PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA

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

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES

B.Sc. AQUACULTURE (Single Major System)
&
B.Voc. Commercial Aquaculture

2023-2024

CHOICE BASED CREDIT SYSTEM

Convened on 31-08-2023

Index

DEPARTMENT OF COLLEGIATE EDUCATION

GOVERNMENT OF ANDHRA PRADESH

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

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

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

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

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

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

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

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

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

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

Further, the Ministry of India, GoI, through NIRF, prescribes quality research, infrastructure augmentation, enhanced placement and progression to higher education, equipment of

employability skills leading to enhanced public perception about the college among the public.

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

ORDER:

In the light of the above mandate and responsibilities prescribed by institutions vision and mission, SDG-4, NEP – 2020, NAAC, NIRF to the autonomous HEIs, need to customize, design and re-orient their academic and research administration in tune with the policies of above bodies, our institution is no exception. Hence, the Chairmen of U.G and P.G Boards of Studies of various Departments are requested to make necessary arrangements for the conduct of the meetings on **31 August 2023**. They are further requested to prepare curricula and extracurricular activities and devise suitable evaluation system keeping in mind above recommendations to make students a wholesome personality and a 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

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

The Chairmen are, therefore, requested to

- Design curricula of Odd and even semesters for the A.Y 2023-24 both for U.G and P.G courses in tune with the stated vision, mission of the institution, RAF of NAAC, NEP-2020 and NIRF.
- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula andinvite suggestions and changes to be made.
- Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc. A soft copy shall be communicated well in advance to the members to have an idea on the matters.
- Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, resource utilization by staff

and students, etc.,

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

Following contents shall be presented in the BOS document in order

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

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

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

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

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

CIA structure for Single Major system

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

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

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

Ø

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

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

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

CIA structure for 3 Major system

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

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

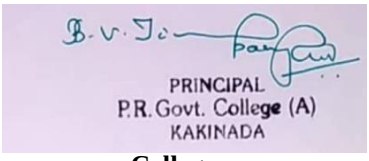
CIA structure for 3 Major system for Honors programmes (2020-21AB)

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

Assignment- 10M	Seminar- 5	Quiz -5M

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

PRINCIPAL
Pithapur Rajah's **Government Autonomous**



College

Kakinada

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

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

R.C.No.1/A.C./BOS/2023-24, Dated: 29.08.2023

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

REF: 1. UGC Guidelines of for Autonomous Colleges-2018.

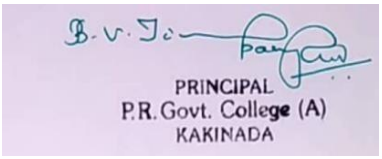
ORDERS:

The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG Boards of Studies in Aquaculture & B.Voc CA- for framing the syllabi in respective Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1	Sri. B. Chakravarthi	Chairman & Head, Department of Zoology & Aquaculture
2	Dr. K. Ramesh Babu	Dept of Marine Living Resources, Andhra University, Vishakhapatnam.
3	Dr. K. Ramaneswari	Subject Expert -I, Department of Zoology, Dean Research Cell, Adikavi Nannaya University, Rajamahendravaram
4	Dr N Sreenivas	Subject Expert – II, Lecturer in Zoology, Govt. Degree College, Ramachandrapuram.
5	Sri M Phaneendra	Representative from Industry, Aqua Industry consultant
6	Dr. Kiran Kumar Pappu	Member
7	Dr. B. Elia	Member
8	Sk. Madina Saheb	Member
9	Y. Gowthami	Member
10	P.V. Chandrika	Member
11	B. Devi	Member
12	T. Sushma	Member
13	MD. Shamreen	Member
14	M. Sowmya	Member
15	A.Manju Lakshmi	Student Alumni Member
16	K Ayyappa Swamy	Student Member
17	K Jagadeesh	Student Member
18	V Ramya	Student Member

The above members are requested to attend the BoS meeting on 31 - 08 -2023 and share their valuable reviews, and suggestions on the following functionaries.

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



PRINCIPAL
P. R. Government College(A), Kakinada

BOS Meetings 2023-2024

Guidelines for Departments

Please ensure that the following parameters are reflected while adopting resolutions in the BOS minutes.

- The resolutions shall be in tune with the vision & mission of the college. VISION, MISSION & OBJECTIVES FROM 2023-24

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 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 mould the character of each constitutional provisions-abiding and inquisition-arousing.

The activities and plans of actions for AY 2023-24 and BOS resolutions shall be in tune with vision & Mission of the college.

OBJECTIVES:

1. To prepare and introduce students to the world of work through development of cognitive skills, discipline-specific skills, technical and professional skills, information processing sills, problem-solving skills, social engagement and emotional skills.
2. To forge collaborations with industry, Government and third sector organizations
3. To promote intuition among students
4. To devise plans for rolling out socially conscious, culturally synchronizing and environmental friendly students.
5. To make students access to ICT infrastructure for enhanced quality higher education
6. To make students find innovative solutions to societal problems and adapt themselves to

- The changes in the syllabus made shall be atleast 20% and tabulate the changes(No.of topics added)/ (Total No.of topics)x 100 = 20%

Name of the Department	Semester, Program, Paper Number & Title of the Paper,	Titles of Topics deleted	Topics added during BO Smeeting August 2023	Percentage of changes made in syllabus	Justification per each topic deleted/ added

- The changes in theory for sciences shall be in tune with the local & global level industry required skill development and employment opportunities.
- The Practicals shall be according to theoretical concepts. If required, new nee & innovative practicals shall be proposed and approved keeping the futuristic and advanced technologies in future.
- Each Department shall approve at least two expert/guest lectures per semester per faculty member with tentative months and dates
- Each Department shall plan and approve at least one student- centric National level conference/ seminar/ conclave/workshop, etc., either offline/ webinar-based per year.
- Each Department shall plan & approve one faculty - centric National level conference/ seminar/ conclave/workshop, etc., either offline/ webinar-based per year.

- Each Department shall plan & approve at least one industrial / Educational tour per yearwith specific month and tentative dates.
- Each Department shall plan & approve at least two – community extension/ outreach programmes per semester.
- Each Department shall plan & approve at least one certificate course per semester, one MOOCs by each faculty per year
- Each department shall resolve to publish the number of research papers equivalent to theno.of faculty in the department per year.
- Mandatory publication of atleast one book by each faculty member.
- Each department shall discuss, plan & approve atleast two best practices for 2023-24.
- Each department shall conduct at least two career guidance programmes for AY 2023-24 in tune with the vision & mission.
- Each department shall resolve the attendance requirements for students to allow them appear for midterm examinations and SEE. 1.60% attendance for I mid-term examination 2. 75% attendance for II mid and SEE theory & 90% attendance for practical examinations
- Minimum of 60% integration of ICT into transaction of curriculum
- Remedial coaching for slow learners and project works, research, Conferences, etc., for advanced learners.

S.No	Parameter	Unit of Time	Benchmarking (Number/quantity)	Remarks
1	Certificate courses	Semester	1	
2	Value added courses	Semester	1	
3	MOOCs for student	Year	1	
4	MOOCs for faculty	Semester	1	
5	LMS by faculty	Semester	1	Each faculty shall prepare topic wise/ chapter wise LMS (4 - quadrant approach)
6	Field/ industrial/ Educational trips	Year	1	Department level – Each dept shall conduct
7	Research papers	Year	1	Minimum one research publication per year per lecturer
8	Conferences/ Workshops/ – National level	Year	1	Offline (Preferably one month after commencement of odd/ evensemester)

9	Conferences/ Workshops/ – State level	Year	1	Webinar (Preferably two months after commencement of odd/ evensemester)
10	Book publications	Year	**	Each faculty shall publish atleastone book per year
11	Career Guidance Programmes	Semester	2	1 Department level & 1 by faculty
2	Parent-teacher meetings	Semester	1	
13	Meeting with employers on curriculum design & feedback	Semester	1	At least one week before the beginning of BOS meetings
14	Meeting with Alumni for feedback on curriculum design	Semester	1	At least one week before the beginning of BOS meetings
15	Review meetings on syllabus completion byeach			
16	Mentoring(Faculty)	Semester	3 times per candidate	1. In first week after commencement of semester 2. In sixth week after commencement of semester 3. In Tenth week after commencement of semester 4.
17	Frequency of tests	At the end of every chapter		Its besides CIA
18	Group Discussions, Quizprograms, etc	Monthly/faculty	1 GD 1 Quiz 1 Extracurricular activity 1 Career Guidance activity (sports/ c ultural)	

19	Participation of students in seminars/ workshopa	Semester	At least 50% of advanced learners shall participate & present papers in conferences/ workshops	
20	Feedback by Department on the Departmental performance and that of faculty performance (Self Assessment of the Department)	Semester	2	1. 15 days after commencement of instruction 2. 10 days before the closure of the instruction for the semester
21	Department wise Slow and advanced learner identification (Class-wise	Semester	1	One week immediately after commencement of instruction basing on previous SEE examination (from II semester onwards) or through test result (for I semester students)
22	Participation of faculty in Conferences/ workshops and paper presentation	Semester	1	Every faculty shall invariably take part and present at least in 2 conferences, etc., in other colleges @ at least 1/ each semester online or offline.
23	Participation in short term/ FDP/ Orientation/ Refresher course by faculty	Year	1	Each faculty shall invariably take training through mentioned programs annually
24	Departmental trainings/ FDPs	Semester	1	Each department shall invariably conduct training in pedagogy/ departmental initiatives such as OTLM/ FRS/ research paper writing, preparation and maintenance of academic documents such as CSP, DS, daily etc.,
25	Research Board meetings	Monthly	1	Each Department shall constitute Research Board (RB) for it with HoD as Chairman and one of the faculty members as Director. It shall prepare Plan of Action per year with No.of publications,

				research activity to be done. Review of progress of research by scholars and guides of the department.
26	Collaborations	Yearly	5-10	
27	Consultancy services	Yearly	Minimum Rs .25000/- generation	Its mandatory on the part of each department to offer consultancy in its areas of study/ research affiliated areas and generate funding through Govt/ Non- Govt organizations.
28	Library usage by faculty members	Monthly	15 Hours	Each faculty member shall optimally utilize library resources, update knowledge through physical and N-LIST resources. Daily Utilization of e-content of N-LIST is recommended.
29	Merit scholarships by Departments	Yearly	Atleast for 10 students of the dept.	Each dept shall mobilize merit scholarships for its students through donors/ philanthropists.
30	Student Grievance redressal	Weekly/ whenever required	1	Each department shall evolve a mechanism for redressing grievances of students. It shall constitute a committee with atleast on woman faculty and two male and two female students each. It shall arrange a grievance box in the HoD room for dropping grievance related letters The committee shall meet at 3:00 P.M on every Monday in the department and open the box in the presence of committee and students. The grievances shall be tabulated and addressed within 3 days. The grievances pertaining to college level shall be sent to the principal.

31	Departmental initiative for progression to Higher Education	Semester	15 classes	Each faculty member shall engage one class per week for coaching for P.G entrance examinations
32	Coaching for Employment. / Skill Development	Semester	1 course	In collaboration with JKC/ Centre for 21st century skills/ on its own, each department shall offer value addition courses like indian polity/ Technical skills/ Analytical skills/ Communications skills, etc., for an edge in competitive examinations
33	Environmental sustainability	Weekly	1	Each faculty member shall in at least one day in a week attend the college without personal vehicle (Car/ Bike) and rather use public transportation/ bicycle, the environment friendly modes

DEPARTMENT OF ZOOLOGY & AQUACULTURE

Consolidated Report of Board of Studies For The Year 2023– 2024

The Board of studies Meeting in the Department of Zoology was convened on 31-08-2023 at

3 PM under the Chairmanship of Sri. B. Chakravarthi, Lecturer in Charge, Department of Zoology and Aquaculture Technology. The following members are present:

S. No	Name of the Person	Designation
1	Sri. B. Chakravarthi	Chairman & Lecturer In charge, Department of Zoology & Aquaculture
2	Dr. K. Ramesh Babu	Dept of Marine Living Resources, Andhra Unversity, Vishkhapatnam.
3	Dr. K. Ramaneeswari	Subject Expert -I, Department of Zoology, Dean Research Cell, Adikavi Nannaya University, Rajamahendravaram
4	Dr N Sreenivas	Subject Expert – II, Lecturer In Zoology, Govt. Degree College, Ramachandrapuram.
5	Sri M Phaneendra	Representative from Industry, Aqua Industry consultant
6	Dr. Kiran Kumar Pappu	Member
7	Dr. B. Elia	Member
8	Sk. Madina Saheb	Member
9	Y. Gowthami	Member
10	P.V. Chandrika	Member
11	B. Devi	Member
12	T. Sushma	Member
13	MD. Shamreen	Member
14	M. Sowmya	Member
15	A.Manju Lakshmi	Student Alumni Member
16	K Ayyappa Swamy	Student Member
17	K Jagadeesh	Student Member
18	V Ramya	Student Member

Date: 31-08-2023

Signature of the Chairperson

AGENDA FOR BOARD OF STUDIES MEETING -2023-2024

Agenda

1. Approval of Single major system for UG B.Sc. Hounours (Zoology) SEM I &SEM II From the adamic year 2023-24
2. Approval of Syllabus for all the Semesters and implementation of Choice Based Credit System
3. Model question papers, Blue Print Panel of paper setters and examiners.
4. Methodologies of Teaching – Learning and Evaluation.
5. Implementation of newly introduced Skill Enhancement Courses (SEC's) in Zoology & Aquaculture Technology by 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 2023-2024
7. Conduct of guest lectures, field visits, assigning of project works etc.
8. Additional inputs and changes in the curriculum.
9. Introducing Certificate course entitled **Certificate Course on Water quality assessment for fresh water Aquaculture**
10. Implementation of Community Service Project and Internship and apprenticeship Programmes introduced from 2020-2021 admitted batch.
11. Continuous Internal Assessment pattern (CIA) introduced by APCCE
12. Designing and conduct of workshops and seminars
13. Arrangement of skill development, training programs and MOUs.
15. Conduct of Bridge Course and Remedial Coaching.
16. 75% attendance compulsory for Mid and Sem End Exams.
17. Course outcome Assessment manual as per UGC norms and Blooms taxonomy
18. Approval of new courses introduced in the academic year 2023-24
19. Any other proposal with the permission of the Chair.

Discussion:

The members of BOS have discussed all the points of Agenda extensively and made the following resolutions

PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES MEETING (2023-24) CONVENED ON 31ST August 2023-2024

Resolutions

The members, Board of Studies, Zoology met through online and offline on 31-08-2023 at 3.00 PM to discuss the agenda points and to approve the course structure, Theory and Practical syllabus, Blue Print, Model question papers, Additional inputs in the Curriculum, Study Projects, Co-curricular and extracurricular activities of Department, Skill Development Courses and Certificate Course offered by the Department, Internship programmes, Continuous Internal Assessment pattern (CIA) and Semester End examination Pattern.

The following resolutions are made.

Resolution-1

1. It is resolved to adapt Single major system for UG B.Sc **Aquaculture** from the adamic year 2023-24 as per the Guidelines of APSHE.

2.It is resolved to follow the syllabus as well as Choice Based Credit System introduced by UGC/APSCHE through Adikavi Nannaya University, Rajamahendravaram for I, II-III- & IV-Year students from the academic year 2023-24.

Resolution-2

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

Resolution-3

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

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

Resolution-4

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

Resolution-5

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

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

Resolution-6

Resolved to implement the Action plan proposed for the Academic year 2023-2024

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

Resolution-7

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

Resolution-8

It is resolved to follow the existing Syllabus prescribed by APSCHE &Adikavi Nannaya University for the 2021-2022, and 2022-23 admitted batches for 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 I &v II Year students. Also resolved to conduct a certificate course in Biodiversity of Mangrove fauna in the academic year 2023-24.

Resolution-10

Resolved to implement the SOP given by APSCHE through Adikavi Nannaya University regarding I Phase of Internship (Community Service Project) between1stand2ndyear, II Phase of Internship between2ndand3rd year and III phase of internship during entire 6th Semester from 2020-2021 admitted batch onwards.

