

Reference Books

1. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New AgeInternational Publ. New Delhi, India.
2. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age InternationalPublishers.

BLUE PRINT

MODULE	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	02	02	30
MODULE – III	02	03	35
Total no.of Questions	05 Of which 3 to be answered	07 Of which 4 to be answered	85 marks including choice Of which 50 marks to be answered

PITAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA
MULTI DISCIPLINARY COURSE SEM I
PRINCIPLES OF BIOLOGICAL SCIENCES MODEL PAPER
SECTION- A

Time:2hrs.

Max.Marks:50

Answer any THREE of the following questions

3X10=30

1. Write an overview on five kingdom classification?
2. Discuss the ultrastructure of a cell and the functions of cell organelles. Compare the structure of plant cells and animal cells?
3. Explain the physiology of photosynthesis, respiration, and transportation in plants.
4. Discuss Mendel's laws of inheritance and their significance in understanding genetic traits.
5. Examine common plant diseases. Describe the causal preventive measures, and treatment methods.


SECTION- B

Answer any FOUR of the following questions

4X5=20

6. Viroid
7. Plant Reproductive organs
8. Plant cell structure
9. Fertilization
10. Geological time scale
11. Applications of Biotechnology
12. Photosynthesis

SEMESTER-II

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II			
Course Code	TITLE OF THE COURSE COURSE 3: ANIMAL DIVERSITY-I BIOLOGY OF NON- CHORDATES				
Teaching	Hours Allocated: 60 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	5	3	2	4

Course Objectives:

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to protozoa to hemichordata.
- To understand the structural organization of animals phylum from protozoa to hemi chordata.
- To understand the origin and evolutionary relationship of different phyla from protozoa to hemi chordata.
- To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

On Completion of the course, the students will be able to-

CO1	• Describe concept of animal kingdom classification and general characters of Protozoa
CO2	• Classify Porifera and Coelenterata with taxonomic keys
CO3	• Classify Phylum Platy & Nematelminthes using examples, parasitic adaptation
CO4	• Describe Phylum Annelida & Arthropoda using examples and economic importance of vermicomposting & economic importance of insects.
CO5	• Describe Mollusca, Echinodermata & Hemi chordata with suitable examples in relation to the phylogeny

Knowledge	Application	Employability		Entrepreneurship	
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Syllabus

UNIT-I

- 1.1 Whittaker's five kingdom concept and classification of Animal Kingdom.
- 1.2 Protozoa General Characters and classification up to classes with suitable examples
- 1.3 Protozoa Locomotion & nutrition
- 1.4 Protozoa reproduction

Activity: Assignment /Seminar on the above

Evaluation: Marks to be awarded for written and oral presentations

- 2.1 Porifera General characters and classification up to classes with suitable examples
- 2.2 Canal system in sponges
- 2.3 Coelenterata General characters and classification up to classes with suitable examples
- 2.4 Polymorphism in coelenterates & Corals and coral reefs

Activity: Assignment /Seminar /Quiz/Project on the above

Evaluation: Evaluation of Written part + Evaluation of oral Presentation, Assessment of students in Quiz participation and Ranking - Evaluation of Project Report and oral presentation

UNIT – III

- 3.1 Platyhelminthes General characters and classification up to classes with suitable examples
- 3.2 Parasitic Adaptations in helminthes
- 3.3 Nematelminthes General characters and classification up to classes with suitable examples
- 3.4 Life cycle and pathogenicity of Ascaris lumbricoides

Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – IV

- 4.1 Annelida General characters and classification up to classes with suitable examples
- 4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost
- 4.3 Arthropoda General characters and classification up to classes with suitable examples
- 4.4 Peripatus - Structure and affinities

Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – V

- 5.1 Mollusca General characters and classification up to classes with suitable examples
- 5.2 Pearl formation in Pelecypoda
- 5.3 Echinodermata General characters and classification up to classes with suitable examples Water vascular system in star fish
- 5.4 Hemichordata General characters and classification up to classes with suitable examples

Balanoglossus - Structure and affinities

Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

Co-curricular activities (suggested)

- Preparation of chart/model of phylogenic tree of life, 5-kingdom classification
- Visit to Zoology Museum or Coral Island as part of Zoological tour
- Charts on polymorphism
- Clay models of canal system in sponges
- Plaster-of-paris model of Peripatus
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Chart on pearl forming layers using clay
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Observation of Balanoglossus for its tubicolous habit

•

Reference books:

- L.H. Hyman „The Invertebrates’ Vol I, II and V. – M.C. Graw Hill Company Ltd.
- Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
- E.L. Jordan and P.S. Verma „Invertebrate Zoology’ S. Chand and Company.
- R.D. Barnes „Invertebrate Zoology’ by: W.B. Saunders CO., 1986.
- Barrington. E.J.W., „Invertebrate structure and Function’ by ELBS.
- P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.
- Parker, T.J. and Haswell „A text book of Zoology’ by, W.A., Mac Millan Co. London.
- Barnes, R.D. (1982). Invertebrate Zoology, V Edition”

Web Links:

1. [Elphidium: Structure and Life History \(With Diagram\) \(notesonzooology.com\).pdf](http://notesonzooology.com)
2. [WATER VASCULAR SYSTEM IN STARFISH \(bioscience.com.pk\)](http://bioscience.com.pk)

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Pithapur Rajah's Govt. College (A) Kakinada.

DEPARTMENT OF ZOOLOGY

II SEMESTER ZOOLOGY - PAPER - I

COURSE 3: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

BLUE PRINT

Time: 2 1/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	1	1
V	2 Out of 6, 3 questions should be answered 3X10=30M	2 Out of 7, 4 questions should be answered 4X5=20M

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY

MODEL question PAPER FOR

II SEMESTER - ZOOLOGY - PAPER - I

COURSE 3: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

Time: 2 hrs

Max. Marks: 50

I. Answer any THREE of the following. Choosing at least one from each part.

Draw labeled diagrams wherever necessary

3x10=30

SECTION - APART- I

1. What is the Whittaker's Five Kingdom concept and how does it classify the animal kingdom?
2. Describe the Canal system in sponges
3. Explain Parasitic Adaptations in Helminthes

PART- II

4. Explain Vermicompost, economic importance of vermicompost
5. Describe the Pearl formation in Pelecypoda
6. Describe the Water vascular system in star fish


SECTION - B

II. Answer any FOUR of the following:

Draw labeled diagrams wherever necessary

4x5=20

7. Amoeboid Movement
8. Ascon type canal System
9. Trematoda
10. Pathogenicity of Ascaris
11. Nephridia
12. Gastropoda
13. Affinities of Balanoglossus

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II			
Course Code	TITLE OF THE COURSE COURSE 3: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES Practicals				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:		0	0	3	2

Objectives:

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labelled record of identified museum specimens

SYLLABUS:

Study of museum slides / specimens / models (Classification of animals up to orders)

- Protozoa: Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax
- Porifera: Sycon, Spongilla, Euspongia, Sycon- T.S & L.S, Spicules, Gemmule
- Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula
- Platyhelminthes: Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium
- Nematelminths: Ascaris (Male & Female), Drancunculus, Ancylostoma, Wuchereria
- Annelida: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva
- Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus,

Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly.

- Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva
- Echinodermata: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva
- Hemichordata: Balanoglossus, Tornaria larva

Dissections:

Computer - aided techniques should be adopted or show virtual dissections Dissection of edible (Prawn/Pila) invertebrate as per UGC guidelines

An "Animal album" containing photographs, cut outs, with appropriate write up about the above- mentioned taxa. Different taxa/ topics may be given to different set of students for this purpose

Reference books:


- Practical Zoology- Invertebrates S.S. Lal
- Practical Zoology - Invertebrates P.S. Verma
- Practical Zoology - Invertebrates K.P. Kurl
- Ruppert and Barnes (2006) Invertebrate Zoology, 8th Edition, Holt Saunders

International Edition

- **Virtual Lab Links:**

REFERENCE WEB LINKS:

- <https://virtualmicroscopy.peabody.yale.edu/>
- <https://tnhm.in/category/assorted-gallery-for-vertebrates-and-invertebrates/invertebrates/>
- <http://www.nhc.ed.ac.uk/index.php?page=24.25.312>
- <https://biologyjunction.com/invertebrate-notes/>
- <https://lanwebs.lander.edu/faculty/rsfox/invertebrates/>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II
Course Code	TITLE OF THE COURSE COURSE 3: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES Model question paper	
Max marks :50		Time 3hrs

I. Identify the following specimens or spotters & slides, draw neat labeled diagram. Write notes on----


----- 6x5=30M

- 1- Paramecium
- 2- Euspongia
- 3- Physalia
- 4- Fasciola hepatica
- 5- Ascaris
- 6- Hirudinaria

II. Dissect and draw the labeled diagram of Prawn Nervous system 1x10=10 M

III. Practical Record 5M

IV. Viva-voce 5M

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II			
Course Code	TITLE OF THE COURSE COURSE 4: CELL & MOLECULAR BIOLOGY				
Teaching	Hours Allocated: 60 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	3	1	-	3

Course Objectives:

- To understand the cell and distinguish between prokaryotic and eukaryotic cell
- To understand the role of different cell organelles in maintenance of life activities
- To acquaint the students with the concepts of cell division and cell cycle
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings
- To acquaint the students on the biological importance of biomolecules.

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell and molecular biology by the completion of the course the graduate shall be able to –

CO1	<ul style="list-style-type: none"> • Understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
CO2	<ul style="list-style-type: none"> • Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
CO3	<ul style="list-style-type: none"> • Explain the cell cycle and bioenergetics of the cell
CO4	<ul style="list-style-type: none"> • Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins

Syllabus
CELL & MOLECULAR BIOLOGY

UNIT – I Cell Biology-I

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
- 1.2 Electron microscopic structure of animal cell.
- 1.3 Plasma membrane –Models and Fluid mosaic model
- 1.4 Transport functions of plasma membrane-Active – passive- facilitated.

Activity: Model preparation of cell/Assignment /Students Seminar /Quiz/Project/Peerteaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – II Cell Biology-II

- 2.1 Structure and functions of Golgi complex & Endoplasmic Reticulum
- 2.2 Structure and functions of Lysosomes & Ribosomes
- 2.3 Structure and functions of Mitochondria & Centriole
- 2.4 Structure and functions of Nucleus & Chromosomes

Activity: Model preparation of cell organelles/Assignment /Students Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – III Cell Biology-III

- 3.1 Cell Division- mitosis, meiosis
- 3.2 Cell cycle – stages- check points- regulation
- 3.3 Abnormal cell growth- cancer- apoptosis
- 3.4 Bio energetics- Glycolysis-Krebs cycle-ETS

Activity: Model preparation cell division /Assignment /Students Seminar /Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation:

Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT IV: Molecular Biology-I

- 4.1 Central Dogma of Molecular Biology
- 4.2 Basic concepts of - DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)
- 4.3 Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)
- 4.4 Translation – Initiation, Elongation and Termination

Activity: Model preparation of DNA/Assignment /Students Seminar /Quiz/Project/Peer teaching/Report writing after watching any video on the above Evaluation:

Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT V: Molecular Biology-II

- 5.1 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes
- 5.2 Biomolecules- Carbohydrates (Glucose- structure-properties- biological importance only)
- 5.3 Biomolecules- Protein (Amino acid- structure- properties- biological importance only)
- 5.4 Biomolecules- Lipids (Fatty acid- structure - properties- biological importance only)

Activity: Assignment /Students Seminar /Quiz/Project/Peer teaching/Report writingafter watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of theabove activity

Co-curricular activities (Suggested)

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Power point presentation of any of the above topics by students

Reference books:

- Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell „Molecular Cell Biology“ W.H. Freeman and company New York.
- Cell Biology by De Robertis
- Bruce Alberts, Molecular Biology of the Cell
- Rastogi, Cytology
- Varma & Aggarwal, Cell Biology
- C.B. Pawar, Cell Biology
- Molecular Biology by Freifelder
- Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
- James D. Watson, Nancy H. Hopkins „Molecular Biology of the Gene“

Web Links:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3197541/>
2. [https://bio.libretexts.org/Bookshelves/Introductory and General Biology/Book%3AGeneral Biology \(Boundless\)/16%3AGene Expression/16.02%3A Regulation of Gene Expression - Prokaryotic versus Eukaryotic Gene Expression](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/16%3AGene_Expression/16.02%3A_Regulation_of_Gene_Expression_-_Prokaryotic_versus_Eukaryotic_Gene_Expression)

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY

MODEL PAPER FOR II SEMESTER ZOOLOGY -PAPER - II

COURSE 4: CELL & MOLECULAR BIOLOGY

Time: 2 1/2 hrs

Max. Marks: 50

Answer any THREE of the following. Choosing at least one from each part. Draw

labeled diagrams wherever necessary

3x10=30

SECTION - APART- I

1. Fluid mosaic model of Plasma Membrane.
2. Structure and functions of Mitochondria
3. Mechanism of Apoptosis

PART- II

4. Central Dogma of Molecular Biology
5. Gene Expression in eukaryotes
6. Structure and Properties of Fatty Acids

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary

4x5=20

7. Virus
8. Ribosomes
9. Meiosis
10. Glycolysis
11. Initiation
12. Gene Expression
13. Amino acid- structure


BLUE PRINT

Time: 2 1/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	1	1
V	2 Out of 6, 3 questions should be answered 3X10=30M	2 Out of 7, 4 questions should be answered 4X5=20M

BLUEPRINT

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II			
Course Code	TITLE OF THE COURSE COURSE 4: CELL & MOLECULAR BIOLOGY				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:		0	0	3	2

Objectives:


- Acquainting and skill enhancement in the usage of laboratory microscope
- Hands-on experience of different phases of cell division by experimentation
- Develop skills on human karyotyping and identification of chromosomal disorders
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny and ecological history of origin & evolution of animals

SYLLABUS:

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis with prepared slides
3. Observation of various stages of Meiosis with prepared slides
4. Mounting of salivary gland chromosomes of Chironomus
5. Test for carbohydrate in given biological sample (Benedict's test)
6. Test for Protein in given biological sample (Nitric acid test -white ring)
7. Test for lipid in the given biological sample (Saponification test)

REFERENCE WEB LINKS:

- <https://cbi-au.vlabs.ac.in/>
- <https://www.youtube.com/watch?v=xhnUZAYNdQk>
- https://www.youtube.com/watch?v=l8LXQq5_VL0
- <https://www.labster.com/simulations>
- <https://www.sciencecourseware.org/BiologyLabsOnline/protected/TranslationLab/index.php>
- <https://virtual-labs.github.io/exp-analysis-of-carbohydrates-au/procedure.html>
- https://www.labxchange.org/library/items/lb:LabXchange:f10fd7ad:lx_simulation:1
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II
Course Code	TITLE OF THE COURSE COURSE 4: CELL & MOLECULAR BIOLOGY Model question paper	
Max marks :50		Time 3hrs

I. Identify the given spotter/slides and write identification points with neat labeled diagrams
 5X4=20 marks

- A.
- B.
- C.
- D.
- E.

