

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE  
(AUTONOMOUS) NAAC "A" GRADE**

**KAKINADA**



**XXII—BOARD OF STUDIES**

**B VOC COMMERCIAL AQUACULTURE**

**DEPARTMENT OF**

**Zoology and Aquaculture**

**2022-23**

**(CHOICE BASED CREDIT SYSTEM)**

**P.R. GOVT.COLLEGE (AUTONOMOUS) KAKINADA.  
2022 -23 XXII BOARD OF STUDIES MEETING.**

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

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

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

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

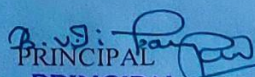
**REF: 1.UGC Guidelines for Autonomous colleges-2018.**

**ORDER:**

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

S.No	Name of the Nominee	Designation
1	Sri. B. Chakravarthi	Chairman
2	Dr.K. Ramesh Babu	University Nominee, Andhra University Visakhapatnam
3.	Dr. P. Ramaneswari	Subject Expert: Adikavi nannaya University
4.	Smt.M.Vasanth Lakshmi	Subject Expert: Local nominee Lec.Incharge Zoology/ A.S.D (W) College,Kakinda
5.	M.Phanidra	Aqua Industrialist
6.	Sri B. Ahmed Ali Baba	Member
7.	Dr.N.SreenivasMember	Member
8.	Dr. P. Kiran Kumar	Member
9.	Dr. B. Elia	Member
10	Sk. Madina Saheb	Member
11.	Y. Gowthami	Member
12.	P.Vijaya Chandrika	Member
13	B. Devi	Member
14.	I. Shanthi Grace	Member
15.	J. Anudeep	Member
16.	Y. Nagavalli	Member
17.	B.Lavanya Sri	Student Member CZAC
18.	A.Manju Lakshmi	Student Member II CZAC
19.	K.Ayyappa Swamy	Student Member I CZAC

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

  
PRINCIPAL  
P.R.Govt. College (A)  
KAKINADA  
7 Oct 2022

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

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

Dt.25 Sept2022

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

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

- Ref: 1. Minutes of IQAC meeting dated18 September 2022  
2. Resolutions adopted in Staff Council Meeting held on 23  
Sept 20

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

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

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

The HEIs are also, as per the Revised Accreditation Framework [RAF] of NAAC, endowed with the responsibility of rolling out quality and holistic human resources to the modern Indian Economy by ingraining quality in teaching- learning process by facilitating the students experience a wide range of participative and experiential learning strategies including field trips,

conferences, integration of technology, community service programmes, career guidance, certificate and value added courses, research and inquisition based teaching, exchange programmes, gender equity programmes, etc.

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

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

### **ORDER:**

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

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

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

Further, the Chairman of the each BOS, in association with the IQAC coordinator, preceding the BOS meeting, is requested to prescribe benchmarking, quality initiatives in pedagogy and learning in design of curriculum and optimum utilization of

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

The Chairmen are, therefore, requested to

- Conduct meeting with employers, parents, alumni, shall take feedback on the existing curricula and invite suggestions and changes to be made.
  - Invite the University nominee, subject experts, industrial nominees, student nominees, parents well in advance along with the date, venue, agenda, etc., A soft copy shall be communicated well in advance to the members to have an idea on the matters.
  - Facilitate much room for intense deliberation on the design of the curricula, evaluation system, research component, enhancing learning experiences, etc.,
  - Each Department shall approve and recommend additional credits for additional modules, training programmes, N.S.S, N.C.C, participation in cultural programs, sports and games, environmental programs, blood donations camps, etc.
  - All meetings shall be offline. Online attendance of members faculty will be permitted only in exceptional cases.
  - The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the commencement of the examination.
  - Each Chairman of BOS, shall get the rough draft of the curricula verified by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity among the departments.
- 
- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.
  - The Academic Coordinator and IQAC coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 and explain the structure of curricula, uniformity other modalities.

- The Controller of Examinations of the institution shall fund the BOS meeting expenditure from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course ( If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.500/-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

**BOS document should contain the following contents in order**

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

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

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

S.No	Subject	Sem	Title of the Course	Topic	Parameter as per Blooms taxonomy (Knowledge/ Application/ Creativity / Innovation)	Experiential learning component	Scope (Skill/ employability/ entrepreneurship)
1	Zoology	III	Cell Biology	Animal Cell	Knowledge	Shall be shown Microscope	

8. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification, in the Proforma given in Annexure – I.
9. Table showing Members present with signatures.
10. List of Examiners & Paper setters
11. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50 marks) for each course.
12. PO attainment data (CO-PO mapping)

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

Enclosures: Annexure I, II & III

Copy to:

Lecturers-in-Charge (BOS Chairmen) of all the departments

Academic Coordinator

IQAC coordinator

Controller of Examinations

Office

## **VISION:**

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

## **MISSION:**

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



## AGENDA FOR BOARD OF STUDIES MEETING -2022-2023

### Agenda

1. Approval of Syllabus for all the Semesters and implementation of Choice Based Credit System
  2. Model question papers, Blue Print
  3. Panel of paper setters and examiners.
  4. Methodologies of Teaching – Learning and Evaluation.
5. Implementation of newly introduced Skill Enhancement Courses (SEC's) in Zoology & Aquaculture Technology by APSCHE through affiliating University for the fifth semester and select one pair of courses based on the choice of majority of the stakeholders.
6. Action plan 2022-2023
7. Deliver of guest lectures and conduct of field visits, assigning of project works.
8. Additional inputs and changes in the curriculum.
- 9. Introducing Certificate course entitled **Certificate Course on Water Quality Assessment** and offering of Skill Development Courses entitled '**Dairy Technology**' in II Semester and '**Poultry Farming**' and **Environmental Studies** as Life skill course in III Semester.**
10. Implementation of Community Service Project and Internship Programmes introduced from 2020-2021 admitted batch.
11. Continuous Internal Assessment pattern (CIA) introduced by APCCE from 2021-2022 admitted batch onwards
12. Designing and conduct of workshops and seminars
13. Arrangement of skill development, training programmes and MOUs.

15. Conduct of Bridge Course and Remedial Coaching.
16. 75% attendance compulsory for Mid and Sem End Exams.
17. Any other proposal with the permission of the Chair.

Discussion:

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

1. Dr. K. Ramaneeswari enquired about the need of CO-PO Mapping and advised to inform the same to

Students.

2. Dr. P. Ram Mohan Rao, Aqua consultant has advised to utilize the services of local industries for

student internship

**PITHAPUR RAJAH'S GOVT COLLEGE (A), KAKINADA**

**DEPARTMENT OF ZOOLOGY**

**BOARD OF STUDIES MEETING (2022-23) CONVENED ON 05<sup>TH</sup> NOVEMBER 2022**

**Resolutions**

The members, Board of Studies, Zoology met through online and offline on 05-11-2022 at 11.00 AM to discuss the agenda points and to approve the course structure, Theory and Practical syllabus, Blue Print, Model question papers, Additional inputs in the Curriculum, Study Projects, Co-curricular and extracurricular activities of Department, Skill Development Courses and Certificate Course offered by the Department, Internship programmes, Continuous Internal Assessment pattern (CIA) and Semester End examination Pattern.