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

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

The weightage shall be:

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

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

The weightage shall be:

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

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

The weightage shall be:

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

External Assessment Component	Max. Marks	Marks Awarded
Performance Assessment by the Evaluation Committee, converting the grades awarded by the industry, enterprise, etc	100	
External Viva Voce	50	
Total	**150**	
Grand Total	**200**	

Resolution-11

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

Resolution-12

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

Resolution-13

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

Resolution-14

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

Resolution-15

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

Resolution-15

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

Resolution-16

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

Resolution-17

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

Resolution-18

It is resolved to introduce the following new courses in—B.Sc. (Honours) Zoology, from the AY 2023-24

S.No	Course Code	Title of the new course	Programmes in which it is introduced
1	AICB23	Introduction to Classical Biology	B.Sc. (Honours) Aquaculture/SEMI
2	AIAB23	Introduction to Applied Biology	B.Sc. (Honours) Aquaculture / SEMI
3	APBS23	Principles Of Biological Sciences (MDC)	B. A/B. Com/(Honours) SEMI
4	ABNC23	Taxonomy and Functional Anatomy of Fin Fish and Shellfish	B.Sc. (Honours) Aquaculture / SEMII
5	ACMB23	Biology of fin fish & shell fish	B.Sc. (Honours) Aquaculture / SEMII

P.R. GOVT COLEGE (A), KAKINADA
ACTION PLAN 2023-24
DEPARTMENT OF ZOOLOGY & AQUACULTURE

	July- 2023	I Mid EXAMS Sem II/IV Guest lectures to be organized by all Regular faculty Field Trip to Aquaculture students	3-7-2023 to 6-7-2023 3rd week of July 2023 4th week of July	Conducted
	August-2023	National Conference I Bridge course to I Sem students I Student seminars BOS for newly introduced Zoology Single major and Honors programme	4th August 2023 2nd week of August 3rd week of Aug-2023 4th week of Aug-2023	
	September2023	Student Seminars	Ist week of September	
		Training to Aquaqculture students at SIFT, Kakinada	3rd Week of September	
		Field trip	4th Week of September	
	October 2023	Wild Life week celebrations Certificate course on Mangrove Fauna Certificate course on Water quality Assessment	First week of October October 2023 October 2023	
	November2023	1. Extension activity in Rural high Schools 2. Guest Lecture by Fisheries experts	3rd Week of November 4th Week of November	
	December2023	One day Faculty Development Programme (FDP) for High school teachers	1st week of December 2023	
		Field visits, Industrial visits One day workshop for students in laboratory specimen examination and preservation tech. I Mid Exam to III/V Sem	2nd week of December 20-23 Dec	
	January 2024			
		Hands-on training to B.Voc students	2ndweek of Jan-2024	

		at CIFE, Kakinada		
		Field Visit to III-year BZC students	Third week of Jan-2024	
	February 2024	Work shop on Hematological Techniques National Science Day	4th week of February 2024 28th February	
	March 2024	Practical exams Student Projects for Final year students.	1-13 March 3rd week of March	

Tentative Budget Estimate for 2023-2024

1. Field trips - Rs.50,000
2. Guest lectures - Rs.10,000

3.Internships Programmes for CZAC & B Voc – Rs.75,000

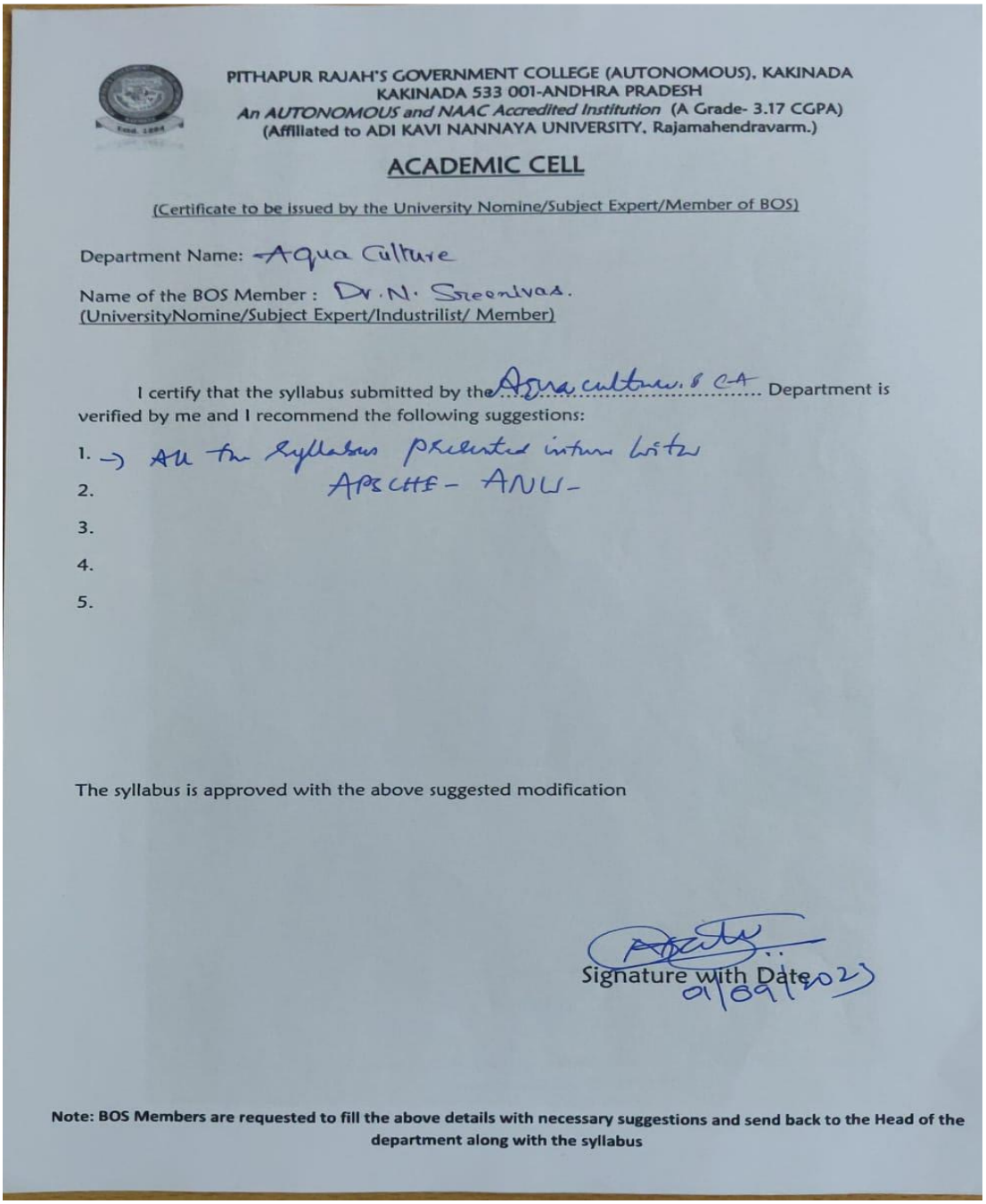
4.National Seminar – Rs. 1,25,000

5.Purchase of Consumable items for Practicals -Rs. 50,000

6. BOS Meetings -Rs. 30,000

Total Rs. 3,40,000

The following members attended (Offline/online) and approved resolutions:



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (A Grade- 3.17 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravarm.)

ACADEMIC CELL

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

Department Name: Aqua Culture

Name of the BOS Member : Dr. N. Sreenivas.
(UniversityNomine/Subject Expert/Industrilist/ Member)

I certify that the syllabus submitted by the Aqua culture & CA Department is verified by me and I recommend the following suggestions:

1. → All the Syllabus presented in the list
2. APSCHE - ANU -
3.
4.
5.

The syllabus is approved with the above suggested modification

Signature with Date 01/09/2023

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (A Grade: 3.17 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravarm.)

ACADEMIC CELL

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

Department Name: Zoology & Aquaculture

Name of the BOS Member: Dr. K. Ramaneswari
(UniversityNomine/Subject Expert/Industrilist/ Member)

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

1.

2.

3.

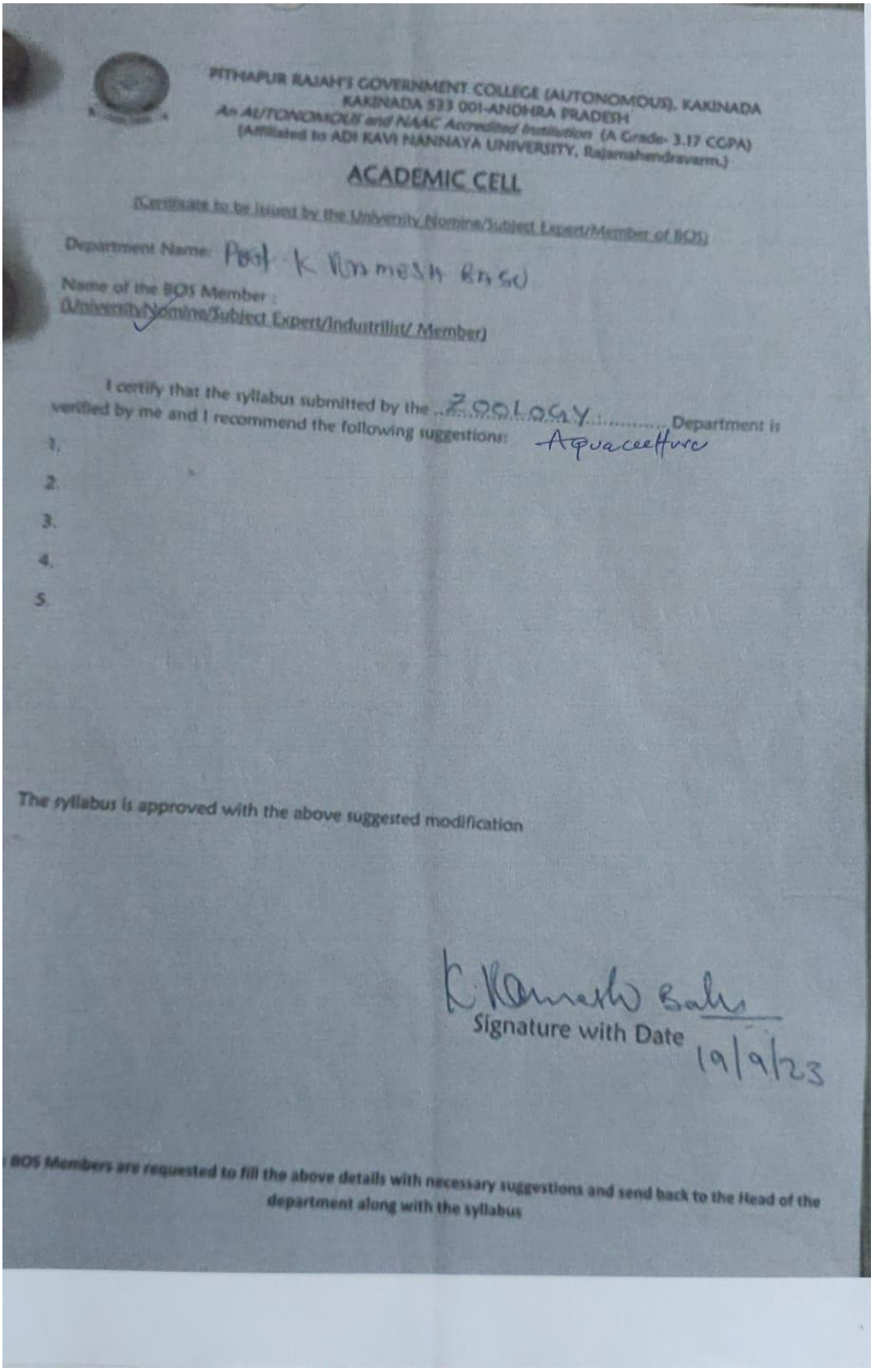
4.

5.

The syllabus is approved with the above suggested modification

Signature with Date
31/8/2023

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



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (A Grade- 3.17 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravaram.)

ACADEMIC CELL

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

Department Name: Prof. K Ramesh Babu

Name of the BOS Member :
(University Nomine/Subject Expert/Industrilist/ Member)

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

1. Aquaculture
2.
3.
4.
5.

The syllabus is approved with the above suggested modification

K. Ramesh Babu
Signature with Date 19/9/23

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

PITHAPUR RAJAH'S GOVERNMENTCOLLEGE(A), Kakinada

Aquaculture

BOARD OF STUDIESMEETING 2023-24

CHOICE BASED CREDIT SYSTEM

(2020-21 admitted batch onwards) Old Pattern

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 Biologyof Chordates	50	50	04
			Practical-II		50	01
II	III	III	Fish Nutrition & Feed Technology	50	50	04
			Practical-III		50	01
	IV	IV	Fresh Water & Brackish Water Aquaculture	50	50	04
			Practical-IV		50	01
III	V	V 6	Fisheries Extension, Economics & Marketing	50	50	04
			Practical-V		50	01
			Marine Biology	50	50	04
		7	Practical		50	01
			Marine fisheries	50	50	04
			Practical		50	01
	VI		Apprenticeship			

New Pattern

2023-2024 Admitted Batch onwards

Single major System

B.Sc (Honours) with Single Major

Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr)			Multi Disny' (2 Cr)			Skill Enhancement Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total		
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr
Sem 1	2*	10	8				2	8	6	1	2	2	2	6	4							7	26	20
Sem 2	2	10	8	1	3+2	4	2	8	6				2	6	4							7	29	22
Community Service Project of 180 hours with 4 Credits. Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																								
Sem 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24
Sem 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits. Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																								
Sem 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26
Sem 6	**Semester Internship/Apprenticeship/OJT with 12 Credits. Student is eligible for Exit Option-3 with the award of Degree in respetive major**																							
																			IKS#					
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
Sem 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0	47		**160**

20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship

C Courses **H** Hours **Cr** Credits **OOTC** Open Online Transdisciplinary

IKS# Indian Knowledge Systems - Audit Course

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

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

w.e.f. AY 2023-24

COURSE STRUCTURE

SEMESTER	Code	Title of the paper	Hr /week	Credits
I	1	Introduction to Classical Biology	5	4
	2	Introduction to Applied Biology	5	4
II	3	Taxonomy and Functional Anatomy of Fin Fish and Shellfish- (T)	3	3
		Taxonomy and Functional Anatomy of Fin Fish and Shellfish-(P)	2	1
	4	Biology of fin fish & shell fish - (T)	3	3
		Biology of fin fish & shell fish- (P)	2	1
III	5	Basic Principles of Aquaculture- (T)	3	3
		Basic Principles of Aquaculture - (P)	2	1
	6	Capture Fisheries- (T)	3	3
		Capture Fisheries- (P)	2	1
	7	Fresh water Aquaculture- (T)	3	3
		Fresh water Aquaculture- (P)	2	1
	8	Brackish water Aquaculture- (T)	3	3
		Brackish water Aquaculture- (P)	2	1
IV	9	Fish Health management- (T)	3	3
	9	Fish Health management- (P)	2	1
	10	Shrimp Health Management- (T)	3	3
	10	Shrimp Health Management- (P)	2	1
	11	Fish nutrition & Feed technology - (T)	3	3
	11	Fish nutrition & Feed technology - (P)	2	1
V	12	Extension, Economics & Marketing- (T)	3	3
	12	Extension, Economics & Marketing- (P)	2	1
	13	Ornamental Fishery- (T)	3	3
	13	Ornamental Fishery - (P)	2	1
	14	Fishery Engineering- (T)	3	3
	14	Fishery Engineering - (P)	2	1
	15	Fish Processing Technology- (T)	3	3
	15	Fish Processing Technology- (P)	2	1
VI		Internship		
VII	16	Post Harvest Technology& Transportation- (T)	3	3
	16	Post Harvest Technology& Transportation - (P)	2	1
	17	Fishery Microbiology- (T)	3	3
	17	Fishery Microbiology - (P)	2	1
	18	Quality Control in Processing Plants. - (T)	3	3
	18	Quality Control in Processing Plants. - (P)	2	1
	19	Crustacean culture- (T)	3	3

VIII	19	Crustacean culture - (P)	2	1
	20 A	Molluscan and Seaweed culture- (T)	3	3
	20 A	Molluscan and Sea weed culture - (P)	2	1
		OR		
	20 B	Genetics in Aquaculture- (T)	3	3
	20 B	Genetics in Aquaculture - (P)	2	1
	21 A	Marine Fin Fish culture- (T)	3	3
	21 A	Marine Fin Fish culture - (P)	2	1
		OR		
	21 B	Fish Immunology- (T)	3	3
	21 B	Fish Immunology - (P)	2	1