II. Major experiment.....15M.
 III. Minor experiment5M.
 IV. Viva –Voce-.....5M
 V. Record.....5M
 _____-Total -..

ZOOLOGY MINOR - SEMESTER-II

COURSE 1: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

Theory Credits: 3 3hrs/week

LEARNING OBJECTIVES:

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to protozoa to hemichordata.
- To understand the structural organization of animals phylum from protozoa to hemi chordata.
- To understand the origin and evolutionary relationship of different phyla from protozoa to hemi chordata.
- To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

LEARNING OUTCOMES: By the completion of the course the graduate should able to –

- Describe concept of animal kingdom classification and general characters of Protozoa
- Classify Porifera and Coelenterata with taxonomic keys
- Classify Phylum Platy & Nematelminthes using examples, parasitic adaptation
- Describe Phylum Annelida & Arthropoda using examples and economic importance of vermicomposting & economic importance of insects.
- Describe Mollusca, Echinodermata & Hemi chordata with suitable examples in relation to the phylogeny

SYLLABUS:

UNIT-I

- 1.1 Whittakers five kingdom concept and classification of Animal Kingdom.
- 1.2 Protozoa General Characters and classification up to classes with suitable examples
- 1.3 Protozoa Locomotion & nutrition
- 1.4 Protozoa reproduction

Activity: Assignment /Seminar on the above

Evaluation: Marks to be awarded for written and oral presentations

UNIT –II

- 2.1 Porifera General characters and classification up to classes with suitable examples
- 2.2 Canal system in sponges
- 2.3 Coelenterata General characters and classification up to classes with suitable examples
- 2.4 Polymorphism in coelenterates & Corals and coral reefs

Activity: Assignment /Seminar /Quiz/Project on the above

Evaluation: Evaluation of Written part + Evaluation of oral Presentation, Assessment of students in Quiz participation and Ranking - Evaluation of Project Report and oral presentation
UNIT – III

3.1 Platyhelminthes General characters and classification up to classes with suitable examples

3.2 Parasitic Adaptations in helminthes

3.3 Nematelminthes General characters and classification up to classes with suitable examples

3.4 Life cycle and pathogenicity of *Ascaris lumbricoides*

Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – IV

4.1 Annelida General characters and classification up to classes with suitable examples

4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

4.3 Arthropoda General characters and classification up to classes with suitable examples

4.4 *Peripatus* - Structure and affinities

Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – V

5.1 Mollusca General characters and classification up to classes with suitable examples

5.2 Pearl formation in Pelecypoda

5.3 Echinodermata General characters and classification up to classes with suitable examples

Water vascular system in star fish

5.4 Hemichordata General characters and classification up to classes with suitable examples

Balanoglossus - Structure and affinities

Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

Co-curricular activities (suggested)

- Preparation of chart/model of phylogenetic tree of life, 5-kingdom classification
- Visit to Zoology Museum or Coral Island as part of Zoological tour
- Charts on polymorphism
- Clay models of canal system in sponges
- Plaster-of-paris model of *Peripatus*
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Chart on pearl forming layers using clay
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Observation of *Balanoglossus* for its tubicolous habit

REFERENCE BOOKS:

- L.H. Hyman „The Invertebrates’ Vol I, II and V. – M.C. Graw Hill Company Ltd.
- Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
- E.L. Jordan and P.S. Verma „Invertebrate Zoology’ S. Chand and Company.
- R.D. Barnes „Invertebrate Zoology’ by: W.B. Saunders CO., 1986.
- Barrington. E.J.W., „Invertebrate structure and Function’ by ELBS.
- P.S. Dhama and J.K. Dhama. Invertebrate Zoology. S. Chand and Co. New Delhi.
- Parker, T.J. and Haswell, „A text book of Zoology’ by, W.A., Mac Millan Co. London.
- Barnes, R.D. (1982). Invertebrate Zoology, V Edition”

BLUE PRINT

Time: 21/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	1	1
V	2 Out of 6, 3 questions should be answered 3X10=30M	2 Out of 7, 4 questions should be answered 4X5=20M

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Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY

MODEL question PAPER FOR

II SEMESTER - ZOOLOGY - MINOR BIOLOGY
OF NON-CHORDATES

Time: 2 1/2 hrs

Max. Marks: 50

III. Answer any THREE of the following. Choosing at least one from each part.

Draw labeled diagrams wherever necessary

3x10=30

SECTION - APART- I

14. What is the Whittaker's Five Kingdom concept and how does it classify the animal kingdom?
15. Describe the Canal system in sponges
16. Explain Parasitic Adaptations in Helminthes

PART- II

17. Explain Vermicompost, economic importance of vermicompost
18. Describe the Pearl formation in Pelecypoda
19. Describe the Water vascular system in star fish


SECTION - B

IV. Answer any FOUR of the following:

Draw labeled diagrams wherever necessary

4x5=20

20. Amoeboid Movement
21. Ascon type canal System
22. Trematoda
23. Pathogenicity of Ascaris
24. Nephridia
25. Gastropoda
26. Affinities of Balanoglossus

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-III			
Course Code	TITLE OF THE COURSE COURSE 5: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES				
Teaching	Hours Allocated: 45 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	3	1	-	3

Course Objectives:

- To understand the animal kingdom.
- To understand the taxonomic position of Protochordata to Mammalia.
- To understand the general characteristics of animals belonging to Fishes to Reptilians.
- To understand the body organization of Chordata.
- To understand the taxonomic position of Protherian mammals.

LEARNING OUTCOMES:

By the completion of the course the graduate should able to –

CO1	• Describe general taxonomic rules on animal classification of chordates
CO2	• Classify Protochordata to Mammalia with taxonomic keys
CO3	• Understand Mammals with specific structural adaptations
CO4	• Understand the significance of dentition and evolutionary significance

Skill Development		Employability		Entrepreneurship	
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SYLLABUS

UNIT - I

- 1.1 General characters and classification of Chordata up to classes
- 1.2 Salient features of Cephalochordata, Salient features of Urochordata
- 1.3 Structure and life history of *Herdmania*, Retrogressive metamorphosis –Process and Significance
- 1.4 Cyclostomata, General characters, Comparison of Petromyzon and Myxine

Activity: *Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - II

- 1.1 General characters of Fishes, Salient features Dipnoi
- 1.2 *Scoliodon*: External features, Digestive system, Respiratory system
- 1.3 *Scoliodon* Structure and function of Heart, Structure and functions of the Brain.
- 1.4 Migration in Fishes, Types of Scales

Activity: *Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - III

- 3.1 General characters of Amphibia, General characters of Reptilia
- 3.2 *Rana hexadactyla*: External features, Respiratory system, Structure and function of Heart
- 3.3 *Rana hexadactyla* structure and functions of the Brain
- 3.4 *Calotes*: External features, Digestive system, structure and function of Brain
- 3.5 Identification of Poisonous snakes

Activity: *Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - IV

- 4.1 General characters of Aves
- 4.2 *Columba livia*: External features, Digestive system, Respiratory system
- 4.3 *Columba livia*: Structure and function of Heart, structure and function of Brain
- 4.4 Migration in Birds, Flight adaptation in birds

Activity: *Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - V

- 5.1 General characters of Mammalia
- 5.2 Classification of Mammalia up to sub - classes with examples
- 5.3 Comparison of Prototherians, Metatherians and Eutherians
- 5.4 Dentition in mammals, Aquatic mammals Adaptations

Activity: *Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

Co-curricular activities (suggested)

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Model of fish heart and brain

- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology Museum
- Map pointing of prototherian and metatherian mammals

Reference books:

- J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted
- Arumugam, N. Chordate Zoology, Vol. 2. Saras Publication. 278 pages. 200 figs.
- A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker & Haswell, 1961).
- M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. Viswanathan Pvt. Ltd., Madras).
- P.S. Dhami & J.K. Dhami, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.
- Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols., 1573 pp., tables, figs.
- A.K. Sinha, S. Adhikari & B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New Central Book Agency, Calcutta). 560 pages.
- R.L. Kotpal, 2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.
- E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.
- G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.
- Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
- Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.

Web Links:

[Migration In Fishes - Definition, Types, Significance, Examples \(microbiologynote.com\)](#)
[Morphological Adaptations to Migration in Birds | SpringerLink](#)

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

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

QUESTION BANK

UNIT-I ESSAY QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Explain the life history of Herdmania	BT1	CO1	PO2
2	Explain the origin and general characters of chordates	BT2	CO1	PO2
3	Describe the process of retrogressive metamorphosis and its significance	BT1	CO1	PO2
4	Illustrate the comparison between Petromyzon and Myxine	BT2	CO1	PO2

SHORT QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Retrogressive metamorphosis	BT1	CO1	PO2
2	Urochordata	BT2	CO2	PO2
3	Cephalochordata	BT2	CO1	PO1
4	Cyclostomata	BT1	CO2	PO2
5	Notochord	BT1	CO1	PO2

UNIT-II ESSAY QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Describe the structure of heart of <i>Scoliodon</i>	BT1	CO1	PO2

2	Explain the process of migration in fishes	BT2	CO1	PO2
3	Explain the process of digestion in Scoliodon	BT1	CO1	PO2
4	Discuss the general characters of fishes and add a note on the salient features of dipnoi			

SHORT QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Placoid scale	BT1	CO1	PO2
2	Lateral line	BT2	CO1	PO2
3	Elasmobranch	BT1	CO1	PO2
4	Dog fish	BT1	CO1	PO2

UNIT-III ESSAY QUESTIONS

S.No.	QUESTION	BT-LEVEL	CO	PO
1	Describe the brain of <i>Rana hexadactyla</i>	BT1	CO1	PO2
2	Explain the external features of <i>Calotes</i>	BT2	CO1	PO2
3	Describe the general characters of Amphibia	BT1	CO1	PO2
4	Describe the Structure and function of heart in Rana	BT1	CO1	PO2
5	Give a detailed description on the process of identification of poisonous snakes	BT1	CO1	PO2

SHORT QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	<i>Apoda</i>	BT1	CO1	PO2
2	Crocodylia	BT2	CO1	PO2
3	Neoteny	BT1	CO1	PO2
4	Hybernation	BT2	CO1	PO2
5	Venom	BT1	CO1	PO2

**UNIT-IV
ESSAY QUESTIONS**

S.No.	QUESTION	BT LEVEL	CO	PO
1	Describe the flight adaptations in birds	BT1	CO1	PO2
2	Explain the respiratory system of <i>Columba livia</i>	BT2	CO1	PO2
3	Describe the general characters of Aves	BT1	CO1	PO2
4	Describe the structure and function of brain in <i>Columbia livia</i>			

SHORT QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Quil feather	BT1	CO1	PO2

2	<i>Archaeopteryx</i>	BT2	CO1	PO2
3	syrinx	BT1	CO1	PO2
4	Claws	BT1	CO1	PO2
5	Adaptation	BT2	CO1	PO2

UNIT-V
ESSAY QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Compare the characters of Metatheria and Eutheria	BT1	CO1	PO2
2	Write an essay on dentition in mammals	BT2	CO1	PO2
3	Describe the Aquatic adaptation in mammals	BT1	CO2	PO1
4	Explain the general characters of mammals	BT2	CO1	PO2
5	Explain the classification of mammals upto classes	BT2	CO2	PO1
6	Illustrate the comparison between Prototherians, Metatherians and eutherians	BT1	CO2	PO1

SHORT QUESTIONS

S.No.	QUESTION	BT LEVEL	CO	PO
1	Prototheria	BT1	CO1	PO2
2	Canines	BT2	CO1	PO2
3	Mammary glands	BT1	CO1	PO2
4	Eutheria	BT1	CO1	PO2

5	Diphidont	BT2	CO1	PO2
6	Marsupials	BT1	CO1	PO2

BLUE PRINT

Time: 2 1/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	1	1
V	2	2
Total	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4 questions should be answered 4X5=20M

Pithapur Rajah's Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations - III Semester (w.e.f 2023-24)
For 2023-24 batch
SEMESTER-II: COURSE 3: ANIMAL DIVERSITY.1 BIOLOGY OF
CHORDATES (MAJOR 1)
Model Paper

Time: 2 Hrs.

Max. Marks: 50

Answer any FIVE of the following:
Draw labeled diagrams wherever necessary

3x10=30M

SECTION - A
PART- I

1	Explain the life history of Herdmania	BT1	CO1	PO2
2	Compare the characters of <i>Petromyzon</i> and <i>Myxine</i>	BT1	CO1	PO2
3	Describe the brain of <i>Ranahexadactyla</i>	BT1	CO1	PO2

PART- II

4	Write an essay on flight adaptations in birds	BT2	CO1	PO2
5	Compare the characters of Metatheria and Eutheria	BT1	CO1	PO2
6	Write an essay on dentition in mammals	BT2	CO1	PO2

SECTION - B

I. Answer any FOUR of the following:

Draw labeled diagrams wherever necessary

4x5=20 M

7	Amphioxus	BT1	CO1	PO2
8	Placoid Scales	BT1	CO1	PO2
9	Hybernation	BT1	CO1	PO2
10	Apoda	BT1	CO1	PO2

11	Migration	BT1	CO1	PO2
12	Metatheria	BT1	CO1	PO2
13	Rodentia	BT1	CO1	PO2

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester			
Course Code	TITLE OF THE COURSE COURSE 5: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES	B.Sc. Honours in Zoology (Major) Semester-III			
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:		0	0	3	2

• **Course Objectives:**

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

SYLLABUS:

1. Protochordata: *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomes: *Petromyzon and Myxine*.
3. Pisces: *Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Catla, Clarius, Channa, Anguilla*.
4. Amphibia: *Ichthyophis, Amblystoma, Axolotl larva, Hyla*,
5. Reptilia: *Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja, Krait, Hydphis, Crocodile*.
6. Aves: *Psittacula, Eudynamis, Bubo, Alcedo*.
7. Mammalia: *Ornithorhynchus, Pteropus, Funambulus*.
8. **Dissections**-As per UGC guidelines
Scoliodon IX and X, Cranial nerves
Scoliodon Brain
Mounting of fish scales

Note: 1. Dissections are to be demonstrated only by the faculty or virtual.
2. Laboratory Record work shall be submitted at the time of practical examination.

REFERENCE WEB LINKS:

- <https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190715/InspireScience6-8CA/LS15/index.html>
- <https://themammallab.com/>
- <http://abacus.bates.edu/acad/depts/biobook/LabConCh.htm>
- <https://virtualzoology.wordpress.com/scoliodon/>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>



**Pithapur Rajah's Govt. Degree College (A)
Kakinada.**

**Program &
Semester**
B.Sc. Honours in Zoology
(Major)
Semester-III

Course Code

TITLE OF THE COURSE

**COURSE 5: ANIMAL DIVERSITY-I BIOLOGY OF
CHORDATES**

Model question paper

Max marks :50

Time 3hrs

I .Identify the following specimens or spotters & slides, draw neat labeled diagrams–write notes on
-----6x5=30M

- A.
- B.
- C.
- D.
- E.
- F.

II .Dissect and draw the labeled diagram of Scoliodon IX and X, Cranial nerves

1x10=10M

III. Viva –Voce-----5M

IV. Record-----5M

Total -----50M

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY

SEMESTER-III
COURSE 6: PRINCIPLES OF GENETICS

Theory Credits: 3

3 hrs/week

LEARNING OBJECTIVES

- To provide the background knowledge on the history of genetics and the importance of Mendelian principles.
- To provide the required knowledge on the gene interactions
- To acquaint the students, distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance and extrachromosomal inheritance.
- To understand the principles of sex determination in animals with a reference to human being, and sex-linked inheritance
- To understand the human karyotyping and the concept of pedigree analysis basics.

