

PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA

(Re- Accredited by NAAC with A Grade)

Kakinada, AP – 533002

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES

IN

ZOOLOGY

2022-2023



CHOICE BASED CREDIT SYSTEM

Convened on 05-11-2022

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

Dt.25 Sept2022

Rc.No.12A/A.C/ BOS/2022-23

Sub: P.R.G.C[A] – Academic Cell –
ConductofBOSMeetingsfortheAcademicYear2022-23– Guidelines issued -
Regarding.

- Ref: 1. Minutes of IQAC meeting dated 18 September 2022
2. Resolutions adopted in Staff Council Meeting held on 23 Sept 20

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 public good.

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

The HEIs are also, as per the Revised Accreditation 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.

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

ORDER:

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

Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments and their Chairmen are requested to prepare 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 BOS chairmen are requested to make necessary arrangements for the conduct of the meetings separately between 11 October 2022 and 15 October 2022 duly incorporating above mandate as agenda in the meeting. The SOP prescribing mandatory 20% changes in the existing curricula and other benchmarks has been attached herewith for reference as **Annexure – I**.

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning in design of curriculum and optimum utilization of existing human, physical and ICT resources and adopt resolutions to the extent of benchmarks. Further, as the regular attendance of students to the classes is a deciding factor in enhancement of quality in learning, a minimum attendance of 60% for I mid-term examination, 75% for II mid-term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS. The Chairmen are also requested to approve the new programmes to be introduced for 2022-23, if any, number of certificate courses, their frequency, Bloom's-Taxonomy based evaluation system for effective learning outcomes as per the Annexure - I

The Chairmen are, therefore, requested to

- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and invite suggestions and changes to be made.
- Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc., A soft copy shall be communicated well in advance to the members to have an idea on the matters.
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, etc.,
- Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.
- All meetings shall be offline. Online attendance of members faculty will be

permitted only in exceptional cases.

- The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the commencement of the examination.
- Each Chairman of BOS, shall get the rough draft of the curricula verified by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity among the departments.
- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.
- The Academic Coordinator and IQAC coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 and explain the structure of curricula, uniformity other modalities.
- The Controller of Examinations of the institution shall fund the BOS meeting expenditure 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).

BOS document should contain the following contents in order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the college
4. Agenda: 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

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting (Activities and Benchmarking 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	Sem	TitleoftheCourse	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity/ Innovation)	Experiential learning component	Scope (Skill/ employability/ entrepreneurship)
1	Zoology	III	Cell 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. Table showing Members present with signatures.
10. List of Examiners & Paper setters
11. Syllabus for each course (both theory & Practical in case of Sciences subjects) followed by model question papers (theory & practical) and allocation of CIA (50 marks) for each course.
12. PO attainment data (CO-PO mapping)


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

Enclosures: Annexure I, II & III

Copy to:

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

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

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

R.C.No.12A/A.C./BOS/2022-2023, Dated: 24.09.2022.

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.


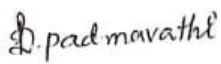



S.No	Name of the Nominee	Designation
1	Sri. B. Chakravarthi	Chairman
2	Dr. M. Tejo Murthy	University Nominee, PVKN Govt.College(A),chittoor.
3.	Dr. P. Ramaneswari	Subject Expert: Adikavi nannaya University
4.	Dr. D. Padmavathi	Subject Expert: Local nominee Lec.Incharge /zoo/Rtd. Senior Lecturer in zoology
5.	Dr. P.Rama Mohan Rao	Representative from Industry, Aqua Industry Consultant
6.	Sri B. Ahmed Ali Baba	Member
7.	Dr.N.Sreenivas	Member
8.	Dr. P. Kiran Kumar	Member
9.	Dr. B. Elia	Member
10	Sk. Madina Saheb	Member
11.	Y. Gowthami	Member
12.	P.Vijaya Chandrika	Member
13	B. Devi	Member
14.	I. Shanthi Grace	Member
15.	J. Anudeep	Member
16.	Y. Nagavalli	Member
17.	V.Lakshmi narasamma	Alumni Student Member B.Sc B.Z.C
18.	P.Abhishek Nageswar Rao	Student Member I B.Sc B.Z.C
19.	Y.Sandhya	Student Member II B.Sc B.Z.C E.M
20.	P.Anantha Lakshmi	Student Member II B.Sc B.Z.C T.M

The above members are requested to attend the BOS Meeting on .10.2022 and share their valuable views, and suggestions.

B.V.D:
PRINCIPAL
PRINCIPAL
P.R. Govt. College (A),
KAKINADA
17/09/2022

DEPARTMENT OF ZOOLOGY
Consolidated Report of Board of Studies For The Year 2022-2023

The Board of studies Meeting in the Department of Zoology was convened on 05-11-2022 at 11 AM under the Chairmanship of Sri. B. Chakravarthi, Lecturer in Charge, Department of Zoology and Aquaculture Technology. The following members are present:

S. No	Name	Designation	Signature
1.	Sri. B. Chakravarthi, Lecturer in Charge, Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College, Kakinada	Chair person	
2.	Dr. K. Ramaneeswari Associate Professor Department of Zoology Adi Kavi Nannaya University Rajahmundry.	Subject Expert	
3.	Dr. M. Tejo Murthy Lecturer in Zoology, PVKN. Govt. College (A), Chittoor	University Nominee	Attended on line BGS
4.	Dr. D. Padmavathi, Lecturer in Zoology (Retd), MSN Degree College, Kakinada	Subject Expert	
5.	Dr. P. Rama Mohana Rao, Aquaculture Consultant 9885144557	Industrialist	
6.	Dr. N. Sreenivas Lecturer in Zoology, Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College, Kakinada	Member	
7.	Sri. B. A. Ali Baba Lecturer in Zoology, Department of Zoology & Aquaculture,	Member	

	Pithapur Rajah's Govt. College. Kakinada		
8.	Dr. P. Kiran Kumar Lecturer in Zoology, Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College. Kakinada	Member	
9.	Dr. B. Elia Lecturer in Zoology, Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College. Kakinada	Member	<i>B. Elia</i>
10.	Sri. Sk. Madina Saheb Lecturer in Zoology (Contract) Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College. Kakinada	Member	<i>Sk. Madina Saheb</i>
11.	Ms. P.V. Chandrika Lecturer in Zoology (Guest) Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College. Kakinada	Member	<i>P.V. Chandrika</i>
12.	Ms. B. Devi Lecturer in Zoology (Guest) Department of Zoology & Aquaculture, Pithapur Rajah's Govt. College. Kakinada	Member	<i>B. Devi</i>
13.	Kum. Lakshmi Narasamma	Alumni	<i>V. Lakshmi Narasamma</i>
14.	P. Abhishek Nageswararao	Student I BZC	<i>P. Abhishek</i>
15.	Y. Sandhya	Student II BZC	<i>Y. Sandhya</i>
16.	P. Anantha Lakshmi	Student III BZC	

Date: 05-11-2022

[Signature]
Signature of the Chairperson
LECTURER - INCHARGE
DEPT. OF ZOOLOGY & AQUACULTURE
P. R. GOVT (A) COLLEGE
KAKINADA

VISION:

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

MISSION:

- To provide conducive and outcome-based skill development environment in the institution to brighten prospects for progression to higher education, employment opportunities in Government and Private agencies, for personal growth and enhanced productivity and economic growth.
- To collaborate with coaching centers or skill development institutions for skill development.
- To develop systems for quality enhancement in learning by student through promotion of ICT integration into learning, deployment of learning resources at the door steps of students for optimum utilization.
- Designing and implementing student-centric, inquisitive, practical-rich and research based curriculum
- curricula, including project works, problem-solving & applications oriented TLPs, field trips, etc., that facilitate experiential and participative learning.
- To strengthen research and development and create new research knowledge through intense research, collaborations, knowledge and technology transfer
- To foster innovation among students through trainings and forging collaborations with outside organizations
- To turn each student into a wholesome personality through initiatives in Community Service, Gender equity initiatives, Environment protection, personality development, transferable skills, understanding constitution and its spirit and their role in nation building.
- To inculcate scientific temper in young minds to foster human values

AGENDA FOR BOARD OF STUDIES MEETING -2022-2023

Agenda

1. Approval of Syllabus for all the Semesters and implementation of Choice Based Credit System
2. Model question papers, Blue Print
3. 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 APSCHE 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 2022-2023
7. Deliver of guest lectures and conduct of field visits, Assigning of project works.
8. Additional inputs and changes in the curriculum.
 9. Introducing Certificate course entitled **Certificate Course on Water Quality Assessment** and offering of Skill Development Courses entitled '**Dairy Technology**' in II Semester and '**Poultry Farming**' and **Environmental Studies** as Life skill course in III Semester.
10. Implementation of Community Service Project and Internship Programmes introduced from 2020-2021 admitted batch.
11. Continuous Internal Assessment pattern (CIA) introduced by APCCE from 2021-2022 admitted batch onwards
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. 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

1. Dr. K. Ramaneeswari enquired about the need of CO-PO Mapping and advised to inform the same to Students.
2. Dr. P. Ram Mohan Rao, Aqua consultant has advised to utilize the services of local industries for student internship

PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA
DEPARTMENT OF ZOOLOGY

BOARD OF STUDIES MEETING (2022-23) CONVENED ON 05TH NOVEMBER 2022

Resolutions

The members, Board of Studies, Zoology met through online and offline on 05-11-2022 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

It is resolved to follow the syllabus as well as Choice Based Credit System introduced by UGC/APSCHE through Adikavi Nannaya University, Rajamahendravaram for I, II- & III-year students.

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 admitted batch, and 60% - 40 % for 2020-2021 admitted batch as mentioned below

	Internal Assessment						External Assessment
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 co-curricular activities (assignment/quiz/group discussion) 10 Marks for Mini project and 5 Marks for (seminar) presentation.