B. Sc Major –Aquaculture

First Semester Structure

S.No	Course/ paper	Title	Total hrs/week	No.of Credits	Remarks
1.	Major Paper– I	Introduction to Classical Biology	05	4	No Lab
2.	Major Paper– II	Introduction to Applied Biology	05	4	No Lab
3.	Multidisciplinary courses	Introduction to Social Work Principles of Psychology Indian History	02	2	A student must choose ONE course from among the six courses listed against the semester.
4.	Skill courses (2 papers)	Entrepreneurship Development Leadership Skills Analytical Skills Communication Skills	2+2 =4 (Each course /Paper -2 hrs/ week)	2+2	A student must choose any TWO of four courses
5.	English	A Course in Communication and Soft Skills	04	3	
6.	Telugu/ Hindi/ Sanskrit	Relevant paper	04	3	
		24 hrs/week		20	

B.Sc. Aquaculture with Minor

Second Semester Structure

S.No	Subject/ paper	Title	Total hrs /week	No. of Credits	Remarks
1.	**Major III**	**Taxonomy and Functional Anatomy of Fin Fish and Shellfish**	3+2= 5 Hrs	3+2	
2.	**Major IV**	**Biology of fin fish & shell fish**	3+2= 5 Hrs	3+2	
3	**Minor I**	Biotechnology	3+2= 5 Hrs	3+2	
4	**First Language**	English	4 Hrs	4	
	Second Language	Tel/San/Hindi	4 Hrs	4	
	Skill Courses (2 Papers)	Business Writing	2+2= 4 Hrs	2+2	A student must choose any **TWO** of four courses
		Marketing Skills			
		Investment Planning			
		Stock Market Operations			
		Digital Literacy			
			Total :27 Hrs.	**27**	

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**				

B.Sc., Honours in AQUACULTURE: MAJOR

w.e.f AY 2023-24 onwards

COURSE STRUCTURE

SEMESTER	Code	Title of the paper	Hr /week	Credits
I	1	Introduction to Classical Biology	5	4
	2	Introduction to Applied Biology	5	4
II	3	Taxonomy and Functional Anatomy of Fin Fish and Shellfish- (T)	3	3
		Taxonomy and Functional Anatomy of Fin Fish and Shellfish-(P)	2	1
	4	Biology of fin fish & shell fish - (T)	3	3
		Biology of fin fish & shell fish- (P)	2	1
III	5	Basic Principles of Aquaculture- (T)	3	3
		Basic Principles of Aquaculture - (P)	2	1
	6	Capture Fisheries- (T)	3	3
		Capture Fisheries- (P)	2	1
	7	Fresh water Aquaculture- (T)	3	3
		Fresh water Aquaculture- (P)	2	1
	8	Brackish water Aquaculture- (T)	3	3
		Brackish water Aquaculture- (P)	2	1
IV	9	Fish Health management- (T)	3	3
	9	Fish Health management- (P)	2	1
	10	Shrimp Health Management- (T)	3	3
	10	Shrimp Health Management- (P)	2	1
	11	Fish nutrition & Feed technology - (T)	3	3
	11	Fish nutrition & Feed technology - (P)	2	1
V	12	Extension, Economics & Marketing- (T)	3	3
	12	Extension, Economics & Marketing- (P)	2	1
	13	Ornamental Fishery- (T)	3	3
	13	Ornamental Fishery - (P)	2	1
	14	Fishery Engineering- (T)	3	3
	14	Fishery Engineering - (P)	2	1
	15	Fish Processing Technology- (T)	3	3
	15	Fish Processing Technology- (P)	2	1
VI		Internship		
VII	16	Post Harvest Technology& Transportation- (T)	3	3
	16	Post Harvest Technology& Transportation - (P)	2	1
	17	Fishery Microbiology- (T)	3	3
	17	Fishery Microbiology - (P)	2	1
	18	Quality Control in Processing Plants. - (T)	3	3
	18	Quality Control in Processing Plants. - (P)	2	1
	19	Crustacean culture- (T)	3	3
	19	Crustacean culture - (P)	2	1
	20 A	Molluscan and Seaweed culture- (T)	3	3

VIII	**20 A**	Molluscan and Sea weed culture - (P)	**2**	**1**
		OR		
	20 B	Genetics in Aquaculture- (T)	**3**	**3**
	20 B	Genetics in Aquaculture - (P)	**2**	**1**
	21 A	Marine Fin Fish culture- (T)	**3**	**3**
	21 A	Marine Fin Fish culture - (P)	**2**	**1**
		OR		
	21 B	Fish Immunology- (T)	**3**	**3**
	21 B	Fish Immunology - (P)	**2**	**1**

B. Sc Major –Aquaculture

First Semester Structure

S.No	Course/ paper	Title	Total hrs/week	No.of Credits	Remarks
1.	Major Paper– I	Introduction to Classical Biology	05	4	No Lab
2.	Major Paper– II	Introduction to Applied Biology	05	4	No Lab
3.	Multidisciplinary courses	Introduction to Social Work Principles of Psychology Indian History	02	2	A student must choose ONE course from among the six courses listed against the semester.
4.	Skill courses (2 papers)	Entrepreneurship Development Leadership Skills Analytical Skills Communication Skills	2+2 =4 (Each course /Paper -2 hrs/ week)	2+2	A student must choose any TWO of four courses
5.	English	A Course in Communication and Soft Skills	04	3	
6.	Telugu/ Hindi/ Sanskrit	Relevant paper	04	3	
		24 hrs/week		20	

B.Sc. Honours Zoology with Minor

Second Semester Structure

S.No	Subject/ paper	Title	Total hrs /week	No. of Credits	Remarks
1.	**Major III**	Cell Biology, Genetics, Molecular Biology & Evolution	3+2= 5 Hrs	3+2	
2.	**Major IV**	Physiology, Cellular Metabolism & Embryology	3+2= 5 Hrs	3+2	
3	**Minor I**	Cell Biology, Genetics, Molecular Biology & Evolution	3+2= 5 Hrs	3+2	
4	**First Language**	English	4 Hrs	4	
	Second Language	Tel/San/Hindi	4 Hrs	4	
	Skill Courses (2 Papers)	Business Writing	2+2= 4 Hrs	2+2	A student must choose any **TWO** of four courses
		Marketing Skills			
		Investment Planning			
		Stock Market Operations			
		Digital Literacy			
			Total :27 Hrs.	**27**	

B.Sc. Aquaculture

AP STATE COUNCIL OF HIGHER EDUCATIONREVISED UG SYLLABUS UNDER CBCS

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

Domain Subject: Aquaculture

Courses for Semesters VII

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

Higher Order Courses for semester-VII

VII	**16**	Post Harvest Technology& Transportation- (T)	**3**	**3**
	16	Post Harvest Technology& Transportation - (P)	**2**	**1**
	17	Fishery Microbiology- (T)	**3**	**3**
	17	Fishery Microbiology - (P)	**2**	**1**
	18	Quality Control in Processing Plants. - (T)	**3**	**3**
	18	Quality Control in Processing Plants. - (P)	**2**	**1**
VIII	**19**	Crustacean culture- (T)	**3**	**3**
	19	Crustacean culture - (P)	**2**	**1**
	20 A	Molluscan and Seaweed culture- (T)	**3**	**3**
	20 A	Molluscan and Sea weed culture - (P)	**2**	**1**
		OR		
	20 B	Genetics in Aquaculture- (T)	**3**	**3**

	20 B	Genetics in Aquaculture - (P)	**2**	**1**

	21 A	Marine Fin Fish culture- (T)	**3**	**3**
	21 A	Marine Fin Fish culture - (P)	**2**	**1**
		OR		
	21 B	Fish Immunology- (T)	**3**	**3**
	21 B	Fish Immunology - (P)	**2**	**1**

Skill Enhanced Courses Syllabus will be available in due course of time.

13 **ONE ONLINE COURSE FROM ANY DISCIPLINE**

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

PROGRAMME OUTCOMES

- Aquaculture is a fascinating programme that provides a platform to the students to learn about various types of culture, cultivable species, Aquatic ecosystems and sustainable Aquaculture practices
- This program enables them to understand Pathology and microbiology in fish and shrimp culture ponds .
- Students can easily understand the concepts of Induced breeding, Bundh breeding, composite culture, Monoculture and Intensive culture practices to pursue either employability or entrepreneurship.
- This program creates deep sense of understanding about food security, nutrition and employment generation in rural areas.
- Aquaculture is an avenue of opportunities as well as challenges where one can explore the potential of huge water resources.

B.Sc. Aquaculture

SEMESTER-I

Introduction to Classical biology

Introduction to Applied biology

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus

Unit 1: Introduction to systematics, taxonomy and ecology.

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

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

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

1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

2.1. The classification of plant kingdom.

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

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

2.4. Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

3.1. The classification of Kingdom Animalia and Chordata.

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

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

3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Activities :

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

Unit 4: Cell biology, Genetics and Evolution

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

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

4.3. Central Dogma of Molecular Biology.

4.4. Origin of life

Activities:

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

Unit 5: Essentials of chemistry

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

5.2. Branches of chemistry

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

5.4. Green chemistry

ADDITIONAL INPUTS:

1. Scope of Biology - For better understanding of importance of Biology in other sciences.
2. Branches of Biology - For systematic study of living things.
3. Microscopy
4. Slide preparation
5. Specimen Collection

1. Reference books:

2. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.

3. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers, New Delhi, India.

4. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.

5. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International

Publishers.

6. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.

7. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.

8. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.

9. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.

10. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.

Web Links:

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

CO-PO Mapping:

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

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

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

DEPARTMENT OF ZOOLOGY

I SEMESTER ZOOLOGY - PAPER - I

COURSE I: **Introduction to Classical Biology**

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

DEPARTMENT OF ZOOLOGY

SEMESTER - I

INTRODUCTION TO CLASSICAL BIOLOGY

Time: 2 1/2 Hours **Max Marks: 50M**

Section -I

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

Part – A

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

Part - B

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

Section II

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

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

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

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Course Objectives:

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

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

Skill Development			Employability			Entrepreneurship	

Syllabus

Unit 1: Essentials of Microbiology and Immunology

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

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

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

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

Unit 2: Essentials of Biochemistry

2.1. Biomolecules I – Carbohydrates, Lipids.

2.2. Biomolecules II – Amino acids & Proteins.

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

2.4. Basics of Metabolism – Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

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

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

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

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

Unit 4: Analytical Tools and techniques in biology – Applications

4.1. Applications in forensics – PCR and DNA fingerprinting

4.2. Immunological techniques – Immunoblotting and ELISA.

4.3. Monoclonal antibodies – Applications in diagnosis and therapy.

4.4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

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

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

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

5.4. **Accessi**ng Nucleic Acid and Protein databases, NCBI Genome Workbench

ADDITIONAL INPUTS

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

ACTIVITIES

1. Identification of given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganism from pond water.
4. Visit to a waste water treatment plant.
5. Retrieving a DNA or protein sequence of a gene'
6. Performing a BLAST analysis for DNA and protein.
7. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.

Reference books:

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

Web Links:

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

CO-PO Mapping:

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

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

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

DEPARTMENT OF ZOOLOGY

I SEMESTER ZOOLOGY - PAPER - II

COURSE II: **Introduction to Applied Biology**

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

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

Introduction to Applied Biology

Time: 2 1/2 Hours **Max Marks: 50M**

Section -I

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

Part – A

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

Part - B

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

Section II

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

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

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-I
Course Code	**TITLE OF THE COURSE** **Multidisciplinary Courses** **PRINCIPLES OF BIOLOGICAL SCIENCES**	

Teaching	Hours Allocated: 30 (**THEORY**)	L	T	P
Pre-requisites:	Basics of Zoology	3	1	-

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

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

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

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

UNIT-I Diversity of Life

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

UNIT-II Biomolecules and metabolisim

2.1 Ultra structure of cell and Cell organelles (Structure and Functions), Plant cell vs Animal cell
2.2 Plant Physiology: Photosynthesis, Respiration, Transportation, Mechanisms of Nitrogen fixation.
2.3 Plant growth and development, physiology of flowering.

2.4 Human Physiology: Digestion, Respiration, Circulation
2.5 Male and female reproductive organs, gametogenesis, fertilization.

UNIT-III Principles of Biology

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

Text Books

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

Reference Books

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

BLUE PRINT

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

PITAPUR RAJAH'S GOVERNMENT COLLEGE (A),

KAKINADA

MULTI DISCIPLINARY COURSE SEM I

PRINCIPLES OF BIOLOGICAL SCIENCES
MODEL PAPER
SECTION- A

Time:2hrs. Max.Marks:50

Answer any THREE of the following questions 3X10=30

1. Write an overview on five kingdom classification?

2.Discuss the ultrastructure of a cell and the functions of cell organelles. Compare the structure of plant cells and animal cells?

3.Explain the physiology of photosynthesis, respiration, and transportation in plants.

4.Discuss Mendel's laws of inheritance and their significance in understanding genetic traits.

5.Examine common plant diseases. Describe the causal preventive measures, and treatment methods.

SECTION- B

Answer any FOUR of the following questions 4X5=20

6. Viroid

7. Plant Reproductive organs

8. Plant cell structure

9. Fertilization

10. Geological time scale

11. Applications of Biotechnology

12. Photosynthesis

SEMESTER-II

Course 3: Taxonomy and Functional Anatomy of Fin Fish and Shellfish

Course 4: Biology of fin fish & shell fish

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	**Program & Semester** B.Sc. Honours in Aquaculture(Major) Semester-II			
Course Code	**TITLE OF THE COURSE** **COURSE 3:** Taxonomy and Functional Anatomy of Fin Fish and Shellfish				
Teaching	Hours Allocated: 45 (**THEORY**)	L	T	P	C
Pre-requisites:	Basics of Aquaculture	3	1	-	3

Course Objectives:

- To understand the taxonomy and functional anatomy position of Fin fish and Shell fish
- To understand the general characteristics of animals belonging to Fin fish and Shell fish
- To understand the structural organization of fin and shell fish
- Understand the digestive and respiratory systems of fin and shell fish
- Understand the reproductive biology of fin and shell fish fish

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Acquire knowledge on the Classification of major groups of Finfish and Shell fish
CO2	Students will be familiar with the Digestive & Respiratory systems of Finfish and Shell fish
CO3	Gain knowledge on the structure and functions of circulatory system
CO4	Understand the difference between the brain of fish and prawn
CO5	Acquire knowledge on the Reproductive system of fish and prawn

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

DEPARTMENT OF ZOOLOGY

Syllabus:

Unit I: General characters & Classification of Cultivable fin fish and shell fish

1.1 General Characters of Crustacea

1.2 Classification of Crustacean: Major groups up to orders and their important characters

1.3 General Characters of fishes

1.4 Classification of Fishes**:** Major groups up to subclass and their important characters.

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

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

Unit 2: Digestive and Respiratory systems of Fish and shell fish

2.1: Digestive system of fish

2.2 Respiratory system of fish

2.3 Digestive system of Prawn

2.4 Respiratory system of prawn

Activity : comparative study on different systems is emphasized .Seminars/Quiz/Projects are given .

Evaluation : students are evaluated on their knowledge and skills.

Unit 3: Circulatory systems of Fish and shell fish

3.1 Cardiovascular system: Structure of heart in fishes

3.2 Blood vascular system in prawn

Activity : Detailed study on structure and functions of heart is emphasized.

Unit 4: Nervous system of Fish and shell fish

4.1Nervous system in fish: Structure and functions of Brain

4.2Central Nervous system in prawn.

Unit 5: Reproductive system of Fish and shell fish

5.1Urino-genital system in fishes

5.2Reproductive system in prawn

Activity: Assignment /Seminar /Quiz/Project/ is conducted

Co-Curricular activities:

- Prepare an album depicting various fin and shell fishes
- Should be able to identify and classify various fin and shell fishes
- Differentiate between different systems and prepare working models of fin and shell fishes
- Thermocol and clay models of fin and shell fishes

REFERENCE BOOKS

Bond E. Carl. 1979. *Biology of Fishes*, Saunders.

Halver JE. 1972. *Fish Nutrition.* Academic Press.

Hoar WS and Randall DJ. 1970. *Fish Physiology*, Vol. I-IX, Academic Press, New York.

Lagler KF, Bardach, JE, Miller, RR, Passino DRM. 1977. *Ichthyology*, 2nd Ed. John Wiley & Sons, New York.