LEARNING OUTCOMES: By the completion of the course the graduate should be able to –

- To understand the history of genetics, gain knowledge basic terminology of genetics
- To acquire knowledge on interaction of genes, various types of inheritance patterns existing in animals with reference to non-Mendelian inheritance.
- To acquire knowledge on chromosomal inheritance
- Acquiring in-depth knowledge on various aspects of genetics involved in sex determination,
- Acquiring in-depth knowledge on human karyotyping, pedigree analysis and chromosomal disorders concepts of proteomics and genomics

SYLLABUS:

UNIT-I:

- 1.1 History of Genetics- Concepts of Phenotype, Genotype, Heredity, Variation, Pure lines and Inbred Lines
- 1.2 Mendelian Principles on Monohybrid cross, back cross and Test cross
- 1.3 Mendelian Principles on Dihybrid cross

UNIT-II:

- 2.1 Linkage - Definition, Types of linkage-complete linkage and incomplete linkage, Significance of linkage.
- 2.2 Crossing over - definition; Mechanism of crossing over: Chiasma Interference and coincidence
- 2.4 Gene Interactions: Incomplete dominance, codominance, Pleiotropy
- 2.5 Gene Interactions: Lethal alleles, Epistasis, Non- Epistasis

UNIT-III:

- 3.1 Polygenes (General Characteristics & examples)
- 3.2 Multiple Alleles (General Characteristics and Blood group inheritance)
- 3.3 Rh inheritance erythroblastosis foetalis
- 3.4 Extra chromosomal inheritance- Kappa particles in Paramecium and Shell coiling in snails

UNIT-IV:

- 4.1 Sex determination- Chromosomal theory and Genic Balance theory
- 4.2 Sex determination- Hormonal, Environmental and Haplo-diploidy types
- 4.3 Sex linked inheritance: X-linked inheritance
- 4.4 Sex linked inheritance: Y-linked & XY-linked inheritance

UNIT-V:

5.1 Human karyotyping, Pedigree Analysis(basics)

5.2 Autosomal Recessive disorder-Sickle cell anaemia – causes, treatment, inheritance pattern, modes of testing and prevention

5.3 Autosomal Dominant disorder- Huntington disease

5.4 Basics on Genomics and Proteomics

Co-curricular activities (Suggested) ☐ Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanical garden or local village as a student study project activity ☐ Observation of blood group inheritance in students, from their parents and grandparents ☐ Karyotyping and preparation of pedigree charts for identifying diseases in family history ☐ Charts on chromosomal disorders

REFERENCE BOOKS:

☐ Harper, P. (2010). Practical genetic counselling. CRC Press.

Kessler, S. (Ed.). (2013). Genetic counselling: psychological dimensions. Academic Press. 3. Stevenson, A. C., & Davison, B. C. (2016). Genetic counselling. Elsevier.

☐ Evans, C. (2006). Genetic counselling: a psychological approach. Cambridge University Press.

☐ References:

☐ Atlas of Inherited Metabolic Diseases☐

☐ Mendelian Inheritance in Man: A Catalog of Human Genes and Genetic Disorders, Victor A. McKusick,☐☐ Vol I & II

☐ Stacy L Blachford (Editor) 2001. The Gale Encyclopedia of Genetic Disorders. Gale Group Publishers, Vol.1 (A-L), Vol.II (M-Z).

☐ Limoine, W.R. and Cooper, D.NB. 1996: Gene Trophy, Bios Scientific Pub.Oxford.

☐ REFERENCES:

☐ Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India

☐ Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.

☐ Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.

☐ Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.

☐ Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co.

☐ James D. Watson, Nancy H. Hopkins ‘Molecular Biology of the Gene’

☐ Gupta P.K., ‘Genetics

Pithapur Rajah's Govt. Degree College (A) Kakinada.
 DEPARTMENT OF ZOOLOGY
 III SEMESTER ZOOLOGY - PAPER-6
 COURSE 6: **PRINCIPLES OF GENETICS**
 BLUE PRINT

Time: 2 1/2 hrs Max. Marks: 50

Unit	Essay	Short	Marks allotted to the unit
I	1	1	15
II	2	2	30
III	1	2	20
IV	1	1	15
V	1	1	15
Total	6	7	95
	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4 questions should be answered 4X5=20M	

Pithapur Rajah's Govt. Degree College (A) Kakinada.
 DEPARTMENT OF ZOOLOGY

MODEL question PAPER
 III SEMESTER - ZOOLOGY - PAPER - 6
 COURSE 6: **PRINCIPLES OF GENETICS**

Time: 2 1/2 hrs Max. Marks: 50

I. Answer any THREE of the following. Choosing at least one from each part.

Draw labeled diagrams wherever necessary 3x10=30

SECTION - A
PART- I

- 1) Explain the Mendelian principle behind the dihybrid cross
- 2) What is crossing over? Explain the mechanism of crossing over in chromosomes
- 3) What is epistasis? Explain epistasis with a suitable example

PART- II

- 4) What is extrachromosomal inheritance? Explain the inheritance of kappa particles in Paramecium
- 5) What is Haemophilia? Explain how it is inherited among the family members
- 6) Write an essay on the basics of Genomics and Proteomics

SECTION - B

II. Answer any FOUR of the following:

Draw labeled diagrams wherever necessary

4x5=20

- 7) Monohybrid Cross
- 8) Types of Linkage
- 9) Incomplete Dominance
- 10) Multiple Alleles
- 11) Erythroblastosis foetalis
- 12) Haplo-diploidy
- 13) Sickle Cell Anaemia

SEMESTER-III
COURSE 6: PRINCIPLES OF GENETICS

Practical Credits: 1 2 hrs/week

LEARNING OBJECTIVES

- To acquire practical knowledge on the importance of Mendelian principles by solving the problems.
- To provide the required knowledge on the gene interactions
- To acquaint the students on Human karyotype & pedigree analysis basics
- To understand the various genetic concepts through Virtual labs

SYLLABUS:

1. Study of Mendelian inheritance using suitable examples/Problems
2. Study of linkage recombination, gene mapping using the data
3. Study of human karyotypes
4. Blood grouping and Rh in humans
5. Demonstration of prenatal diagnosis (Virtual lab).
6. Amniocentesis demo or virtual lab
7. Demonstration of Ultrasonography (Virtual lab).
8. Scoring dysmorphic features in syndromic patients
9. Genetic Counselling methods based on case history
10. Construction and analysis of Pedigree

REFERENCE WEB LINKS:

<https://www.iitg.ac.in/cseweb/vlab/anthropology/Experiments/Mendels%20law/index.html>

<https://learn.genetics.utah.edu/content/labs/>

https://virtuallabs.merlot.org/vl_biology.html

<https://blog.praxilabs.com/2020/06/30/dna-extraction-virtual-lab/>

<https://jru.edu.in/studentcorner/lab-manual/agriculture/Fundamentals%20of%20Genetics.pdf>

https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1008&context=ny_oers

<https://sjce.ac.in/wp-content/uploads/2018/04/Cell-Biology-Genetics-Laboratory-Manual-17-18.pdf>

<https://www.rlbcu.ac.in/pdf/Agriculture/AGP%20113%20%20Fundamentals%20of%20Genetics.pdf>

https://coabnau.in/uploads/1610707528_GPB3.2PracticalManual-Final.pdf


Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY

MODEL question PAPER
III SEMESTER - ZOOLOGY - PAPER - 6
COURSE 6: PRINCIPLES OF GENETICS
PRACTICAL MODEL QUESTION PAPER

Max Marks: 50
Time: 3 Hrs

- | | |
|---------------------------------------|---------|
| 1) Determination of human blood Group | 10M |
| 2) Problems on Mendelian inheritance | 2X5=10M |
| a) | |
| b) | |
| 3) Syndromes | 3x5=15M |
| a) Klinefelter Syndrome | |
| b) Turner Syndrome | |
| c) Down Syndrome | |
| 4) Amniocentesis/Human Karyotype | 5M |
| 5) Record- | 5M |
| 6) Viva - | 5M |

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
 DEPARTMENT OF ZOOLOGY
 ZOOLOGY -MAJOR ,SEMESTER-III
 COURSE 7: ANIMAL BIOTECHNOLOGY

	PRGOVERNMENTCOLLEGE(AUTONOMOUS): KAKINADADEPARTMENTOFZOOLOGY	Program &Semester PAPER VII HONOURS ZOOLOGY SEMESTER -IV			
CourseCode	Animal Biotechnology				
Theory	Credits:3	3 hrs/week			
Teaching	HoursAllocated:60(Theory)	L	T	P	C
Pre-requisites:	Knowledgeonthe Basicsof Animal Biotechnology	4	0	2	4

HOURS:60

Max.Marks: 50

COURSE OUTCOMES

This course will provide students with a deep knowledge in immunology, genetics, embryology, and ecology and by the completion of the course the graduate shall be able to

CO1 To get knowledge of the organs of Immune system, types of immunity, cells, and organs of immunity.

CO2 To describe immunological response as to how it is triggered (antigens) and regulated (antibodies)

CO3 Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.

CO4 Get familiar with the tools and techniques of animal biotechnology.

PROGRAMME OUTCOMES

BZC is a fascinating program comprising of courses Botany, Zoology and Chemistry that provides a platform to the students to learn not only about the diversity of fauna and flora but also about the chemical and physical structure of biological cells, tissues, organs, organisms, and their physiology. The vital role played by plants in the global ecosystems can easily be understood by choosing BZC program. Creates deep sense of understanding about human health, conservation of nature and natural resources.

Students can easily understand the concepts of origin of life, Evolution, basic genetics, blood group inheritance, embryonic development, and stem cell technology etc., through this program.

The BZC program creates an understanding of elements and compounds composed of atoms and molecules, and their role in the composition of life. It gives an opportunity to know how biological cells are made up of chemical substances.

After completing B.Sc., BZC program students can get lot of employment opportunities in various fields such as agriculture, aquaculture, horticulture and pharmaceuticals either in private or government sectors. This program enables students to establish their own business in the area like Aquaculture,

Sericulture and Horticulture etc., Students can also pursuing her studies in Botany, Zoology or Chemistry and they may focus on scientific research also.

BZC is a fascinating program comprising of courses Botany, Zoology and Chemistry that provides a platform to the students to learn not only about the diversity of fauna and flora but also about the chemical and physical structure of biological cells, tissues, organs, organisms, and their physiology. The vital role played by plants in the global ecosystems can easily be understood by choosing BZC program. Creates deep sense of understanding about human health, conservation of nature and natural resources.

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LEARNINGOBJECTIVES:

To provide knowledge on animal cell and tissue culture and their preservation

To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hybridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms

To explain *in vitro* fertilization, embryo transfer technology and other reproduction manipulation methodologies.

To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.

To understand principles of animal culture, media preparation.

LEARNINGOUTCOMES:

This course will provide students with a deep knowledge in animal biotechnology, by the completion of the course the graduate shall able to—Get knowledge of the Vectors and Restriction enzymes used in biotechnology

Describe the gene delivery mechanism and PCR technique

Acquire basic knowledge on media preparation and cell culture techniques

Understand the manipulation of reproduction with the application of biotechnology

Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.

Knowledge		Skill		Employability		Entrepreneurship	
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SYLLABUS:

UNIT-I:

- ✓ Enzymes and Vectors Restriction modifications systems: Types I, II and III.
- ✓ Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering
- ✓ DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyltransferase, kinases and phosphatases, and DNA ligases
- ✓ Cloning Vectors: Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs,

Activity: Assignment/ Students Seminar/ Quiz/ Project/ Peerteaching/ Report writing after watching any video on the above/ Preparation of models of Cloning vectors with biodegradable material/

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-II:

- ✓ Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery.
- ✓ PCR: Basics of PCR.
- ✓ DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing
- ✓ Hybridization techniques : Southern, Northern and Western blotting

Activity: Assignment/ Students Seminar/ Quiz/ Project/ Peerteaching/ Report writing after watching any video on the above/ Visit to any clinical testing laboratory for hands on experience of PCR Use

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-III:

- ✓ Natural and Synthetic Cell cultures: primary culture, secondary culture, continuous cell lines
- ✓ Organ culture; Cryopreservation of cultures.
- ✓ Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb
- ✓ Stem cells: Types of stem cells, applications

Activity: Assignment/ Students Seminar/ Quiz/ Project/ Peerteaching/ Report writing after watching any video on the above/ Visit to any clinical testing laboratory for observation of various cultures

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-IV:

- ✓ Manipulation of reproduction in animals: Artificial Insemination, In vitro fertilization
- ✓ Manipulation of reproduction in animals : Superovulation , Embryo transfer, Embryo cloning
- ✓ Transgenic Animals: Strategies of Gene transfer;
- ✓ Transgenic -sheep, -fish; applications

Activity: Assignment/ Students Seminar/ Quiz/ Project/ Peer teaching/ Report writing after watching any video on the above/ Visit to laboratory for observation of Artificial Insemination, In vitro fertilization/ model preparation of transgenic animal

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-V:

- ✓ DNA fingerprinting
- ✓ Application of biotechnology in fisheries – monoculture in fishes, polyploidy in fishes
- ✓ Gene therapy-application
- ✓ Bioinformatics-concept-definition-database types

Activity: Assignment/ Students Seminar/ Quiz/ Project/ Peer teaching/ Report writing after watching any video on the above/ Case study

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

Co-curricular activities (suggested)

Organizing awareness on immunization importance in local village in association with NCC and NSS teams

Charts on types of cells and organs of immune system

Students study project on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
Visit to research laboratory in any University as part of Zoological tour and exposure and/or hands-on training on animal cell culture.

Visit to biotechnological laboratory in university or any central/state institutes and create awareness on PCR, DNA fingerprinting and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.

Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA

Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.

Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press

Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education

Brown TA. (2007). Genomes-3. Garland Science Publishers

Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

Animal Cells Culture and Media, D.C. Darling and S.J. Morgan, 1994. BIOS Scientific Publishers Limited.

Methods in Cell Biology, Volume 57, Jennie P. Mathur and David Barnes, 1998. Animal Cell Culture Methods Academic Press.

P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).

B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001)

CO-PO-PSOMapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High],'-':NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	2	2	1	2	2	2	2
CO2	3	2	2	2	2	2	1	1	1	1
CO3	1	2	2	2	3	3	2	2	3	1
CO4	1	2	3	2	2	3	1	2	2	2
CO5	1	2	3	2	3	3	1	2	3	3

DELETION AND ADITION OF SYLLUBUS

S.No	Unit topic	Justification
1	ADDING ---IN UNIT -II PCR APPLICATIONS IN ANIMAL BIOTECHNOLOGY	PCR- TECHNIQUES APPLICATIONS ARE VERY USEFULL TO STUDENTS SKILL DEVELOPMENTS
2	Bioinformatics and Genetic Testing	Genetic tests are available for many conditions, but vary in their clinical validity and usefulness. Genetic tests can have social and ethical implications.