The following resolutions are made.

**Resolution-1 It is resolved to follow the syllabus as well as Choice Based Credit System introduced by UGC/APSCH through Adikavi Nannaya University, Rajamahendravaram for I, II- & III-year students.**

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

**Resolution-2**

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

**Resolution-3**

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

		Internal Assessment			External Assessment	
I Mid	II Mid	Project	Seminar	Assignment etc,	Total	50 M (2021 admitted batch)
25M	25 M	10M	5M	10M	50M	
25M	25M		5M	10M	40M	60 M (2020 admitted batch)

#### Resolution-4

Resolved to split 50 marks of theory internal as 25 marks for mid exams and 10 marks for co-curricular activities (assignment/quiz/group discussion) 10 Marks for Mini project and 5 Marks for (seminar) presentation.

#### Resolution-5

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

Course Number	Name of Course	Hours / Week	Credits	Marks	
				IA – 20 Filed Work 05	Sem End
6 & 7					
6A	MARINE BIOLOGY	3	3	40	60
6A LAB	MARINE BIOLOGY- LAB	3	2	-	50
7A	MARINE FISHERIES	3	3	40	60
7A LAB	MARINE FISHERIES LAB	3	2	-	50

#### Resolution-6

**Resolved to implement the Action plan proposed for the Academic year 2022-2023**

**Resolution VI:** Resolved to introduce SDC as prescribed by the APSCHE. Department

of Zoology anchoring the Dairy Technology for the II semester, Environmental Science, Health and Hygiene in the III semester

#### **Resolution-7**

Resolved to offer choice-based Skill Development Courses by Department of Zoology entitled '**Dairy Technology**' in II Semester '**Poultry Farming**' and **in III semester and Environmental Studies** as Life skill course in III Semester as prescribed by 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 I, II, III, IV & V semesters with the following additional inputs and changes in the curriculum within the frame work of Autonomy.

#### **Resolution-9**

It is resolved to offer a Certificate Course entitled **Water Quality Assessment** for II & III Year students

#### **Resolution-10**

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

#### **Resolution-11**

It is resolved to implement 100% external assessment for Skill Development Courses and 100% internal assessment for Certificate Course and resolved to follow the standard operating procedures given by APSCHE through Adikavi Nannaya University for the evaluation of three internships.

#### **Resolution-12**

Resolved to arrange Bridge Course for the newly admitted students and remedial classes for slow learners/ Extracurricular/Co-Curricular activities has to be conducted in the 7<sup>th</sup> 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, quizprogrammes, elocution, debate, Group discussion, Extension Activities, Study Projects and field trips and to encourage experiential learning and student participation in extracurricular activities of the college.

### **Resolution-15**

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

### **Resolution-15**

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

### **Resolution-16**

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

Date: 05-11--2022

Kakinada

Signature of the  
Chairperson

Parents, and industry at the end of the semester.

A

**Resolution-16**

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

Date: 05-11--2022

  
Signature of the Chairperson

Members:

Sl No	Name and affiliation	Designation	Signature
01	B.Chakravarthi Lecturer in-charge Dept of zoology P.R.Govt College (A) Kakinada.		
02	Dr.K. Ramesh Babu Prof. in Zoology Dept. of Zoology Andhra University Visakhapatnam		
03	Dr. K. Rameswari Prof. in Zoology Adikavi Nannayya University Rajamahendravaram	Subject Expert	
04	Smt. M. Vasantha Lakshmi Lecturer in zoology ASD, Govt college for women (A) kakinada	Subject Expert	
05	M V R PHANEENDRA Kakinada	Industrial Nominee	

02	Dr.K. Ramesh Babu Prof. in Zoology Dept. of Zoology Andhra University Visakhapatnam	Vice- Chancellor's Nominee	<i>[Signature]</i> Member
03	Dr. K. Ramaneswai Prof. in Zoology Adikavi Nannayya University Rajamahendravaram	Subject Expert	<i>[Signature]</i> Member
04	SMT M V VASANTHA LAKSHMI LECTURER IN ZOOLOGY ASD COLLEGE FOR WOMEN (A), KAKINADA	Subject Expert	
05	M V R PHANEENDRA	Industrial Nominee	

**DEPARTMENTAL STAFF**

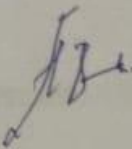
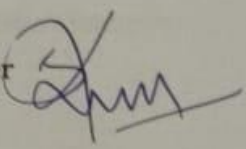
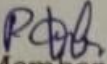

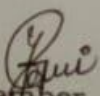
1. Dr. N. Srinivas  
Lecturer in zoology  
P.R.Govt College (A)  
Kakinada
2. B.Ahmad Ali Baba  
Lecturer in zoology  
P.R.Govt College (A)  
Kakinada

**MEMBER**

*[Signature]*  
Member

*[Signature]*  
Member



- |  |   |
|--|---|
| 3. Dr.P. Kiran Kumar<br>ordinator<br>Lecturer in Zoology<br>P.G Co-ordinator<br>P.R.Govt College (A)<br>Kakinada | Member& P.G Co-   |
| 4. B. Elia<br>Lecturer in Zoology<br>P.R.Govt College (A)<br>Kakinada  | <br>Member   |
| 5. SK. Madina Saheb<br>Lecturer in Zoology (Contract)<br>P.R.Govt College (A)<br>Kakinada                        | Member       |
| 6. P.Vijaya Chandrika<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada                         | <br>Member  |
| 7. B.Devi<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada                                     | <br>Member |
| 8. Y.Gowthami<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada                                 | <br>Member |
| 9. I.Shanthi Grace<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada                            | Member  |
| 10. J.Anudeep<br>Lecturer in Zoology(Guest)<br>P.R.Govt College (A)<br>Kakinada                                  | Member  |

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

	<b>MONTH &amp; YEAR</b>	<b>ACTIVITY</b>	<b>Tentative Date</b>	<b>Remarks</b>
1.	June 2022	Annual Curricular Plans & Department Plan of Action Community Service Project NAAC- Orientation Programme	June -2022  June-2022 3 <sup>rd</sup> Week of June	
2.	July - 2022	Guest Lectures  Mendel's Birth Day celebrations  Student Seminars 1st mid Exams (II&IV Sem)	1st week of July 20 <sup>th</sup> July  4 <sup>th</sup> week of July 27-30 <sup>th</sup> July	
3.	August - 2022	Field trip/Training programme - BZC  FDP/TOT on Dairy Technology  World Mosquito Day	1 <sup>st</sup> Week of August 2 <sup>nd</sup> week of August 20 <sup>th</sup> August	
4.	Septembe r2022	Academic Audit  Remedial classes	1st week of September  3 <sup>rd</sup> week of September	
		Extension Lecture	4 <sup>th</sup> Week of September	
		2 <sup>nd</sup> mid exams (II&IV Sem)  1 <sup>st</sup> mid exams Isem	26 <sup>th</sup> -30 <sup>th</sup>  September	
5.	October 2022	Earn While You Learn/EDP for Girl Students  Sem end practical exams  Prefinal exams	First week of October  2 <sup>nd</sup> week of October  3 <sup>rd</sup> week of October	