Resolution-5

It is resolved to adopt newly introduced Skill Enhancement Courses (SEC's) in Zoology for the academic year 2022-2023 by APSICHE 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 2022-2023

Resolution VI: Resolved to introduce SDC as prescribed by the APSICHE. Department of Zoology anchoring the Dairy Technology for the II semester, Environmental Science, Health and Hygiene in the III semester

Resolution-7

Resolved to offer choice-based Skill Development Courses by Department of Zoology entitled 'Dairy Technology' in II Semester 'Poultry Farming' and in III semester and Environmental Studies as Life skill course in III Semester as prescribed by APSICHE / AKNU and CCE

Resolution-8

It is resolved to follow the existing Syllabus prescribed by APSICHE & Adikavi Nannaya University for the 2021-2022, and 2022-23 admitted batches for I, II, III, 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

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.

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 APSCHE through Adikavi Nannaya University for the evaluation of three internships.

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 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.

Date: 05-11--2022

Signature of the Chairperson

Members:

PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA
ACTION PLAN 2022-23
DEPARTMENT OF ZOOLOGY & Aquaculture

	MONTH & YEAR	ACTIVITY	Tentative Date	Remarks
1.	June 2022	Annual Curricular Plans & Department Plan of Action Community Service Project NAAC- Orientation Programme	June -2022 June-2022 3 rd Week of June	
2.	July - 2022	Guest Lectures Mendel's Birth Day celebrations Student Seminars 1st mid Exams (II&IV Sem)	Ist week of July 20 th July 4 th week of July 27-30 th July	
3.	August – 2022	Field trip/Training programme – BZC FDP/TOT on Dairy Technology World Mosquito Day	1 st Week of August 2 nd week of August 20 th August	
4.	September 2022	Academic Audit	Ist week of September	
		Remedial classes	3 rd week of September	
		Extension Lecture	4th Week of September	
		2 nd mid exams (II&IV Sem) 1 st mid exams Isem	26 th -30 th September	
5.	October 2022	Earn While You Learn/EDP for Girl Students Sem end practical exams Prefinal exams	First week of October 2 nd week of October 3 rd week of October 14-26 October	
6.	November 2022	1. II&IV Sem end exams 2. Commencement of Internship Programme for V Sem students	27 th to 12 th of November 3rd Week of	

		3. National Seminar on Biodiversity	November 4th Week of November	
7.	December 2022	Certificate Course on Water Quality Assessment	December 2022	
		Field visits, Industrial visits One day workshop for students in laboratory specimen examination and preservation tech. I Mid Exam to III/V Sem	2 nd week of December 20 th -23rd Dec	
8.	January 2023			
		Hands-on training to B.Voc students at SIFT, Kakinada	2nd week of Jan-2023	
		Field Visit to III-year BZC students II Mid Exam to III/V Sem	Third week of Jan-2023 27 th to 30 th Jan	
9.	February 2023	Certificate Course on Basic Digital Literacy – Work shop on Career opportunities, Prospects in Higher Education with biology background National Science Day	Feb - 2023 4 th week of February 2023 28 th February	
10	March 2023	Practical exams Student Projects for Final year students. Prefinal exams Sem end exams	1-13 March 3rd week of March 14 to 23 March 27 th to 18 th April	
11	April 2023	World Earth Day Sem end exams	22 nd April 27 th to 18 th April	
12	May 2023	One week Training Programme at CIFE, Kakinada World Biodiversity Day	Ist week of May 2023 22 nd May	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A)

KAKINADA

DEPARTMENT OF ZOOLOGY

BOARD OF STUDIES MEETING 2022-23

CHOICE BASED CREDITS SYSTEM

2020-21 admitted batch onwards

YEAR	SEM	PAPER	TITLE	MARKS(100)		CREDITS	
				MID	END		
I	I	I	Animal Diversity-I Biology of Non- Chordates	50	50	04	
			Practical-I		50	01	
	II	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	IV	Physiology, Cellular Metabolism & Embryology	50	50	04	
			Practical-IV		50	01	
		V	V	Immunology & Animal Biotechnology	50	50	04
				Practical-V		50	01
III	V	6A Sustainable Aquaculture Management	60	40	04		
		Practical		50	01		

VI	7A	Post- Harvest Technology of Fish and Fisheries	60	40	04
		Practical		50	01
		Apprenticeship			

UG Program (4 years Honors) Structure (CBCS)2020-21 A. Y.,onwards
BACHELOR OF SCIENCE
(3rdand 4thyear detailed design will be followed as per APSCHEGUIDELINES)

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C		
Languages															
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1						
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1						
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1						
M-1	SEC (C6, C7)									4+2	4+1				
M-2	SEC (C6, C7)									4+2	4+1				
M-3	SEC (C6, C7)									4+2	4+1				
Hrs/ Week (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	1	4	4
Project Work															
Extension Activities (Non- Academic Credits)															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	1	4	4

THIRD PHASE of APPRENTICESHIP Entire 6th Semester

FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).

											2		
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M= Major; C= Core; SEC: Skill Enhancement Courses

MARKS & CREDITS DISTRIBUTION: UG-SCIENCES

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	Second Lang.	3	4	3	9	25	75	100	300
3	LSC	4	2	2	8	0	50	50	200
4	SDC	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	200	200
		38			159				4550
8	Extension Activities (Non-Academic Credits)								
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits								
	Total	40			142				

PROGRAMME OUTCOMES

- BZC is a fascinating programme 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 programme. 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 programme.
- The BZC programme 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 programme students can get lot of employment opportunities in various fields such as agriculture, aquaculture, horticulture and pharmaceuticals either in private or government sectors. This programme enables students to establish their own business in the areas like Aquaculture, Sericulture and Horticulture etc., Students can also pursue higher studies in Botany, Zoology or Chemistry and they may focus on scientific research also.

SEMESTER-I

	P.R. Government College (Autonomous) Kakinada	Program & Semester BZC - I			
Course Code ZO 1208	ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES				
Teaching	HoursAllocated:60 (Theory)	L	T	P	C
Pre-requisites:	Outline Classification of Kingdom Animalia & Classification of Major Invertebrate Phyla	4	0	2	4

L=Lecture; T=Tutorial; P=Practical; C=Credits

Course Outcomes:

CO1: Can understand the general taxonomic rules of animal classification.

CO2: Classify Protozoa to Coelenterate with taxonomic keys

CO3: Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermi-composting

CO4: Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscans

CO5: Describe Echinodermata to Hemichordata with suitable examples and larval stages in relation to the phylogeny

Course Outcomes

On completion of the course, the students will be able to-		Cognitive Domain
CO1	understand the general taxonomic rules of animal classification	Remembering /Understanding
CO2	Classify Protozoa to Coelenterate with taxonomic keys	Application
CO3	Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermi-composting	Analyzing
CO4	Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscans	Knowledge & Application
CO5	Describe Echinodermata to Hemichordata with suitable examples and larval stages in relation to the phylogeny	Understanding & Application

COURSE WITH FOCUS ON EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT

MODULE-I (PROTOZOA & PORIFERA)

15 Hrs

- 1.1. Principles of Taxonomy- Binomial Nomenclature- Whittaker's Five kingdom Concept
- 1.2 General Characters and classification of Protozoa up to classes.
- 1.3. Elphidium Type study-structure and Life history;
- 1.4 Protozoan Locomotion and Reproduction – Binary fission and Conjugation.
- 1.5 General Characters and classification of Porifera up to classes
- 1.6 Skeleton in sponges - Canal system in Sponges

MODULE-II (CNIDARIA, PLATYHELMINTHES & NEMATODA)

15Hrs

- 2.1. General Characters and classification of Coelenterata upto classes.
- 2.2. Obelia: Structure of Polyp and Medusa.
- 2.3. Polymorphism in Coelenterates; Corals and Coral reef formation.
- 2.4. General characters of Phylum Ctenophora
- 2.5. General Characters and classification of Platyhelminthes up to classes.
- 2.6. Fasciola hepatica: Life cycle of Fasciola hepatica
- 2.7 General Characters and classification of Nematoda up to classes.
- 2.8. Life Cycle and pathogenicity of Ascaris lumbricoides

MODULE-III (ANNELIDA, ARTHROPODA & ONYCHOPHORA)

15Hrs

- 3.1. General Characters and classification of Annelida up to classes
- 3.2. Evolution of Coelom and Coelomoducts,
- 3.3. Vermiculture-scope, significance, and economic importance of Vermicompost
- 3.4. General Characters and classification of Arthropoda up to classes
- 3.5. Vision and Respiration in Arthropoda, Metamorphosis in Insects
- 3.6. Peripatus- Affinities and Significance
- 3.7. Social life in Termites

MODULE-IV (MOLLUSCA, ECHINODERMATA AND HEMICHORDATA) 15 Hrs

- 4.1. General Characters and classification of Mollusca upto classes
- 4.2. Pearl formation in Pelecypoda, Sense organs in Mollusca
General Characters and classification of Echinodermata upto classes
- 4.3. Water vascular system in Star Fish
- 4.4. General characters and classification of Hemichordata up to classes with suitable examples
- 4.5. Balanoglossus: Structure and affinities.
- 4.6. Non-Chordate Larval Forms Trochophore, Nauplius, Bipinnaria, Tornaria, Glochidium.