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
MAJOR –ZOOLOGY ,
SEMESTER-III

COURSE 7: ANIMAL BIOTECHNOLOGY

Blue print

ModuleName	PART I EssayTypeQuestions10ma rks each	PartIIShortAnswerQues tions 5 markseach	Marks Allotted tothe Chapter
1.Immunology– I(OverviewofImmune system)	1	02	20
2.Immunology – II(Antigens,Antibodies,MHCa nd Hypersensitivity)	1	01	15
3. BiotechnologyTechniques	2	02	30
4. Applications of AnimalBiotechnology	1	01	15
5 module	1	01	15
6.Total	06 Of which 3 to beanswered	07 Of which 4 to beanswered	95 Marks includingchoice. Ofwhich50Marks to beanswered

QUESTION BANK

Unit-1 Essay questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	Applications of Type II restriction enzymes in genetic engineering	BT1	CO1	PO2
2	Describe the DNA modifying enzymes and their applications	BT2	CO1	PO2
3	Write an essay on Cloning Vectors (Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors)	BT1	CO1	PO2

4	Explain the different Cosmid vectors : BACs, YACs	BT2	CO1	PO2
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Short Answer Questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	State the type I restriction enzymes	BT1	CO1	PO2
2	Polymerases	BT2	CO1	PO2
3	pUC vector	BT1	CO1	PO2
4	YACs	BT1	CO1	PO2
5	M13 based vector	BT2	CO1	PO2
6	DNA polymerase	BT1	CO2	PO2

Unit-2 Essay questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	Describe the different types of gene delivery methods	BT1	CO1	PO2
2	What is PCR? Explain the Basics of PCR	BT2	CO1	PO2
3	What is Sequencing ? Explain Sanger's method of DNA sequencing	BT1	CO1	PO2
4	Illustrate the different types of Hybridization techniques in			

Short Answer Questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	Gene gun	BT1	CO1	PO2
2	Traditional method of Sequencing	BT2	CO1	PO2
3	Automated method of sequencing	BT1	CO1	PO2
4	Western method	BT1	CO1	PO2

5	Southern method			
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Unit-3 Essay questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	What is culture ? Differentiate the primary culture, secondary culture	BT1	CO1	PO2
2	Cryopreservation of cultures	BT2	CO1	PO2
3	Describe the Applications of mAb	BT1	CO1	PO2
4	Define mAb .and explain Production of Monoclonal antibodies (mAb),	BT1	CO1	PO2
5	What is stem cell ? Explain different Types of stem cells and their applications	BT2	CO1	PO2

Short Answer Questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	Cell culture	BT1	CO1	PO2
2	Continuous cell lines	BT2	CO1	PO2
3	Cryopreservation	BT1	CO1	PO2
4	Stem cells	BT1	CO1	PO2
5		BT2	CO3	PO2

Unit-4 Essay questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	What is the process of In vitro fertilization? Explain	BT1	CO1	PO2
2	Describe the Embryo transfer technology in Animals	BT2	CO1	PO2

3	Write an essay on Transgenic Animals	BT1	CO1	PO2
4				

Short Answer Questions

S.No.	QUESTION	BT LEVEL	CO	PO	
1	Artificial Insemination	BT1	CO1	PO2	
2	Superovulation	BT2	CO1	PO2	
3	Gene transfer strategy	BT1	CO1	PO2	
4	Transgenic -sheep,	BT1	CO3	PO2	
5	Transgenic-fish	BT2	BT1	CO1	PO2
			BT2	CO1	PO2

Unit-5 Essay questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	Illustrate the DNA fingerprinting process	BT1	CO1	PO2
2	Explain Application of biotechnology in fisheries	BT2	CO1	PO2
3	Write a note on Gene therapy process and their application	BT1	CO3	PO2
4	Describe the Bioinformatics-concept-definition-database types of Bio informatics	BT1	CO1	PO2

Short Answer Questions

S.No.	QUESTION	BT LEVEL	CO	PO
1	Monoculture in fishes	BT1	CO1	PO2
2	Polyploidy in fishes	BT2	CO1	PO2
3	Gene therapy	BT1	CO1	PO2

4	Bioinformatics	BT2	CO1	PO2

**P R GOVERNMENT COLLEGE (AUTONOMOUS):
KAKINADA DEPARTMENT OF ZOOLOGY**

Model Question Paper

Max Marks 50

Time: 2. Hrs

PART-I

Answer any **THREE** questions choosing at least one question from each section All questions carry equal marks 3x10=30 Marks

SECTION – A

1. Applications of Type II restriction enzymes in genetic engineering	BT1	CO1	PO2
2. What is PCR? Explain the Basics of PCR	BT1	CO1	PO3
3. What is culture? Differentiate the primary culture, secondary culture	BT1	CO2	PO2

SECTION-B

4. What is stem cell? Explain different Types of stem cells and their applications	BT1	CO2	PO2
5. What is the process of In vitro fertilization? Explain	BT2	CO1	PO3
6. Illustrate the DNA fingerprinting process	BT1	CO2	PO3

PART-II

Answer any **FOUR** of the following 4x5=20 Marks

7. State the type I restriction enzymes	BT1	CO1	PO2
8. pUC vector	BT2	CO3	PO2
9. Gene gun	BT1	CO1	PO2
10. Cryopreservation of cultures	BT2	CO1	PO2

11. Stem cells	BT1	CO2	PO3
12. Transgenic -fish	BT2	CO1	PO2
13. Genetherapy	BT1	CO3	PO2

Practical Credits: 12hrs/week

LEARNING OBJECTIVES

This course will provide students with a practical knowledge in animal biotechnology, by the completion of the course the graduates shall be able to –

- Acquire knowledge on Cloning vectors widely used in biotechnology
- Empower with the process of DNA quantification and amplification
- Explain purification of biological compounds by paper chromatography
- Get insight into maintenance of laboratory apparatus
- Understand principles of animal culture, media preparation

SYLLABUS:

- 1. Cloning Vectors: Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs, (Charts/Images/Models)**
- 2. DNA quantification using DPA Method.**
- 3. Techniques: DNA Fingerprinting**
- 4. Separation, Purification of biological compounds by paper chromatography**
- 5. Cleaning and sterilization of glass and plastic wares for cell culture.**
- 6. Preparation of culture media.**
- 7. Amplification of DNA by PCR**

Note: above practical may be demonstrated in the lab or demonstrated by V-lab

REFERENCE WEBLINKS:

<https://vlab.amrita.edu/>

<https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering>

<https://blog.praxilabs.com/2020/06/30/dna-extraction-virtual-lab/>

<http://mbvi-au.vlabs.ac.in/>

https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC203J-lab-manual.pdf

https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BT%200312%20-%20ANIMAL%20CELL%20AND%20TISSUE%20CULTURE%20LABORATORY.pdf

<https://davjalandhar.com/dbt/biotechnology/SOP/BSc%20Biotechnology%20Semester%20V%20%26%20VI.pdf>

https://www.austincc.edu/awheeler/Files/BIOL%201414%20Fall%202011/BIOL1414_Lab%20Manual_Fall%202011.pdf

P R GOVERNMENT COLLEGE(AUTONOMOUS):
KAKINADA
DEPARTMENT OF ZOOLOGY & AQUACULTURE
ZOOLOGY PRACTICAL SYLLABUS FOR SEMESTER - III
COURSE-7 ANIMAL BIOTECHNOLOGY

Periods: 24

Max.Marks:50

Time 2Hrs

Practical Examination Model paper

1.DNA quantification using DPA Method	15 Marks
2 .Preparation of culture media	10 Marks
3.Slides /Models /Charts	3x5 =15 marks
Slide -A	
Slide B-	
Slide- C	
4.Record	05 Marks
5.Viva Voce	05 Marks
Total	----- 50 Marks

COURSE 8: EVOLUTION AND ZOOGEOGRAPHY

Theory

Credits: 3

3 hrs/week

LEARNING OBJECTIVES

- To provide knowledge on origin of life, theories and forces of evolution
- To explore the evidences of evolution
- To Explain the theories of evolution
- To understand the role of variations and mutations in evolution of organisms
- To understand the zoogeographical distribution of animals

LEARNING OUTCOMES:

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Evolution and zoo geography, by the completion of the course the graduate shall able to –

- Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals
- Explain the different evidences of evolution
- Understand the theories of evolution
- Explain the various tools for evolution
- Map the distribution of animals according to zoological realms

SYLLABUS:

UNIT-I

- 1.1 Origin of life: different ancient concepts -Origin of Earth and Solar system: Big Bang theory, Primitive atmosphere, formation of macromolecules
- 1.2 Biological evolution: Coacervates, Microspheres, formation of Nucleic acids, Nucleoproteins
- 1.3 Formation of primary organisms, evolution of modes of nutrition, oxygen revolution, present day atmosphere, evolution of eukaryotes.
- 1.4 Experimental evidences in support of Biochemical origin of life (Miller and Urey experiment)

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT-II

- 2.1 Palaeontological and taxonomical evidences of evolution
- 2.2 Morphological and anatomical evidences of evolution
- 2.3 Embryological and physiological evidences of evolution
- 2.4 Evidences from connecting links, missing links and bio geographical distribution

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing afterwatching any video on the above/Visit to Archaeological Museum for observation of fossils*
Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the aboveactivity*

UNIT -III

- 3.1 Lamarckism-Neo Lamarckism
- 3.2 Germplasm theory-August Weismann
- 3.3 Darwinism-Theory of Natural selection
- 3.4 Modern synthetic theory of evolution (Neo Darwinism)

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing afterwatching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT-IV

- 4.1 Variations-types-sources of variations- importance in evolution
- 4.2 Mutations-classification-causes-significance in evolution
- 4.3 Isolation mechanisms-role in evolution
- 4.4 Sewall wright effect, Hardy Weinberg Principle

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing afterwatching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT-V

- 5.1 Animal distribution and barriers of distribution
- 5.2 Zoogeographical realms – Palearctic & Nearctic regions
- 5.3 Zoogeographical realms – Neotropical & Ethiopian regions
- 5.4 Zoogeographical realms – Oriental & Australian regions

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing afterwatching any video on the above/Case study on the observation of fauna in the college locality/in the residential area*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

Co-curricular activities (Suggested)

- Chart on industrial melanism to teach directed selection, Darwin's finches to teach genetic drift, collection of data on weight of children born in primary health centres to teach stabilizing selection etc.

REFERENCES BOOKS:

- Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
- Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
- Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.

- Minkoff, E. (1983). *Evolutionary Biology*. Addison-Wesley.
- Organic evolution by Organic evolution by Dr. Veer Bala Rastogi, 2019 Kedar Nath Ramnath
- Palaeontology and Zoogeography Organic evolution by Dr. Veer Bala Rastogi, 2019 Kedar Nath Ramnath
- Rastogi VB. 1991. *Organic Evolution*. Kedar Nath Ram Nath Publications, Meerut, Uttar Pradesh, India.
- Stahl FW. 1965. *Mechanics of Inheritance*. Prentice-Hall.
- White MJD. 1973. *Animal Cytology and Evolution*. Cambridge Univ. Press

SEMESTER-III
COURSE 8: EVOLUTION AND ZOOGEOGRAPHY

Practical

Credits: 1

2 hrs/week

LEARNING OBJECTIVES

- Acquainting and skill enhancement in the usage of laboratory equipment
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny and geological history of origin & evolution of animals
- To understand the zoogeographical distribution of animals

SYLLABUS:

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Study of embryological evidences by charts/ pictures
4. Study of Lamarckism with images /animations
5. Study of Darwinism with images/ animation
6. Study of connecting links/missing links images/charts
7. Phylogeny of horse with pictures
8. Study of Genetic Drift by using examples of Darwin's finches (pictures)
9. Visit to Natural History Museum and submission of report
10. Mapping distribution of animals according to zoogeographical regions.
11. Mapping zoogeographical regions

REFERENCE WEB LINKS:

- <https://www.labster.com/course-packages/evolution-and-diversity>
- <https://www.biointeractive.org/classroom-resources/stickleback-evolution-virtual-lab>
- <https://www.youtube.com/watch?v=tXbmPhrS4eA>
- <https://www.studocu.com/en-us/document/temple-university/bioe-lab-2-biomaterials/1632834116536-zoogeography-assignment/17915777>
- <https://guides.library.tulsacc.edu/c.php?g=932434&p=6720765>
- https://bio.libretexts.org/Courses/Butte_College/BC%3A_BIOL_2_-_Introduction_to_Human_Biology_%28Grewal%29/Text/09%3A_Biological_Evolution/9.3%3A_Evidence_for_Evolution
- <https://www.coursehero.com/study-guides/boundless-biology/evidence-of-evolution/>

SEMESTER-III MINOR

COURSE 2: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Theory

Credits: 3

3 hrs/week

LEARNING OBJECTIVES

- To understand the animal kingdom.
- To understand the taxonomic position of Protochordata to Mammalia.
- To understand the general characteristics of animals belonging to Fishes to Reptilians.
- To understand the body organization of Chordata.
- To understand the taxonomic position of Protherian mammals.

LEARNING OUTCOMES: By the completion of the course the graduate should be able to –

- Describe general taxonomic rules on animal classification of chordates
- Classify Protochordata to Mammalia with taxonomic keys
- Understand Mammals with specific structural adaptations
- Understand the significance of dentition and evolutionary significance
- Understand the origin and evolutionary relationship of different phyla from Prochordata to Mammalia.

SYLLABUS:

UNIT - I

- 1.1 General characters and classification of Chordata up to classes
- 1.2 Salient features of Cephalochordata, Salient features of Urochordata
- 1.3 Structure and life history of *Herdmania*, Retrogressive metamorphosis –Process and Significance
- 1.4 Cyclostomata, General characters, Comparison of Petromyzon and Myxine

Activity: *Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - II

- 2.1 General characters of Fishes, Salient features Dipnoi
- 2.2 *Scoliodon*: External features, Digestive system, Respiratory system
- 2.3 *Scoliodon* Structure and function of Heart, Structure and functions of the Brain.
- 2.4 Migration in Fishes, Types of Scales

Activity: *Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - III

- 3.1 General characters of Amphibia, General characters of Reptilia
- 3.2 *Rana hexadactyla*: External features, Respiratory system, Structure and function of Heart
- 3.3 *Rana hexadactyla* structure and functions of the Brain
- 3.4 *Calotes*: External features, Digestive system, structure and function of Brain
- 3.5 Identification of Poisonous snakes

Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Reportwriting after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the aboveactivity

UNIT - IV

- 4.1 General characters of Aves
- 4.2 *Columba livia*: External features, Digestive system, Respiratory system
- 4.3 *Columba livia*: Structure and function of Heart, structure and function of Brain
- 4.4 Migration in Birds, Flight adaptation in birds

Activity: Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Reportwriting after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the aboveactivity

UNIT - V

- 5.1 General characters of Mammalia
- 5.2 Classification of Mammalia up to sub - classes with examples
- 5.3 Comparison of Prototherians, Metatherians and Eutherians
- 5.4 Dentition in mammals, Aquatic mammals Adaptations

SEMESTER-III

COURSE 2: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Practical

Credits: 1

2

hrs/week

LEARNING OBJECTIVES

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

SYLLABUS:

1. Protochordata: *Herdmania*, *Amphioxus*, *Amphioxus* T.S through pharynx.
2. Cyclostomes: *Petromyzon* and *Myxine*.
3. Pisces: *Pristis*, *Torpedo*, *Hippocampus*, *Exocoetus*, *Echeneis*, *Labeo*, *Catla*, *Clarius*, *Channa*, *Anguilla*.
4. Amphibia: *Ichthyophis*, *Amblystoma*, *Axolotl* larva, *Hyla*,
5. Reptilia: *Draco*, *Chamaeleon*, *Uromastix*, *Testudo*, *Trionyx*, *Russels viper*, *Naja*, *Krait*, *Hydrophis*, *Crocodile*.
6. Aves: *Psittacula*, *Eudynamis*, *Bubo*, *Alcedo*.
7. Mammalia: *Ornithorhynchus*, *Pteropus*, *Funambulus*.
8. **Dissections**-As per UGC guidelines
 - Scoliodon* IX and X, Cranial nerves
 - Scoliodon* Brain
 - Mounting of fish scales

Note: 1. Dissections are to be demonstrated only by the faculty or virtual.
2. Laboratory Record work shall be submitted at the time of practical examination.