			14-26 October	
6.	November 2022	<p>1. II&amp;IV Sem end exams</p> <p>2. Commencement of Internship Programme for V Sem students</p> <p>3. National Seminar on Biodiversity</p>	<p>27<sup>th</sup> to 12<sup>th</sup> of November</p> <p>3rd Week of November</p> <p>4th Week of November</p>	
7.	December 2022	Certificate Course on Water Quality Assessment	December 2022	
		Field visits, Industrial visits One day workshop for students in laboratory specimen examination and preservation tech. I Mid Exam to III/V Sem	<p>2<sup>rd</sup> week of December</p> <p>20<sup>th</sup> -23<sup>rd</sup> Dec</p>	
8.	January 2023			
		Hands-on training to B.Voc students at SIFT, Kakinada	2nd week of Jan-2023	
		Field Visit to III-year BZC students II Mid Exam to III/V Sem	<p>Third week of Jan-2023</p> <p>27<sup>th</sup> to 30<sup>th</sup> Jan</p>	
9.	February 2023	<p>Certificate Course on Basic Digital Literacy –</p> <p>Work shop on Career opportunities, Prospects in Higher Education with biology background</p> <p>National Science Day</p>	<p>Feb - 2023</p> <p>4<sup>th</sup> week of February 2023</p> <p>28<sup>th</sup> February</p>	
10	March 2023	<p>Practical exams</p> <p>Student Projects for Final year students.</p> <p>Prefinal exams</p>	<p>1-13 March</p> <p>3rd week of March</p> <p>14 to 23 March</p>	

		Sem end exams	27 <sup>th</sup> to 18 <sup>th</sup> April	
11	April 2023	World Earth Day Sem end exams	22 <sup>nd</sup> April 27 <sup>th</sup> to 18 <sup>th</sup> April	
12	May 2023	One week Training Programme at CIFE, Kakinada World Biodiversity Day	Ist week of May 2023  22 <sup>nd</sup> May	

**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
		Lab	50	1		Practical	50	1
2.	Core II	Principles of Aquaculture	50	2	Major II	Chemistry	100	4
		Lab/ind.training	50	1		Practical	50	1
					Languages	English	100	3
						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
		Lab	50	1		Practical	50	1
2.	Core IV	Crafts and Gears in Fisheries	50	2	Major II	Chemistry	100	4
		Lab/ind.training	50	1		Practical	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
		Lab	50	1		Practical	50	1
	Core VI	Inland and Marine Fisheries	50	2	Major II	Chemistry	100	4
		Lab/ind.training	50	1		Practical	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	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
<b>SIX Semester</b>								
<b>INTERNSHIP</b>								

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

**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**

**B.VOC (Commercial Aquaculture) Semester-I**

**TITLE: BIOLOGY OF FIN FISH AND SHELL FISH - Core: I**  
**SYLLABUS**

<b>OBJECTIVES:</b>	<b>LEARNING OUTCOMES</b>
<ul style="list-style-type: none"><li>□ To introduce the learner to general morphology and taxonomy of fin &amp; Shell fishes. To study the Biological, Morphological and physiological characteristics of fish &amp; shellfish</li><li>□ To provide the knowledge on the taxonomic characteristics of the fin &amp; Shellfishes</li><li>□ To give an introduction to Fresh water aquaculture practices.</li></ul>	<ul style="list-style-type: none"><li>□ By the end of the course the student will be equipped with the knowledge of taxonomy, morphology &amp; physiology of fin &amp; Shellfishes.</li><li>□ Knowledge on the basic taxonomic tools for the identification of fin &amp; shell fishes will be learnt by the student.</li><li>□ At the end of the course student can able to gain the knowledge on the fresh water aquaculture practices.</li></ul>

**UNIT-I: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELL FISH**

1.1 General Characters and classification of fishes, crustaceans and molluscs up to the level of Class. Fish, Crustaceans and Molluscs of commercial importance.

1.2 Specialized organs in fishes – electric organs, Sound producing organs, Poison glands in fishes and Bioluminescence in fishes.

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

**UNIT-II: FOOD, FEEDING AND GROWTH**

2.1. Natural fish food, feeding habits, gut content analysis, structural modifications in relation to feeding habits, forage ratio and food selectivity index

2.2 Principles of Age and growth determination; Growth rate measurement – scale method, otolith method, skeletal parts as age indicators

2.3 Genetic, biotic & ecological factors in determining the longevity of fishes, length-frequency method, age composition, age-length keys, absolute and specific growth, annual survival rate, Length-weight relationship, condition factor.

**UNIT-III: REPRODUCTIVE BIOLOGY**

3.1 Breeding in fishes, breeding places, breeding habits & places, courtship and reproductive cycles

3.2 Induced breeding in fishes

3.3 Breeding in shrimp, pearl oyster, pila, and cephalopods

3.4 Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding, Embryonic and larval development of fishes and Shrimp.

**UNIT – IV: DEVELOPMENT, HORMONES AND GROWTH**

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

4.2 Endocrine system in fishes - Neurosecretary cells, androgenic gland, ovary,

4.3 Chromatophores, pericardial glands and cuticle.

4.4 Molting, molting stages, metamorphosis in crustacean shell fish

**PRESCRIBED BOOK(S):**

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

**REFERENCES:**

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, Voll. Invertebrates (eds. Marshal AJ & Williams). ELBS & Mc Millan & Co.



**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**TITLE: BIOLOGY OF FIN FISH AND SHELL FISH - Core: I**

**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODULE NO.</b>	<b>ESSAY QUESTIONS 10 MARKS</b>	<b>SHORT ANSWER QUESTIONS 5 MARKS</b>	<b>VERY SHORT ANSWER QUESTIONS 2 MARKS</b>	<b>MARKS ALLOTTED TO THE UNIT</b>
MODULE	02	01	02	29
MODULE - II	01	01	02	19
MODULE - III	01	02	02	24
MODULE - IV	01	02	02	24
<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-I Paper-I**  
**Semester End Examinations**  
**BIOLOGY OF FIN FISH & SHELL FISH CORE: I**

**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION -I**

**Answer any SIX of the following**  
**6x5=30Marks**

**(Draw labelled diagrams wherever necessary)**

1. Commercial importance of molluscs
2. Buoyancy in fishes
3. Gut content analysis
4. Length frequency method
5. Breeding habits in fishes
6. Ovo-viviparity, oviparity and viviparity
7. Y- organ and Chromatophores
8. Molting and molting stages

**SECTION -II**

**Answer any THREE the questions each question**  
**Marks**

**3x10=30**

**(Draw diagrams wherever necessary)**

9. Write an essay on General characters of fish
10. Write an essay on Principles of age determination and growth
11. Write an essay on Induced breeding in fishes
12. Write an essay on Endocrine system in fishes

## QUESTION BANK

### **CORE: I - BIOLOGY OF FIN FISH & SHELL FISH**

#### **ESSAY ANSWER QUESTIONS:**

1. Classification fishes and shell fish
2. General characters of shell fish
3. Commercial importance of shell fish
4. Buoyancy in fishes
5. Natural fish feed and feeding habits
6. Structure and modifications in relation to feeding
7. Age and growth determination
8. Length frequency method
9. Length weight relationship
10. Ecological factors in longevity of fishes
11. Breeding in fishes
12. Breeding places and breeding habits
13. Reproductive cycles
14. Parental care in fishes
15. Endocrine system in fishes
16. Reproduction and development of cultivable fish and shell fish
17. Metamorphosis in crustaceans
18. Molting and molting stages
19. Environmental factors effective reproduction.
20. Chromatophores and pericardial glands .