Additional Module

- 1.1 Nutrition in Protozoa
- 1.2 Life cycle of Obelia

TEXT BOOKS

1. A text book of Invertebrate Zoology-by R.L.Kotpal
2. A text book of invertebrate Zoology-by Jordan & Verm

REFERENCES

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

WEBLINKS:

1. <https://naturalhistory.si.edu/research/invertebrate-zoology>
2. <https://mcz.harvard.edu/invertebrate-zoology>
3. <https://epgp.inflibnet.ac.in/>

Co-curricular activities (suggested)

- Preparation of chart/model of phylogenic tree of life, 5-kingdom classification, Elphidium life cycle etc.
- Visit to Zoology Museum or Coral island as part of Zoological tour
- Charts on life cycle of Obelia, polymorphism, sponge spicules
- Clay models of canal system in sponges
- Preparation of charts on life cycles of Fasciola and Ascaris
- Visit to adopted village and conducting awareness campaign on diseases, to people as part of Social Responsibility.
- Plaster-of-Paris or Thermocol model of Peripatus
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Models of compound eye, bee hive and termitarium (termitaria) by students
- Visit to apiculture centre and short-term training as part of apprenticeship programme of the govt. Of Andhra Pradesh
- Chart on pearl forming layers using clay or Thermocol
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Phylogeny chart on echinoderm larvae and their evolutionary significance
- Preparation of charts depicting the feeding mechanism, 3 coeloms, tornaria larva etc., of Balanoglossus

PROGRAMME SPECIFIC OUTCOMES

PSO1: Appreciate the Natural History of Invertebrates

PSO2: Understand the difference between Taxonomy and Systematics

PSO3: Gain knowledge about the body plan of various invertebrates

PSO4: Phylogeny of Invertebrates

PSO 5: Economic importance of certain invertebrates

COURSE OUTCOMES

CO1 Describe general taxonomic rules on animal classification.

CO2 Classify Protozoa to Coelenterata with taxonomic keys

CO3 Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermi-composting

CO4 Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscs

CO5 Describe Echinodermata to Hemichordata with suitable examples and larval stages in relation to the phylogeny

CO-PO– PSO Mapping:

- (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

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
Zoology	Sem I, B.SC (BZC, Commercial Aquaculture, Biotech Zoology, Chemistry), Paper-I, Animal Diversity- Biology of Chordates	Nil	3.7 Social life in Termites 4.6 Glochidium Larva Additional Module 1.1 Nutrition in Protozoa 1.2 Life cycle of Obelia	20%	To make the students understand the different types of individuals in a termite colony and their social behaviour To make the student understand the structure of larval form of a Mollusc Useful for competitive exams

P.R. GOVERNMENT COLLEGE (A), KAKINADA
I B.Sc., (BZC), SEMESTER-I
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES
COURSE CODE: ZO 1208
MODEL QUESTION PAPER

Time: 2 ½ hrs.

Max Marks: 50

PART – 1

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

SECTION-A (MODULE-I & II)

1. Write an essay on Reproduction in Elphidium
2. Write an essay on Canal system in sponges
3. Write an account of life history of Liver Fluke

SECTION-B (MODULE III & IV)

4. Write an essay on the affinities of Peripatus and its significance
5. Describe the pearl formation in Pelecypoda.
6. Describe the water vascular system in Starfish

Part – II

Answer any FOUR questions

4x5=20M

1. Binomial Nomenclature
2. Obelia Polyp
3. Miracidium
4. Coelomoducts
5. Antennary glands
6. Bipinnaria
7. Affinities of Balanoglossus.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
I B.Sc., (BZC), SEMESTER-I
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES
BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 50

Time: 2 ½ hrs

MODULE NO. & NAME	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I (Protozoa & Porifera)	01	02	20
MODULE – II (Cnidaria, Platyhelminthes &Nematoda)	02	02	30
MODULE – III (Annelida, Arthropoda&Onychophora)	01	02	20
MODULE – IV (Mollusca, Echinodermata &Hemichordata)	02	02	30
Total No.of Questions	06 Of which 3 to be Answered	08 Of which 4 to be answered	100 Marks including choice. Of which 50 Marks to be answered

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

I B.Sc., (BZC), SEMESTER-I

(WITH EFFECTIVE FROM 2021-2022)

TITLE: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

PRACTICAL SYLLABUS (with effective from 2021-22)

Learning Outcomes:

- 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

I. DISSECTIONS-Only Demonstration

- a) Mounting of Cephalothoracic and abdominal appendages of Prawn
- b) Nervous system of Prawn
- c) Digestive system of Prawn
- d) Insect Mouth Parts
- e) 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
- f) Computer - aided techniques should be adopted or show virtual dissections

II. OBSERVATION OF THE FOLLOWING SLIDES / SPECIMENS / MODELS:

1. Protozoa – Amoeba, Entamoeba, Plasmodium Elphidium. Paramecium – binary fission and Conjugation.
2. Porifera – Cydon, Spongilla, Euspongia.
3. Coelenterata - Physalia, Aurelia, Obelia colony, Medusa Corallium, Gorgonia,
4. Platyhelminthes and Nematelminths – Ascaris-male & female, Larval stages of Fasciola Miracidium, Redia, Cercaria, Ancylostoma duodenale, Taenia solium, Wuchereria.
5. Annelida - Nereis, Hirudinaria, Trochophore larva. Chaetopus
6. Arthropoda - Sacculina, Limulus, Julus, Scolopendra, Peripatus. Larvae: Nauplius, Mysis, Zoea, Mouthparts of Anopheles and Culex mosquitoes
7. Mollusca - Chiton, Unio, Sepia, Octopus, Nautilus, Glochidium larva.
8. Echinodermata – Asterias, Ophiothrix, Echinus, Cucumaria, Antedon, Bipinnaria larva.
9. Hemichordata – Balanoglossus, Tornaria larva.

REFERENCE MANUALS:

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

I B.Sc., (BZC), SEMESTER-I
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES
PRACTICAL MODEL
PAPER
(AT THE END OF I-SEMESTER-EFFECTIVE FROM 2021-22)

Max marks: 50

Time: 2Hrs

1. Dissect and display the nervous system of Palaemon. Draw a neat labelled diagram	10M
2. Identification of spotters	6X5=30M
A) -----	
B) -----	
C)-----	
D)-----	
E) -----	
F) -----	
3. Record	05M
4. Viva voce	05M
Total	50M

SEMESTER-II

	P.R.GovernmentCollege(Autonomous) Kakinada	Program & Semester BZC - II			
Course Code ZO 2208	ANIMAL DIVERSITY – BIOLOGY OF CHORDATES				
Teaching	HoursAllocated:60 (Theory)	L	T	P	C
Pre-requisites:	Outline Classification of Kingdom Animalia & Classification of Vertebrate Phyla	4	0	2	4

L=Lecture; T=Tutorial; P=Practical; C=Credits

Course Outcomes:

- 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 types of dentition and its evolutionary significance
- CO5:** Understand the origin and evolutionary relationship of different phyla from

Prochordata to Mammalia

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Describe general taxonomic rules on animal classification of chordates	Remembering /Understanding
CO2	Classify Protochordata to Mammalia with taxonomic keys	Application
CO3	Understand Mammals with specific structural adaptations	Analyzing
CO4	Understand the types of dentition and its evolutionary significance	Knowledge & Application
CO5	Understand the origin and evolutionary relationship of different phyla from Prochordata to Mammalia	Understanding & Application

MODULE-I (PROTOCHORDATES)**18Hrs**

- 1.1. General Characters and Classification of Chordates upto classes.
- 1.2 Salient features of Urochordata and Cephalochordata
- 1.3 Salient features of Cyclostomes
- 1.4 General Characters and Classification of Fishes up to sub class level,
- 1.5. Structure and life-history of Herdmania, Significance of retrogressive Metamorphosis.

MODULE-II (FISHES & AMPHIBIA)**12Hrs**

- 2.1. Scoliodon: Morphology, structure of Heart, Brain and sense organs.
- 2.2 Respiratory system in Scoliodon
- 2.3. Migration in fishes and types of scales; Dipnoi fishes
- 2.4 Characters and Classification of Amphibia upto orders
- 2.5. Rana : Morphology, respiratory system, structure of heart, Brain and reproductive systems only.

MODULE-III (REPTILIA)**12Hrs**

- 3.1. Characters and Classification of Reptilia upto orders
- 3.2. Calotes: Morphology, digestive system, urinogenital system and Brain
- 3.3. Identification of Poisonous and Non-poisonous snakes

MODULE-IV (AVES & MAMMALS)**18Hrs**

- 4.1. General characters of Aves and Classification of Mammals- comparison of Prototheria, Metatheria and Eutheria
- 4.2. Pigeon (Columbia Livia): Exoskeleton, respiratory system, structure of heart,
- 4.3. Migration in birds and its significance, Flight adaptations in birds
- 4.4. Dentition in Mammals

Additional Topic

- 1.1 Types of skulls in reptiles

Co-curricular activities (suggested)

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Thermocol or Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Thermocol 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
- Chart preparation for dentition in mammals

TEXT BOOKS

Chordate Zoology-by R.L. Kotpal

Chordate Zoology-by Jordan & Verma

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. SarasPublication. 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. EkambaranathaAyyar, 1973. A manual of zoology. Part II. (S. ViswanathanPvt. 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, 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, 2000. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).

WEB LINKS

<https://www.biologydiscussion.com/>

<https://epgp.inflibnet.ac.in/>

<https://www.bnhs.org/>

<https://www.worldwildlife.org/>

CO-PO– PSO Mapping:

- (1: Slight 2: Moderate [Medium];3:Substantial[High] : 0: 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

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
Zoology	Sem I, B.SC (BZC, CZAC, BTZC), Paper-I, Animal Diversity- Biology of Chordates	Nil	2.2. Respiratory system of Scoliodon Additional topic Types of skulls in Reptiles	20%	Useful for Competitive exams Useful for competitive exams

I B.Sc., (BZC), SEMESTER-II
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES
Course Code: ZO 2208
MODEL QUESTION PAPER

Time: 2 ½ hrs.