Multidisciplinary Course
w.e.f. AY 2023-24
SEMESTER-III
HEALTH AND HYGIENE

Credits: 2

2 hrs/week

The course is designed to provide a complete guidance on health and hygiene systems, guidelines for implementing and role of government and public in maintaining a healthy life. At the end of the course the student shall be able to understand –

- the importance of health and hygiene in life
- the importance of nutrition for a healthy life
- different health care programmes of India
- basic concept of health impact assessment as a means of assessing the policies, plans and projects using quantitative and qualitative techniques
- importance of community and personal health & hygiene measures
- Importance of food, social tenets, mental condition, physical activity on health

Learning Objectives:

- To provide knowledge on different health indicators and types of hygiene methods
- To impart knowledge on different health care programmes taken up by India
- To make student understand the latest concepts of health such as HIA, EIA, SIA and SEA
- To enable student with disaster mitigation strategies
- To create awareness on community health and hygiene
- To enrich knowledge on communicable and non-communicable diseases and their control
- To aware the student on the importance of food, social strategies, mental status and physical activities on health
- To introduce different community-based mobile apps on health to student and thereby to the community

Learning / Course Outcomes: On completion of this course, the students will be able to understand -

- What is a healthy diet
- How can we use available information to optimize our diet?
- Can nutrition be used for a healthy life?
- Is there a one-size-fits-all “good” diet or should we individualize our dietary goals?
- Disaster management and responsiveness of public in pandemic and epidemic diseases
- Assess the impact of policies on health and hygiene Health measures to consider while travelling
- Awareness in public through digital media viz., mobile apps

Unit I: Basics of Nutrition

10 Hrs.

1. Nutrition – definition, importance, Good nutrition and mal nutrition; Balanced Diet: Basics of Meal Planning
2. Carbohydrates –functions, dietary sources, effects of deficiency.
3. Lipids –functions, dietary sources, effects of deficiency.
4. Proteins –functions, dietary sources, effects of deficiency.
5. Brief account of Vitamins- functions, food sources, effects of deficiency,
6. Macro and micro minerals –functions, effects of deficiency; food sources of Calcium, Potassium and Sodium; food sources of Iron, Iodine and Zinc
7. Importance of water– functions, sources, requirement and effects of deficiency.

Unit II: Health

10 Hrs.

8. Health - Determinants of health, Key Health Indicators, Environment health & Public health; Health-Education: Principles and Strategies
9. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India-2017; Functioning of various nutrition and health organizations in India viz., NIN (National Institution of Nutrition), FNB (Food and Nutrition Board), ICMR (Indian Council of Medical Research), IDA (Indian Dietetics Association), WHO-India, UNICEF-India

10. National Health Mission: National Rural Health Mission (NRHM) Framework, National Urban Health Mission (NUHM) Framework
11. Women & Child Health Care Schemes: Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+); Janani Shishu Suraksha Karyakaram (JSSK); Rashtriya Bal Swasthya Karyakram(RBSK); India Newborn Action Plan (INAP); Adolescent Health- Rashtriya Kishor Swasthya Karyakram (RKSK)
12. Disaster Management – Containment, Control and Prevention of Epidemics and Pandemics – Acts, Guidelines and Role of Government and Public

Unit III: Hygiene


10 Hrs.

13. Hygiene – Definition; Personal, Community, Medical and Culinary hygiene; WASH (WATER, Sanitation and Hygiene) programme
14. Rural Community Health: Village health sanitation & Nutritional committee (Roles & Responsibilities); About Accredited Social Health Activist (ASHA); Village Health Nutrition Day, Rogi Kalyan Samitis
15. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public places
16. Public Awareness through Digital Media - An Introduction to Mobile Apps of Government of India: NHP, Swasth Bharat, No More Tension, Pradhan Mantri Surakshit Mantrivta Abhiyan (PM Suman Yojana), My Hospital (Mera aspataal), India fights Dengue, JSK Helpline, Ayushman Bhava, Arogya Setu, Covid 19AP

REFERENCES

- **Bamji, M.S., K. Krishnaswamy & G.N.V. Brahmam (2009)** *Textbook of Human Nutrition(3rd edition)* Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
- **Swaminathan (1995)** *Food & Nutrition*(Vol I, Second Edition) The Bangalore Printing &Publishing Co Ltd., , Bangalore
- **Vijaya Khader (2000)** *Food, nutrition & health*, Kalyan Publishers, New Delhi
- **Srilakshmi, B., (2010)** *Food Science, (5th Edition)* New Age International Ltd., New Del

**PITHAPUR RAJAH'S GOVT COLLEGE (A), KAKINADA DEPARTMENT OF
ZOOLOGY & AQUACULTURE MAJOR ZOOLOGY
IV SEMESTER COURSE : EMBRYOLOGY**

	P .R.GOVERNMENT COLLEGE (A) KAKINADA	Program & Semester SEMESTER – IV PAPER-9			
TITLE	EMBRYOLOGY				
Course Code					
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Credits 3	4	1	2	5

Skill Development	Employability	Entrepreneurship	knowledge
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Course with focus on employability / entrepreneurship / Skill Development module

SEMESTER-IV COURSE 9: EMBRYOLOGY

Theory Credits: 3 hrs/week

OBJECTIVES	LEARNING OUT COME
<ul style="list-style-type: none"> ➤ The objective of this course is to provide a comprehensive understanding of the concepts of early animal development. ➤ Students taking this course must develop a critical appreciation of methodologies specifically used to study the process of embryonic development in animals. ➤ In this course different concepts of animal development will be elaborated. Students will be made familiar 	<ul style="list-style-type: none"> ➤ The overall course outcome is that the student shall develop deeper understanding of concepts of embryology. This course will provide students with a deep knowledge in embryology by the completion of the course the graduate shall able to – ➤ Understand the historical perspective and concepts of embryology

<p>with different approaches that have been used to study embryology.</p> <ul style="list-style-type: none"> ➤ Topics that will be discussed are organogenesis and regeneration. 	<ul style="list-style-type: none"> ➤ Acquire knowledge on gametogenesis, fertilization and cleavage patterns ➤ Understand the fate of germinal layers and extraembryonic membranes ➤ Explain the process of regeneration in certain animals ➤ Examine the process of organogenesis
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- **CURRICULAR ACTIVITIES (Suggested)**

- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.
- Chart on the organogenesis
- RBPT on the Placenta
- Model of extra embryonic membrane
- Laboratory observation of chick embryonic development

Pithapur Raja's Govt. College (Autonomous), Kakinada DEPARTMENT OF ZOOLOGY AND AQUACULTURE

Major zoology Semester-IV SEMESTER-IV

COURSE 9: EMBRYOLOGY SYLLABUS

UNIT I:

- 1.1 Historical perspective and basic concepts: Phases of development
- 1.2 Cell-Cell interaction, Pattern formation, Differentiation and growth
- 1.3 Differential gene expression,
- 1.4 Cytoplasmic determinants and asymmetric cell division

UNIT-II:

- 2.1 Gametogenesis, Spermatogenesis, Oogenesis;
- 2.2 Types of eggs, Egg membranes; Fertilization (External and Internal)
- 2.3 Planes and patterns of cleavage; Types of Blastulae; Fate maps
- 2.4 Early up to development of frog and chick gastrulation.

UNIT-III:

- 3.1 Fate of Germ Layers
- 3.2 Extra-embryonic membranes
- 3.3 Placenta (Structure, types and functions of placenta)
- 3.4 Amniocentesis

UNIT-IV:

- 4.1 Metamorphosis: Changes, hormonal regulations in amphibians
- 4.2 Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (in Turbellarians)
- 4.3 Ageing: Concepts and Theories
- 4.4 Teratogenic agents and their effects on embryonic development

UNIT-V:

- 5.1 Organogenesis of Central Nervous system
 - 5.2 Organogenesis of Eye, Ear
 - 5.3 Organogenesis of Skin
 - 5.3 Organogenesis of Circulatory system
- (* Organogenesis in Human need to be explained)

Additional topic

Polyspermy, cortical granule reaction, synthetic embryology.

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation)

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

**Pithapur Raja's Govt. College (Autonomous), Kakinada DEPARTMENT OF
ZOOLOGY AND AQUACULTURE
Major zoology Semester-IV**

Name of the Department	Semester, Program, Paper Number & Title of the Paper,	Titles of Topics deleted	Topic added in 2024 bos	Percentage of changes made in syllabus	Justification per each topic deleted/ added
Zoology & Aquaculture	Sem IV , Major Zoology Paper-9 embryology	Nil	Polyspermy, cortical granule reaction. Synthetic embryology.	20%	Useful for Competitive exams Useful for competitive exams

**TITLE: Embryology – PAPER 9
BLUE PRINT FOR QUESTION PAPER SETTER**

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
Module -I	01	02	20
Module -II	02	01	25
Module -III	01	01	15
Module -IV	01	01	15
Module -V	01	02	20
TOTAL	06 Of which 3 to be answered	07 Of which 4 to be answered	95 marks including choice Of which 50 marks to be answered

**Pithapur Raja's Govt. College (Autonomous), Kakinada DEPARTMENT OF
ZOOLOGY AND AQUACULTURE
Major zoology Semester-IV**

MODEL QUESTION PAPER

Time: 3 hrs.

Max Marks: 50

SECTION –I

Answer Any THREE of the following by choosing at least one question in each section(Draw labeled diagrams wherever necessary)

S NO	Question	co	po
1	Discuss the phases of development in embryology and explain how they contribute to the formation of a complex organism.	1	2
2	Explain the types of eggs and egg membranes. How do these structures facilitate fertilization in both external and internal environments?	2	3
3	explain the process an types of cleavage occurring in the zygote duringembryo development	1	2

Or

S no	Question	co	po
4	Explain the process of organogenesis in the central nervoussystem.	1	3
5	Describe the modes of regeneration, including epimorphosis, morphallaxis, and compensatory regeneration in Turbellarians.	1	1
6	Discuss the fate of germ layers during embryonic development. How do these layers give rise to different tissues and organs in the developing organism?	2	2

Answer Any Five of the following questions

4x5=20 Marks

s.no	Short Question	Co	po
7	What are the main phases of embryonic development	2	1
8	Describe the structures of different types of eggs and their role in fertilization.	1	2

9	What is meant by "differential gene expression,"	1	3
10	Explain the structure and functions of the placenta	2	1
11	Briefly explain the process of metamorphosis in amphibians.	2	2
12	How does organogenesis occur in the central nervous system?	3	1
13	Briefly explain how the skin develops during organogenesis.	1	2

**Pithapur Raja's Govt. College (Autonomous), Kakinada DEPARTMENT OF
ZOOLOGY AND AQUACULTURE**

QUESTION BANK

MODULE -I

Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Discuss the phases of development in embryology and explain how they contribute to the formation of a complex organism.	BT 1	co 1	Pso 1
2	Cell-cell interactions play a crucial role in embryonic development. Explain the significance of these interactions in pattern formation, differentiation, and growth.	BT 3	co 2	Pso1

Short Answer Question

S.NO	QUESTION	BT LEVEL	CO	PO
1	What are the main phases of embryonic development?	BT 1	CO 2	PSO 3
2	How do cell-cell interactions influence pattern of formation of embryo?	BT 1	CO 1	PSO 2
3	What is meant by "differential gene expression,"	BT 2	CO 3	PSO 3

MODULE II

Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Compare and contrast spermatogenesis and oogenesis, highlighting their similarities and differences.	BT 1	CO 3	PSO
2	Explain the types of eggs and egg membranes. How do these structures facilitate fertilization in both external and internal environments?	BT 2	CO3	PSO 5
3	explain the process an types of cleavage occurring in the zygote during embryo evvelopment?	BT 1	CO3	PSO 5

Short Answer Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Define spermatogenesis and oogenesis?	BT 1	CO3	PSO 5
2	Describe the structures of different types of eggs and their role in fertilization.	BT 2	CO1	PSO 3
3	What are the planes and patterns of cleavage	BT 2	CO3	PSO 5

MODULE III

Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Discuss the fate of germ layers during embryonic development. How do these layers give rise to different tissues and organs in the developing organism?	BT 3	CO4	PSO4
2	Explain the functions of extra-embryonic membranes in embryonic development.?	BT 1	CO5	PSO5
3	Describe the structure, types, and functions of the placenta?	BT 1	CO5	PSO4

Short Answer Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Write a brief note on germ layers?	BT 2	CO3	PSO2
2	Describe the functions of extra-embryonic membranes	BT 1	CO4	PSO5
3	Explain the structure and functions of the placenta.	BT 2	CO3	PSO2

MODULE IV

Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Discuss the significance of metamorphosis in the life cycle of amphibians.	BT 3	CO3	PSO2
2	Describe the modes of regeneration, including epimorphosis, morphallaxis, and compensatory regeneration in Turbellarians.	BT 1	CO1	PSO2
3	Discuss the concepts and theories of ageing.	BT 1	CO1	PSO2

short Answer Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Briefly explain the process of metamorphosis in amphibians.	BT 2	CO1	PSO3
2	What are the different modes of regeneration	BT 1	CO2	PSO2
3	What are teratogenic agents, and how do they affect embryonic development	BT 1	CO2	PSO2

MODULE V

Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Explain the process of organogenesis in the central nervous system.	BT 3	CO3	PSO2
2	Describe the organogenesis of the eye and ear and what are the key molecular mechanisms involved?	BT 1	CO1	PSO2
3	Discuss the organogenesis of the skin. How do different layers of the skin develop, and what factors regulate the formation of skin appendages such as hair follicles and sweat glands?	BT 1	CO1	PSO2

Short Answer Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	How does organogenesis occur in the central nervous system?	BT 2	CO3	PSO2
2	Describe the process of organogenesis in the eye and ear.	BT 1	CO4	PSO5
3	Briefly explain how the skin develops during organogenesis.	BT 2	CO3	PSO2
4	What is the process of organogenesis in the circulatory system?	BT 1	CO4	PSO3

REFERENCES BOOKS:

- Developmental Biology by Balinsky
- Developmental Biology by Gerard Karp
- Chordate embryology by Varma and Agarwal
- Embryology by V.B. Rastogi
- Austen CR and Short RV. 1980. Reproduction in Mammals. Cambridge University Press.
- Gilbert SF. 2006. Developmental Biology, 8th Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
- Longo FJ. 1987. Fertilization. Chapman & Hall, London.
- Rastogi VB and Jayaraj MS. 1989. Developmental Biology. Kedara Nath Ram Nath Publishers, Meerut, Uttar Pradesh.
- Schatten H and Schatten G. 1989. Molecular Biology of Fertilization. Academic Press, New York.