Lovell J. 1989. *Nutrition and Feeding of Fish.* Van Nostrand Reinhold, New York.

Moyle PB and Joseph J. Cech Jr. 2004. *Fishes: An Introduction to Ichthyology.* 5th Ed. Prentice Hall.

Nikolsky GV. 1963. *Ecology of Fishes*, Academic Press.

Web links

https://med.libretexts.org/Courses/Kansas_State_University/FNDH_413%3A_Science_of_Food/02%3A_Proteins/2.03%3A_Fish_Shellfish/2.3.01%3A_Fish_Classifications_and_Composition

https://courseware.cutm.ac.in/courses/anatomy-and-biology-of-finfish/

CO-PO Mapping:

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

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

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

DEPARTMENT OF ZOOLOGY

II SEMESTER ZOOLOGY - PAPER - I

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

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

DEPARTMENT OF ZOOLOGY

MODEL PAPER FOR II SEMESTER ZOOLOGY

- PAPER - I

COURSE 3: Taxonomy and Functional Anatomy of Fin Fish and Shellfish

Time: 21/2 hrs **Max. Marks: 50**

I. **Answer**

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

Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

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

PART- II

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

SECTION - B

II. Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

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

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

DERARTMENT OF ZOOLOGY

SEMESTER-II

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	**Program & Semester** B.Sc. Honours in Aquaculture(Major) Semester-II			
Course Code	**TITLE OF THE COURSE** **COURSE 3:** Taxonomy and Functional Anatomy of Fin Fish and Shellfish				
Teaching	Hours Allocated: 30 (**LAB**)	L	T	P	C
Pre-requisites:	Basics of Aquaculture			2	1

SYLLABUS

List of Practicals:

1). Study of mouth parts in herbivorous and carnivorous fishes

2). Comparative study of digestive system of herbivorous and carnivorous fishes

3). Demonstration of brain of fish

4). Demonstration of cranial nerves of fish

5). Demonstration of Nervous system of prawn

6). Exposure of gills of prawn

7). Exposure of gills of fish

REFERENCE BOOKS

Bond E. Carl. 1979. *Biology of Fishes*, Saunders.

Halver JE. 1972. *Fish Nutrition.* Academic Press.

Hoar WS and Randall DJ. 1970. *Fish Physiology*, Vol. I-IX, Academic Press, New York.

Lagler KF, Bardach, JE, Miller, RR, Passino DRM. 1977. *Ichthyology*, 2nd Ed. John Wiley & Sons, New York.

Lovell J. 1989. *Nutrition and Feeding of Fish.* Van Nostrand Reinhold, New York.

Moyle PB and Joseph J. Cech Jr. 2004. *Fishes: An Introduction to Ichthyology.* 5th Ed. Prentice Hall.

Nikolsky GV. 1963. *Ecology of Fishes*, Academic Press.

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

DEPARTMENT OF ZOOLOGY

Taxonomy and Functional Anatomy of Fin Fish and Shellfish

PRACTICAL MODEL PAPER

Time: 3hrs **Max. Marks: 50**

I. Identify the following specimens or spotters & slides, draw neat labeled diagrams –write notes on 4x5=20M

A. Nauplius

B. Glochidium

C. Alima

D. Oyster eggs

II Write notes on the following 20x1=20M

E. Study of nest building and brooding of fishes

III. Practical Record 5x1=5 M

Viva voce 5M

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

Course Objectives :

- Gain Knowledge of feeding habits, gut content analysis and growth factors in fishes. 2.Understand the commercial importance of crustaceans and Fish
- Understand and learn breeding in fishes, breeding habits, method of induced breeding in fishes.
- To create awareness on parental care of Fishes and embryonic and larval development and environmental factors affecting development of major aquaculture organisms.
- Acquire knowledge about Endocrine system in fishes

On Completion of the course, the students will be able to-	
CO1	Gain knowledge on classification of fishes
CO2	Nuturing the skills on food,feed and growth parameters
CO3	Understand the reproductive biology of fish
CO4	Understand the parental care in fishes
CO5	Understand the endocrine system in fishes

Skill Development			Employability			Entrepreneurship	

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

DEPARTMENT OF ZOOLOGY

II SEMESTER

Course No.: 4 -Biology of Fin Fish & Shellfish

SYLLABUS

UNIT- I: Specialized organs in fish

1.1 Sense organs of fishes and crustaceans.

1.2 Specialized organs in fishes – electric organ, venom and toxins

1.3 Buoyancy in fishes- swim bladder and mechanism of gas secretion

1.4 Fish and Crustaceans of commercial importance

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

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

UNIT- II: Food, Feeding and Growth

2.1 Natural fish food, feeding habits, feeding intensity, stimuli for feeding, utilization of food, gut content analysis, forage ratio

2.2 Principles of Age and growth determination; growth regulation, Growth rate measurement –

scale method, otolith method, skeletal parts as age indicators

2.3 Length-frequency method, age composition, age-length keys, absolute and specific growth, back calculation of length and growth, annual survival rate,

2.4 Length-weight relationship.

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

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

UNIT- III: Reproductive Biology

3.1 Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles

3.2. Induced breeding in fishes

3.3 Breeding in shrimp, oysters, mussels, clams, pearl oyster, pila, and cephalopods.

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

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

UNIT- IV: Development

4.1. Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding

4.2. Embryonic and larval development of fishes

4.3. Embryonic and larval development of shrimp, crabs and molluscans of commercial importance

4.4. Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish

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

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

UNIT- V: Hormones & Growth.

5.1 Endocrine system in fishes.

5.2 Neuro-secretory cells, androgenic gland, ovary, chromatophores,

5.3 Molting, molting stages, metamorphosis in crustacean shell fish

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

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

Co- Curricular Activities

- Identify different sense organs of fishes
- To make chart on feed formulation
- To identify age determination of fishes –scales,otolith and skeletal methods
- Collect different larval forms of fish ,shrimps,crabs and molluscans
- To know about hypophysation techniques from the Fisheries Department.

Text books:

1. Bone Q et al., 1995. Biology of fishes, Blackie academic & professional, LONDON

2. Saxena AB 1996. Life of Crustaceans. Anmol Publications Pvt.Ltd., New Delhi

Reference books:

1. Tandon KK & Johal MS 1996. Age and Growth in Indian Fresh Water Fishes. Narendra Publishing House, New Delhi.

2. Raymond T et al., 1990. Crustacean Sexual Biology, Columbia University Press, New York

3. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.

4. Barrington FJW 1971. Invertebrates: Structure and Function.ELBS

5. Parker F & Haswell 1992. The text book of Zoology, VolI. Invertebrates (eds. Marshal AJ

& Williams). ELBS & Mc Millan & Co

Web Links:

1. https://www.slideshare.net/sbmptdr/biology-of-finfish-2nd-semester-full-sylabus-106322965
2. http://ecoursesonline.iasri.res.in/course/view.php?id=427

CO-PO Mapping:

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

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

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

DEPARTMENT OF ZOOLOGY

II SEMESTER - AQUACULTURE

COURSE 4: **BIOLOGY OF FIN FISH AND SHELL FISH**

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

DEPARTMENT OF ZOOLOGY

MODEL PAPER FOR II SEMESTER

COURSE 4: BIOLOGY OF FIN FISH AND SHELL FISH

Time: 21/2 hrs **Max. Marks: 50**

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

Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1.Explain sensory organs of Fish

2. How do you analyze gut contents to estimate quality of fish

3. Write an essay on Induced breeding in fish

PART- II

4. Discuss larval stages in the development of shrimp

5. Discuss the commercial importance of Crabs and Molluscans

6. Write an essay on metamorphosis in crustaceans

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7. Swim bladder

8.Natural fish food

9.Otolith method

10.Artificial ponds

11.Parental care in fish

12.Neurosecretory cells

13.Growth rate measurement

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

SEMESTER-II

Course -4: BIOLOGY OF FINFISH AND SHELLFISH

Practical Syllabus

Credits :1

List of Practicals:

1. Length-weight relationship of fishes
2. Gut content analysis in fishes and shrimp
3. Mouth parts and appendages of cultivable prawns, shrimps and other crustaceans
4. Study of eggs of fishes, shrimps, prawns and other crustaceans
5. Study of oyster eggs
6. Embryonic and larval development of fish
7. Study of gonadial maturity and fecundity in fishes and shellfish 8..Observation of crustacean larvae
8. Study of nest building and brooding of fishes

PRESCRIBED BOOK(S)

Bone Q et al., 1995. Biology of fishes, Blackie academic & professional, LONDON

Saxena AB 1996. Life of Crustaceans. Anmol Publications Pvt.Ltd., New Delh

REFERENCES:

Tandon KK & Johal MS 1996. Age and Growth in Indian Fresh Water Fishes. Narendra Publishing House, New Delhi.

Raymond T et al., 1990. Crustacean Sexual Biology, Columbia University Press, New York

GuilandJ.A (ed) 1984. Penaeid shrimps- Their Biology and Management. 1.18Barrington FJW 1971. Invertebrates: Structure and Function.ELBS

1.19Parker F & Haswell 1992. The text book of Zoology, VolI. Invertebrates (eds. Marshal AJ & Williams). ELBS & Mc Millan & Co.

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

DEPARTMENT OF ZOOLOGY

ZOOLOGY PRACTICAL SYLLABUS FOR II SEMESTER

BIOLOGY OF FINFISH AND SHELLFISH

PRACTICAL MODEL PAPER

Time: 3hrs **Max. Marks: 50**

I. Identify the following specimens or spotters & slides, draw neat labeled diagrams –write notes on 4x5=20M

A. Nauplius

B. Glochidium

C. Alima

D. Oyster eggs

II Write notes on the following 10x2=20M

A. Study of nest building and brooding of fishes

B. Appandages of Prawn

III. Practical Record 5x1=5M

IV.Viva voce 5M

MINOR SYLLABUS FOR AQUACULTURE II SEMESTER

SEMESTER-II

COURSE 1: BIOMOLECULES AND ANALYTICAL TECHNIQUES

Theory Credits: 3 3 hrs/week

I. LEARNING OUTCOMES

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

1. Learn about classification, structure and properties of Carbohydrates, Proteins and Lipids.

2. Learn about structure and function of DNA, RNA, Vitamins and Bioenergetics.

3. Learn about basic principles of Centrifugation, Chromatography and Electrophoresis.

4. Learn about principles of Spectroscopy, Microscopy and Techniques.

5. Learn about basics of Biostatistics.

II. Syllabus

Unit-I-Carbohydrates, Protein and Lipids

1. Classification, structure, properties of carbohydrates, amino acids, peptide bond and peptides.

2. Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins. Denaturation and renaturation of proteins.

3. Classification structure and properties of saturated and unsaturated fatty acids.

Unit-II- Nucleic acid, Vitamins, and Bioenergetics

1. Structure and functions of DNA and RNA.

2. Source, structure, biological role, and deficiency manifestation of vitamin A, B, C, D, E, and K. Free energy, entropy, enthalpy, and redox potential.

3. High energy compounds, Electron-Transport System and Oxidative Phosphorylation.

Unit-III-Centrifugation, Chromatography, and Electrophoresis

1. Basic principles of sedimentation and types of centrifugations.

2. Principle, instrumentation, and application of partition, absorption, paper, TLC, ion exchange, gel permeation, and affinity chromatography.

3. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Introduction to 2D & Isoelectric Focusing.

Unit - IV-Spectroscopy, Microscopy and Laser Techniques

1. Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and application of photoelectric calorimeter and UV-visible spectrophotometer. Introduction to crystallography and application.

2. Types and design of microscopes - compound, phase contrast, fluorescent electron microscopy (TEM, SEM).

3. Introduction to radioisotopes, measurement of radioactivity (scintillation counter and autoradiography

Unit –V- Biostatistics

1. Mean, median, mode, standard deviation,

2. One-way ANOVA, Two-way Anova

3. t-test, F-test and chi-square.

III. Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. learn about basic instruments and their operation

2. learn about Qualitative and Quantitaive analysis of carbohydrates

3. Learn about estimations nucleic acids and protein by various methods

4. learn about the separation of molecules by chromatography and electrophoresis

5. Learn about problems on mean median mode

SEMESTER-II

COURSE 1: BIOMOLECULES AND ANALYTICAL TECHNIQUES

Practical Syllabus

Practical Credits: 1 **2 hrs/week**

1. Introduction to basic instruments (Principle standard operation procedure) demonstration and record
2. Calculation of molarity, normality, and molecular weight of compounds.
3. Qualitative analysis of carbohydrates (sugars)
4. Quantitative analysis of carbohydrates
5. Quantitative estimation of protein - Lowery method
6. Estimation of DNA by diphenylamine reagent
7. Estimation of RNA by orcinol reagent
8. Assay of protease activity
9. Preparation of starch from potato and its hydrolyze by salivary amylase
10. Preparation of standard buffer and pH determination
11. Separation of amino acids by paper chromatography
12. Separation of lipids of TLC
13. Agarose gel electrophoresis
14. Calculation of mean, median and mode

V. REFERENCES

1. Outlines of Biochemistry, 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons, USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffory Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H. Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley and Sons, Inc. USA

5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H.Freeman and Company,

6. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu. Pvt.Ltd. New Delhi, India

7. Biochemical Methods,1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India

8. Textbook of Biochemistry with Clinical Correlations, 7th Edition, (2010), Thomas M. Devlin; John Wiley and Sons, USA

9. Proteins: biotechnology and biochemistry, 1st edition, (2001), Gary Walsch; Wiley, USA

10. Biochemical Calculations, 2nd Ed., (1997), Segel Irvin H; John Wiley and Sons, NY

11. Biophysical Chemistry Principles & Techniques Handbook, (2003), A. Upadhyay, K. Upadhyay, and N. Nath

12. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001), Palmer Trevor, Publisher: Horwood Pub. Co., England.

13. Analytical Biochemistry, 3rdedition, (1998), David Holmes, H.Peck, Prentice-Hall, UK

14. Introductory Biostatistics, 1st edition, (2003), Chap T. Le; John Wiley, USA.

15. Methods in Biostatistics, (2002), B. K. Mahajan –Jaypee Brothers.

16. Statistical methods in biology, (1995), Bailey, N. T.; Cambridge university press

VI. CO-Curricular Activities

a) Suggested C0-Curricular Activities

1. Assignments

2. Seminars, Group Discussions on related topics

3. Charts preparation on vitamins

P. R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM
AQUACULTURE TECHNOLOGY COURSE SYLLABUS
(Effective from 2018-2019 onwards)
SEMESTER III – PAPER-1II (OLD PATTERN)

	P. R. GOVERNMENT COLLEGE (A) KAKINADA	**Program & Semester** **SEMESTER - III** **PAPER-III**			
CourseCode	**TITLE OF THE COURSE** **TITLE - FISH NUTRITION & FEED TECHNOLOGY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		4	1	2	5

FISH NUTRITION & FEED TECHNOLOGY

UNIT-I: NUTRITIONAL REQUIREMENTS OF CULTIVABLE FISH

1-1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns
1-2 Essential amino acids and fatty acids, protein to energy ratio, nutrient interactions and protein sparing effect
1-3 Dietary sources of energy, effect of ration on growth, determination of feed ingredients, check tray
1-4 Factors affecting energy partitioning and feeding

UNIT-II: FORMS OF FEEDS & FEEDING METHODS

2-1 Fed conversion efficiency, feed conversion ratio and protein efficiency ratio
2-2 Wet feeds, moist feeds, dry feeds, mashes, pellet feeds, floating and sinking pellets, advantages of pelletization.
2-3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding & tray feeding

UNIT-III: FEED MANUFACTURE & STORAGE

3-1 Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients
3-2 Feed formulation – extrusion processing and steam pelleting, grinding, mixing and drying, palletization, and packing
3-3 Water stability of feeds, farm made aqua feeds, micro-coated feeds, micro-encapsulated feeds and micro-bound diets.