Max Marks: 50

PART – 1

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

SECTION- A (MODULE-I & II)

1. What is retrogressive metamorphosis? Discuss with special reference to the life history of an Ascidian and write its significance
2. Explain migration in fishes
3. Explain the structure of heart of frog

SECTION-B (MODULE III & IV)

4. Explain the urinogenital system of Calotes with a neat labelled diagram
5. Explain the various flight adaptations in birds
6. Write an essay on Dentition in mammals

Part – II

Answer any **FOUR** questions

4x5=20

1. Cephalochordata
2. Placoid scales
3. Buccopharyngeal respiration
4. Crocodilia
5. Brain in Calotes
6. Quill feather
7. Prototheria
8. Metatheria

P.R. GOVERNMENT COLLEGE (A), KAKINADA
I B.Sc., (BZC), SEMESTER-II
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES
BLUE PRINT FOR QUESTION PAPER SETTER

Max Marks: 50

Time: 2 ½ hrs

MODULE NO. & NAME	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I (Urochordata & Pisces)	01	02	20
MODULE – II (Amphibia)	02	02	30
MODULE – III (Reptilia)	01	02	20
MODULE – IV (Aves & Mammalia)	02	02	30
Total No. of Questions	06 Of which 3 to be answered	08 Of which 4 to be answered	100 Marks including choice. Of which 50 Marks to be answered

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

I B.Sc., (BZC), SEMESTER-II
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES
PRACTICAL SYLLABUS

Learning Outcomes:

- To understand the taxidermic and other methods of preservation of chordates
- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for “empathy towards the fellow living beings”
- To maintain a neat, labeled record of identified museum specimens

I. Dissections-

Scoliodon III, VII, IX and X Cranial nerves (Only Demonstration)

Mounting of fish scales

III Identification of slides/spotters

1. Protochordata: Herdmania, Amphioxus, Amphioxus T.S through pharynx.
2. Cyclostomata: Petromyzon and Myxine.
3. Pisces: Pristis, Torpedo, Hippocoampus, 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, Petrous, Funambulus.

REFERENCE BOOKS:

1. S.S. Lal, Practical Zoology – Vertebrata
2. P.S.Verma, A manual of Practical Zoology – Chordata

I B.Sc., (BZC), SEMESTER-II
(WITH EFFECTIVE FROM 2021-2022)
TITLE: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES
PRACTICAL MODEL PAPER
(AT THE END OF II-SEMESTER-EFFECTIVE FROM 2017-18)

Max marks: 50

Time: 2Hrs

- | | |
|--|------------------|
| 1. Dissect and display the III & VII cranial nerves of Scoliodon. Draw a neat labelled diagram | 10M |
| 2. Identification of 5 spotters | 6 X5=30M |
| A) ----- | |
| B) ----- | |
| C)----- | |
| D)----- | |
| E)----- | |
| F) ----- | |
| 3. Record | 05M |
| 4. Vivavoce | 05M |
| | Total 50M |

Question Bank
Animal diversity – II
BIOLOGY OF CHORDATES

Essay question

Module – I

1. Write an essay on the General Chordates of chordates
2. What is retrogressive metamorphosis? Discuss with special reference to the life history of an Ascidian and write its significance.
3. Life history of Herdmania.

Module – II

4. Explain migration in fishes.
5. Scoliodon respiratory system.
6. Write about the different sense organs in Scoliodon.
7. Respiratory system in Rana.
8. Reproductive system in Rana.

Module - III

9. Describe the structure and functions of Calotes digestive system.
10. Urinogenital system of Calotes
11. Identification of poisonous snakes.

Module - IV

12. Write about exoskeleton of Columbalivia.
13. Explain various flight adaptations in birds.
14. Explain respiratory system in birds.
15. Explain migration in birds
16. Write essay on dentition in mammals.

SHORT ANSWERS

Module – I

1. Salient features of Urochordata
2. Salient features of Cephalochordata.
3. Salient features of Cyclostomes
4. Structure of Herdmania

Module – II

5. Dipnoi
6. Scales in fishes.
7. Ampulla of Lorenzini
8. Buccopharyngeal respiration in frog.
9. Brain of Frog

Module - III

10. General characters of Reptilia.
11. Digestive glands of calotes.
12. Calotes brain.
13. Urinogenital system of male calotes.

Module - IV

14. Quill feathers.
15. Pigeon heart.
16. Air sacs.
17. Syrinx in birds.
18. Prototheria.
19. General characters of mammals.
20. Metatheria
21. Eutheria

SEMESTER - III

	P.R. Government College (Autonomous) Kakinada	Program & Semester II BZC - III			
Course Code	CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION				
Teaching	HoursAllocated:60(Theory)	L	T	P	C
Pre-requisites:	Basic structure of Cell – Mendelian Principles – Structure of DNA–Fundamentals of Evolution	4	1	2	4

Course 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 Cell Biology, Genetics and Evolution and by the completion of the course the graduate shall be able to–

- CO1** To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- CO2** Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- CO3** To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- CO4** Acquiring in-depth knowledge on principles of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders.
- CO5** Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- CO6** 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 for the benefit of the society

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	understand the basic unit of the living organisms and to differentiate the organisms by their cell structure	Remembering /Understanding
CO2	Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.	Application
CO3	Analyze various aspects of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals	Analyzing
CO4	Have in-depth knowledge on various of aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders	Knowledge & Application
CO5	Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.	Understanding
CO6	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 for the benefit of the society	Understanding & Application

Module –I Cell Biology

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus , Bacteriophages*
- 1.2 Electron microscopic structure of animal cell
- 1.3 Plasma membrane – Unit membrane model* - Fluid mosaic model and functions
- 1.4 Structure and functions of Endoplasmic Reticulum, Mitochondria and
- 1.5. Nucleus and Chromosomes

Module–II Genetics - I

2. 1 Mendel's Laws of Inheritance
2. 2 Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes
- 2.3 Multiple alleles Blood group inheritance - *
2. 4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)
2. 5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Module – III Genetics - II

- 3.1 Chromosomal Disorders (Autosomal and Allosomal), Human Karyotyping
- 3.2 Basics on Genomics and Proteomics
- 3.3 DNA replication
- 3.4 Gene Expression in prokaryotes (Lac Operon),
- 3.5 Gene Expression in eukaryotes

Module – IV Evolution

- 4.1 Origin of life
- 4.2. Geological time scale*
- 4.3 Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation theory
- 4.4 Neo-Darwinism: Modern Synthetic theory of Evolution, Hardy-Weinberg Equilibrium
- 4.5 Forces of Evolution: Isolation, Speciation

Additional Module

- Models of Plasma membrane – Bilamellar, Micellar
- Golgi complex Lysosomes and Ribosomes
- Genetic Drift, Natural Selection,

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
- 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
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Model of tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the timeline 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.
- **PROGRAMME SPECIFIC OUTCOMES**
- **PSO1:** Analyze the metabolism and principles of plant physiology, genetics and plant breeding techniques. Understand the principles of plant tissue culture and bio technological applications and plant diversity
- **PSO2.** Analyze and understand the origin of life, principles of evolution and microbial diversity
- **PSO3:** Recognize and apply the principles of atomic and molecular structure to predict chemical properties and chemical reactivity.

- **PSO4:** Acquire basic knowledge and skills in certain applied branches to enable them for self-employment Students gain knowledge and skills in the fundamentals of animal sciences, understands the complex interactions among various living organisms
- **PSO 5:** Recognize and apply key principles Genetics, Molecular biology, and Evolution in day-to-day life
- **COURSE OUTCOMES**
- **CO1** To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- **CO2** Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- **CO3** To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- **CO4** Acquiring in-depth knowledge on principles of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders.
- **CO5** Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.

CO-PO– PSO Mapping:

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

	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

REFERENCES:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell 'Molecular Cell Biology' W.H. Freeman and company New York.
2. Cell Biology by DeRobertis
3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Powar, Cell Biology
7. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India.
8. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and SonsInc.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.
10. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
11. 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.
12. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
13. Molecular Biology by freifelder
14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
15. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
16. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.

17. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
18. Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
19. James D. Watson, Nancy H. Hopkins 'Molecular Biology of the Gene'
20. Jan M. Savage. Evolution, 2nd ed, Oxford and IBH Publishing Co., New Delhi.
21. Gupta P.K., 'Genetics

**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. Unit membrane model	1. Provides conceptual understanding about structure of Plasma membrane
2. Multiple alleles	2. One of the important deviations from Mendelian Genetics
3. Geological time scale	3. Tool to portray the history of Earth

**II B.Sc., (BZC), SEMESTER-III
ZOOLOGY SYLLABUS
w.e.f. 2022-23 (Revised in SEPTEMBER-2022)
AT THE END OF SEMESTER-III**

**Blue print for CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND
EVOLUTION**

Module Name	PART I Essay Type Questions 10 marks each	Part II Short Answer Questions 5 marks each	Marks Allotted to the Chapter
1.Cellbiology	1	2	20
2. Genetics I	2	2	30
3. Genetics II	1	2	20
4.Evolution	2	2	30
5.Total	6 Of which 3 to be answered	8 Of which 4 to be answered	100 Marks including choice. Of which 50 Marks to be answered

QUESTION BANK FOR CYTOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

MODULE -I

Essay Questions

1. Enumerate differences between prokaryotes and eukaryotes
2. How do you correlate the structure and functions of Plasma Membrane?
3. Endoplasmic Reticulum is an important cell organelle, elaborate
4. Interpret the Structure and Types of Chromosomes

Short Answer Question

1. Prokaryotes
2. eukaryotes
3. Virus
4. Fluid Mosaic model
5. Mitochondria
6. Nucleus

MODULE II

Essay Questions

1. Give an account of Mendel's laws of inheritance
2. Compare unique features of incomplete dominance and co-dominance
3. Explain the law of independent assortment with suitable illustrations
4. Analyse different methods of sex determination
5. Give an account on X Linked inheritance

Short Answer Questions

1. Law of segregation
2. Epistasis
3. Y linked inheritance
4. Genic balance theory
5. sex determination in Human beings
6. XY linked inheritance

MODULE III

Essay Questions

1. Critically examine the features of Autosomal disorders in human beings
2. Describe the process of DNA replication and the significance
3. Explain the concept of Lac operon in detail
4. Write an essay on Gene expression in Eukaryotes

Short Answer Questions

1. Edward's Syndrome
2. Turner syndrome
3. Klinefelter syndrome
4. Genomics
5. lacoperon

MODULE IV**Essay Questions**

1. Link up different phases of the origin of life sequentially
2. Make critical analysis on Darwinism
3. Write an essay on Isolation
4. What is speciation? Write an essay on types of speciation.