**Pithapur Raja's Govt. College (Autonomous), Kakinada DEPARTMENT OF
ZOOLOGY AND AQUACULTURE**

Major zoology Semester-IIIV SEMESTER

Course No.: 9 - embryology
credits :1

PRACTICAL SYLLABUS

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages)
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages)
3. Study of different sections of placenta (photomicrograph/ slides)
4. Project report on chick embryo development.

PRACTICAL MODEL PAPER

Embryology

PRACTICAL MODEL PAPER


- | | |
|--|-----|
| 1. Project report on chick embryo development. | 12M |
| 2. Study of different sections of placenta | 8 M |

5X4=20M

- A) Embryology slide
- B) Embryology slide
- C) Embryology slide
- D) Embryology slide
- E) Embryology slide

- | | |
|--------------|-----------|
| 2. Record | 05 M |
| Viva | 05 M |
| Total | 50 |

P.R GOVT COLLEGE (A),KAKINADA
DEPARTMENT OF ZOOLOGY & AQUACULTURE
IV SEMESTER
COURSE 4: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS
Theory Credits: 3

	P .R.GOVERNMENT COLLEGE (A) KAKINADA	Program & Semester SEMESTER 4 PAPER-IV			
TITLE	ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS Core: VII				
CourseCode					
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Credits 3	4	1	2	5

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship		knowledge	
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SSYLLABUS

OBJECTIVES	LEARNING OUT COME
<ul style="list-style-type: none"> ➤ To understand the structure and functions of organ systems. ➤ To develop the ability to integrate physiology from the cellular and molecular level to the organ system and level of organization. 	<ul style="list-style-type: none"> ➤ Understand the physiology of digestion and hormonal control of digestion ➤ Develop a comprehensive picture of respiratory physiology ➤ Acquire knowledge on the Renal & Nerve physiology and muscle structure <p>Understand the physiology of heart physiolog.</p>

Course outcomes:

The overall course outcome is that the student shall develop deeper understanding of concepts of Physiology. This course will provide students with a deep knowledge in physiology by the completion of the course the graduate shall able to –

1. Understand the physiology of digestion and hormonal control of digestion
2. Develop a comprehensive picture of respiratory physiology
3. Acquire knowledge on the Renal physiology
4. Understand the physiology of Nerve and muscle
5. Understand the physiology of heart

SYLLABUS

UNIT-I: Physiology of Digestion

- 1.1 Structural organization and functions of gastrointestinal tract and associated glands;
- 1.2 Vitamins & Mineral composition of food & Mechanical and chemical digestion of food;
- 1.3 Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins;
- 1.4 Hormonal control of secretion of enzymes in Gastrointestinal tract.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Chart preparation on the hormonal control of secretion of enzymes

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-II: Physiology of Respiration

- 2.1 Structural organization of Respiratory system, Mechanism of respiration, Control of respiration
- 2.2 Pulmonary ventilation; Respiratory volumes and capacities;
- 2.3 Transport of oxygen in blood and dissociation curves and the factors influencing it
- 2.4 Transport of Carbon dioxide in blood; dissociation curves and the factors influencing it, Carbon monoxide poisoning

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the CO poisoning/Debate on the dissociation curves

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-III: Renal Physiology

- 3.1 Structure of kidney and its functional unit
- 3.2 Mechanism of urine formation
- 3.3 Regulation of water balance
- 3.4 Regulation of acid-base balance

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the Urine formation/Working model of Kidney

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-IV: Physiology of exciting tissues

- 4.1 Neuron structure and types
- 4.2 Nerve impulse transmission-(Myelinated, Non-myelinated, synaptic)
- 4.3 Ultra structure of muscle
- 4.4 Molecular and chemical basis of muscle contraction

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the impulse transmission/Debate on the dissociation curves

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT- V: Physiology of Heart

- 5.1 Structure of mammalian heart, Coronary circulation;
- 5.2 Structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses
- 5.3 Cardiac Cycle-Cardiac output and its regulation
- 5.4 Nervous and chemical regulation of heart rate. Blood pressure and its regulation

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the phases of Cardiac output /case study on the Blood

Pressure

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

Structure and Functions of different types of organ systems , structure of Muscle, respiratory system, digestive system and excretory system.

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation)

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

Name of the Department	Semester, Program, Paper Number & Title of the Paper,	Titles of Topics deleted	Topics added during BOS meeting November, 2022	Percentage of changes made in syllabus	Justification per each topic deleted/ added
ZoologyAqua culture	Sem IV , Major Zooligy Paper-4 ANIMAL PHYSIOLOGY	Nil	Structure and Functions of different types of organ systems , structure of Muscle, respiratory system, digestive system and excretory system.	20%	Useful for Competitive exams Useful for competitive exams

P.R. Govt. College (Autonomous), Kakinada
DEPARTMENT OF ZOOLOGY AND AQUACULTURE

Major zoology Semester-IV

TITLE: ANIMAL PHYSIOLOGY: – PAPER :4
BLUE PRINT FOR QUESTION PAPER SETTER

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
Module -I	01	02	20
Module -II	01	02	20
Module -III	02	01	25
Module -IV	01	01	15
Module -V	01	01	15
	06 Of which 3 to be answered	07 Of which 5 to be answered	95 marks including choice Of which 50 marks to be answered

**P.R.
Govt.
College**

Semester-IV

TITLE : ANIMAL PHYSIOLOGY PAPER: IV

MODEL QUESTION PAPER

Time: 2 hrs

Max. Marks :50

PART – 1

Note: Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3 X10 = 30

SECTION- A

1. write an essay on the process of Absorptions. BT3
2. Ellucidate the transport of O₂ and CO₂ through lungs ? BT2
3. Discuss about the urine formation Mechanism. BT2

SECTION-B

4. Describe the structural and fictional unit of kidney. BT2
5. Discuss about the Process of Muscle contractions .BT2
6. Write an essay on cardiac cycle. BT2

Part – II

Answer any Four of the following.

4x5=20

7. chemical digestion of food. BT1
8. gastrointestinal tract associated glands. BT 2
9. Pulmonary ventilation; BT1
10. Respiratory volumes and capacities. BT2
11. Regulation of acid-base balance .BT1
12. Structure of Nueron BT2
14. Blood pressure and its regulation. BT2

P.R. Govt. College (Autonomous), Kakinad

Semester-IV

TITLE : ANIMAL PHYSIOLOGY PAPER: IV

Question Bank

UNIT :I ESSAY QUESTIONS

1. Write an essay on Structural organization and functions of gastrointestinal tract and associated glands. BT1
2. Write an essay on the process of Absorptions. BT3
3. Discuss about Hormonal control of different Types of enzymes in Gastrointestinal tract. BT2
4. Elucidate the Mechanical and chemical digestion of food. BT2

Shots

1. Vitamins & Mineral composition of food.
2. Absorptions.
3. Gastrointestinal tract associated glands.
4. Mechanical digestion of food.

UNIT :II ESSAY QUESTIONS

1. Elucidate the transport of O₂ in blood; dissociation curves and the factors influencing it? BT2
2. Elucidate the Transport of Carbon dioxide in blood; dissociation curves and the factors influencing it, BT2
3. Write an essay on Mechanism of respiration and Control of respiration .BT1

Shorts

1. Carbon monoxide poisoning .
2. Pulmonary ventilation.
3. Respiratory volumes and capacities.

UNIT :III ESSAY QUESTIONS

1. Discuss about the urine formation Mechanism. BT2
2. Describe the structural and functional unit of kidney. BT2
3. Describe the structure and functions of Kidney. BT2
4. Discuss about the Regulation of water and acid-base balance .BT2

Shorts:

1. kidney structure
2. counter current Mechanism.

- 3.Regulation of water balance
- 4 .Regulation of acid-base balance

UNIT :IV ESSAY QUESTIONS

- 1.Discuss about the Process of Muscle contractions .BT2
- 2.Write an essay on Neuron structure and its types .BT1
- 4..3.Describe the Ultra structure of muscle.BT1

Shorts

- 1.Nerve impulse transmission.
- 2.Nueron structure.
- 3.Myelinated and Non-myelinated sheeth.
- 4.Nuerotransmitters.

UNIT :V ESSAY QUESTIONS

- 1.Write an essay on cardiac cycle. BT2
2. Elucidate the Structure of mammalian heart.BT2
- 3.Describe the Structure and working of heart.BT2

Shorts

- 1 structure of heart.
- 2.Myogenic heart.
- 3.Nuerogenic heart.
- 4.Blood pressure and its regulation.

SEMESTER-IV
COURSE 4: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS
Practical Credits: 1

2 hrs/week

LEARNING OBJECTIVES

1. To acquire knowledge of anatomy of certain important organs.
2. To develop the ability to test the biological sample like saliva and urine.
3. To Effectively estimate the blood haemoglobin.
4. To Acquire skill to use the sphygmomanometer in recording blood pressure.
5. To observe the ECG

SYLLABUS:

1. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney
2. Study of activity of Salivary amylase under optimum condition
3. Qualitative tests for identification of Carbohydrates
4. Qualitative tests for identification of Proteins
5. Qualitative tests for identification of Fats
6. Urine test for sugar, albumin
7. Estimation of haemoglobin using Sahli's haemoglobinometer
8. Recording of blood pressure using a sphygmomanometer
9. Recording of frog's heart beat under in situ and perfused conditions
10. ECG observation- Spotting/identification of curves from the given ECG

REFERENCE WEB LINKS:

1. <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>
2. <https://library.csi.cuny.edu/oer/virtuallabs-simulations#anatomy>
3. <https://www.labster.com/simulations?course-packages=animal-physiology>
4. <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>
5. [https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_\(2013\).pdf](https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_(2013).pdf)

PRACTICAL MODEL PAPER
ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

PRACTICAL MODEL PAPER

1. Estimation of the salivary Amylase Activity.	12M
2. Identification of Protein test (Any Four).	8 M
Slides Identification	5X4=20M
1.kidney	
2 .lung.	
3.liver.	
4.stomach	
Record	05 M
Viva	05 M
Total	50M

COURSE 11: IMMUNOLOGY

Theory

Credits: 3

3 hrs/week

LEARNING OBJECTIVES

- To promote critical thinking among students.
- To provide students with a foundation in immunological processes
- To provide students with knowledge on how the immune system works building on their previous knowledge
- To clearly state the role of the immune system.
- To compare and contrast the innate versus adaptive immune systems.
- To provide an overview of the interaction between the immune system and pathogens.

LEARNING OUTCOMES:

The overall course outcome is that the student shall develop deeper understanding of concepts of immunology. This course will provide students with a deep knowledge in immunology by the completion of the course the graduate shall able to –

- Articulate the roles of innate recognition receptors in immune responses
- Compare and contrast humoral versus cell-mediated immune responses
- Distinguish various cell types involved in immune responses and associated functions;
- Distinguish and characterize antibody isotypes, development, and functions
- Understand the role of cytokines in immunity and immune cell activation;
- Understand the significance the Major Histocompatibility Complex in terms of immune response and transplantation

SYLLABUS:

UNIT – I: Overview of Immune system

- 1.1 Introduction to basic concepts in Immunology
- 1.2 Innate and adaptive immunity
- 1.3 Cells of immune system
- 1.4 Organs of immune system

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above/Model chart preparation of cells/organs of immune system

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – II : Antigens

- 2.1 Basic properties of antigens
- 2.2 B and T cell epitopes, paratopes
- 2.3 Haptens and adjuvants
- 2.4 Factors influencing immunogenicity

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/ Model chart preparation of organogenesis

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – III: Antibodies

- 3.1 Structure of antibody
- 3.2 Classes of antibodies
- 3.3 Functions of antibodies
- 3.4 Monoclonal antibodies

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/ Model chart preparation of antibodies

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – IV: Working of Immune system

- 4.1 Structure and functions of major histocompatibility complexes
- 4.2 Exogenous pathway of antigen presentation and processing
- 4.3 Endogenous pathway of antigen presentation and processing
- 4.4. Basic properties and functions of cytokines

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/ Model chart preparation ofMHC

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT – V: Immune system in health and disease

- 5.1 Gell and Coombs' classification and brief description of various types of hypersensitivities
- 5.2 Introduction to concepts of autoimmunity and immunodeficiency
- 5.3 General introduction to vaccines Types of vaccines, Immunization programme
- 5.4 Organ transplantation- Graft rejection, immune suppressors

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/ Model chart preparation of classification of Hypersensitivity

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

Co-curricular activities (suggested)

- Organizing awareness on immunization importance in local village in association with NCC and NSS teams
- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc.,as per the creativity and vision of the lecturer and students

REFERENCES BOOKS:

- Judy Owen, Jenni Punt, Sharon Stranford 2013 Kuby Immunology: International Edition W. H. Freeman
- Abbas AK, 2011, Cellular and Molecular Immunology 7th Ed. Elsevier Health Sciences – India.
- Delves P, Martin S, Burton D, Roitt IM 2011 Roitt's Essential Immunology. 12th Ed. Wiley-Blackwell Scientific Publication, Oxford.
- Murphy K, 2011 Janeway's Immunobiology. 8th Ed. Garland Science Publishers, New York.

- Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
- Richard Coico, Geoffrey Sunshine 2008 Immunology: A Short Course, 6th Edition Wiley-Blackwell
- Sudha Gangal 2013 Textbook of Basic and Clinical Immunology Orient Blackswan Private Limited - New Delhi

COURSE 11: IMMUNOLOGY

Practical

Credits: 1

2 hrs/week

LEARNING OBJECTIVES

- To acquire knowledge on the distribution of lymphoid organs
- To study the histology of lymphoid organs
- To acquaint with the process of blood grouping with kit
- To acquaint with the ELISA test
- To acquaint with the Widal test

SYLLABUS:

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of ELISA
5. Demonstration of Immunoelectrophoresis
6. Testing for Typhoid antigens by Widal test.
7. Differential Leukocyte Count
8. Isolation of monocytes from blood.
9. Rapid Plasma Reagin (RPR) Test

REFERENCE WEB LINKS:

- <https://vlab.amrita.edu/?sub=3&brch=69>
- <https://ivl1-au.vlabs.ac.in/List%20of%20experiments.html>
- <https://ivl2-au.vlabs.ac.in/List%20of%20experiments.html>
- <https://www.medicine.mcgill.ca/physio/vlab/immun/vlabmenuimmun.htm>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>
- <http://www.lucp.net/books-pdf/Lab%20Manual%20Dr.%20Idris%20Adewale%20Ahmed/15.%20BASIC%20IMMUNOLOGY.pdf>
- https://www.avit.ac.in/lab/immunology_bioprocess_engineering_lab/download/17BTCC89/lab_manual.pdf
- <https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelinger-lab/documents/Immunology-Lab-Manual.pdf>
- https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf

SEMESTER-IV
COURSE 3: EMBRYOLOGY

Theory

Credits: 3

3 hrs/week

LEARNING OBJECTIVES

- The objective of this course is to provide a comprehensive understanding of the concepts of early animal development.
- Students taking this course must develop a critical appreciation of methodologies specifically used to study the process of embryonic development in animals.
- In this course different concepts of animal development will be elaborated
- Students will be made familiar with different approaches that have been used to study embryology.
- Topics that will be discussed are organogenesis and regeneration.