3-4 Microbial, insect and rodent damage of feed, chemical spoilage during storage period and proper storage methods

UNIT-IV: FEED ADDITIVES & NON-NUTRIENT INGREDIENTS

4-1 Binders, anti-oxidants, probiotics
4-2 Feed attractants and feed stimulants
4-3 Enzymes, hormones, growth promoters and pigments
4-4 Anti-metabolites, afflatoxins and fiber

PRESCRIBED BOOK(S):

1. HALVER JE 1989. Fish nutrition. Academic press, San diego
2. Lovell rt 1998. Nutrition and feeding of fishes, Chapmann& Hall, NewYork
3. Sena de silva, trevor a anderson 1995. Fish nutrition in aquaculture**.** Chapmann&Hall,
4. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology andManagement.
5. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, NewDelhi

CO-POMapping:

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

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

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

PaPaper III - FISH NUTRITION & FEED TECHNOLOGY

MODEL QUESTION PAPER

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

I. Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Describe Essential amino acids and fatty acids, protein to energy ratio
2. Analyze aspects of Feed formulation
3. Comment on floating and sinking pellets, advantages of palletization

PART- II

4.Write an essay on Dietary sources of energy, effect of ration on growth
5.Give an account of Anti-metabolites, aflatoxins
6.Discuss on Feed additives

SECTION - B

II. Answer any FOUR of the following:
Draw labeled diagrams wherever necessary **4x5=20**

7. Micro-encapsulated feeds

8. Micronutrients
9. Determination of feed ingridients, check tray

10. Factors affecting energy partitioning and feeding

11. Fed conversion efficiency
12. Feed conversion ratio
13. Protein efficiency ratio

QUESTION BANK

ESSAYS

1. Essential amino acids and fatty acids, protein to energy ratio.

2 Dietary sources of energy, effect of ration on growth.

3. Wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets, advantages of pelletization (Types of feeds).

4. Feeding methods

5. Feed formulation

6. Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients

7. Binders, anti-oxidants, probiotics

8. Enzymes, hormones

9. Anti-metabolites, afflatoxins

SHORTS

1. Proteins

2. Micronutrients

3. Determination of feed ingridients, check tray

4. Factors affecting energy partitioning and feeding

5. Fed conversion efficiency

6. Feed conversion ratio

7. Protein efficiency ratio

8. Water stability of feeds

9. Micro-coated feeds, micro-encapsulated feeds

10. Chemical spoilage during storage period

11. Feed attractants

12. Feed stimulants

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards) SEMESTER III – PAPER-III

TITLE - FISH NUTRITION & FEED TECHNOLOGY

PRACTICAL SYLLABUS

PRACTICALS: (Any 8 as per the local Industry needs and Requirement)

1. Estimation of protein content in aquaculture feeds
2. Estimation of carbohydrate content in Aquaculture feeds
3. Estimation of lipid content in aquaculture feeds
4. Estimation of ash in Aquaculture feed
5. Study of water stability of Pellet feeds
6. Feed formulation and preparation in the lab
7. Study of binders used in Aquaculture feeds
8. Study of feed Packing materials
9. Study of physical and chemical change during storage
10. Study on physical characteristics of floating and sinking feeds
11. Visit to a aqua-feed production unit
12. Visit to a farm for studying feeding practices

A

QUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2020-2021 onwards) SEMESTER III – PAPER-III
TITLE - FISH NUTRITION & FEED TECHNOLOGY

PRACTICAL MODEL PAPER

MaxMarks50 **Time2hrs**

I. Estimate Protein content in aquaculture feeds. Write procedure	15marks
II. Estimate the Ash content in aquaculture feed Write procedure	10marks
III. Different Feed formulation Identification using charts	05marks
IV. Record	05marks
V. Field Notebook	05marks
VI. viva voice	10marks
Total	**50marks**

P .R.GOVERNMENT COLLEGE (A),
KAKINADA

CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards) SEMESTER IV – PAPER-IV

	P .R.GOVERNMENT COLLEGE (A) KAKINADA	**Program & Semester**			
CourseCode	**TITLE OF THE COURSE** **FRESH WATER & BRACKISHWATER AQUACULTURE**	**SEMESTER - IV PAPER-IV**			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		4	1	2	5

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

UNIT-1: INTRODUCTION TO FRESHWATER AQUACULTURE AND CARP CULTURE

1.1 Status, scope and prospects of fresh water aquaculture in the world, India and AP
1.2 Different fresh water aquaculture systems
1.3 Major cultivable Indian carps – Labeo, Catla and Cirrhinus& Minor carps
1.4 Exotic fish species introduced to India – Tilapia,Pangassius and Clarius sp.3
1.5 Composite fish culture system of Indian and exotic carps
1.6 Impact of exotic fish, Compatibility of Indian and exotic carps and competition among them

UNIT-II: CULTURE OF AIR-BREATHING AND COLD WATER FISH

2.1Recent developments in the culture of clarius, anabas, murrels,

2.2Advantages and constraints in the culture of air-breathing and cold water fishes-seed resources, feeding, management and production

2.3Special systems of Aquaculture- brief study of culture in running water, re-circulatory systems, cages and pens, sewage-fed fish culture

UNIT-III: CULTURE OF PRAWN

3.1Fresh water prawns of India - commercial value

3.2Macrobrachiumrosenbergii and *M. Malcomsonii*– biology, seed production, pond preparation.

3.3stocking, management of nursery and grow-out ponds, feeding, morpho types and harvesting

UNIT-IV: CULTURE OF BRACKISHWATER SPECIES

4.1Culture of P.mondon – Hatchery technology and Culture practices including feed and disease management

4.2Culture of L. vannamei – hatchery technology and culture practices including feed and disease management.

4.3Mixed culture of fish and prawns

PRESCRIBED BOOK(S):

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi 2.Sena de silva, trevor a anderson 1995. Fish nutrition in aquaculture**.** Chapmann& Hall,
3. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology andManagement.
4. Barrington FJW 1971. Invertebrates: Structure andFunction.ELBS
5. Parker F &Haswell 1992. The text book of Zoology, VolI.Invertebrate

CO-POMapping:

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

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CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P.R. GOVERNMENT COLLEGE (A),

II B.Sc., (Fisheries), SEMESTER-IV

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

MODEL QUESTION PAPER

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

I. Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

PART- I

1. Describe the general planning and design of brackish water farms
2. Write an essay on shrimp farming culture practices
3. Comment on floating and sinking pellets, advantages of palletization

PART- II

4. Write an essay on recent developments in mariculture
5. Write an essay on Monoculture and poly culture
6. Explain about Nursery, rearing and grow out in ponds

SECTION - B

III. Answer any FOUR of the following:
Draw labeled diagrams wherever necessary **4x5=20**

7. Scope of fresh water aquaculture at global level

8. Site selection

9. Cage culture and pen culture
10. Abiotic and biotic factors
11. Fresh water aquaculture systems

12. Ecological factors

13. Present status of fresh water farming

P.R.GOVERNMENT COLLEGE (A),

II B.Sc., (Fisheries), SEMESTER-IV

FRESH WATER, BRACKISH WAQUACULTURE

QUESTION BANK

ESSAY ANSWER QUESTIONS:

1. Introduction, history, development and present status of fresh water farming in India.
2. Explain the Biology and culture systems of Indian major carps.
3. Composite fish culture system
4. Write an essay on recent developments in brackish water
5. Monoculture and poly culture
6. Brackish water farming
7. Mixed culture of fish and prawn
8. Culture of Litopenaeus vannamei.
9. Cage culture and pen culture
10. Sewage fed fish culture
11. Explain the Biology of Exotic carps.
12. Seed collection in cat fishes.
13. Culture of fresh water prawn(M.Rosenbergii,M.malcomsonii)

SHORT ANSWER QUESTIONS:

1. Present status of fresh water aqua systems.
2. Tilapia
3. Different culture systems
4. Open sea farming
5. Air breathing fishes.
6. Cage culture
7. M. rosenbergii
8. Brackish water shrimps
9. Murrels
10. Common carp
11. Pangaisius
12. P.Monodon
13. Fresh water prawn commercial value.
14. Biology of Litopenaeus vannamei

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards) SEMESTER IV – PAPER-1V

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

PRACTICALS SYLLABUS

PRACTICALS: (Any 8 as per the local Industry needs and Requirement)

1. Identification of important cultivable carps
2. Identification of important cultivable air-breathing fishes
3. Identification of important cultivable fresh water prawns
4. Identification of different life history stages offish
5. Identification of different life history stages of fresh water prawn
6. Collection and study of weed fish
7. Identification of commercially viable crabs – Scylla cerrata, Portunus pelagicus,P.sanguinolentus, Neptunuspelagicus, N.Sanguinolentus
8. Identification of lobsters – Panuliru spolyphagus, P.ornatus, P.homarus, P.sewelli,*P.penicillatus*
9. Identification of oysters of nutritional significance – Crossostreamadrasensis, C.gryphoides, C. cucullata, C.rivularis , Picnodanta
10. Identification of mussels and clams
11. Identification of developmental stages of oysters
12. Field visit to aqua farm and study of different components like dykes etc.

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards)

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE
SEMESTER IV – PAPER-IV PRACTICALS MODEL PAPER

MaxMarks50 **Time2hrs**

6x5=30M

I. Identify the following specimens and write a short notes on their commercial importance
   a. Carp
   b. Fresh water prawn
   c. Stages of prawn
   d. Crab
   e. Oyesters
   f. Mussel/clam

II. Record 10marks

III. Viva voice 10marks

Total **50marks**

ADDITIONS	JUSTIFICATION
➢ Migration in fishes(Module III) ➢ Specialiged Organs in fishes(Module I)	➢ Relevant to the Paper ➢ Advanced Knowledge towards Paper
DELETIONS	**JUSTIFICATION**
➢ condition factor/ Ponderal index, relative condition factor(Module II) ➢ Absolute And Specific growth(Module II)	➢ Not Suitable for Recent trends ➢ Repeated

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

	P .R.GOVERNMENT COLLEGE (A) KAKINADA	**Program & Semester**			
CourseCode	**TITLE OF THE COURSE** **FISHERIES EXTENSION, ECONOMICS & MARKETING**	**SEMESTER - IV PAPER-V**			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		4	1	2	5

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards)

SEMESTER IV – PAPER-V

FISHERIES EXTENSION, ECONOMICS & MARKETING

UNIT – 1 INTRODUCTION

1-1 Meaning and scope of economics with reference to fisheries
1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand, law of diminishing marginal utility
1-3 Theory of production, production function in fisheries
1-4 Various factors influencing the fishery products price

UNIT – I1 FISHERIES MARKETING

2-1 Basic marketing functions, consumer behavior and demand, fishery market survey and test marketing a product
2-2 Fish marketing – prices and price determination of fishes
2-3 Marketing institutions- primary(producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)
2-4 Methods of economic analysis of business organizations
2-5 Preparation of project and project appraisal

UNIT-III FISHERIES ECONOMICS

3-1 Aquaculture economics- application of economics principles to aquaculture operations
3-2 Various inputs and production function. Assumptions of production function in aquaculture analysis, least cost combination of inputs, laws of variable proportions
3-3 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
3-4 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives
3-5 Contribution of fisheries to the national economy

UNIT-IV FISHERIES EXTENSION & TRANSFER OF TECHNOLOGY

4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension Education; Fisheries extension methods and rural development
4-2 Adoption and diffusion of innovations; ICAR programs – salient features of, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI,TRYSEM
4-3 Training – meaning, training vs. education and teaching
4-4 DAATT centreis and their role in tot programs, video conferencing, education of farmers through print and electronic media

CO-POMapping:

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

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

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P.R. GOVERNMENT COLLEGE (A),

II B.Sc., (Fisheries), SEMESTER-IV

PAPER V

FISHERIES EXTENSION, ECONOMICS & MARKETING

(WITH EFFECTIVE FROM 2020-2021)

MODEL QUESTION PAPER

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

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

Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Explain about the scope of fisheries economics in India.
2. Explain the methods of economic analysis of fishery marketing.
3. Discuss preparation of project and their appraisals.

PART- II

4. Explain the Role of NABARD in fishermen cooperatives.
5. Write an account on the economic principles to Aquaculture.
6. Give an account on the ICAR programs.

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7.Goods and services

8.Law of diminishing

9.Types of economics

10.Market functions

11.Price determination

12.NABARD

13.ORP and NDS

PRACTICAL:

50M

Project work/on-job training at industry	40m
Viva voice	10m

PRESCRIBED BOOK(S):

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBHCo.Pvt. Ltd. NewDelhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University Tuticorn
3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

REFERENCES:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, NewDelhi
2. Korakandy R 1996. Economics of Fisheries Mana gement. Daya Publishing House,Delhi
3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society,Mangalore.

ADDITIONS	JUSTIFICATION
➢ PMMSY ➢ YSR Matsyakara Nestam	➢ Entrepreneurship ➢ Emloybilty and Skill

DELETION	JUSTIFICATION
➢ LLP, IRDP, ITDA, FCS, FTI	➢ NOT SUITABLE FOR RECENT KNOWLEDGE

Question Bank

10 Marks

1. Explain about the scope of fisheries economics in India.
2. Describe the various factors influencing the fishery products.
3. Explain the basic marketing functions and demand.
4. Give an account on the price determination of fishes.
5. Explain the methods of economic analysis of fishery marketing.
6. How to preparation of project and their appraisals.
7. Explain the Role of NABARD in fishermen cooperatives.
8. Write an account on the economic principles to Aquaculture.
9. Explain the various cost and earning of Aquaculture systems.
10. Explain about the various inputs and production functions.
11. Give an account on the ICAR programs.
12. Describe the fisheries extensions, objectives and their scope.

5 Marks

1. Goods and services
2. Law of diminishing
3. Types of economics
4. Microeconomics
5. Macroeconomics
6. Market functions
7. Price determination
8. Economic analysis
9. Project appraisal
10. Primary producer fishermen
11. Aquaculture economics
12. Aquaculture economic principles
13. Role of Matsyafed
14. NABARD
15. Fishermen cooperative
16. Fisheries National economy
17. Fisheries Extension
18. Fisheries rural development
19. DAATT Centers
20. ORP and NDS
21. FFDA and TRYSEM
22. LLP and IRDP
23. Fisheries Transfer of Technology

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

	P. R. GOVERNMENT COLLEGE (A) KAKINADA	Program & Semester SEMESTER -V PAPER-VI			
Course Code	TITLE OF THE COURSE **MARINE BIOLOGY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		4	1	2	5

I. COURSE OUT COMES:

- After successful completion of this course student will be able to
- Understand the Divisions, life of Marine Ecosystem
- Assess the Productivity of Marine Ecosystem
- Know the ecological importance of critical ecosystems associated with marine ecosystem
- Judge the adaptations of animals in the marine ecosystem

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

Unit – I Introduction:

Divisions of marine environment- pelagic, benthic, euphotic, aphotic divisions and their subdivisions.

Life in oceans – general account of major groups of phytoplankton, sea weeds, major zooplankton groups.

Environmental factors affecting life in the oceans- salinity, temperature, light, currents, waves, tides, oxygen, and carbon dioxide.

Unit – II

2.1 Primary, secondary and tertiary production.

2.2 Marine food chains and food webs. Vertical migration of zooplankton. Phytoplankton-Zooplankton relationship, plankton and fisheries.

Unit – III

3.1 Benthos- a life in rocky, sandy, and muddy shores.

3.2 Mangroves Ecosystem and Ecological importance

3.3 Coral reefs ecosystem-ecological importance

Unit – IV

4.1 Boring and fouling organisms- examples with adaptations.

4.1 Nekton- outline composition of nekton, habitats of nekton.

4.3 Bioluminescence and indicator species, red tides

Unit –V

5.1 Biology and classification of marine mammals,

5.2 Adaptations in marine mammals for conserving body heat and submersion for long dive.

III. References:

Reference Books

1. Carmelo, T.R., 1997. Identifying Marine Phytoplankton by Academic Press.

2. ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.

3. Gage. J.D. and Tyler, P.A. 1991. Deep Sea Biology, Cambridge University Press, Cambridge.

4. William, C., 1991. Seashore life between the tides. Dover Publication

5. Makoto, Omori and Tsutomu Ikeda, 1984. Methods in Marine Zooplankton Ecology, Wiley & Sons. Inc. Canada

6.Venkataraman, K., C. Raghunathan. R. Raghuramanand C.R. Sreeraj. 2012. Marine Biodiversity in India, Zoological Surv. India, Kolkata, 164pp.

7.Morrissey, J.F. and J.L. Sumich. 2012. Introduction to the Biology of Marine Life. Jones & Bartlett learning, U.K., 467pp.

8.Kathiresan, K and S.Z. Qasim 2005. Biodiversity of Mangrove Ecosystems. Hindustan Lever Limited.

9.Fish, J.D & S. Fish. 2010. A Students Guide to the Seashore. Cambridge University Press, 527pp.