#### **SHORT ANSWER QUESTIONS:**

1. General characters of shell fish
2. Commercial importance of fish
3. Classification shell fish
4. Mechanism of gas secretion
5. Gut content analysis
6. Structural modifications in fishes
7. Growth rate measurement
8. Scale method and otolith method as age indicators
9. Age composition and age length keys
10. Annual survival rate
11. Length frequency method
12. Breeding in fishes
13. Breeding places and breeding habits
14. Reproductive cycles
15. Breeding in shrimp /perl oyster
16. ovo – viviparity , viviparity and oviparity
17. next building brooding
18. Chromatophores
19. Moulting and stages
20. Neuro secretory cells androgenic gland and ovary

**SEMESTER – I PAPER-I**  
**BIOLOGY OF FIN FISH & SHELL FISH**

**PRACTICALS:**

1. Study of mouth parts in herbivorous and carnivorous fishes
2. Comparative study of digestive system of herbivorous and carnivorous fishes
3. Length-weight relationship of fishes
4. Gut content analysis in fishes and shrimp
5. Mouth parts and appendages of cultivable prawns, shrimps
6. Study of eggs of fishes, shrimps, prawns
7. Study of oyster eggs
8. Embryonic and larval development of fish
9. Observation of crustacean larvae
10. Study of nest building and brooding of fishes

**SEMESTER – I PAPER-I**  
**BIOLOGY OF FIN FISH & SHELL FISH**

**PRACTICAL MODAL PAPER**

I.	Gut content analysis in fishes	10marks
II.	Identification of spotters	5X4 = 20marks
	A Crustacean of larva	
	B. Study of eggs (Oyster)	
	C. Study of eggs (fish)	
	D. Appendages of shrimp	
III.	Record	5marks
IV.	Internal assessment	15marks
	Total	50 marks

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**TITLE: PRINCIPLES OF AQUACULTURE - Core: II**  
**SYLLABUS**

OBJECTIVES	LEARNING OUTCOMES
<ul style="list-style-type: none"> <li>☐ To study the aquatic environment their components.</li> <li>☐ To study the pond ecosystem</li> <li>☐ To study the cultivable fresh water fishes</li> </ul>	<ul style="list-style-type: none"> <li>☐ By the end of the course the student will be equipped with the aquatic ecosystem</li> <li>☐ Knowledge on the pond ecosystem will be learnt by the student.</li> <li>☐ Knowledge on the cultivable fishes will be learnt by the student.</li> </ul>

**UNIT-I: INTRODUCTION**

- 1-1 Concept of Blue Revolution - History and definition of Aquaculture
- 1.2 Scope of Aquaculture at global Level, India and Andhra Pradesh
- 1.3 Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and & Semi-Intensive Systems and their significance.
- 1.4 Monoculture, Polyculture and Monosex culture systems

**UNIT-II: POND ECOSYSTEM**

- 2.1 General Concepts of Ecology, Carrying Capacity and Food Chains
- 2.2 Lotic and lentic systems, streams and springs
- 2.3 Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen
- Importance of Plankton and Benthos in culture ponds, and algal blooms
- 2.4 Concepts of Productivity

**UNIT-III: TYPES OF FISH PONDS and CONSTRUCTION**

- 3.1 Functional classification of ponds - head pond, hatchery, nursery ponds rearing, production, stocking and quarantine ponds
- 3.2 Fish Hatchery design
- 3.3 Important factors in the construction of an ideal fish pond – site selection, nature of the soil, water resources, topography. Lay out and arrangements

**UNIT- IV: POND PREPARATION AND MANAGEMENT**

- 4.1 Pond preparation for stocking, Need of fertilizer and manure application in culture ponds
- 4.2 Physico-chemical conditions of soil and water optimum for culture –temperature, depth, turbidity, light, water and shore currents, PH, DOD, CO<sub>2</sub> and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of PH

4.3 Eradication of predators and weed control – weed plants in culture ponds, aquatic weeds, weed fish, toxins used for weed control and control of predators

**PRESCRIBED BOOK(S):**

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
2. Pillay TVR, 1996. Aquaculture Principles and Practices, Fishing News Books Ltd., London

**REFERENCES:**

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc. 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
4. Bose AN et.al., 1991. Coastal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**TITLE: PRINCIPLES OF AQUACULTURE - Core: II**

**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODULE NO.</b>	<b>ESSAY QUES TIONS  10 MARK S</b>	<b>SHOR T ANSW ER QUES TIONS  5 MARK S</b>	<b>VERY SHORT ANSWE R QUEST IONS  2 MARKS</b>	<b>MAR KS ALL OTE D TO THE UNIT</b>
<b>MODULE - I</b>	02	01	02	29
<b>MODULE - II</b>	01	01	02	19
<b>MODULE - III</b>	01	02	02	24
<b>MODULE - IV</b>	01	02	02	24
<b>Total no.of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**Semester End Examinations**  
**TITLE: PRINCIPLES OF AQUACULTURE - Core: II**  
**MODEL QUESTION PAPER**

**Time: 2 hrs.**

**Max Marks: 50**

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**SECTION -I**

**Answer any SIX of the following**

**4x5 = 20Marks**

**(Draw labeled diagrams wherever necessary)**

1. Scope of aquaculture at global level
2. Extensive farming
3. Lotic and lentic systems
4. Site selection
5. Nursery ponds
6. Aquatic weeds and their control

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Write an essay on Concept of blue revolution
10. Write an essay on General concepts of Ecology
11. Write an essay on Construction of an ideal fish pond
12. Write an essay on Physico-chemical conditions of soil and water in pond



## QUESTION BANK

## PRINCIPLES OF AQUACULTURE - Core: II

### ESSAY ANSWER QUESTIONS:

1. Concept of blue revolution
2. Scope of aqua culture at global level
3. Different aqua culture systems
4. Poly culture
5. General concepts of ecology
6. Nutrient cycles in culture ponds
7. Concepts of productivity
8. Classification of ponds
9. Construction of an ideal pond
10. Fish hatchery design
11. Pond preparation for stocking
12. Physico-chemical conditions of soil and water optimum for culture
13. Eradication of predators and weed control
14. Measures to increase oxygen and reduce ammonia and hydrogen sulphide in culture ponds