LEARNING OUTCOMES:

The overall course outcome is that the student shall develop deeper understanding of concepts of embryology. This course will provide students with a deep knowledge in embryology by the completion of the course the graduate shall able to –

- Understand the historical perspective and concepts of embryology
- Acquire knowledge on gametogenesis, fertilization and cleavage patterns
- Understand the fate of germinal layers and extraembryonic membranes
- Explain the process of regeneration in certain animals
- Examine the process of organogenesis

SYLLABUS:

UNIT-I:

- 1.1 Historical perspective and basic concepts: Phases of development
- 1.2 Cell-Cell interaction, Pattern formation, Differentiation and growth
- 1.3 Differential gene expression,
- 1.4 Cytoplasmic determinants and asymmetric cell division

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-II:

- 2.1 Gametogenesis, Spermatogenesis, Oogenesis;
- 2.2 Types of eggs, Egg membranes; Fertilization (External and Internal)
- 2.3 Planes and patterns of cleavage; Types of Blastulae; Fate maps
- 2.4 Early development of frog and chick up to gastrulation

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above/Model preparation on cleavage planes

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-III:

- 3.1 Fate of Germ Layers
- 3.2 Extra-embryonic membranes
- 3.3 Placenta (Structure, types and functions of placenta)
- 3.4 Amniocentesis

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above/Chart preparation on the placenta*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT-IV:

- 4.1 Metamorphosis: Changes, hormonal regulations in amphibians
- 4.2 Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (in Turbellarians)
- 4.3 Ageing: Concepts and Theories
- 4.4 Teratogenic agents and their effects on embryonic development

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Flow chart preparation on the process of metamorphosis highlighting the periodical changes vs hormone activity*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT-V:

- 5.1 Organogenesis of Central Nervous system
- 5.2 Organogenesis of Eye, Ear
- 5.3 Organogenesis of Skin
- 5.3 Organogenesis of Circulatory system
(* Organogenesis in Human need to be explained)

Activity: *Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Flow chart preparation on the process of organogenesis highlighting the gradual developments of organ systems*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

Co-curricular activities (Suggested)

- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.
- Chart on the organogenesis
- RBPT on the Placenta
- Model of extra embryonic membrane
- Laboratory observation of chick embryonic development

REFERENCES BOOKS:

- Developmental Biology by Balinsky
- Developmental Biology by Gerard Karp
- Chordate embryology by Varma and Agarwal
- Embryology by V.B. Rastogi

- Austen CR and Short RV. 1980. *Reproduction in Mammals*. Cambridge University Press.
- Gilbert SF. 2006. *Developmental Biology*, 8th Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
- Longo FJ. 1987. *Fertilization*. Chapman & Hall, London.
- Rastogi VB and Jayaraj MS. 1989. *Developmental Biology*. KedaraNath Ram Nath Publishers, Meerut, Uttar Pradesh.
- Schatten H and Schatten G. 1989. *Molecular Biology of Fertilization*. Academic Press, New York.

MINOR COURSES SEMESTER-IV
COURSE 3: EMBRYOLOGY

Practical

Credits: 1

2 hrs/week

LEARNING OBJECTIVES

- The objective of this course is to provide a comprehensive practical knowledge on the embryology
- Must develop a critical understanding of the early embryological events
- Acquire knowledge on the developmental stages of chick
- Understand the histology of placenta

SYLLABUS:

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages)
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages)
3. Study of different sections of placenta (photomicrograph/ slides)
4. Project report on chick embryo development

REFERENCE WEB LINKS:

- <https://praxilabs.com/en/3d-simulations/cultivation-and-preparation-of-the-virus-in-chick-embryo-virtual-lab>
- <https://vlab.amrita.edu/>
- <https://www.vlab.co.in/>
- https://www.youtube.com/watch?v=p_tx88He8Pk
- <https://core.ac.uk/download/143957972.pdf>
- <https://egyankosh.ac.in/bitstream/123456789/57549/1/Exercise%207%20Chick%20Embryo.pdf>
- http://www.macollege.in/app/webroot/uploads/department_materials/doc_501.pdf
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

SEMESTER-IV

COURSE 4: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Theory

Credits: 3

3 hrs/week

LEARNING OBJECTIVES

- To acquire knowledge of organ systems function.
- To develop the ability to integrate physiology from the cellular and molecular level to the organ system and organismic level of organization.
- To Effectively read, evaluate and communicate scientific information related to physiological processes in the body.
- To gain a deep knowledge of current topics in physiology.

LEARNING OUTCOMES:

The overall course outcome is that the student shall develop deeper understanding of concepts of Physiology. This course will provide students with a deep knowledge in physiology by the completion of the course the graduate shall able to –

- Understand the physiology of digestion and hormonal control of digestion
- Develop a comprehensive picture of respiratory physiology
- Acquire knowledge on the Renal physiology
- Understand the physiology of Nerve and muscle
- Understand the physiology of heart

SYLLABUS:

UNIT-I: Physiology of Digestion

- 1.1 Structural organization and functions of gastrointestinal tract and associated glands;
- 1.2 Vitamins & Mineral composition of food & Mechanical and chemical digestion of food;
- 1.3 Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins;
- 1.4 Hormonal control of secretion of enzymes in Gastrointestinal tract.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Chart preparation on the hormonal control of secretion of enzymes Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-II: Physiology of Respiration

- 2.1 Structural organization of Respiratory system, Mechanism of respiration, Control of respiration
- 2.2 Pulmonary ventilation; Respiratory volumes and capacities;
- 2.3 Transport of oxygen in blood and dissociation curves and the factors influencing it
- 2.4 Transport of Carbon dioxide in blood; dissociation curves and the factors influencing it, Carbon monoxide poisoning

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the CO poisoning/Debate on the dissociation curves

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-III: Renal Physiology

- 3.1 Structure of kidney and its functional unit
- 3.2 Mechanism of urine formation
- 3.3 Regulation of water balance
- 3.4 Regulation of acid-base balance

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the Urine formation/Working model of Kidney Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-IV: Physiology of exciting tissues

- 4.1 Neuron structure and types
- 4.2 Nerve impulse transmission-(Myelinated, Non-myelinated, synaptic)
- 4.3 Ultra structure of muscle
- 4.4 Molecular and chemical basis of muscle contraction

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the impulse transmission/Debate on the dissociation curves Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT- V: Physiology of Heart

- 5.1 Structure of mammalian heart, Coronary circulation;
- 5.2 Structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses
- 5.3 Cardiac Cycle-Cardiac output and its regulation
- 5.4 Nervous and chemical regulation of heart rate. Blood pressure and its regulation

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the phases of Cardiac output /case study on the Blood Pressure Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

Co-curricular activities (Suggested)

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Working model of human / any mammalian urine formation
- Chart/model of sarcomere
- Chart/model on nerve impulse transmission

REFERENCES BOOKS:

- Eckert H. *Animal Physiology: Mechanisms and Adaptation*. W.H. Freeman & Company.
- Floray E. *An Introduction to General and Comparative Animal Physiology*. W.B. Saunders Co., Philadelphia.
- Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, Rastogi Publications, Meerut, U.P.
- Hoar WS. *General and Comparative Physiology*. Prentice Hall of India, New Delhi.
- Lehninger AL. Nelson and Cox. *Principles of Biochemistry*. Lange Medical Publications, New Delhi.
- Prosser CL and Brown FA. *Comparative Animal Physiology*. W.B. Saunders Company, Philadelphia.

SEMESTER-IV

COURSE 4: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Practical

Credits: 1

2 hrs/week

LEARNING OBJECTIVES

- To acquire knowledge of anatomy of certain important organs.
- To develop the ability to test the biological sample like saliva and urine.
- To Effectively estimate the blood haemoglobin.
- To Acquire skill to use the sphygmomanometer in recording blood pressure.
- To observe the ECG


SYLLABUS:

1. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney
2. Study of activity of Salivary amylase under optimum condition
3. Qualitative tests for identification of Carbohydrates
4. Qualitative tests for identification of Proteins
5. Qualitative tests for identification of Fats
6. Urine test for sugar, albumin
7. Estimation of haemoglobin using Sahli's haemoglobinometer
8. Recording of blood pressure using a sphygmomanometer
9. Recording of frog's heart beat under in situ and perfused conditions
10. ECG observation- Spotting/identification of curves from the given ECG

REFERENCE WEB LINKS:

- <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>
- <https://library.csi.cuny.edu/oer/virtuallabs-simulations#anatomy>
- <https://www.labster.com/simulations?course-packages=animal-physiology>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>
- [https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_\(2013\).pdf](https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_(2013).pdf)

V SEMESTER – OLD PATTERN

	P.R. Government Degree College (A) Kakinada	Program & Semester			
CourseCode	TITLE OF THE COURSE Domain Subject: ZOOLOGY Semester –V Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT	III B.Sc., (V SEM)			
Teaching	Hours Allocated: 50 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	Students at the successful completion of this course will be able to
CO2	Evaluate the present status of aquaculture at the Global level and National level
CO3	Classify different types of ponds used in aquaculture
CO4	Demonstrate induced breeding of carps
CO5	Acquire critical knowledge on commercial importance of shrimps

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Knowledge		Employability		Entrepreneurship	
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Syllabus

(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit: 1

1.1 Present status of Aquaculture – Global and National scenario

1.2 Major cultivable species for aquaculture: freshwater, brackish water and marine.

1.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

1.4 Design and construction of fish and shrimp farms

Unit: 2

- 2.1 Functional classification of ponds– head pond, hatchery, nursery ponds
- 2.2 Functional classification of ponds-rearing, production, stocking, and quarantine ponds
- 2.3 Need of fertilizer in aquaculture
- 2.4 Physio-chemical conditions of soil and water optimum for culture
- 2.5 (Temperature, depth, turbidity, light, water, PH, BOD, CO₂ and nutrients)

Unit: 3

- 3.1. Induced breeding in fishes
- 3.2. Culture of Indian major carps: Pre-stocking management
(Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)
- 3.3. Culture of Indian major carps –Stocking management
- 3.4. Culture of Indian major carps-post-stocking management

Unit: 4

- 4.1 Commercial importance of shrimp and prawn
- 4.2 Macrobrachium rosenbergii-Biology, seed production.
- 4.3 Culture of L.vannamei– hatchery technology and culture practices
- 4.4 Mixed culture of fish and prawns

Unit: 5

- 5.1 Viral diseases of Fin fish & shell fish
- 5.2 Fungal diseases of Fin & Shell fish
- 5.3 Bacterial diseases of Fin fish & Shell fish
- 5.4 Prawn Diseases pertaining to East Godavari with special reference to White gut, WSSV, Gill rot, Black shell diseases

Textbooks:

1. Textbook of Fish Biology and Fisheries, By SS Khanna
2. Post-Harvest Technology of Fish and Fish Products, K. K. Balachandran (Author)
3. RECENT TECHNOLOGIES IN FISH AND FISHERIES, G.KrishnaveniandN.Veerabhdra
Mr.K.Veeranjaneyulu

Referencebooks:

1. PillayTVR&M.A.Dill, 1979. Advances in Aquaculture. FishingNews BooksLtd.,London
2. StickneyRR 1979. Principles of WarmWaterAquaculture. John Wiley&SonsInc.1981
3. BoydCE1982. Water QualityManagementfor Pond
FishCulture.ElsivierScientificPublishingCompany.
4. BoseANet.al. 1991.CostalAquacultureEngineering.Oxford&IBHPublishingCompanyPvt.Ltd
- 5.

WebLinks:

1. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
2. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
3. <https://www.notesonzooology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], 0: No Correlation)

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

Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT
 (Skill Enhancement Course (Elective), -Credits: 05)

Additions And Deletions of Paper SustainableAquaculture Management

	Deleted Topics	Reasons for deleting
1.	5. Prophylaxis in aquaculture	It is dealt already individually in 5.1, 5.2, 5.3
2.	2. Manure application in culture ponds	It is dealt in 2.3
	List of Added topics	Reasons for adding
1.	1. Blue revolution	It is important in explaining present status of aquaculture
2.	5. Prawn Diseases pertaining to East Godavari with special reference to White gut, WSSV, Gillrot, Black shell diseases	Catering to local needs by studying the local epidemics.

Blue Print

Module Name	PART I Essay Type Questions 10 marks each	Part II Short Answer Questions 5 marks each	Marks Allotted to the Chapter
UNIT I	1	01	15
UNIT II	1	02	20
UNIT III	2	01	25
UNIT IV	1	02	20
UNIT V	1	01	15
5.Total	06 Of which 3 to be answered	07 Of which 4 to be answered	95 Marks including choice. Of which 60 Marks to be answered

NONOTE: The question paper setters are requested to kindly adhere to the format given in the table

P.R. GOVERNMENT COLLEGE (A), KAKINADACHOICE BASED CREDIT SYSTEM

Four – year B.Sc. (Hons) Domain Subject: ZOOLOGY

Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENTMODEL PAPER

PART – 1

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams wherever necessary 3 X10

=30

SECTION- A

1. Describe the present status of Aquaculture in Global and National Scenario
2. Write an essay on Design and construction of a fish farm
3. What are the Physico-chemical conditions of water required for aqua culture

SECTION-B

4. Write an essay on Induced breeding
5. Explain the mixed culture of Fish and Prawn
6. Explain the viral diseases in Fin Fish

Part – II

Answer any Six questions

6x5=30

7. Nursery pond
8. Turbidity
9. Fertilizer in culture pond
10. Algal bloom
11. Quarantine pond
12. Macrobrachium
13. White Spot Disease

Four – year B.Sc. (Hons) Domain Subject: ZOOLOGY

Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT PRACTICAL SYLLABUS

I. Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Identify the characters of Fresh water cultivable species
- Estimate physico chemical characteristics of water used for aquaculture
- Examine the diseases of fin and shell fish
- Suggest measures to prevent diseases in aquaculture

II. Practical (Laboratory) Syllabus:

(30hrs) (Max.50Marks)

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)- ANY THREE
2. Brackish water cultivable species (Fin & Shell fish- Specimens- Observation of Morphological Character by observing drawing) - ANY THREE
3. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)
4. Demonstration of Hypophysation (Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
5. Viral diseases of Fin & Shell Fish (Observation of pathological slides / Charts/ Models of viral pathogens in fin/ shell fish) ANY THREE
6. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/Models - ANY THREE
7. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish) ANY THREE

III. Lab References

1. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company
2. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
3. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
4. <https://www.notesonzooology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871>

Web resources suggested by the teacher concerned and the college librarian including reading material

IV. Co-Curricular Activities

a) **Mandatory:**(Student training by teacher in field skills: Total 15 hrs., Lab:10 + field 05)

1. For Teacher: Training of students by the teacher in laboratory/field for not less than 15 hours on Breeding- Induced breeding in carps -hatchery technology of L. Vennami- Farming techniques- disease diagnostic techniques—concepts –Demonstration @ any aqua laboratory

2. For Student: Students shall (individually) visit a Hatchery/Farm/ Aqua diagnostic center and make careful observations of the process method and implements- protocols and report on the same in 10 pages hand written Fieldwork/Project work Report.