10.Chapman, V.J. and D.J. Chapman, 1980. Seaweed and Their Use. Chapman & Hall, London.

11. Chapman, V.J., 1976. Mangrove Vegetation. J. Gramer, Berlin.

12. Balakrishnan Nair, N. and D.M. Thampy, 1980. A Text Book of Marine Ecology. The Macmillan Co. of India Ltd., New Delhi

13 Svedrup et al The Oceans Prentice Hall

14.Tait RV Elements of marine ecology Butterworths

15.Riley & Skirrow Chemical Oceanography Academic Press

16. Newell RC Biology of intertidal animals Logos Press

17. Kinne O (Ed) Marine ecology John Wiley & Sons

18. Marshall NB Aspects of Deepsea Biology Hutchinson

19. Ekman S Zoogeography of the sea. Sidgwick & Jackson

20. http://ecoursesonline.iasri.res.in/course/view.php?id=430

CO-POMapping:

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

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

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE BIOLOGY

SEMESTER -V PAPER-VI
MODEL QUESTION PAPER

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

Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Write an essay on environmental factors affecting the life in oceans
2. Describe the divisions of Marine environment
3. Explain about the relationship of phytoplankton and zooplankton

PART- II

4.Describe the ecological importance of mangrove ecosystem

5.Discuss about boring and fouling organisms

6.Analyze the advantages of marine mammal adaptations.

SECTION - B

Answer any FOUR of the following:
Draw labeled diagrams wherever necessary **4x5=20**

7.See weed

8.Primary production

9.Marine food chain

10. Rocky shore environment
11. Nekton habitat
12. Red tides
13. Coral reefs

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE BIOLOGY
SEMESTER -V PAPER-VI
Course 6A: MARINE BIOLOGY

PRACTICAL (LAB) SYLLABUS

Lab work - Skills Outcomes:

- After successful completion of this practical course student will be able to
- Operate the instruments for collection of plankton
- Identify the plankton
- Preserve the plankton

Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

1. Study of common instruments used for collection of phytoplankton
2. Study of common instruments used zooplankton
3. Study of common instruments benthos.
4. Collection, preservation and analysis of phytoplankton, zooplankton, and benthos
5. Identification of Phytoplankton – (Identification and Record work)
6. Identification of Zooplankton - (Identification /Microscopy/Record work)
7. Identification of Boring and fouling organisms

Lab references

ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.

https://drs.nio.org/drs/bitstream/handle/2264/95/Zooplankton_Manual.pdf?sequence=1&isAllowed=y

https://drs.nio.org/drs/bitstream/handle/2264/97/Phytoplankton-manual.PDF

http://www.coastalwiki.org/wiki/Sampling_tools_for_the_marine_environment

https://www.fao.org/3/W3732E/w3732e0s.htm

https://adkinstruments.in/categories/oceanography/plankton-nets

https://www.slideshare.net/poojakamble1609/fouling-and-boring

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE BIOLOGY
SEMESTER -V PAPER-VI

Course 6A: MARINE BIOLOGY

PRACTICAL (LAB) MODEL PAPER

1. Phytoplankton /Zooplankton/Benthos collection instrument details explanation with diagram ---10

2. Phytoplankton /Zooplankton/Benthos collection instruments Explanation with diagrams--------10

3. Collection of Zooplankton/Phytoplankton/Benthos—procedure / Preservation of

Zooplankton/Phytoplankton/Benthos----------5 Marks

4. Spotters/images/charts 5 x 4= 20 Marks

A. Zooplankton

B. Phytoplankton

C. Benthos

D. Borer

E. Fouler

5. Record 5 Marks

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

MARKET ORIENTED COURESE- AQUACULTURE TECHNOLOGY

	P. R. GOVERNMENT COLLEGE (A) KAKINADA	Program & Semester SEMESTER -V PAPER-VII			
Course Code	**TITLE OF THE COURSE** **MARINE FISHSERIES**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		4	1	2	5

Semester – V Course 7 A: MARINE FISHSERIES

Learning Outcomes:

- After successful completion of this course student will be able to
- Understand Marine fishery resources
- Assess the Pelagic fishery resources
- Know the ecological importance of India's EEZ
- Judge the applications of remote sensing & GIS in capture fishery

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

Unit – I

1.1 Classification and definition of fishery zones and fishery resources of world.

1.2 Overview of marine fisheries resources of the world and India.

1.3 Marine capture fishery of Andhra Pradesh.

Unit – II

2.1 Major exploited marine fisheries of India, their developmental history and present status

2.2 Pelagic fisheries of India: sardines, mackerels, anchovies, tuna, ribbonfish, Bombay duck, pomfrets, mullets.

2.3 Features and trends in the production of pelagic fisheries. Conservation of pelagic fish stocks.

Unit – III

3.1 Demersal fisheries of India: sharks, major perches, threadfin, breams, sciaenids, silver belly.

3.2 Features and trends in production of demersal fisheries.

3.3 Impact of trawling. Conservation of demersal fish stocks.

Unit – IV

4.1 Potential marine fishery resources of the India's EEZ.

4.2 History of deep-sea fishing.

4.3 Oceanic and deep-sea fisheries of India. Deep sea fishing policy of India.

Unit – V

5.1 GIS and remote sensing in marine capture fishery

5.2 Ancillary fishery resources - seaweeds, crab, lobsters, chank and bivalves.

III. References:

Text Books

1. Bal, D.V., and Rao, K.V. 1990. Marine Fisheries of India. Tata McGraw Hill Pub. Co.

2. Srivastava, C.B.L. and Mahal, K., 1999. A text book of fishery science and Indian fisheries. Shree Publishers.

Reference Books

1. Carmelo, T.R., 1997. Identifying Marine Phytoplankton by Academic Press.

2. ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.

3. Biswas, K.P. 2011. Marine Prawns & Shrimps. Daya Publishing House, Delhi, 329pp.

4. ICAR 2011. Handbook of Fisheries and Aquaculture. ICAR, New Delhi, 1116 pp.

5. Jhingran, V.G. 1983. Fish and Fisheries of India. Hindustan Publ. Corpn. (India), Delhi, 666 pp.

6. Pillai, N.G.K. 2011. Marine Fisheries & Mariculture in India. Narendra Publishing House, Delhi, 352pp.

7. Aravind Kumar, 2004. Fishery Management. APH Publ. Corpn., New Delhi, 371 pp.

8. Belgrano & Andrea. 2011. Ecosystem Based Management for Marine Fisheries. Cambridge University Press, Cambridge, 402pp.

9. Dholakia, A.D. 2004. Fisheries and Aquatic Resources of India. Daya Publ. Hse., Delhi.

10.FAO (2012). The State of World Fisheries and Aquaculture. FAO Fisheries and Aquaculture Department, FAO, Rome (http://www.fao.org/docrep/016/i2727e/i2727e00.htm)

11 ICAR 2011. Handbook of Fisheries and Aquaculture. ICAR, New Delhi, 1116 pp.

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE FISHERIES
SEMESTER -V PAPER-VII
MODEL QUESTION PAPER

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

Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Write an essay on the marine fisery resources of India

2. Describe the Divisions of Marine environment

3. Write an essay on the sardine and mackerel fishery of India

PART- II

4.Describe the conservation measures of demersal fish stocks.
5. Describe the history of deep-sea fishing.
6. Write an essay on the application of remote sensing in marine fish capture.

SECTION - B

Answer any FOUR of the following:
Draw labeled diagrams wherever necessary **4x5=20**

7. Marine fishery of AP

8. Ribbon fish

9. Conservation of pelagic fish stock

10. Silver belly fish

11. EEZ of India

12. Deep sea fishing policy

13. Seaweed economic importance

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

MARKET ORIENTED COURESE- AQUACULTURE TECHNOLOGY

Course 7 A: MARINE FISHSERIES

PRACTICAL (LAB) SYLLABUS

IV. Lab work - Skills Outcomes:

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

Identify the commercially important marine products

Analyze the marine catches

Identify the potential marine landing centers

Understand the records related to catch data

V. Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

1.Visit to marine fish landing centers.

2.Familiarization of commercially important groups viz., marine and elasmobranchs, crustaceans, molluscs and seaweeds

3.Analysis of marine catches by major crafts and gears

4.Analysis and species composition of commercial fish catches at landing and centers

5.Maintenance of records of marine fish catch data

6.GIS and Remote Sensing Applications in capture fishery

VI. Lab References:

http://krishi.icar.gov.in/jspui/handle/123456789/63903

https://mpeda.gov.in/?page_id=1007

https://icar.org.in/content/icar-cmfri-launches-gis-based-info-vicinity-fish-landing-centres-covid-19-hotspots

https://incois.gov.in/MarineFisheries/PfzAdvisory

http://kvkernakulam.org.in/fishwatch.html

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE FISHERIES

SEMESTER -V PAPER-VII

Course 7A: MARINE FISHERIES

PRACTICAL (LAB) MODEL PAPER

1. SPOTTERS 5 X 4 = 20 Marks

A. MARINE FISH

B. MARINE FISH

C. MARINE ELASMOBRANCH

D. MARINE ELASMOBRANCH

E. MARINE CRUSTACEAN

2. Submission of Report on the filed vist to Fish landing center with photos and catches 20 Marks

3. Record 5 Marks

4. Viva-voce 5 M

PITHAPUR RAJAH'SGOVERNMENT COLLEGE

(AUTONOMOUS) KAKINADA

NAAC "A" GRADE

B VOC COMMERCIAL AQUACULTURE

DEPARTMENT OF

Zoology and Aquaculture

2023-24

(CHOICE BASED CREDIT SYSTEM)

P.R. GOVT.COLLEGE (AUTONOMOUS) KAKINADA.

2023 -24 XXIII BOARD OF STUDIES MEETING.

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) SYLLABUS AND NAME OF THE PAPERS

NSDC, NSQF & ASCI - LEVELS OF ASSESSMENT – 2020-21

S.No	VOCATIONAL COMPONENT		Marks	Credits	GENERAL COMPONENT		Marks	Credits
I	I Year	First Semester						(28)
1.	Core I	Biology of Fin fishes and shell fishes	100	4	Major I	Zoology	100	4
						Practical	50	1
		Lab	50	1	Major II	Chemistry	100	4
2.	Core II	Principles of Aquaculture	50	2		Practical	50	1
					Languages	English	100	3
		Lab/ind.training	50	1		Language T/H/S	100	3
					Life skills and skill development course	(CSS)-Comp	50	2
						(Plant Nursery)-Bot. dept	50	2
II		Second Semester						(30)
1.	Core III	Freshwater, Brackishwater and Mariculture	100	4	Major I	Zoology	100	4
						Practical	50	1
		Lab	50	1	Major II	Chemistry	100	4
2.	Core IV	Crafts and Gears in Fisheries	50	2		Practical	50	1
		Lab/ind.training	50	1	Languages	English	100	3
						Language T/H/S	100	3
					Life skills and skill development course	(ICT)-Computer dept	50	2
						(Diary techniques)-Zoology dept	50	2
						(Fruit & Veg preservation)-Botany dept	50	2
III	II Year	Third Semester						(30)
	Core V	Aquaculture Nutrition	100	4	Major I	Zoology	100	4
						Practical	50	1
		Lab	50	1	Major II	Chemistry	100	4
	Core VI	Inland and Marine Fisheries	50	2		Practical	50	1
		Lab/ind.training	50	1	Languages	English	100	3
						Language T/H/S	100	3
					Life skills and skill development course	(Environment education)-Zoology dept.	50	2
						(Personality development and leadership)-Eng dept.	50	2
						(Environment audit)-Chemistry dept.	50	2
IV		Fourth Semester						(30)
	Core VII	Pathology in Aquaculture	100	4	Major I	Zoology I	100	4
		Practical	50	1		Practical	50	1
	Core VIII	Fisheries Management	100	4		Zoology II	100	4
		Practical	50	1		Practical	50	1
					Major II	Chemistry I	100	4
						Practical	50	1
						Chemistry II	100	4
						Practical	50	1

V	III Year FIFTH Semester							
	CORE IX	MARINE BIOLOGY	100	4	MAJOR I	SEC A ZOOLOGY	100	4
		LAB	50	1		SEC A LAB ZOOLOGY	50	1
	CORE X	MARINE FISHERIES	100	4		SEC B ZOOLOGY	100	4
		LAB	50	1		SEC B LAB ZOOLOGY	50	1
					MAJOR II	SEC A CHEMISTRY	100	4
						SEC A CHEMISTRY LAB	50	1
						SEC A CHEMISTRY	100	4
						SEC B CHEMISTRY LAB	50	1
SIX Semester								
INTERNSHIP								

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-III

TITLE: AQUACULTURE NUTRITION - Core: V

SYLLABUS

OBJECTIVES:	LEARNING OUT COME
➢ To provide a basic understanding about fish nutrition. ➢ Provide the knowledge on the Fish feeding physiology, nutritional requirements.	➢ Student will learn the concept of the fish nutrition,. ➢ Knowledge on the physiology of fish feeding and nutritional requirements will be learnt by the students. ➢ Knowledge on the fish feed composition, formulation and balanced diet will be learned.

UNIT I: Biochemical aspects, Feed ingredients &feed requirements of Fish

1.1. Protein and amino acid requirement, carbohydrate and lipid requirement, Essential fatty acids, Non protein nitrogen sources.

1.2. Vitamin and mineral requirements, vitamin C for fish and shell fishes.

1.3. Anti-nutritional factors. Compounded feeds, pellets, crumbles and microencapsulated feed. Storage, quality standards, proximate composition & chemical evaluation.

1.4. Different feed ingredients- animal, plant, microbial origin, SCP, silages, fermented products.

UNIT II: Feed & Feed Manufacturing

2.1. Different forms of feed-fodders, mash, pellets, floating and sinking feeds. Feed formulation - methods, square method.

2.2. Feed manufacturing processes, Extrusion, Pelletization.

2.3. Quality problems- toxins, pests, rancidity.

UNIT III: Feed Management & Feed Quality

3.1. Feed schedule in finfish and shellfish, Protein requirements of finfish and shellfish

3.2. Artificial feed formulations of different cultural species

3.3. Wet feed, dry feed and larval feeds; advantages and disadvantages in culture farms.

3.4. Feed energetic, feed conversion efficiency, protein efficiency ratio, feed conversion ratio, net protein utilization, leaching, water stability. Quality standards.

UNIT IV: Larval nutrition (10Hours)

4.1. Larval stages, nutritional requirements of fish and shellfish larvae, quality requirements of larval feeds (particle size, digestibility).

4.2. Natural food and its importance in aquaculture, nutritional quality of commonly used fish food organisms, bioenrichment, biofilm/periphyton and its uses.

PRESCRIBED BOOK(S):

1. Brown E.E Fish Farming Handbook

2. Milne P.H. Fish and shell fish farming in coastal waters

3. CMFRI manual on research methods for fish and shellfish nutrition

4. Borgstorm,G. Fish as Food

5. Heen,E and Kreuzer,R. Fish in Nutrition

6. Shepherd,J and Brommage,W. Intensive Fish Farming Techniques

7. Hepher,B. and Pruginin,Y. Commercial Fish Farming

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture)

Semester-III

AQUACULTURE NUTRITION - Core: V

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

B.VOC (Commercial Aquaculture) Semester-III

AQUACULTURE NUTRITION - Core: V

MODEL question PAPER FOR

Time: 21/2 hrs **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Describe the essential fatty acids.
2. Write an essay on anti-nutritional factors.
3. Write an essay storage and transportation of feeds.

PART- II

4.Explain the feed conversion efficiency.