### SHORT ANSWER QUESTIONS:

1. Definition of aquaculture
2. Aqua culture in AP state
3. Extensive, Intensive, semi intensive
4. Poly culture and monosex culture
5. Pond cage and pen culture
6. Carrying capacity and food chain
7. Lentic systems
8. Carbon and nitrogen cycles
9. Algal blooms and culture ponds
10. Importance of planktons and benthos
11. Classification of ponds
12. Nursery ponds rearing
13. Site selection and water resources
14. Quarantine ponds
15. Need of fertilizer and manure applications
16. PH, BOD, COD
17. Aquatic weeds
18. Toxins used for weed control
19. Control of predators
20. Weed plants and culture ponds

**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-II**  
**TITLE: FRESHWATER, BRACKISHWATER AND MARICULTURE - Core: III**  
**SYLLABUS**

<b>OBJECTIVES:</b>	<b>LEARNING OUT COME</b>
<p>To provide basic biology of the species used for brackish water aquaculture and mariculture.</p> <p>□ To provide a basic idea about various Mari culture practices.</p> <p>□ To provide basic information on fishing methods</p>	<p>Knowledge on the biology and biological cycle of the brackish water &amp; marine cultivable species will be learnt.</p> <p>Knowledge on the Mari culture will be learnt by the student.</p> <p>Knowledge on different fishing methods</p>

**UNIT-1: INTRODUCTION TO FRESHWATER AQUACULTURE**

- 1-1 Status, scope and prospects of fresh water aquaculture in the world, India and AP. Different fresh water aquaculture systems
- 1-2 Introduction, history, development and present status of brackish water farming in India. Brackish water as a medium for aquaculture, ecological factors – abiotic and biotic factors.

**UNIT-II: CARP CULTURE**

- 2-1 Major cultivable Indian carps Labeo, Catla and Cirrhinus & Minorcarps. Exotic fish species introduced to India – Tilapia, Pangassius and Clarius sp. Nursery, rearing and grow out in ponds.
- 2-2 Composite fish culture system of Indian and exotic carps
- 2-3 Impact of exotic fish, Compatibility of Indian and exotic carps and competition among them
- 2-4 Selection of site, general planning and design of brackish water farms

**UNIT-III: CULTURE OF AIR-BREATHING AND COLD WATER FISH**

- 3-1 Recent developments in the culture of clarius, anabas, murrels,
- 3-2 Advantages and constraints in the culture of air-breathing and cold water fishes- seed resources, feeding, management and production
- 3-3 Special systems of Aquaculture- brief study of culture in running water, re-circulatory systems, cages and pens, sewage-fed fish culture

**UNIT-IV: Mariculture**

- 4-1 Ecological subdivisions of the sea. Selection of site and selection of materials for sea farming.
- 4-2 Different designs of open sea farming structures – construction of cages – bioengineering problems and

solutions – scope of open sea farming in India.  
4-3 recent developments in mariculture.

Present status and

**PRESCRIBED BOOK(S):**

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
2. Sena de silva, Trevor A and Anderson 1995. Fish nutrition in aquaculture. Chapman & Hall,
3. Guilford 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, Vol. I. Invertebrates

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: FRESHWATER, BRACKISHWATER AND MARICULTURE - Core: III**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODU LE NO.</b>	<b>ESSAY QUESTIO NS  10 MARKS</b>	<b>SHORT ANSWER QUESTIO NS  5 MARKS</b>	<b>VERY SHORT ANSWER QUESTI ONS  2 MARKS</b>	<b>MARK S ALLOT ED TO THE UNIT</b>
<b>MODULE - I</b>	02	01	02	29
<b>MODULE - II</b>	01	01	02	19
<b>MODULE - III</b>	01	02	02	24
<b>MODULE - IV</b>	01	02	02	24
<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**Semester End Examinations**

**TITLE: FRESHWATER, BRACKISHWATER AND MARICULTURE - Core: III**  
**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION -I**

**Answer any SIX of the following**

**6x5 = 30Marks**

**(Draw labeled diagrams wherever necessary)**

1. Scope of fresh water aquaculture at global level
2. Primary producers
3. Site selection
4. Cage culture and pen culture
5. Abiotic and biotic factors
6. Ecological factors
7. Present status of fresh water farming
8. Fresh water aquaculture systems

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Describe the general planning and design of brackish water farms
10. Write an essay on shrimp farming culture practices
11. Write an essay on recent developments in mariculture
12. Write an essay on Monoculture and polyculture
13. Explain about Nursery, rearing and grow out in ponds

**QUESTION BANK FRESHWATER, BRACKISHWATER AND MARICULTURE Core: III**

**ESSAY ANSWER QUESTIONS:**

1. Introduction, history, development and present status of brackishwater farming in India.
2. Describe the general planning and design of brackishwater farms.
3. Explain the Biology and culture systems of *Lates calcarifer*.
4. Nursery, rearing and grow out in ponds, cages and pens.
5. Write an essay on shrimp farming culture practices.
6. Explain the pond design, management of crab farm and culture practices.
7. Explain the ecological subdivisions of the sea.
8. Write an essay on recent developments in mariculture.
9. Abiotic and biotic factors.
10. Monoculture and polyculture
11. Brackishwater farming
12. Ecological factors
13. *Mugil cephalus*
14. Biology of *Litopenaeus vannamei*
15. Semi-intensive culture
16. Open sea farming
17. Cage culture and pen culture
18. Scope of open sea farming in India

**SHORT ANSWER QUESTIONS:**

1. Present status of fresh water farming
2. Brackishwater fisheries
3. Abiotic and biotic factors
4. Marine sub-divisions
5. Primary producers
6. Monoculture and polyculture
7. Cage culture and pen culture
8. Different culture systems
9. Ecological factors
10. Open sea farming
11. Site selection of the sea farming
12. Cage culture
13. Mullet
14. Zoea larvae
15. brackishwater shrimps

**SEMESTER – II PAPER-III**

**CORE 3: FRESHWATER, BRACKISHWATER AND MARICULTURE  
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 of fish
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*, *Neptunus pelagicus*, *N. Sanguinolentus*
8. Identification of lobsters – *Panulirus polyphagus*, *P.ornatus*, *P.homarus*, *P.sewelli*, *P.penicillatus*
9. Identification of oysters of nutritional significance – *Crossostrea madrasensis*, *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.

**SEMESTER – II PAPER-III**

**CORE 3: FRESHWATER, BRACKISHWATER AND MARICULTURE  
PRACTICAL MODAL PAPER**

- |   |          |
|---|----------|
| I. Identify the following specimens and write a short notes on their commercial | 10 M     |
| II. Importance  | 5x4=20   |
| M   |          |
| a. Carp   |          |
| b. Freshwater prawn   |          |
| c. Stages of prawn  |          |
| d. Crab   |          |
| e. Oysters  |          |
| f. Mussel/clam  |          |
| III. Record   | 05M      |
| IV. Internal assessment   |          |
| 15M   |          |
| Total   | 50 marks |



**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: CRAFTS AND GEARS IN FISHERIES - Core: IV**  
**SYLLABUS**

<b>OBJECTIVES:</b>	<b>LEARNING OUT COME</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> To develop basic knowledge about various crafts</li> <li><input type="checkbox"/> To understand operation of various fishing gears</li> <li><input type="checkbox"/> To create awareness about fish finding devices.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Student will learn the knowledge on the crafts.</li> <li>➤ Mechanism involved in the operation of the fishing gear will be learnt by the student.</li> <li>➤ Tools for the identification of fishery resources will be learnt by the student.</li> </ul>

**UNIT I: Inland Fishing Crafts and Gears**

- 1.1. Introduction, Different types of fishing crafts and gears in India; Crafts-Rafts, Boats; Gears-Trap net, Hand net, Drag net, fixed net and miscellaneous types.
- 1.2. Boat building materials - wood, steel, FRP, ferro-cement, aluminum etc.