Short Answer Questions

1. Practical evidence for origin of life / Miller and Urey experiment
2. Lamarckism
3. Neo-Darwinism
4. Hardy-Weinberg law
5. Germ plasm theory

ZOOLOGY MODEL PAPER

III SEMESTER - ZOOLOGY - PAPER - III

CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Time: 2 1/2 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 X 10 = 30

SECTION- A

1. Enumerate differences between prokaryotes and eukaryotes
2. Explain the role of chromosomes in sex determination
3. Compare X and Y linked inheritance

SECTION-B

4. Write an essay on gene expression in eukaryotes
5. Give an account on Modern synthetic theory
6. Write an essay on Speciation

Part – II

Answer any **Four** questions **4x5=20**

7. Prokaryotic cell
8. Mitochondria
9. Genic balance theory
10. Incomplete Dominance
11. Turner syndrome
12. Lacoperon
13. Hardy Weinberg Equilibrium
14. Neo Darwinism

ZOOLOGY PRACTICAL SYLLABUS

III SEMESTER - ZOOLOGY - PAPER - III

CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Periods:24

Max. Marks: 50

Learning 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 geological history of origin & evolution of animals

I. Cell Biology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of Chironomus

II. Genetics

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex-linked inheritance
3. Study of human karyotypes (Down's syndrome, Edwards syndrome, Turner's syndrome and Klinefelter syndrome)

III. Evolution

1. Study of homology and analogy from suitable specimens and pictures
2. Phylogeny of horse with pictures
3. Study of Genetic Drift by using examples of Darwin's finches (pictures)

REFERENCE BOOKS

1. Burns GW. 1972. The Science of Genetics. An Introduction to Heredity. Mac Millan Publ.Co.Inc.
2. Gardner EF. 1975. Principles of Genetics. John Wiley & Sons, Inc. New York.
3. Harth and Jones EW. 1998. Genetics – Principles and Analysis. Jones and Bar Hett Publ. Boston.
4. Levine L. 1969. Biology of the Gene. Toppan.
5. Pedder IJ. 1972. Genetics as a Basic Guide. W. Norton & Company, Inc.
6. Rastogi VB. 1991. A Text Book of Genetics. KedarNath Ram Nath Publications, Meerut, Uttar Pradesh, India.
7. Rastogi VB. 1991. Organic Evolution. KedarNath Ram Nath Publications, Meerut, Uttar Pradesh, India.
8. Stahl FW. 1965. Mechanics of Inheritance. Prentice-Hall.
9. White MJD. 1973. Animal Cytology and Evolution. CambridgeUniv.Press.

II B.Sc., (BZC), SEMESTER-III
ZOOLOGY - PAPER – III (At the End of III semester)
PRACTICAL MODEL PAPER
CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY & EVOLUTION

Max marks: 50

Time: 2Hrs

1. Prepare temporary slides of Mitotic divisions with onion root tips 10M

2. Identification of 6 spotters/Genetic Problems 6X5=30M

A) (Cytology)

B) (Cytology)

C) (Genetics)

D) (Genetics)

E) (Evolution)

F) (Evolution)


3. Record 5M

4. Viva

5M

Total 50M

SEMESTER IV

	P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA DEPARTMENT OF ZOOLOGY	Program & Semester			
Course Code ZO 4208	ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY	BZC – IV ACTZC-IV BTZC-IV			
Teaching	HoursAllocated:60 (Theory)	L	T	P	C
Pre-requisites:	Knowledge on the physiological process in the animal kingdom. Knowledge on the embryological processes	4	0	2	4

Course Outcomes: This course will provide students with a deep knowledge in Physiology, Cellular metabolism and Molecular Biology and by the completion of the course the graduate

On completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand the functions of important animal physiological systems including digestion, cardio-respiratory and renal systems.	REMEMBERING/ UNDERSTANDING
CO2	Understand the muscular system and the neuro-endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.	UNDERSTANDING / APPLICATION
CO3	Describe the structure, classification and chemistry of biomolecules and enzymes responsible for sustenance of life in living organisms	KNOWLEDGE AND APPLICATION
CO4	Develop broad understanding the basic metabolic activities pertaining to the catabolism and anabolism of various biomolecules	UNDERSTANDING / APPLICATION

shall able to –

CO5	<p>Describe the key events in early embryonic development starting from the formation of gametes up to gastrulation and formation of primary germ layers.</p> <p>Describe the key events in early embryonic development starting from the formation of gametes up to gastrulation and formation of primary germ layers.</p>	<p>KNOWLEDGE, SKILL, AND APPLICATION</p>
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Learning Objectives

- To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals.
- To instill the concept of hormonal regulation of physiology, metabolism and reproduction in animals.
- To understand the disorders associated with the deficiency of hormones
- To demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes
- To demonstrate an understanding of fundamental biochemical principles such as the function of biomolecules, metabolic pathways and the regulation of biochemical processes
- To make students gain proficiency in laboratory techniques in biochemistry and orient them to apply the scientific method to the processes of experimentation and hypothesis testing.

Knowledge

Skill

Employability

Entrepreneurship

UNIT I Animal Physiology – I 15 hrs

- 1.1 Process of digestion and assimilation-K
1.2 Respiration - Pulmonary ventilation, transport of oxygen and CO₂-KS
(Note: Need not study cellular respiration here)
1.3 Circulation - Structure and functioning of heart, Cardiac cycle-KS
1.4 Excretion - Structure and functions of kidney urine formation, counter current
Mechanism-KSE

UNIT II Animal Physiology – II 15 hrs

- 2.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers-KS
2.2 Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction-KS
2.3 Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas-UK
2.4 Hormonal control of reproduction in a mammal-UKS

UNIT III Cellular Metabolism 10 hrs

- 3.1 Carbohydrates - Classification of carbohydrates. Structure of glucose-KE
3.2 Proteins - Classification of proteins. General properties of amino acids-KS
3.3 Lipids - Classification of lipids, Properties of Lipids -KS
3.4 Enzymes: Classification and Mechanism of Action of enzymes -KU

UNIT IV Embryology 15 hrs

- 4.1 Gametogenesis-US
4.2 Fertilization-UK
4.3 Types of eggs-UKS
4.4 Types of cleavages-UKS
4.5 Development of Frog up to formation of primary germ layers-UKS

- (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

Co-curricular activities (Suggested)

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Chart of sarcomere/location of endocrine glands in human body
- Chart affixing of photos of people suffering from hormonal disorders
- Student study projects such as identification of incidence of hormonal disorders in the local primary health centre, studying the reasons thereof and measures to curb or any other as the lecturer feels good in nurturing health awareness among students
- Chart on structures of biomolecules/types of amino acids (essential and non-essential)Chart preparation by students on Glycolysis / kreb's cycle/urea cycle etc.
- Model of electron transport chain
- Preparation of models of different types of eggs in animals
- chart on frog embryonic development, fate map of frog blastula, cleavage etc.

REFERENCE BOOKS

1. Eckert H. Animal Physiology: Mechanisms and Adaptation. W.H. Freeman & Company.
2. Floray E. An Introduction to General and Comparative Animal Physiology. W.B. SaundersCo., Philadelphia.
3. Goel KA and Satish KV. 1989. A Text Book of Animal Physiology, Rastogi Publications, Meerut, U.P.
4. Hoar WS. General and Comparative Physiology. Prentice Hall of India, New Delhi.
5. Lehninger AL. Nelson and Cox. Principles of Biochemistry. Lange MedicalPublications, New Delhi.
6. Prosser CL and Brown FA. Comparative Animal Physiology. W.B. SaundersCompany, Philadelphia.
7. Developmental Biology by Balinsky

8. Developmental Biology by Gerard Karp
9. Chordate embryology by Varma and Agarwal
10. Embryology by V.B. Rastogi
11. Austen CR and Short RV. 1980. Reproduction in Mammals. Cambridge University Press.
12. Gilbert SF. 2006. Developmental Biology, 8th Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
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P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
w.e.f. 2022-23 (Revised in NOVEMBER -2022)
ZOOLOGY – SEMESTER IV

Blue print for PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

Module Name	PART I Essay Type Questions 10 marks each	Part II Short Answer Questions 5 marks each	Marks Allotted to the Chapter
1. Animal Physiology - I	1	03	25
2. Animal Physiology - II	2	01	25
3. Cellular Metabolism	1	03	25
4. Embryology	2	01	25
5.Total	06 Of which 3 to be answered	8 Of which 4 to be answered	100 Marks including choice. Of which 50 Marks to be answered

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
MODEL PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM
AND EMBRYOLOGY
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 3 x 10 = 30 Marks

SECTION – A

1. Write an essay on Urine formation
2. Describe Muscle contraction mechanism
3. Describe the hormonal control of reproduction of mammals

SECTION -B

4. Explain mechanism of enzyme action
5. Describe the process of spermatogenesis
6. Describe in detail the development of frog up to gastrulation level?