5.Write essay on natural food and its importance in aquaculture

6.Discuss methods of larval nutrition

SECTION - B

Answer any FOUR of the following:
Draw labeled diagrams wherever necessary **4x5=20**

7.Non protein nitrogen
8. Preservatives
9.Fermented products
10.Floating and sinking
11.Larval nutrition
12.Square method
13.Rancidity

QUESTION BANK **AQUACULTURE NUTRITION, CORE-V**

ESSAY ANSWER QUESTIONS:

1. Describe the essential fatty acids.
2. Write an essay on anti nutritional factors.
3. Write an essay storage and transportation of feeds
4. Describe the shrimp feeds in India.
5. Explain the feed conversion efficiency.
6. Write essay on natural food and its importance in aquaculture.
7. Write about the vitamin and mineral requirements in feed
8. Write about quality problems, toxins and rancidity
9. Explain briefly about different forms of feed fodders
10. Write about artificial feed production and different culture species
11. Write bridgly about bio-enrichment, biofilm/periphyton and its uses
12. Describe the feed manufacturing process

SHORT ANSWER QUESTIONS:

1. Non protein nitrogen
2. Preservatives
3. Fermented products
4. Feed formulation
5. Floating and sinking
6. Feed energetic
7. Larval nutrition
8. Carbohydrate
9. Vitamin
10. Define SCP
11. Pellets
12. Square method
13. Rancidity
14. Check trays
15. Shrimp
16. Protein efficiency diseases
17. Feed schedule
18. Bio-film
19. Quality standards
20. Wet feed and dry feed
21. Preservatives
22. Fermented products
23. Feed formulation
24. Floating and sinking
25. SCP

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-III

TITLE: AQUACULTURE NUTRITION - Core: V

PRACTICAL SYLLABUS

PRACTICALS: (Any 8 as per the local Industry needs and Requirement)

1. Estimation of protein content in aquaculture feeds
2. Estimation of carbohydrate content in aquaculture feeds
3. Estimation of lipid content in aquaculture feeds
4. Estimation of ash in aquaculture feed
5. Study of water stability of pellet feeds
6. Feed formulation and preparation in the lab
7. Study of binders used in aquaculture feeds
8. Study of feed packing materials
9. Study of physical and chemical change during storage
10. Study on physical characteristics of floating and sinking feeds
11. Visit to a aqua-feed production unit
12. Visit to a farm for studying feeding practices

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-III

TITLE: AQUACULTURE NUTRITION - Core: V

PRACTICAL MODEL PAPER

Time 2hrs **Max Marks 50**

I. Estimate Protein content in aquaculture feeds. Write procedure 10 M
II. Estimate the Ash content in aquaculture feed. Write procedure 10 M
III. Different Feed formulation identification using charts 05M
IV. Study of feed packing materials 10M
V.
VI. Record
05 M
VII. Field
Note book 05 M

VIII. Viva-voce
05 M

Total **50 marks**

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-III TITLE:

INLAND AND MARINE FISHERIES - Core: VI SYLLABUS

OBJECTIVES:	LEARNING OUT COME
➢ To study the Riverine, Reservoir and Estuarine fisheries. ➢ To understand pelagic fishery resources and demersal resources	➢ Student learns the knowledge on the inland fishery resources ➢ Student learns the knowledge on the pelagic and demersal fishery resources

UNIT I: Riverine and Estuarine Fisheries

1.1. Riverine fisheries – Major river systems in India, important characteristic features of Rivers.
1.2. Estuarine fisheries- definition, Ecological significance of estuary, Biota of estuary, classification and categories of estuaries- capture fisheries- resident and migrant species.
1.3. Fishing methods, recent statistics of catches.

UNIT II: Reservoir and Lacusterine Fisheries

2.1. Reservoir fisheries- Major reservoirs in India- important characteristic features of reservoirs.
2.2. Lacusterine fisheries- definition, Types of lakes based on circulation, nutrients and surface temperature.
2.3. Fishing methods, recent statistics of catches.

UNIT III: Marine Fisheries- Coastal fisheries

3.1. Introduction – Stratification of marine habitat; Groups of marine fisheies;
3.2. Coastal fisheries – Elasmobranch fishery; Teleost fishery- Sardines, Anchovies, Mackerel, Mumbai duck, Catfishes, Eels, Ribbon fish, Perches, Mullets, Polnemids, Pomfrets, Scianids, Seer fishes, Flying fishes
3.3. Methods of fishing - Recent catch statistics of pelagic fisheries.

UNIT IV: Marine Fisheries- Demersal Resources & Deep Sea Resources

4.1. Major demersal resource groups- elasmobranchs, cephalopods, silver bellies, flat fishes, crabs, sciaenids, pomfrets, bombay duck, prawns, lobsters, molluscan resources.
4.2. Methods of fishing, recent catch statistics. Fishery of mud banks.
4.3. Major deep sea resources - status of deep sea fishing in India; Fishing regulations.

PRESCRIBED BOOK(S):

1. Jhingran, V.G. 1993. Fish and fisheries of India. Hindustan Publishing Corporation (India), New Delhi.
2. Ricker, W.E. 1984. Methods for assessment of fish production in freshwaters. Blackwell Publications.
3. Srivastava, C.B.L., 1985. Textbook of Fishery Science and Indian Fisheries. Kutub Mahal Publications, Allahabad.
4. S.S. Khanna. An introduction to fishes
5. Kurian, C.V. and Sebastian, V.O. 1986. Prawns and prawn fishery of India. Hindustan Publishing Corporation (India), New Delhi.
6. Yadav, B.N. Fish and Fisheries. Daya Publishing House

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-III

TITLE: INLAND AND MARINE FISHERIES - Core: VI

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

B.VOC (Commercial Aquaculture)

Semester-III

Semester End Examinations

TITLE: INLAND AND MARINE FISHERIES - Core: VI

MODEL QUESTION PAPER

MODEL question PAPER FOR

Time: 21/2 hrs **Max. Marks: 50**

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

Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Write essay on major riverine systems in India.
2. Define estuary? Write about the classification of estuaries?
3. Write about major pelagic resource groups

PART- II

4. Describe the fishing methods? Write about recent catch statistics.

5. Write essay on fishing policies and problems

6. Write about the ecological significance and biota of estuaries

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7. Capture fisheries
8 Deep resources
9 Fishing gear
10 Reservoir
11 Cephalopods
12. Flying fish
13. Elasmobranchs

QUESTION BANK INLAND AND MARINE FISHERIES CORE-VI

ESSAY ANSWER QUESTIONS:

1. Write essay on major riverine systems in India.
2. Define estuary? Write about the classification of estuaries?
3. Write about major pelagic resource groups.
4. Describe the fishing methods? Write about recent catch statistics.
5. Write essay on fishing policies and problems.
6. Explain the estimation of fish landing.
7. Write about major demersal resources groups
8. Write a brief note a classification and categories of estuaries
9. Write about major deep sea resources
10. Describe the stratification of marine habitat and groups of marine fisheries
11. Write a briefly note on Indian coastal fisheries
12. Explain briefly about the status of deep sea fishing in India
13. Define about Lakesterine fishes and types of lakes
14. Write about the ecological significance and biota of estuaries

SHORT ANSWER QUESTIONS:

1. Capture fisheries
2. Cold water fisheries
3. Migrant fisheries
4. Fishing zones
5. Mud banks
6. Deep resources
7. Deep sea fishing
8. Inland fish
9. Cast net
10. Fishing gear
11. Reservoir
12. Migration
13. Anadromous
14. Pomfrets
15. Cephalopods
16. Molluscan resources
17. Anchovies
18. Flying fish
19. Elasmobranchs
20. Marine habitat

Lab/Industrial training/Institutional training

- Any 3 field visits

  Or
- 15 days Industrial training

  Or
- Lab work related to the concerned paper

  Or
- Mini Project with presentation

Note: For 50 Marks

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-IV

TITLE: PATHOLOGY IN AQUACULTURE -

Core: VII SYLLABUS

OBJECTIVES	LEARNING OUT COME
➢ To understand the various types of diseases among the cultivable fishes, to learn and apply methods of control and precaution of diseases. ➢ To understand the tools for diagnosis, and disease management strategies available today.	➢ Knowledge on the diseases will be learnt. ➢ Precautionary measures will be known to prevent the spread of the disease. ➢ Knowledge on the diagnostic tools will be learnt. ➢ Environmental quality disease free practice will be learnt.

UNIT I: Pathology and Parasitology

1.1. Introduction to fish diseases –Definition and categories of diseases – Disease and environment. pathology and parasitology.

1.2. Stress as a factor in the occurrence of diseases. Parasitism – host-parasite relationship.

UNIT II: Fungal and Viral Diseases

2.1. Fungal diseases (finfish) – Saprolegniosis, brachiomycosis, ichthyophorus diseases.

2.2. Lagenidium diseases – Fusarium disease Viral diseases (finfish) – IPN, IHN, Viral Hemorrhagic Septicemia, Spring Viremia of carps – Major CCVD, Carp lymphocytes.

2.3. Major shrimp viral diseases – *Bacculovirus penaeii*, Monodon Bacculovirus, Bacculoviral midgut necrosis, IHHNV, Hepatopancreatic parvo like virus, Yellow head bacculovirus, white spot bacculovirus.

UNIT III: Bacterial, Protozoan and Metazoan Diseases.

3.1. Common bacterial diseases (Enteric red mouth disease, Bacterial cold water disease, furunculosis, vibriosis, dropsy and Gill and fin rot) their diagnosis and treatment.

3.2. Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis.

3.3. Metazoan Diseases- diseases caused by annelids, helminthes, crustaceans and molluscs.

UNIT IV: Nutritional diseases & Immunology

4.1. Nutritional pathology – lipid liver degeneration,Vitamin and mineral deficiency diseases.

4.2. Nutritional cataract. Genetically and environmentally induced diseases.

4.3. Defense mechanism in fish and shell fish, Application and development of

vaccines.

4.4. Diagnostic tools – immune detection- DNA/RNA techniques.
4.5. General preventive methods and prophylaxis. Methods of pathological examination of fish and infectious diseases, BMP in Aquacultue.

PRESCRIBED BOOK(S):

1. R. Ramachandran Nair Encyclopedia of fish disease –

2. K.P. Biswas Prevention and control of fish and Prawn diseases –

3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease management in FW Pisicultue –

4 Wheaton,F.W. Aquacultural Engineering

5 Bose et al. Coastal Aquacultural Engineering

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

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

B.VOC (Commercial Aquaculture) Semester-IV

Semester End Examinations

TITLE: PATHOLOGY IN AQUACULTURE - Core: VII

MODEL QUESTION PAPER

Time: 21/2 hrs **Max. Marks: 50**

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

Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. What is parasitism? Explain the host parasite relationship.
2. Write an essay on shrimp viral diseases and prophylaxis.
3. Explain about the protozoan diseases and their treatment

PART- II

4.Describe the vitamin deficiency diseases.

5.Explain the diagnostic tools of immunology.

6.Define fish diseases and explain briefly about fungal diseases

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7.Fish diseases

8.Brachiomycosis

9.Metazoan diseases

10.Bacterial diseases

11.Nutritional cataract

12.Diagnostic tools

13. CCVD & IHN

CORE-VII
PATHOLOGY IN AQUACULTURE
QUESTION BANK

ESSAY ANSWER QUESTIONS:

1. What is parasitism? Explain the host parasite relationship.
2. Write an essay on shrimp viral diseases and prophylaxis.
3. Explain about the protozoan diseases and their treatment.
4. Describe the vitamin deficiency diseases.
5. Explain the diagnostic tools of immunology.
6. Write essay on fish health management.
7. Explain the defence mechanism in fish and shellfish
8. Write briefly about the common bacterial diseases in fish
9. Explain the general preventive methods of prophylaxis
10. Explain about the metazoan diseases
11. Describe the nutritional pathology
12. Define fish diseases and explain briefly about fungal diseases

SHORT ANSWER QUESTIONS:

1. Fish diseases
2. Brachiomycosis
3. Metazoan diseases
4. Bacterial diseases
5. Nutritional cataract
6. Diagnostic tools
7. Sustainable aquaculture
8. Pathology
9. Parasitism
10. Define CCVD
11. Define IHN
12. Trypanosomiasis
13. Vitamin
14. Aflatoxixn
15. DNA
16. Whirling diseases
17. BMP in aquaculture
18. Vaccines
19. Parasitology
20. Lagenidium diseases
21. CCVD
22. IHN
23. Immunology

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-IV

TITLE: PATHOLOGY IN AQUACULTURE - Core: VII

PRACTICAL SYLLABUS

1. Enumeration of Bacteria by TPC Method
2. Enumeration of total Coliforms
3. Observation of gross pathology and external lesions of fish and prawn with reference to the common diseases in aquaculture
4. Examination of pathological changes in gills and gut lumen, lymphoid organ, muscles and nerves of fish
5. Examination of pathological changes in gut lumen, hepatopncreas, lymphoid organ, muscles and nerves of prawn and shrimp
6. Collection, processing and analysis of data for epedemeiological investigations of viral diseases
7. Bacterial pathogens – isolation, culture and characterization
8. Identification of parasites in fishes: Protozoan, Helmiths, Crustaceans
9. Antibiograms – preparation and evaluation
10. Molecular and immunological techniques; Biochemical tests; PCR; ELISA; Agglutination test; Challenge tests; Purification of virus for development of vaccines (Demonstration at institutes/labs)
11. Estimation of dose, calculation of concentration, methods of administration of various chemotherapeutics to fish and shell fish
12. Estimation of antibiotics used in aquaculture practices
13. Estimation of probiotics used in aquaculture
14. Field visit to farm for health monitoring and disease diagnosis

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-IV TITLE:

PATHOLOGY IN AQUACULTURE - Core: VII PRACTICAL

MODEL PAPER

1. Dissect and display the external lesions of fish/prawn. Draw a neat labelled diagram 15M

2. Identification of spotters 5X5=25M

A) .....

B) .....

C) .....

D) .....

E) .....

3. Record 05M

4. Viva voce 15M

Total **50M**

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

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

B.VOC (Commercial Aquaculture) Semester-IV

TITLE: FISHERIES MANAGEMENT - Core: VIII

SYLLABUS

OBJECTIVES	LEARNING OUT COME
➢ To understand the various types of diseases among the cultivable fishes, to learn and apply methods of control and precaution of diseases. ➢ To understand the tools for diagnosis, and disease management strategies available today.	➢ Knowledge on the diseases will be learnt. ➢ Precautionary measures will be known to prevent the spread of the disease. ➢ Knowledge on the diagnostic tools will be learnt. ➢ Environmental quality disease free practice will be learnt.

UNIT I: Inroduction

1.1 Definitions and approaches, scope and importance of management. Management as an art of science-comparative management

1.2 Functions of managers- Environment impact management, Functions of Managers- Planning, organizing, staffing, directing and controlling. Contributions of Henry Fayol to the scientific techniques of management

UNIT II: Human resource management

2.1 Man power planning and recruitment- Organizational development. Training, Motivation, Leadership, Organizational communication, conflicts and decision making.

2.2 Human resource development and its role in the context of fisheries sector. Important institutions involved in human resource development in fisheries sector

UNIT III: Processing Sector Management

3.1 Organizational setup in processing industries, state fisheries department.

3.2 Role of EIA, MPEDA and CIFT in the processing industry

3.3 Trade and exports- Export of marine products- trends and present status – India's share in the international trade of sea foods

UNIT IV: Fisheries Acts

4.1 Indian fisheries Act, National institutions of Governance in marine affairs of India-criteria for regulation of fishing effort.

4.2 Code of conduct for responsible fisheries, WTO, Important acts pertaining to

fisheries in Andhra Pradesh – Marine Fisheries Act.

UNIT V: Co-operations and Agencies in fisheries

5.1 Definition, Principles of co-operations, Role of National cooperative development corporation (NCDC), Matsyafed, National Federation of Fishermen cooperations, FFDA, BFFDA, FIRMA

5.2 Problems of Fishery cooperations. Cooperations and their importance in fish production and marketing. Role of NABARD and SIDBI

PRESCRIBED BOOK(S):

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P.R. Govt. College (Autonomous), Kakinada B.VOC

(Commercial Aquaculture) Semester-IV

Semester End Examinations

TITLE: FISHERIES MANAGEMENT - Core: VIII MODEL

QUESTION PAPER

Time: 21/2 hrs **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Describe the scope and importance of fisheries management
2. Explain about Human resource management
3. Describe the criteria for regulation of fishing effort

PART- II

4.Write about the important role of NCDC

5.Write a brief note on marine fisheries act
6.Write the role of FFDA, BFFDA and FIRMA

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7.Definition of fisheries management
8.Scientific techniques of management
9.Training and motivation
11.MPEDA and CIFT
11.Marine fisheries act
12.Matsyafed
13.Importance in fish production and marketing

Lab/Industrial training/Institutional training

- Any 3 field visits
  Or
- 15 days Industrial training
  Or
- Lab work related to the concerned paper
  Or
- Mini Project with presentation

Note: For 50 Mark

P.R. GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
B VOC COMMERCIAL AQUACULTURE

	P. R. GOVERNMENT COLLEGE (A) KAKINADA	Program & Semester SEMESTER -V			
Course Code	**TITLE OF THE COURSE MARINE BIOLOGY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	**CORE IX**	4	1	2	5

I. COURSE OUT COMES:

- After successful completion of this course student will be able to
- Understand the Divisions, life of Marine Ecosystem
- Assess the Productivity of Marine Ecosystem
- Know the ecological importance of critical ecosystems associated with marine ecosystem
- Judge the adaptations of animals in the marine ecosystem

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

Unit – I Introduction:

Divisions of marine environment- pelagic, benthic, euphotic, aphotic divisions and their subdivisions.