**UNIT II: Marine Fishing Crafts and Gears**

- 2.1. Introduction, - crafts of the east coast and west coast. Gears-Fixed nets, Trawl nets, shore seines, drift nets, cast nets, trap nets, dip nets (scoop nets), long line and hooks.
- 2.2. Factors affecting the design of fishing gears and fish catching methods. Fishing accessories.
- 2.3. Introduction to netting materials - natural and synthetic fishing gear materials. Yarn numbering systems.

**UNIT III: Active Fishing Gears, Passive Gears and Unconventional Fishing methods**

- 3.1. Active fishing gears, passive gears
- 3.2. Destructive and Prohibited fishing practices, fishing methods like electrical fishing, light fishing; Angling (line fishing) poisoning and use of dynamites.

**UNIT IV: Fish Finding Devices and Conservation.**

- 4.1. Introductory information on echo-sounder, sonar, global positioning systems, remote sensing.
- 4.2. Potential fishing zones (EEZ) Turtle Exclusion Devices (TED) - By-catch Reduction Devices (BRD).

**PRESCRIBED BOOK(S):**

1. Boopendranath, M.R., Meenakumari, B., Joseph, J., Sankar, T.V., Pravin,P., and Edwin, L. (Eds.) 2002, Riverine and Reservoir Fisheries of India, Society of Fisheries Technologists (India), Cochin.
2. Brandt. A. v. (1984) Fish catching methods of the world. Fishing News Books Ltd., London: 432 p.
3. George V.C. (1971) An account of the inland fishing gears and methods of India. Spl. Bull.No.1.CIFT
4. Hameed, M.S. and Boopendranath, M.R. (2000) Modern Fishing Gear Technology, Daya Publishing House, Delhi:186p.
5. Klust, G. (1982) Netting materials for fishing gear, FAO Fishing Manual, Fishing News Books (Ltd)., Farnham,192p.

**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: CRAFTS AND GEARS IN FISHERIES - Core: IV**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODU LE NO.</b>	<b>ESSAY QUESTIO NS  10 MARKS</b>	<b>SHORT ANSWER QUESTIO NS  5 MARKS</b>	<b>VERY SHORT ANSWER QUESTI ONS  2 MARKS</b>	<b>MARK S ALLOT ED TO THE UNIT</b>
<b>MODULE - I</b>	02	01	02	29
<b>MODULE - II</b>	01	01	02	19
<b>MODULE - III</b>	01	02	02	24
<b>MODULE - IV</b>	01	02	02	24
<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**Semester End Examinations**  
**TITLE: CRAFTS AND GEARS IN FISHERIES - Core: IV**  
**MODEL QUESTION PAPER**

**Time: 2 hrs.**

**Max Marks: 50**

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**SECTION -I**

**Answer any SIX of the following**  
**20Marks**

**4x5**

**=**

**(Draw labeled diagrams wherever necessary)**

1. Mechanized boat
2. Fishing accessories
3. Modern fishing gears
4. Traditional fishing gears
5. Electrical fishing
6. Remote sensing & Echo-sounder

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Give an account of the different types of fishing crafts in India?  
Explain the traditional methods.
10. What is netting material? Explain the natural and synthetic fishing gear materials.
11. Explain the factors affecting the design of fishing gears and methods
12. Explain the design and operation of different types of fishing gears.
13. What is the conservation? Explain the potential fishery zones

## QUESTION BANK CORE IV: CRAFTS AND GEARS IN FISHERIES

### ESSAY ANSWER QUESTIONS:

1. Give an account of the different types of fishing crafts in India? Explain the traditional methods.
2. What is netting material? Explain the natural and synthetic fishing gear materials.
3. Active fishing gears, passive gears
4. Explain the factors affecting the design of fishing gears and methods.
5. Describe the modern fishing gears.
6. Explain the design and operation of different types of fishing gears.
7. What is the conservation? Explain the potential fishery zones.
8. Mechanized boat
9. Fishing accessories
10. Modern fishing gears
11. Traditional fishing gears
12. Prohibited fishing practices
13. Electrical fishing
14. Remote sensing
15. Active gears
16. Passive gears
- a. Potential fishing zones (EEZ)
17. Turtle Exclusion Devices (TED) -
18. By-catch Reduction Devices (BRD)

### SHORT ANSWER QUESTIONS:

1. Purse seiners
2. FRP
3. RCC
4. Dol net
5. Dip net
6. Cast net
7. Dynamites
8. Echo-sounder
9. light fishing
10. Traditional fishing gears
11. Prohibited fishing practices
12. Electrical fishing
13. Remote sensing
14. Active gears
15. Passive gears
16. Potential fishing zones (EEZ)

**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-III**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**SYLLABUS**

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<b>OBJECTIVES:</b>	<b>LEARNING OUT COME</b>
<ul style="list-style-type: none"> <li>➤ To provide a basic understanding about fish nutrition.</li> <li>➤ Provide the knowledge on the Fish feeding physiology, nutritional requirements.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Student will learn the concept of the fish nutrition,.</li> <li>➤ Knowledge on the physiology of fish feeding and nutritional requirements will be learnt by the students.</li> <li>➤ Knowledge on the fish feed composition, formulation and balanced diet will be learned.</li> </ul>

**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. Hopher,B. and Pruginin,Y. Commercial Fish Farming



**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODU LE NO.</b>	<b>ESSAY QUESTIO NS  10 MARKS</b>	<b>SHORT ANSWER QUESTIO NS  5 MARKS</b>	<b>VERY SHORT ANSWER QUESTI ONS  2 MARKS</b>	<b>MARK S ALLOT ED TO THE UNIT</b>
<b>MODULE - I</b>	02	01	02	29
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<b>MODULE - IV</b>	01	02	02	24
<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**Semester End Examinations**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION -I**

**Answer any SIX of the following**

**6x5 = 30Marks**

**(Draw labeled diagrams wherever necessary)**

1. Non protein nitrogen
2. Preservatives
3. Fermented products
4. Feed formulation
5. Floating and sinking
6. Feed energetic
7. Larval nutrition
8. Square method
9. Rancidity

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

10. Describe the essential fatty acids.
11. Write an essay on anti nutritional factors.
12. Write an essay storage and transportation of feeds.
13. Explain the feed conversion efficiency.
14. Write essay on natural food and its importance in aquaculture.