PART-II

Answer any **FOUR** of the following

4 x 5 = 20 Marks

7. Oxygen transport
8. Cardiac cycle
9. Digestion in stomach
10. Action Potential
11. Thyroid gland
12. Classification of proteins
13. Lipid structure
14. Glucose structure
15. Types of eggs

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P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
w.e.f. 2022-23 (Revised in September -2022)
II B.Sc., (BZC), SEMESTER-IV ZOOLOGY PRACTICALSYLLABUS
ZOOLOGY - PAPER - IV
ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY
Periods: 24 **Max. Marks: 50**

Learning Objectives:

- Identification of an organ system with histological structure
- Deducing human health based on the information of composition of blood cells
- Demonstration of enzyme activity in vitro
- Identification of various biomolecules of tissues by simple colorimetric methods and also quantitative methods
- Identification of different stages of earl embryonic development in animals

ANIMAL PHYSIOLOGY

- Qualitative tests for identification of carbohydrates, proteins and fats
- Study of activity of salivary amylase under optimum conditions
- T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
- Differential count of human blood

CELLULAR METABOLISM

- Estimation of total proteins in given solutions by Lowry's method.
- Estimation of total carbohydrate by Anthrone method.
- Qualitative tests for identification of ammonia, urea and uric acid

EMBRYOLOGY

- Study of T.S. of testis, ovary of a mammal
- Study of different stages of cleavages (2, 4, 8 cell stages)
- Construction of fate map of frog blastula


REFERENCE BOOKS:

- Harper's Illustrated Biochemistry
- Cell and molecular biology: Concepts & experiments. VI Ed. John Wiley & sons. Inc.
- Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
- Laboratory techniques by Plummer

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
ZOOLOGY - PAPER – IV PRACTIAL MODEL PAPER
ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY
Periods: 24
Max. Marks: 50

1. Salivary amylase activity experiment with detailed procedure	12 Marks
2. Test for Ammonia	08 Marks
3. Embryology slides 2 x 5	10 Marks
a.	
b.	
4. Physiology Slides: 2x5	10 Marks
a.	
b.	
5. Record	05 Marks
6. Viva voce	05 Marks
Total	50 Marks

SEMESTER IV

	P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA DEPARTMENT OF ZOOLOGY	Program & Semester			
Course Code	Immunology & Animal Biotechnology	BZC – IV ACTZC-IV BTZC-IV Semester IV Paper V			
Teaching	HoursAllocated:60 (Theory)	L	T	P	C
Pre-requisites:	Knowledge on the Basics of Immunology & 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 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.

Learning Objectives

- To trace the history and development of immunology
- To provide students with a foundation in immunological processes
- To be able to compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses
- Understand the significance of the Major Histocompatibility Complex in terms of immune response and transplantation
- 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.

• Knowledge

Skill

Employability

Entrepreneurship

Unit – I Immunology – I (Overview of Immune system) 15 hrs

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

Unit – II Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity) 15 hrs

- 2.1 Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
- 2.2 Antibodies: Structure of antibody, Classes and functions of antibodies
- 2.3 Structure and functions of major histocompatibility complexes
- 2.4 Exogenous and Endogenous pathways of antigen presentation and processing
- 2.5 Hypersensitivity – Classification and Types

Unit – III Biotechnology Techniques 15hrs

- 3.1 Animal Cell, Tissue, and Organ culture media: Natural and Synthetic media,
- 3.2 Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Organ culture; Cryopreservation of cultures
- 3.3 Stem cells: Types of stem cells and applications
- 3.4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

Unit – IV Applications of Animal Biotechnology 15 hrs

- 4.1 Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
- 4.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery
- 4.3 Transgenic Animals: Strategies of Gene transfer; Transgenic – sheep, - fish; Applications
- 4.4 PCR: Basics of PCR. -DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing

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
- 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 finger printing and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

REFERENCE BOOKS

- Immunology by Ivan M. Riott
- Immunology by Kubey
- Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International
- Publ.New Delhi, India.

CO-PO– PSO Mapping:

- (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

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
w.e.f. 2022-23 (Revised in September -2022)
II B.Sc., (BZC), SEMESTER-IV ZOOLOGY SYLLABUS
AT THE END OF SEMESTER IV
Blue print for PAPER – V
COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Module Name	PART I Essay Type Questions 10 marks each	Part II Short Answer Questions 5 marks each	Marks Allotted to the Chapter
1. Immunology – I (Overview of Immune system)	1	03	25
2. Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)	2	01	25
3. Biotechnology Techniques	1	03	25
4. Applications of Animal Biotechnology	2	01	25
5.Total	06 Of which 3 to be answered	8 Of which 4 to be answered	100 Marks including choice. Of which 50 Marks to be answered

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
w.e.f. 2022-23 (Revised in September -2022)
II B.Sc., (BZC), SEMESTER-IV ZOOLOGY
MODEL PAPER – V
COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

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 3 x 10 = 30 Marks

SECTION – A

1. Write an essay on the cells of Immune system
2. Describe various classes of Antibodies
3. Explain in detail exogenous path way of antigen presentation

SECTION -B

4. Explain media preparation in detail
5. Describe the Restriction endonucleases
6. What is the application of transgenic animals and give examples?

PART-II

Answer any six of the following

6 x 5 = 30 Marks

7. Adaptive immunity
8. Thymus gland
9. Spleen
10. Epitope
11. Paratope
12. Tissue culture media
13. Primary cell culture
14. MABs
15. Plasmid vector

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
w.e.f. 2022-23 (Revised in September -2022)
II B.Sc., (BZC), SEMESTER-IV
ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER COURSE – 5
IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Periods: 24

Max. Marks: 50

Learning Objectives:

- Acquainting student with immunological techniques vis-à-vis theory taught in the class room
- Interconnect the theoretical and practical knowledge of immunity with the outer world for the development of a healthier life.
- Demonstrate basic laboratory skills necessary for Biotechnology research
- Promoting application of the lab techniques for taking up research in higher studies

I. IMMUNOLOGY

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 a. ELISA
5. Immuno electrophoresis

II. Animal biotechnology

1. DNA quantification using DPA Method.
2. Separation, Purification of biological compounds by paper chromatography
3. Preparation of culture media.

REFERENCE BOOKS

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson
2. Practical Immunology A Laboratory Manual; LAP LAMBERT Academic

Publishing

3. Manual of laboratory experiments in cell biology by Edward, G
4. Laboratory Techniques by Plummer

P R GOVERNMENT COLLEGE (AUTONOMOUS): KAKINADA
DEPARTMENT OF ZOOLOGY
w.e.f. 2022-23 (Revised in September -2022)
II B.Sc., (BZC), SEMESTER-IV
ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER COURSE – 5
IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY


Periods: 24

Max. Marks: 50

Time 2 Hrs

Practical Examination Model paper

1. Paper chromatography		15 Marks
2. Blood Group determination		10 Marks
3. Slides A		
Slide B		
Slide C	3 x 5	15 Marks
4. Record		05 Marks
5. Viva Voce		05 Marks
Total		50 Marks

	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



Syllabus:

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 Finfish & shell fish
- 5.2 Fungal diseases of Fin & Shell fish
- 5.3 Bacterial diseases of Finfish & 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. Krishnaveni and N. Veerabhadra Mr. K. Veeranjanyulu

Reference books:

1. Pillay TVR & M.A. Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc. 1981
3. Boyd CE 1982. Water Quality Management for 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. <http://www.notesonzoology.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.

P.R. GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
 Four – year B.Sc. (Hons)
 Domain Subject: ZOOLOGY
 IV Year B. Sc. (Hons)–Semester –V
Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT
 (Skill Enhancement Course (Elective), -Credits: 05)

UNIT Name	PART I Essay Type Questions	Part II Short Answer Questions 5 marks each	Marks Allotted to the Chapter
UNIT II	10 marks each	02	20
UNIT III	1	03	25
UNIT IV	1	02	20
UNIT V	1	02	20
5.Total	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60 Marks to be answered

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

P.R. GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
Four – year B.Sc. (Hons)
Domain Subject: ZOOLOGY
Course 6 A: SUSTAINABLE AQUACULTURE MANAGEMENT
MODEL 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. Freshwater cultivable species
8. Nurserypond
9. Turbidity
10. Fertilizer in culture pond
11. Algal bloom
12. Quarantine pond
13. Vannamei
14. Macrobrachium
15. White Spot Disease
16. Dropsy

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 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.notesonzoology.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 Sem V Paper VII A			
Course Code	TITLE OF THE COURSE Domain Subject: ZOOLOGY Semester –V Course7A: POSTHARVESTTECHNOLOGY OF FISH ANDFISHERIES				
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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Knowledge		Entrepreneurship	
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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 Alimentarius.

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, NewDelhi
2. Lakshmi Prasad's, Fish Processing Technology 2012, Arjun PublishingHouse
3. Dr Sunitha Rai, Fish Processing Technology, 2015, RandomPublications
4. Safety and Quality Issues in Fish Processing (Woodhead Publishing Series in FoodScience,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 Indain 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 1 0 marks each	Part II Short Ans wer Questions 5 marks each	Marks Allotted to The Chapter
1. Handling and Principles of fish Preservation	1	02	20
2. Methods of fish Preservation	1	02	20
3. Processing and preservation of fish and fish by-products	2	02	30
4. Sanitation and Quality control	1	02	20
5. Quality Assurance, Management and Certification	1	02	20
Total	06 Of which 3 to be answered	10 Of which 6 to be answered	110 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

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

Part-II

Answer any six questions

6x5=30

5. Handling of fresh fish
6. Postmortem Changes
7. Reasons for spoilage of fishes
8. Canning
9. Smoking of fish
10. Fish Oils
11. Good Laboratory Practices
12. Seaweeds
13. Preprocessing control of quality
14. Sanitation.

Course 7 A:

POST HARVEST TECHNOLOGY OF FISH AND FISHERIES

PRACICAL 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-infisheries/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%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
7. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_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%20assessment>)

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

3. Collection of web resources on the Quality assurance, quality control measures in Aqua Industries- cross checking the standards during the visit to any processing units.