Life in oceans – general account of major groups of phytoplankton, sea weeds, major zooplankton groups.

Environmental factors affecting life in the oceans- salinity, temperature, light, currents, waves, tides, oxygen, and carbon dioxide.

Unit – II

2.1 Primary, secondary and tertiary production.

2.2 Marine food chains and food webs. Vertical migration of zooplankton. Phytoplankton-Zooplankton relationship, plankton and fisheries.

Unit – III

3.1 Benthos- a life in rocky, sandy, and muddy shores.

3.2 Mangroves Ecosystem and Ecological importance

3.3 Coral reefs ecosystem-ecological importance

Unit – IV

4.1 Boring and fouling organisms- examples with adaptations.

4.1 Nekton- outline composition of nekton, habitats of nekton.

4.3 Bioluminescence and indicator species, red tides

Unit –V

5.1 Biology and classification of marine mammals,

5.2 Adaptations in marine mammals for conserving body heat and submersion for long dive.

III. References:

Reference Books

1. Carmelo, T.R., 1997. Identifying Marine Phytoplankton by Academic Press.

2. ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.

3. Gage. J.D. and Tyler, P.A. 1991. Deep Sea Biology, Cambridge University Press, Cambridge.

4. William, C., 1991. Seashore life between the tides. Dover Publication

5. Makoto, Omori and Tsutomu Ikeda, 1984. Methods in Marine Zooplankton Ecology, Wiley & Sons. Inc. Canada

6. Venkataraman, K., C. Raghunathan. R. Raghuramanand C.R. Sreeraj. 2012. Marine Biodiversity in India, Zoological Surv. India, Kolkata, 164pp.

7. Morrissey, J.F. and J.L. Sumich. 2012. Introduction to the Biology of Marine Life. Jones & Bartlett learning, U.K., 467pp.

8. Kathiresan, K and S.Z. Qasim 2005. Biodiversity of Mangrove Ecosystems. Hindustan Lever Limited.

9. Fish, J.D & S. Fish. 2010. A Students Guide to the Seashore. Cambridge University Press, 527pp.

10. Chapman, V.J. and D.J. Chapman, 1980. Seaweed and Their Use. Chapman & Hall, London.

11. Chapman, V.J., 1976. Mangrove Vegetation. J. Gramer, Berlin.

12. Balakrishnan Nair, N. and D.M. Thampy, 1980. A Text Book of Marine Ecology. The Macmillan Co. of India Ltd., New Delhi

13 Svedrup et al The Oceans Prentice Hall

14. Tait RV Elements of marine ecology Butterworths

15. Riley & Skirrow Chemical Oceanography Academic Press

16. Newell RC Biology of intertidal animals Logos Press

17. Kinne O (Ed) Marine ecology John Wiley & Sons

18. Marshall NB Aspects of Deepsea Biology Hutchinson

19. Ekman S Zoogeography of the sea. Sidgwick & Jackson

20. http://ecoursesonline.iasri.res.in/course/view.php?id=430

CO-POMapping:

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

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

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P. R. GOVERNMENT COLLEGE (A) KAKINADA B

VOC COMMERCIAL AQUACULTURE

TITLE OF THE COURSE: MARINE BIOLOGY
SEMESTER -V CORE IX

MODEL QUESTION PAPER

Time: 21/2 hrs **Max. Marks: 50**

Answer any THREE of the following. Choosing at least one from each part.
Draw labeled diagrams wherever necessary **3x10=30**

SECTION - A

PART- I

1. Write an essay on the environmental factors affecting the life in oceans
2. Describe the Divisions of Marine environment
3. Explain about the phytoplankton zooplankton relationship.

PART- II

4. Describe the ecological importance of mangrove ecosystem.
5. Write an essay on the boring and fouling organisms with suitable examples.
6. Write an essay on the adaptations in Marine mammals

SECTION - B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7. Sea weed
8. Primary production
9. Rocky shore- environment
10. Coral reefs ecological importance
11. Bioluminescence
12. Classification of Marine mammals
13. Body heat conservation by marine mammals

P. R. GOVERNMENT COLLEGE (A) KAKINADA

B VOC COMMERCIAL AQUACULTURE

TITLE OF THE COURSE: MARINE BIOLOGY
SEMESTER -V CORE IX

CORE IX : MARINE BIOLOGY

PRACTICAL (LAB) SYLLABUS

Lab work - Skills Outcomes:

- After successful completion of thispractical course student will be able to
- Operate the instruments for collection of plankton
- Identify the plankton
- Preserve the plankton

Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

4.Study of common instruments used for collection of phytoplankton
5.Study of common instruments used zooplankton
6.Study of common instruments benthos.
7.Collection, preservation and analysis of phytoplankton, zooplankton, and benthos
18.Identification of Phytoplankton – (Identification and Record work)
19.Identification of Zooplankton - (Identification /Microscopy/Record work)
20.Identification of Boring and fouling organisms

Lab references

ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.

https://drs.nio.org/drs/bitstream/handle/2264/95/Zooplankton_Manual.pdf?sequence=1&isAllowed=y

https://drs.nio.org/drs/bitstream/handle/2264/97/Phytoplankton-manual.PDF

http://www.coastalwiki.org/wiki/Sampling_tools_for_the_marine_environment

https://www.fao.org/3/W3732E/w3732e0s.htm

https://adkinstruments.in/categories/oceanography/plankton-nets

https://www.slideshare.net/poojakamble1609/fouling-and-boring

P. R. GOVERNMENT COLLEGE (A) KAKINADA TITLE

OF THE COURSE: MARINE BIOLOGY

SEMESTER -V CORE IX

B VOC COMMERCIAL AQUACULTURE

CORE IX : MARINE BIOLOGY PRACTICAL

(LAB) MODEL PAPER

1. Phytoplankton /Zooplankton/Benthos collection instrument details explanation with diagram ---10
2. Phytoplankton /Zooplankton/Benthos collection instruments Explanation with diagrams ------- 10
3. Collection of Zooplankton/Phytoplankton/Benthos—procedure / Preservation of Zooplankton/Phytoplankton/Benthos---------5 Marks

4. Spotters/images/charts 5 x 4= 20 Marks

   A. Zooplankton
   B. Phytoplankton
   C. Benthos
   D. Borer
   E. Fouler

5. Record 5 Marks

P.R. GOVERNMENT COLLEGE (A),

KAKINADA CHOICE BASED

CREDIT SYSTEM

B VOC COMMERCIAL AQUACULTURE

	P. R. GOVERNMENT COLLEGE (A) KAKINADA	Program & Semester SEMESTER -V CORE X			
Course Code	TITLE OF THE COURSE MARINE FISHSERIES				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	**CORE X**	4	1	2	5

Semester – V Course CORE X : MARINE FISHSERIES

Learning Outcomes:

- After successful completion of this course student will be able to
- Understand Marine fishery resources
- Assess the Pelagic fishery resources
- Know the ecological importance of India's EEZ
- Judge the applications of remote sensing & GIS in capture fishery

II. Syllabus:

Unit – I

1.1 Classification and definition of fishery zones and fishery resources of world.

1.2 Overview of marine fisheries resources of the world and India.

1.3 Marine capture fishery of Andhra Pradesh.

Unit – II

2.1 Major exploited marine fisheries of India, their developmental history and present status

2.2 Pelagic fisheries of India: sardines, mackerels, anchovies, tuna, ribbonfish, Bombay duck, pomfrets, mullets.

2.3 Features and trends in the production of pelagic fisheries. Conservation of pelagic fish stocks.

Unit – III

3.1 Demersal fisheries of India: sharks, major perches, threadfin, breams, sciaenids, silver belly.

3.2 Features and trends in production of demersal fisheries.

3.3 Impact of trawling. Conservation of demersal fish stocks.

Unit – IV

4.1 Potential marine fishery resources of the India's EEZ.

4.2 History of deep-sea fishing.

4.3 Oceanic and deep-sea fisheries of India. Deep sea fishing policy of India.

Unit – V

5.1 GIS and remote sensing in marine capture fishery

5.2 Ancillary fishery resources - seaweeds, crab, lobsters, chank and bivalves.

III. References:

Text Books

1. Bal, D.V., and Rao, K.V. 1990. Marine Fisheries of India. Tata McGraw Hill Pub. Co.

2. Srivastava, C.B.L. and Mahal, K., 1999. A text book of fishery science and Indian fisheries. Shree Publishers.

Reference Books

1. Carmelo, T.R., 1997. Identifying Marine Phytoplankton by Academic Press.

2. ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.

3. Biswas, K.P. 2011. Marine Prawns & Shrimps. Daya Publishing House, Delhi, 329pp.

4. ICAR 2011. Handbook of Fisheries and Aquaculture. ICAR, New Delhi, 1116 pp.

5. Jhingran, V.G. 1983. Fish and Fisheries of India. Hindustan Publ. Corpn. (India), Delhi, 666 pp.

BLUE PRINT

Time: 21/2 hrs Max. Marks: 50

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

P. R. GOVERNMENT COLLEGE (A) KAKINADA

B VOC COMMERCIAL AQUACULTURE

TITLE OF THE COURSE: MARINE FISHERIES
SEMESTER -V CORE X
MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

SECTION- A

PART – 1

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

Draw labeled diagrams wherever necessary **3x10=30**

.

1.Write an essay on the marine fishery resources of India

2.Describe the Divisions of Marine environment
3.Write an essay on the sardine and mackerel fishery of India

PART – II

1. Describe the conservation measures of demersal fish stocks .
2. Describe the history of deep sea fishing .
3. Write an essay on the application of remote sensing in marine fish capture.

SECTION- B

Answer any FOUR of the following:

Draw labeled diagrams wherever necessary **4x5=20**

7.Marine fishery of AP
8.Ribbon fish
9.Bombay duck
10.Silver belly fish
11.EEZ of India
12.Deep Sea fishing policy
13.Red tide

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

B VOC COMMERCIAL AQUACULTURE

CORE X: MARINE FISHSERIES

PRACTICAL (LAB) SYLLABUS

IV. Lab work - Skills Outcomes:

On successful completion of this practical course, student shall be able to: Identify the commercially important marine products

Analyze the marine catches

Identify the potential marine landing centers Understand the records related to catch data

V. Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

- Visit to marine fish landing centers.
- Familiarization of commercially important groups viz., marine and elasmobranchs, crustaceans, molluscs and seaweeds
- Analysis of marine catches by major crafts and gears
- Analysis and species composition of commercial fish catches at landing and centers
- Maintenance of records of marine fish catch data
- GIS and Remote Sensing Applications in capture fishery

VI. Lab References:

http://krishi.icar.gov.in/jspui/handle/123456789/63903

https://mpeda.gov.in/?page_id=1007

https://icar.org.in/content/icar-cmfri-launches-gis-based-info-vicinity-fish- landing-centres-covid-19-hotspots

https://incois.gov.in/MarineFisheries/PfzAdvisory

http://kvkernakulam.org.in/fishwatch.html

VII. 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 the classroom or in the laboratory for a total of not less than 10 hours various concepts of marines fishery resources- fish landing centers- major catches-records @ landing centers awareness on the GIS and remote sensing applications in marine fishing

2. For Student: Individual laboratory work and visit to Any fish landing center for observation of proceeding at fish landing centers - a brief report preparation with pictures and data /survey

3. Max marks for Field Work Report: 05.

4. Suggested Format for Field work

Name of the landing center visited, date of visit, persons contacted, fish landings visited- details observed in landing center - important points to be correlated with the theory/ practical curriculum

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Visit to fish landing center

2. Collection of web resources on details of landings and revenue

3. Interaction with local fishermen to know about the catch particulars

4. Collection of web resources on the details of development of new fish landing centers in Andhra Pradesh

5. Seminar, Invited lecture, Assignment, Group discussion. Quiz, Collection of Material,

P. R. GOVERNMENT COLLEGE (A) KAKINADA TITLE OF

THE COURSE: MARINE FISHERIES

SEMESTER -V CORE X

CORE X: MARINE FISHERIES

PRACTICAL (LAB) MODEL PAPER

SPOTTERS 5 X 4 = 20 Marks

1.
   A. MARINE FISH
   B. MARINE FISH
   C. MARINE ELASMOBRANCH
   D. MARINE ELASMOBRANCH
   E. MARINE CRUSTACEAN
2. Submission of Report on the filed vist to Fish landing center with photos and catches 20 Marks
3. Record 5 Marks
4. Viva-voce 5 Marks

Programme Outcomes (POs)

Programme Outcomes (POs) are what knowledge, skills and attitudes a graduate should have at the time of graduation. Students of Undergraduate Programme B. Sc at the time of graduation will be able to:

PO1.**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. **Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in at least one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. **Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. **Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO5. **Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO6. **Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.

PO7. **Problem solving skills:** Identify, formulate, and analyze complex problems, reaching substantiated conclusions by applying the knowledge and skills acquired during undergraduate study for the welfare of individuals and society.

PO8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9. **Higher Progression, Employability and Entrepreneurship:** Progress towards higher education / become potential workforce by enhancing employability through skill-based education / become good entrepreneurs.

PSO's of CZAC & CA

1. To develop theoretical and practical skills in Zoology, Chemistry and Aquaculture.
2. To understand the interdisciplinary areas in Chemistry and Zoology.
3. To provide opportunity in pursuing higher studies in all disciplines of life sciences and Chemistry.
4. To create Entrepreneurship / Self-employment opportunities in Aquaculture areas.
5. To apply various laboratory techniques learnt in Chemistry in Aquaculture laboratories in areas such as Quality assurance, Quality Control, and diagnostics.

Additions and deletions of Topics in Each Paper
Depatment of Zoology & Aquaculture
BOS changes 2023-24

Name of the Department	Sl.No	Semester Programme	Paper Number & Paper Title	Titles of the Topics Deleted	Topics to be added during BOS meeting October 2022	Percentage of changes Made in the Syllabus	Justification for each topic deleted	Justification for each topic added
Aquaculture technology	09	I semester	Basic principles of aquaculture	Construction of an ideal fish pond	Physico Chemical conditions of Soil and Water	18	Repeated	Very important to Culture Aquatic Organisams
Aquaculture technology	10	II semester	Biology of fin fish and Shell fish	Condition factor / Ponderal Index	Migration in fishes	15	Not suitable for Recent Trends	Useful to study fish behaviour
Aquaculture technology	11	III Semester	Fish nutrition and feed technology	Energy partition and feeding	Nutritio deficiency in prawn	12	At present Scenario its is not suitable for recent trends	Important Aspect of Productivity
Aquaculture technology	12	III Semester	Fish health management	Nutritional cataract	Black eye Disease of fish	10	Repeated topic	Provide additional knowledge
Aquaculture technology	13	IV Semester	Fresh water and brackish water aquaculture	Culture of P.Monodon	L.vannammei	15	Culture is not under practice in A.P	Widely cultured in A.P
Aquaculture technology	14	IV Semester	Fisheries extension, economics and marketing	LLP IRDP ITDA ORP NDS	Fisheries Institutions	15	Restructured	Extension education
Aquaculture technology	15	V Semester	Aquarium Management Ornamental fish culture	Water quality management	Biology oof Ghost fish	10	Repeated	Recent topic
Aquaculture technology	16	V Semester	Postharvest technology of Fish and Fisheries	Fish chowder	Industrial safety in Processing plants	10	Not suitable for Recent Trends	Safety And Employabilty Skill
Commercial aquaculture	17	I Semester	Biology of fin fish and Shell fish	Condition factor / Ponderal Index	Migration in fishes	10	Not suitable for Recent Trends	Useful to study fish behaviour
Commercial aquaculture	18	I Semester	Principles of aquaculture	Construction of an ideal fish pond	Physico Chemical conditions of Soil and Water	18	Repeated	Very important to

DEPARTMENT OF ZOOLOGY & Aquaculture

LIST OF EXAMINERS

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

Lecturer in charge
Dept of Zoology & Aquaculture

DEPARTMENT OF ZOOLOGY
LIST OF QUESTION PAPER SETTERS

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