3. Max marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.

5. (IE).Unit tests.

b) Suggested Co-Curricular Activities

1. Preparation of Model/Charts of Cultivable species of fin fish shell fish

2. Preparation of Model/Chart of Ideal fish Pond- with the standards prescribed.

3. Observation of aquaculture activities in their area (Observation of any activity related to aquaculture in the vicinity of the college/village)

4. Preparation of Model – charts of Fin /Shell fish Diseases with eco-friendly material.

5. Assignments, Group discussion, Seminar, Quiz, Collection of Material, Video preparation etc., Invited lecture

P.R. GOVERNMENT COLLEGE (A), KAKINADA CHOICE BASED CREDIT SYSTEM

Four – year B.Sc. (Hons) Domain Subject: **ZOOLOGY**

Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT PRACTICAL MODEL

PAPER

Model paper for Practical semester End Examination

Max. Marks 50

Time: 2 Hours

1.	Identify the following spotters/Charts/Photographs (6x5)	30M
A	Fresh water fishes	
B.	Brackish water fish	
C.	Viral disease fish/prawn	
D.	Bacterial Disease fish/prawn	
E.	Marine Fish	
F.	Fungal Disease fish/prawn	
2.	Record	05M
3.	Field note book/project work report	10M
4.	Viva voce	05M
Class tests		
		Total 50M

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

Four – year B.Sc. (Hons) Domain Subject: **ZOOLOGY**

Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT

Question Bank for Sustainable Aquaculture Management

Module I

Essay Questions

1. What is the current status of aquaculture at global and national level?
2. Describe Major Cultivable Fresh water fishes
3. Write an essay on Design and Construction of Fish farm

Short Answer Questions

1. Any 2 Brackish water food fishes
2. Any 2 Marine food fishes
3. Criteria for selection of Fishes for cultivation
4. Extensive fish culture
5. Traditional fish culture

Module II

Essay Questions

1. What are the Physico-chemical conditions of water required for aqua culture
2. What is the Functional Classification of Ponds in a fish farm

Short Answer Questions

1. Nursery Pond
2. Turbidity
3. Fertilizer in Culture Pond
4. Quarantine Pond
5. Stocking Pond

Module III

Essay Questions

1. Write an essay on Induced Breeding
2. Culture of Indian Major carps

Short Answer Questions

1. Algal Bloom
2. Liming
3. Stocking density
4. Predators
5. Ovaprim

Module IV

Essay Questions

1. Explain the mixed culture of Fish and Prawn
2. Commercial Importance of Prawn

Short Answer Questions

1. Vannamei
2. Macrobrachium
3. Larval Stages of Prawn
4. Types of Hatcheries
5. Eye stalk ablation


Module IV Essay

Questions

1. Explain the viral diseases in Fish
2. Explain the Bacterial Diseases in Prawns
3. Explain the Fungal Diseases of Fish

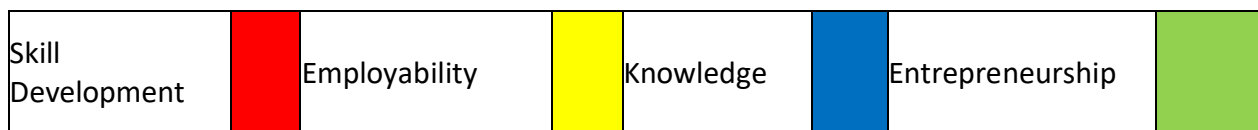
Short answers

1. Any two viral diseases in Prawns
2. Any two bacterial diseases in fish
3. White spot disease
4. Dropsy
5. Prophylaxis

	P.R Government College (Autonomous) Kakinada	Program & Semester B. Sc, BZC , CZAC, CA Sem V Paper VII A			
Course Code	TITLE OF THE COURSE Domain Subject: ZOOLOGY Semester –V Course7A: POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	<ul style="list-style-type: none"> Identify the types of preservation methods employed in aquaculture
CO2	<ul style="list-style-type: none"> Choose the suitable processing methods in aquaculture
CO3	<ul style="list-style-type: none"> Maintain the standard quality control protocols laid down in aqua industry
CO4	<ul style="list-style-type: none"> Identify the best Seafood quality assurance system



Syllabus

Unit –I Handling and Principles of fish Preservation

1. 1 Handling of fresh fish, storage and transport of fresh fish, postmortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.2 Principles of preservation – cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

UNIT II: Methods of fish Preservation

2.1 Traditional methods - sun drying, salt curing, pickling, and smoking.

2.2. Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, irradiation and Accelerated Freeze drying (AFD).

UNIT III: Processing and preservation of fish and fish by-products

3.1 Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.2 Fish by-products – fish glue, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws.

UNIT IV: Sanitation and Quality control

4.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2. Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

UNIT V: Quality Assurance, Management and Certification

5.1. Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, Codex Alimentari

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], 0: No Correlation)

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

REFERENCES:

1. Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford-IBH, New Delhi
2. Lakshmi Prasad's, Fish Processing Technology 2012, Arjun Publishing House
3. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
4. Safety and Quality Issues in Fish Processing (Woodhead Publishing Series in Food Science, Technology and Nutrition) by H ABremner
5. K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021

Web Resources:

1. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=145743>
2. https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03

Topics included under autonomous setup

CLASS : II B.Sc.,
SEMESTER III
PAPER III

TITLE OF THE PAPER: Cell Biology, Genetics, Molecular Biology and Evolution

ADDITIONS	JUSTIFICATION
1. Industrial Safety in Processing plants	1. Employee Safety and Employability skill
DELETED TOPICS	
1. Icing, Fish maws and chitoson	1. Topic repeated, Fish maws and chitoson are not prominent in Indian market

BLUEPRINT

P.R. GOVERNMENT COLLEGE(A), KAKINADA

CHOICE BASED CREDIT SYSTEM

SEC 7A POST HARVEST TECHNOLOGY OF FISH AND FISHERIES

Module Name	PART I Essay Type Questions 10 marks each	Part II Short Answer Questions 5 marks each	Marks Allotted to the Chapter
UNIT I	1	01	15
UNIT II	1	02	20
UNIT III	2	01	25
UNIT IV	1	02	20
UNIT V	1	01	15
5.Total	06 Of which 3 to be answered	07 Of which 4 to be answered	95 Marks including choice. Of which 60 Marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given

POST HARVEST TECHNOLOGY OF FISH AND FISHERIES

MODEL QUESTION PAPER

Time:2½hrs.

MaxMarks: 60

PART – 1

Note: Answer any THREE questions choosing at least one question from each section. Draw diagrams wherever necessary 3X10=30

SECTION-A

1. Describe various aspects of storage and transport of fishes
2. What are different traditional methods of fish preservation
3. Explain Chilling, Freezing and Accelerated Freeze drying

SECTION-B

4. Write an essay on various fish by-products
5. Write an essay on Seafood Quality Assurance Systems.
6. Explain various environmental hygiene practices followed in processing plants

Part-II

Answer any 4 questions

4x5=20

7. Postmortem Changes
8. Canning
9. Smoking of fish
10. Fish Oils
11. Good Laboratory Practices
12. Seaweeds
13. Sanitation.

Course 7 A:

POST HARVEST TECHNOLOGY OF FISH AND FISHERIES PRACTICAL SYLLABUS

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Identify the quality of aqua processed products.
- Determine the quality of fishery by products by observation
- Analyze the protocols of aqua processing methods

Practical (Laboratory) Syllabus:

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured, and fermented fish products for detailed procedure method visit sites:
3. Examination of salt, protein, moisture in dried / cured products
4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
5. Preparation of isinglass, collagen and chitosan from shrimp and crab shell.
6. Developing flow charts and exercises in identification of hazards –
preparation of hazard analysis worksheet
7. Corrective action procedures in processing of fish- flow chart- work sheet preparation

(** Refer the following web sites for complete procedure method and estimations of above listed practicals)

References:

1. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
2. https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03
3. <https://vikaspedia.in/agriculture/fisheries/post-harvest-and-marketing/processing-in-fisheries/fermented-products>
4. <https://krishi.icar.gov.in/jspui/bitstream/123456789/20500/1/Fermentation%20technology%20for%20fish.pdf>
5. <http://jebas.org/00200620122014/Abujam%20et%20al%20JEBAS.pdf>
6. <https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20M>

anual_Hygienic %20drying%20and%20packing%20of%20fish.pdf

7. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20M anual_Hygienic %20drying%20and%20packing%20of%20fish.pdf

8. https://agritech.tnau.ac.in/fishery/fish_byproducts.html

9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/>

10. <http://www.fao.org/3/i1136e/i1136e.pdf>

11. <http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20 a ssesmet>)

VII. Co-Curricular Activities

a) Mandatory:

(Lab/field training of students by teacher (lab 10 + field 05):

1. For Teacher: Training of students by the teacher in laboratory/field for not less than 15 hours on various steps of post-harvest techniques of fishes, on the advanced techniques in post-harvest technology – Training of students on other employability skills in the post-harvest sector of Aquaculture Industry- like Processing, Packing, marketing of processed aqua products.

2. For Student: Students shall (individually) visit - Any fish/shrimp Processing Plant/Packing industry and make observations on post harvesting techniques and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.

3. Max marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements

5. (IE): Unit tests,

b) Suggested Co-Curricular Activities

1. Observation of fish/shrimp processing plants – visit web sites of processing companies and record the details of that Unit

2. Interaction with local fishermen to know the method of preservation and details with the available traditional technology

Semester VI- Apprenticeship

B.Sc. Honours- Zoology

IV Year

AP STATE COUNCIL OF HIGHER EDUCATION REVISED UG
SYLLABUS UNDER CBCS

(Implemented from Academic Year 2020-21) PROGRAMME: FOUR
YEAR B.Sc. (Hons)

Domain Subject: ZOOLOGY

Courses for Semesters VII & VIII

(Syllabus with Learning Outcomes, References, & Co-curricular Activities)

Higher Order Courses for semester-VII

(To choose any three of the following courses Course no)	Course Title (Theory + Lab)	Marks	Credits
Choose any THREE Courses	8A ENDOCRINOLOGY	100+50	4+1
8B	DEVELOPMENTAL BIOLOGY AND REPRODUCTIVE TECHNOLOGIES	100+50	4+1
8C	PARASITOLOGY	100+50	4+1
8D	HUMAN HEALTH AND INFECTIOUS DISEASES	100+50	4+1
8E	BIODIVERSITY AND SYSTEMATICS	100+50	4+1
8F	WILDLIFE AND CONSERVATION BIOLOGY	100+50	4+1

Skill Enhancement Courses for Semester–VII

(To choose one pair from the four alternate pairs of SECs) Course no	Course Title (Theory + Lab)	Marks	Credits
9A	HATCHERY TECHNOLOGY IN AQUATIC ORGANISMS	100+50	4+1
9B	FISH NUTRITION AND FEED TECHNOLOGY	100+50	4+1
(OR)			
10A	MILK AND MILK PRODUCTS TECHNOLOGY	100+50	4+1
10B	MILK AND MEAT HYGIENE, FOOD SAFETY AND PUBLIC HEALTH	100+50	4+1
(OR)			
11A	POULTRY PRODUCTS AND MANAGEMENT	100+50	4+1
11 B	POULTRY WASTE MANAGEMENT	100+50	4+1
(OR)			
12 A	MULBERRY PHYSIOLOGY AND MULBERRY BREEDING & GENETICS	100+50	4+1
12 B	SILKWORM PHYSIOLOGY AND SILKWORM BREEDING & GENETICS	100+50	4+1

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**ONE ONLINE
COURSE FROM ANY
DISCIPLINE**

5

Of the 6 courses in Semesters VII , 5 courses(3+2)are Subject related and 1 course shall mandatorily be OPEN Online course in any discipline, encouraging trans disciplinary

Higher Order Courses for semester-VIII

(To choose any three of the following combination) Choose any THREE Courses	Course no	Course Title (Theory + Lab)	Marks	Credits
14 A		TOOLS AND TECHNIQUES IN BIOLOGY	100+50	4+1
14 B		TOXICOLOGY AND BIOSTATISTICS	100+50	4+1
14 C		ENVIRONMENT BIOLOGY AND ENVIRONMENT PHYSIOLOGY	100+50	4+1
14 D		ANIMAL BEHAVIOUR AND CHRONOBIOLOGY	100+50	4+1
14 E		MOLECULAR AND HUMAN GENETICS	100+50	4+1
14 F		BIOSYSTEMATICS & TAXONOMY	100+50	4+1

Skill Enhancement Courses for Semester-VIII

(To choose one pair from the four alternate pairs of SECs) Course no.	Course Title (Theory + Lab)	Marks	Credits
15 A	MARICUTLURE	100+50	4+1
15 B	ORNAMENTAL FISHERY	100+50	4+1
(OR)			
16 A	LIVESTOCK ECONOMICS, MARKETING AND BUSINESS MANAGEMENT	100+50	4+1
16 B	LIVESTOCK ENTREPRENEURSHIP	100+50	4+1
(OR)			
17 A	POULTRY ECONOMICS, MARKETING	100+50	4+1

	AND INTEGRATION		
17 B	POULTRY ENTERPRENUERS HIP	100+50	4+1
(OR)			
18 A	SERICULTURE MARKETING	100+50	4+1
18 B	SERICULTURE ENTREPRENUERS HIP HUMAN RESOURCE DEVELOPMENT	100+50	4+1

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**ONE ONLINE
COURSE FROM ANY
DISCIPLINE**

5

Of the 6 courses in Semesters VIII , 5 courses(3+2) are Subject related and 1 course shall mandatorily be OPEN Online course in any discipline, encouraging trans disciplinary learning.



DEPARTMENT OF ZOOLOGY
LIST
OF EXAMINERS

S. No	Name of the Examiners	Subject	Name of the College
1.	Dr. N. Sreenivas	Zoology	GDC Ramachandrapuram
2.	B. Ahmad Ali Baba	Zoology	GDC Pithapuram
3.	Dr. P John Kiran	Zoology	GDC Perumallapuram
4.	Dr.M. Vijaya Kumar	Zoology	SRR GDC Vijayawada
5.	Dr.P. Jaya Bharathi	Zoology	VSK College, Vizag
6.	N. Suneetha	Zoology	SRR GDC, Vijayawada
7.	V. Sandhya	Zoology	GDC, Kaikaluru
8.	Dr. R P Dattu	Zoology	GDC, Tiruvuru.
9.	Dr. K Rama Rao	Zoology	VSK College, Vizag
10.	Dr. T Samuel David Raj	Zoology	VSK College, Vizag
11.	Dr. P R Vani	Zoology	VSK College, Vizag
12.	Dr Y. Poli Naidu	Zoology	GDC, Srikakulam
13.	A. Arjuna Apparao	Zoology	GDC, Yellamanchili
14.	Dr G. Mani	Zoology	GDC (M), Srikakulam
15.	P.S.C.H.P Deepika Rani	Zoology	SKR College (W), Rajahmundry
16.	Dr G. Vijay Prathap	Zoology	VSK College, Vizag
17.	Dr. Y. Shantiprabha	Zoology	VSK College, Vizag
18.	M. Hima Sridevi	Zoology	SKR College(W), Rajahmundry



Lecturer in charge
Dept of Zoology & Aquaculture

DEPARTMENT OF ZOOLOGY
LIST OF QUESTION PAPER SETTERS

S. No	Name of the Examiners	Subject	Name of the College
1.	Dr. N. Sreenivas	Zoology	GDC Ramachandrapuram
2.	B. Ahmad Ali Baba	Zoology	GDC Pithapuram
3.	Dr. P John Kiran	Zoology	GDC Perumallapuram
4.	Dr.M. Vijaya Kumar	Zoology	SRR GDC Vijayawada
5.	Dr.P. Jaya Bharathi	Zoology	VSK College, Vizag
6.	N. Suneetha	Zoology	SRR GDC, Vijayawada
7.	V. Sandhya	Zoology	GDC, Kaikaluru
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