4. Assignments, Seminar, Group discussion. Quiz, Collection of Material, invited lecture, Video preparation etc. of above listed practicals)

REFERENCES:

1. Dr Sunitha Rai, Fish Processing Technology, 2015, RandomPublications
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%20Manual_Hygienic
7. [%20drying%20and%20packing%20of%20fish.pdf](#)
8. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic
9. [%20drying%20and%20packing%20of%20fish.pdf](#)
10. https://agritech.tnau.ac.in/fishery/fish_byproducts.html
11. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/>
12. <http://www.fao.org/3/i1136e/i1136e.pdf>
13. <http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20assessment>

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

Co-Curricular Activities

a) **Mandatory:** (*Lab/field training of students by teacher (lab 10 + field05):*)

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 aquaproducs.
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
3. Collection of web resources on the Quality assurance, quality control measures in Aqua Industries- cross checking the standards during the visit to any processing units.
4. Assignments, Seminar, Group discussion. Quiz, Collection of Material, invited lecture, Video preparation etc

LIST OF EXAMINERS**DEPARTMENT OF ZOOLOGY**

S. No	NameoftheExaminers	Subject	Nameofthe College
1	Dr. PJOHNKIRAN	ZOOLOGY	GDC PERUMALLAPURAM
02	M.VASANTHA LAKSHMI	ZOOLOGY	ASDCOLLEGE, KAKINADA
03	Dr. M. VIJAYAKUMAR	ZOOLOGY	SRR GDC VIJAYAWADA
04	P. JAYA	ZOOLOGY	VSK COLLEGE,VIZAG
05	K.USHARANI	ZOOLOGY	ARTS COLLGE RAJAMUNDRY
06	N.SUNEETHA	ZOOLOGY	SRRGDC,VIJAYAWADA
07	Dr. R. INDIRA	ZOOLOGY	ST. THERESSACOLLEGE,EL
08	V. SANDHYA	ZOOLOGY	GDC,KAIKALURU
09	V.V. PADMAVATHI	ZOOLOGY	ST. THERESSACOLLEGE,EL
10	K.BABU	ZOOLOGY	GOVERNEMTNARTSCOLL EGERAJAHMUNDRY
11	DR.R.P.DATTU	ZOOLOGY	GDCTIRUVURU
12	DR.I SCHAKRAPANI	ZOOLOGY	GDCVIDAVALURU
13	DR.GSRINIVAS	ZOOLOGY	GDCKARNOOL
14	MADHAVIRANI	ZOOLOGY	ST. THERESSA COLLEGE,ELURU
15	S. MADHAVI	ZOOLOGY	ASDCOLLEGE KAKINADA
16	K. RAMARAO	ZOOLOGY	VSKCOLLEGE, VISHAKAPATNAM
17	Dr.T.SAMUELDAVIDRAJ	ZOOLOGY	VSKCOLLEGE, VISHAKAPATNAM
18	P.R.VANI	ZOOLOGY	VSKCOLLEGE, VISHAKAPATNAM
19	K. SAMBASIVARAO	ZOOLOGY	GDC MYLAVARM

Lecturer in charge-Dept of Zoology

LIST OF QUESTION PAPER SETTERS

S.No	Name of the Examiners	Subject	Name of the College
1	P. JOH NKIRAN	ZOOLOGY	GDC PERUMALLAPURAM
02	MVASANTHA LAKSHMI	ZOOLOGY	ASD COLLEGE, KAKINADA
03	M.VIJAYAKUMAR	ZOOLOGY	SRR GDC VIJAYAWADA
04	P.JAYA	ZOOLOGY	VSK COLLEGE, VIZAG
05	K.USHARANI	ZOOLOGY	ARTS COLLGE RAJAHMUNDRY
06	N.SUNEETHA	ZOOLOGY	SRRGDC, VIJAYAWADA
07	R.INDIRA	ZOOLOGY	ST. THERESSACOLLEGE, ELUR
08	V. SANDHYA	ZOOLOGY	GDC, KAIKALURU
09	V.V. PADMAVATHI	ZOOLOGY	ST. THERESSA COLLEGE, ELURU
10	KBABU	ZOOLOGY	GOVERNEMTNARTSCOLLE GERAJAHMUNDRY
11	DRRPDATTU	ZOOLOGY	GDCTIRUVURU
12	DR.ISCHAKRAPANI	ZOOLOGY	GDCVIDAVALURU
13	DR.GSRINIVAS	ZOOLOGY	GDCKARNOOL
14	MADHAVIRANI	ZOOLOGY	ST. THERESSACOLLEGE, ELUR
15	S. MADHAVI	ZOOLOGY	ASD COLLEGE KAKINADA
16	K RAMARAO	ZOOLOGY	VSKCOLLEGE, VIS HAKAPATNAM
17	TSAMUELDAVIDRAJ	ZOOLOGY	VSKCOLLEGE, VIS HAKAPATNAM
18	PRVANI	ZOOLOGY	VSKCOLLEGE, VIS HAKAPATNAM
19	K SAMBASIVARAO	ZOOLOGY	GDCMYLAVARM
20	GVANI	ZOOLOGY	GDCTADEPALLIGUDEM

Lecturer in charge

Department of Zoology & Aquaculture

Department	Sl.No	Semester	Paper Title	Titles of the Topics Deleted	Topics to be added during BOS meeting November 2022	Percentage of changes Made in the Syllabus	Justification for each topic deleted	Justification for each topic added
Zoology	01	I	Biology of Non-chordates	Nil				
Zoology	02	II	Biology of Chordates	Nil				
Zoology	03	III	Cell biology, Genetics, Molecular biology and Evolution	Nil	Unit Membrane model ,Multiple alleles, Geological Time Scale	10	Repeated. Comes under modern synthetic theory	1.Provides conceptual understanding 2.One of the important from mendelian Genetics 3.Tool to Potray the history of earth
Zoology	04	IV	Animal physiology,cellular metabolism,Embryology	nil	1.Abnormal cardiac rhythms-tachycardia,bradycardia 2.synaptic transmission 3.properties of lipids	10		1.Student can able to understand the abnormalities in heart rhythms in day to day activities 2.Chemical transmission of impulse can be clearly explained with this topic
Zoology	05	IV	Animal biotechnology	nil	1.Applications of transgenic animals 2.Media preparation for animal cell culture	12		1.Now a days transgenic food materials widely used for consumption knowledge on the applications for the transgenic animal is highly useful 2.practical knowledge the media preparation will be impaired with this topic

Zoology	06	V Semester	Course 6 A: Sustainable Aquaculture Management	2. Manure application in culture ponds	5. Prawn Diseases pertaining to East Godavari with special reference to White gut, WSSV, Gillrot, Black shell diseases	12	2. It is dealt in 2.3 Reasons for Adding 1. It is important in explaining present status of aquaculture 2. Catering to local needs by studying the local epidemics.	Catering to local needs by studying the local epidemics.
Zoology	07		Course 6 A: Sustainable Aquaculture Management	5. Prophylaxis in aquaculture	1. Blue revolution		Reasons for Deleting 1. It is dealt already individually in 5.1, 5.2, 5.3	It is important in explaining present status of aquaculture
Zoology	08	V semester	Post-harvest technology	Icing, fish maws, chitosan	Industrial safety in Processing plants	10	Icing is a Repeated topic and Fish maws chitosan are not being implemented in Indian markets	Employability Skill

BOS CHANGES

Annexure

Syllabus for LSCs &SDCs

1. Environmental Education
2. Health and hygiene
3. Dairy Technology
4. Poultry Farming

AP State Council of Higher Education

Revised Syllabus under CBCS Pattern

(w.e.f. 2020-'21 Academic Year)

A Mandatory Course for BA/ BCom/BSc etc.

ENVIRONMENTAL EDUCATION

(Total hours of Teaching – 30 Hrs. @ 02 Hrs. per Week)

Course objective: A Generic Course intended to create awareness that the life of human beings is an integral part of environment and to inculcate the skills required to protect environment from all sides.

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

1. Understand the nature, components of an ecosystem and that humans are an integral part of nature.
2. Realize the importance of environment, the goods and services of a healthy biodiversity, dependence of humans on environment.
3. Evaluate the ways and ill effects of destruction of environment, population explosion on ecosystems and global problems consequent to anthropogenic activities.
4. Discuss the laws/ acts made by government to prevent pollution, to protect biodiversity and environment as a whole.
5. Acquaint with international agreements and national movements, and realize citizen's role in protecting environment and nature.

Unit 1: Environment and Natural Resources

06 Hrs.

1. Multidisciplinary nature of environmental education; scope and importance.
2. Man as an integral product and part of the Nature.
3. A brief account of land, forest and water resources in India and their importance.

4. Biodiversity : Definition; importance of Biodiversity - ecological,consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels of Biodiversity: genetic, species and ecosystem diversity.

Unit-2: Environmental degradation and impacts

10Hrs

1. Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.
2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflicts over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.
4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house effect - global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment

10 Hrs

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
5. Environment Laws: Environment Protection Act; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois of Rajasthan, Chipko, Silent valley.

Suggested activities to learner: (4 hours)

1. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems-forest, tank, pond, lake, mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

Suggested text book :

- ErachBarucha (2004) *Text book of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commission) Universities Press.
- PurnimaSmarath (2018) *Environmental studies* Kalyani Publishers, Ludhiana

Reference books :

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) *Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. (2011). *Environmental and Pollution Science*. Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) *Environment. 8th edition*. John Wiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) *Ecology and economics: An approach to sustainable development*. OUP.
- Wilson, E. O. (2006) *The Creation: An appeal to save life on earth*. New York: Norton.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) *Principles of Conservation Biology*. Sunderland: Sinauer Associates,

Model question paper for theory examination at the end of IV Semester Life
Skill Course / ENVIRONMENTAL SCIENCE

Max. Time : 2 Hrs.

Max. Marks: 50

Max. Marks: 50 Time: 1 1/2 hrs (90 Minutes)

Section -A

(Total: 4x5=20 Marks)

(Answer any **four questions**. Each answer carries **5 marks**)

(Total 8 questions. At least 1 question should be given from each Unit)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Section- B

(Total: 3x10 = 30 Marks)(Answer any **three questions**. Each answer carries **10 marks**)

(Total five questions. At least 1 question should be given from each Unit)

- 1.
- 2.
- 3.
- 4.
- 5.

Note: Questions may be set in such a way to test the outcomes instead of recalling of information.

APSCHE/ Life Skill Course / HEALTH & HYGIENE
IV Semester/ Optional
(Total teaching hours – 30 Hrs. @ 02 Hrs. per 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 Mantritva 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 Delhi
- Weblinks: <https://nhm.gov.in/>
 - National Rural Health Scheme:
<https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=969&lid=49>
 - National Urban Health Scheme:
<https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=970&lid=137>
 - Village health sanitation & Nutritional committee
<https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=149&lid=225>
 - About Accredited Social Health Activist (ASHA)
<https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=150&lid=226>
 - Village Health Nutrition Day
<https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=152&lid=228>

- Rogi Kalyan Samitis
<https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=153&lid=229>
- Health Impact Assessment - <https://www.who.int/hia/about/faq/en/>
(suggested information only)
http://www.euro.who.int/data/assets/pdf_file/0011/261929/Health-in-Impact-Assessments-final-version.pdf?ua=1
- WASH <https://www.unicef.org/wash/> and
https://www.unicef.org/wash/files/UNICEF_Strategy_for_WASH_2016_2030.PDF
- Healthy Living <https://www.nhp.gov.in/healthylivingViewall>

Note: The above web links are from MoHFW, GoI. Teachers can prepare their notes from other resources also.