**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	05 M
IV. Record	05 M
V. Field Note book	05 M
VI. Internal assessment	15 M
<b>Total</b>	<b>50 marks</b>

**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**

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<b>OBJECTIVES:</b>	<b>LEARNING OUT COME</b>
<ul style="list-style-type: none"> <li>➤ To study the Riverine, Reservoir and Estuarine fisheries.</li> <li>➤ To understand pelagic fishery resources and demersal resources</li> </ul>	<ul style="list-style-type: none"> <li>➤ Student learns the knowledge on the inland fishery resources</li> <li>➤ Student learns the knowledge on the pelagic and demersal fishery resources</li> </ul>

**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 Lacustrine Fisheries**

- 2.1. Reservoir fisheries- Major reservoirs in India- important characteristic features of reservoirs.
- 2.2. Lacustrine 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 fishes;
- 3.2. Coastal fisheries – Elasmobranch fishery; Teleost fishery- Sardines, Anchovies, Mackerel, Mumbai duck, Catfishes, Eels, Ribbon fish, Perches, Mulletts, 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 FOR QUESTION PAPER SETTER**

<b>MODULE NO.</b>	<b>ESSAY QUESTIONS 10 MARKS</b>	<b>SHORT ANSWER QUESTIONS 5 MARKS</b>	<b>VERY SHORT ANSWER QUESTIONS 2 MARKS</b>	<b>MARKS ALLOTTED TO THE UNIT</b>
<b>MODULE - I</b>	02	01	02	29
<b>MODULE - II</b>	01	01	02	19
<b>MODULE - III</b>	01	02	02	24
<b>MODULE - IV</b>	01	02	02	24
<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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



**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**

**Time: 2 hrs.**

**Max Marks: 50**

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**SECTION -I**

**Answer any SIX of the following**  
**20Marks**

**4x5 =**

**(Draw labeled diagrams wherever necessary)**

1. Capture fisheries
2. Deep resources
3. Fishing gear
4. Reservoir
5. Cephalopods
6. Flying fish
7. Elasmobranches

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

8. Write essay on major riverine systems in India.
9. Define estuary? Write about the classification of estuaries?
10. Write about major pelagic resource groups
11. Describe the fishing methods? Write about recent catch statistics.
12. Write essay on fishing policies and problems.

## 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
<ul style="list-style-type: none"> <li>➤ To understand the various types of diseases among the cultivable fishes, to learn and apply methods of control and precaution of diseases.</li> <li>➤ To understand the tools for diagnosis, and disease management strategies available today.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Knowledge on the diseases will be learnt.</li> <li>➤ Precautionary measures will be known to prevent the spread of the disease.</li> <li>➤ Knowledge on the diagnostic tools will be learnt.</li> <li>➤ Environmental quality disease free practice will be learnt.</li> </ul>

**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 – *Baculovirus penaeii*, Monodon Baculovirus, Baculoviral midgut necrosis, IHHNV, Hepatopancreatic parvo like virus, Yellow head baculovirus, white spot baculovirus.

**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 Aquaculture.

**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 Pisciculture –
- 4 Wheaton,F.W. Aquacultural Engineering
- 5 Bose et al. Coastal Aquacultural Engineering

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: PATHOLOGY IN AQUACULTURE - Core: VII**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODULE NO.</b>	<b>ESSAY QUESTIONS 10 MARKS</b>	<b>SHORT ANSWER QUESTIONS 5 MARKS</b>	<b>VERY SHORT ANSWER QUESTIONS 2 MARKS</b>	<b>MARKS ALLOTTED TO THE UNIT</b>
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<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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

**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: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION -I**

**Answer any SIX of the following**

**6x5 = 30Marks**

**(Draw labeled diagrams wherever necessary)**

1. Fish diseases
2. Brachiomyxosis
3. Metazoan diseases
4. Bacterial diseases
5. Nutritional cataract
6. Diagnostic tools
7. Sustainable aquaculture
8. CCVD & IHN

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. What is parasitism? Explain the host parasite relationship.
10. Write an essay on shrimp viral diseases and prophylaxis.
11. Explain about the protozoan diseases and their treatment.
12. Describe the vitamin deficiency diseases.
13. Explain the diagnostic tools of immunology.

**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. Aflatoxin
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, hepatopancreas, lymphoid organ, muscles and nerves of prawn and shrimp
6. Collection, processing and analysis of data for epidemiological investigations of viral diseases
7. Bacterial pathogens – isolation, culture and characterization
8. Identification of parasites in fishes: Protozoan, Helminths, Crustaceans
9. Antibigrams – 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 | 10M        |
| 2. Identification of spotters   | 4X5=20M    |
| A) .....  |            |
| B) .....  |            |
| C) .....  |            |
| D) .....  |            |
| E).....   |            |
| 3. Record   | 05M        |
| 4. Continuous Internal Assessment   | 15M        |
| <b>Total</b>  | <b>50M</b> |

**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
<ul style="list-style-type: none"> <li>➤ To understand the various types of diseases among the cultivable fishes, to learn and apply methods of control and precaution of diseases.</li> <li>➤ To understand the tools for diagnosis, and disease management strategies available today.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Knowledge on the diseases will be learnt.</li> <li>➤ Precautionary measures will be known to prevent the spread of the disease.</li> <li>➤ Knowledge on the diagnostic tools will be learnt.</li> <li>➤ Environmental quality disease free practice will be learnt.</li> </ul>

**UNIT I: Introduction**

- 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

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: FISHERIES MANAGEMENT - Core: VIII**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

<b>MODULE NO.</b>	<b>ESSAY QUESTIONS 10 MARKS</b>	<b>SHORT ANSWER QUESTIONS 5 MARKS</b>	<b>VERY SHORT ANSWER QUESTIONS 2 MARKS</b>	<b>MARKS ALLOTTED TO THE UNIT</b>
<b>MODULE - I</b>	02	01	02	29
<b>MODULE - II</b>	01	01	02	19
<b>MODULE - III</b>	01	02	02	24
<b>MODULE - IV</b>	01	02	02	24
<b>Total no. of Questions</b>	<b>05</b>	<b>06</b>	<b>08</b>	
<b>Total Marks including choice</b>				<b>96</b>

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

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**Semester End Examinations**  
**TITLE: FISHERIES MANAGEMENT - Core: VIII**

**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION -I**

**Answer any SIX of the following**  
**30Marks**

**6x5 =**

**(Draw labeled diagrams wherever necessary)**

1. Definition of fisheries management
2. Scientific techniques of management
3. Training and motivation
4. MPEDA and CIFT
5. Marine fisheries act
6. Matsyafed
7. Importance in fish production and marketing
8. Role of NABARD and SIDBI

**SECTION -II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Describe the scope and importance of fisheries management
10. Explain about Human resource management
11. Describe the criteria for regulation of fishing effort
12. Write about the important role of NCDC
13. Write a brief note on marine fisheries act

**ESSAY ANSWER QUESTIONS:**

1. Describe the scope and importance of fisheries management
2. Define management and explain about functions of managers
3. Write about the Environmental impacts of fisheries management
4. Explain about Human resource management
5. Describe organizational development
6. Write about the role of HRD in the context of fisheries sector
7. Explain briefly about processing sector management
8. Explain briefly about the role of EIA and MPEDA in processing industry
9. Write about the India's share in the international trade of sea foods.
10. Write about Indian fisheries act
11. Describe the criteria for regulation of fishing effort
12. Write about the important acts of fisheries in Andhra Pradesh
13. Write a brief note on marine fisheries act
14. Write the definition and principles of cooperatives
15. Write about the important role of NCDC
16. Write the role of FFDA, BFFDA and FIRMA
17. What are problems of fisheries cooperatives