A.P. STATE COUNCIL OF HIGHER EDUCATION
B A, B Com & B Sc Programmes

Revised CBCS w.e.f. 2020-21
SKILL DEVELOPMENT COURSES
To be Offered from Semesters I to IV

ZOOLOGY STREAM

Syllabus of

POULTRY FARMING

Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks

Learning Outcomes:

By successful completion of the course, students will be able to;

1. Understand the field level structure and functioning of insurance sector and its role in protecting the risks
2. Comprehend pertaining skills and their application for promoting insurance coverage
3. Prepare better for the Insurance Agent examination conducted by IRDA
4. Plan 'promoting insurance coverage practice' as one of the career options.

SYLLABUS:

Section I (Introduction to Poultry Farming): 10Hrs

- 1.1 General introduction to poultry farming -Definition of Poultry; Past and present scenario of poultry industry in India.
- 1.2 Principles of poultry housing. Poultry houses. Systems of poultry farming.
- 1.3 Management of chicks, growers and layers. Management of Broilers.
- 1.4 Preparation of project report for banking and insurance

Section II (Feed and Livestock Health Management): 10 Hrs

- 2.1 Poultry feed management – Principles of feeding, Nutrient requirements for different stages of layers and broilers. Feed formulation and Methods of feeding.
- 2.2 Poultry diseases – viral, bacterial, fungal and parasitic(two each); symptoms, control and management; Vaccination programme.

Section III(Harvesting of Eggs and Sanitation): 10 Hrs

- 3.1 Selection, care and handling of hatching eggs. Egg testing. Methods of hatching.
- 3.2 Brooding and rearing. Sexing of chicks.
- 3.3 Farm and Water Hygiene, Recycling of poultry waste.

Co-curricular Activities Suggested: (4 hrs)

1. Group discussion & SWOT analysis
2. Visit to a poultry farm
3. Invited Lectures by Concerned officers of government or private farms
4. Cheap and Healthy Feed preparation by students based on government standards
5. Market study and Survey (Monitoring of daily price hike in poultry market and analysis)
6. Online SwayamMoocs course on poultry farming (see reference 9 below)

Reference books:

1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Jull A. Morley, 2007. Successful Poultry Management. 2nd Edition. Biotech Books, New Delhi"
3. Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow."
4. Life and General Insurance Management, "
5. Financial services, Tata McGraw hill
6. <http://www.asci-india.com/BooksPDF/Small%20Poultry%20Farmer.pdf>
7. https://nsdcindia.org/sites/default/files/MC_AGR-Q4306_Small-poultry-farmer-.pdf
8. <http://ecoursesonline.iasri.res.in/course/view.php?id=335>
9. https://swayam.gov.in/nd2_nou19_ag09/preview

MODEL QUESTION PAPER & PATTERN

Max. Marks: 50

Time: 1 1/2 hrs (90 Minutes)

SECTION A (Total: 4x5=20 Marks)

(Answer any **four questions**. Each answer carries **5 marks**
(At least **1 question** should be given from each Unit)

1.	Poultry house
2.	Broilers
3.	Any two viral diseases of poultry
4.	Any two bacterial diseases of poultry
5.	Any two fungal diseases of poultry
6.	Egg testing
7.	Brooding
8.	Sexing chicks

SECTION B

(Total: 3x10 = 30 Marks)

(Answer any **three questions**. Each answer carries **10 marks**
(At least **1 question** should be given from each Unit)

1.	Discuss briefly the past, present and future scenario of poultry farming industry in India.
2.	Explain principles of poultry housing in detail, with examples.
3.	Write an essay on viral diseases of poultry.
4.	Give an account of fungal and bacterial diseases (any two each) of poultry
5.	Write an essay on selection, handling and hatching of eggs.

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Note: Please read the following in addition to the Guidelines sent.

- In Unit-2 and Unit-3, Sub-titles highlighted in Yellow colour are Skills. Sub-titles not highlighted are of Theoretical base.*
- Skills, though separately shown, shall also have 'content' to be learnt and written in the examination by the students.*
- The field (hands on) skills are learnt through the Co-curricular Activities.*
- One or two books referred shall be related to 'learning of skills'*
- Topics and syllabus may be prepared keeping all (BA/BSc/BCom) urban as well as rural students in view.*

A.P. STATE COUNCIL OF HIGHER EDUCATION
B A, B Com & B Sc Programmes

Revised CBCS w.e.f. 2020-21
SKILL DEVELOPMENT COURSES
To be Offered from Semesters I to IV

ZOOLOGY STREAM

Syllabus of

DAIRY TECHNOLOGY

Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks

Learning Outcomes:

After successful completion of the course, students will be able to;

1. Understand the pre-requisites for starting a Dairy farm
2. Recognize different breeds of Cows & buffaloes following safety precautions.
3. Prepare and give recommended feed and water for livestock
4. Maintain health of livestock along with productivity
5. Vaccination of cattle, nutrients requirements
6. Entrepreneurship i.e., Effectively market dairy products
7. Ensure safe and clean dairy farm and Standard safety measures to be taken in establishing an industry
8. Efficiently start and manage to establish or develop a Dairy Industry

SYLLABUS:

Section I (Introduction and Establishment of a Dairy Farm): 05 Hrs

- 1.1 Dairy development in India – Dairy Cooperatives (NDRI, NDDB, TCMPF)(1hr)
- 1.2 Constraints of Present Dairy Farming and Future Scope of Dairy Farmer.(1 hr)
- 1.3 Selection of site for dairy farm; Systems of housing – Loose housing system, Conventional Dairy Farm; Records to be maintained in a dairy farm. (2 hrs)

Section II (Livestock Identification and Management): 13 Hrs

- 2.1 Breeds of Dairy Cattle and Buffaloes – Identification of Indian cattle and buffalo breeds and Exotic breeds; Methods of selection of Dairy animals. (5 hrs)
- 2.2 Systems of inbreeding and crossbreeding. (2 hrs)
- 2.3 Weaning of calf, Castration, Dehorning, Deworming and Vaccination programme (3 hrs)
- 2.4 Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks. (3 hrs)

Section III (Feed Management, Dairy Management, Cleaning and Sanitation): 8 Hrs

- 3.1 Basic Principles of Feed, Important Feed Ingredients, Feed formulation and Feed Mixing(2 hrs)
- 3.2 Operation Flood –Definition of Milk and Nutritive value of milk and ICMR recommendation of nutrients –Per Capita Milk production and availability in India and Andhra Pradesh -Methods of Collection and Storage of Milk–Labelling and Storage of milk products (4 hrs)
- 3.3 Cleaning and sanitation of dairy farm – Safety precautions to prevent accidents in an industry. (2 hrs)

Co-curricular Activities Suggested: (4 hrs)

1. Group discussion&SWOT analysis
2. Visit to a Dairy Farm
3. Visit to Milk Cooperative Societies
4. Visit to Feed Milling Plants
5. Market Study and Identification of Government Schemes, Insurance and Bank Loans in relation to dairy farming

Reference books:

1. Dairy Science: Petersen (W.E.) Publisher – Lippincott & Company
2. Principles and practices of Dairy Farm –Jagdish Prasad
3. Text book of Animal Husbandry - G C Benarjee
4. Hand book of Animal Husbandry - ICAR Edition
5. Outlines of Dairy Technology – Sukumar (De) – Oxford University press
6. Indian Dairy Products – Rangappa (K.S.) & Acharya (KT) – Asia Publishing House.
7. The technology of milk Processing – Ananthkrishnan, C.P., Khan, A.Q. and Padmanabhan, P.N. – Shri Lakshmi Publications.
8. Dairy India 2007, Sixth edition
9. Economics of Milk Production – Bharati Pratima Acharya Publishers.
10. <http://www.asci-india.com/BooksPDF/Dairy%20Farmer%20or%20Entrepreneur.pdf>
11. <https://labour.gov.in/industrial-safety-health>

Model Format for Question Paper:

MODEL QUESTION PAPER & PATTERN

Max. Marks: 50

Time: 1 1/2 hrs (90 Minutes)

SECTION A (Total: 4x5=20 Marks)

(Answer any **four questions**. Each answer carries **5 marks**(At least **1 question should be given from each Unit**)

1.	Conventional Dairy Farm
2.	Animal Inbreeding
3.	Sanitation of Dairy Farm
4.	Dairy development in India
5.	Feed Mixing
6.	Deworming
7.	Milk Storage Methods
8.	Identification of characters of any Two Dairy cattle

SECTION B

(Total: 3x10 = 30

Marks)(Answer any **three questions**. Each answer carries **10 marks**
(At least **1 question should be given from each Unit**)

1.	Write an essay on Dairy development in India, its current position and future scenario.
2.	List our different methods involved in selection of dairy animals and discuss briefly.
3.	Give an account of feed ingredients and feed management required for dairy animals.
4.	Explain different methods of collection of milk.
5.	Explain two methods of systems of housing of dairy animals.

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Note: Please read the following in addition to the Guidelines sent.

1. *In Unit-2 and Unit-3, Sub-titles highlighted in Yellow colour are Skills. Sub-titles not highlighted are of Theoretical base.*
2. *Skills, though separately shown, shall also have 'content' to be learnt and written in the examination by the students.*
3. *The field (hands on) skills are learnt through the Co-curricular Activities.*
4. *One or two books referred shall be related to 'learning of skills'*
5. *Topics and syllabus may be prepared keeping all (BA/BSc/BCom) urban as well as rural students in view.*