**SHORT ANSWER QUESTIONS:**

1. Definition of fisheries management
2. Planning and organizing
3. Staffing, directing and controlling
4. Scientific techniques of management
5. Training and motivation
6. Organizational communication
7. MPEDA and CIFT
8. Export of marine products
9. Present status of marine production in india
10. Indian fisheries act
11. Marine fisheries act
12. NCDC
13. Matsyafed
14. BFFDA and FIRMA
15. Importance in fish production and marketing
16. Role of NABARD and SIDBI

**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. GOVERNMENT COLLEGE (A), KAKINADA**

**CHOICE BASED CREDIT SYSTEM**

**B VOC COMMERCIAL AQUACULTURE**

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

**I. COURSE OUT COMES:**

- 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. Raghuraman and 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

**P. R. GOVERNMENT COLLEGE (A) KAKINADA**

**B VOC COMMERCIAL AQUACULTURE**

**TITLE OF THE COURSE: MARINE BIOLOGY  
SEMESTER -V CORE IX  
MODEL QUESTION PAPER**

**Time: 2 ½ hrs. Max Marks: 60**

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**PART - 1**

**Note: Answer any THREE questions choosing at least one question from each section. Draw diagrams where ever necessary. 3 x10 = 30 Marks**

**SECTION- A**

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.

**SECTION- B**

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

**Part - II**

Answer any **Six** question

**6x5=30M**

6. Sea weed
7. Primary production
8. Marine food chain
9. Rocky shore- environment
10. Coral reefs ecological importance
11. Nekton habitats
12. Bioluminescence
13. Red tides
14. Classification of Marine mammals
15. Body heat conservation by marine mammals

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**P. R. GOVERNMENT COLLEGE (A) KAKINADA**

**B VOC COMMERCIAL AQUACULTURE**

**TITLE OF THE COURSE: MARINE BIOLOGY**

**SEMESTER -V CORE IX**

**Time: 2 ½ hrs. Max Marks: 60**

**BLUE PRINT**

<b>MODULE NO.</b>	<b>ESSAY QUESTION S 10 MARKS</b>	<b>SHORT ANSWER QUESTIONS 5 MARKS</b>	<b>MARKS ALLOTTED TO THE UNIT</b>
MODULE - I	02	01	25
MODULE - II	01	02	20
MODULE - III	01	02	20
MODULE - IV	01	03	25
MODULE - IV	01	02	20
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

**P. R. GOVERNMENT COLLEGE (A) KAKINADA**

**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:

- Operate the instruments for collection of plankton
- Identify the plankton
- Preserve the plankton

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

14. Study of common instruments used for collection of phytoplankton
15. Study of common instruments used zooplankton
16. Study of common instruments benthos.
17. 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/2264/95/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](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**

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

**Semester – V Course CORE X : MARINE FISHERIES**

**Learning Outcomes:**

- 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.

**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**

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**PART - 1**

**Note: Answer any THREE questions choosing at least one question from each section. Draw diagrams where ever necessary.**

**3 x10 = 30 Marks**

**SECTION- A**

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

**SECTION- B**

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.

**Part - II**

Answer any **Six** question

**6x5=30M**

7. Marine fishery of AP
8. Ribbon fish
9. Bombay duck
10. Conservation of pelagic fish stock
11. Silver belly fish
12. EEZ of India
19. Deep sea fishing policy
20. Red tide

21. GIS in capture fishery
22. Seaweed economic importance

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**P. R. GOVERNMENT COLLEGE (A) KAKINADA**

**TITLE OF THE COURSE: MARINE BIOLOGY  
SEMESTER -V CORE X**

**Time: 2 ½ hrs. Max Marks: 60**

**BLUE PRINT**

<b>MODULE NO.</b>	<b>ESSAY QUESTION S 10 MARKS</b>	<b>SHORT ANSWER QUESTIONS 5 MARKS</b>	<b>MARKS ALLOTTED TO THE UNIT</b>
MODULE - I	02	01	25
MODULE - II	01	02	20
MODULE - III	01	02	20
MODULE - IV	01	03	25
MODULE - IV	01	02	20
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

**P.R. GOVERNMENT COLLEGE (A), KAKINADA**

**CHOICE BASED CREDIT SYSTEM**

**B VOC COMMERCIAL AQUACULTURE**

**CORE X: MARINE FISHERIES**

**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://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,

Commissionerate of Collegiate Education

**P. R. GOVERNMENT COLLEGE (A) KAKINADA**

**TITLE OF THE COURSE: MARINE FISHERIES  
SEMESTER -V CORE X**

**CORE X: 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 visit to Fish landing center with photos and catches 25 Marks
3. Record  
5 Marks



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

LIST OF EXAMINERS

S.No	Name of the Examiners	Subject	Name of the College
01	Prof. G. Mani	Zoology	GDC (M), Srikakulam
02	D. K. Rama Rao	Zoology	VSK College , Vizag
03	Dr. R. Ramachandra Rao	Zoology	GDC, Rajam
04	K. Sujatha	Zoology	GDC (W),Srikakulam
05	N. Suneetha	Zoology	SRR&CVR GDC (A)
06	M. Vijaya Kumar	Zoology	SRR&CVR GDC (A)
07	Dr. G Vijaya Prathap	Zoology	GDC ,Yalamanchala
08	A. Arjuna apparao	Zoology	GDC ,Yalamanchala
09	Dr. Samuel Devid Raj	Zoology	Dr. VSK GDC (A)
10	Dr. R. Praveen Dathu	Zoology	GDC ,Thiruvuru
11	Dr. V. Sandhya	Zoology	GDC,kaikaluru
12	Dr.Y.PoliNaidu	Zoology	GDC,Srikakulam
13	Dr.P.JohnKiran	Zoology	GDC Perumallapuram
14	Dr.P Jaya	Zoology	Dr. V. S. K(A) Vizag
15	Dr. P. R Vani	Zoology	Dr.V.S.K(A)Vizag
16	Smt. M. Vasantha Lakshmi	Zoology	ASD Women's(A) Kakinada
17	Dr. G. Sithamma	Zoology	Dr. KV R (W),Karnool
18	M.Himasridevi	Zoology	SKRCollege(W),Rajahmandry
19	Dr.P.S.C.H.PDeepikaRani	Zoology	SKRCollege(W),Rajahmandri
20	M.Kasma	Zoology	SKRCollege(W),Rajahmandri

Lecturer in charge- Dept of Zoology

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)

KAKINADA

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

LIST OF QUESTION PAPER SETTERS

DEPARTMENT OF ZOOLOGY

S.N	Name of the Examiners	Subject	Name of the College
01	Dr.Samuel Devid Raj	Zoology	V.S.K. College(A) , Vizag
02	Dr.P.R Vani	Zoology	V.S.K. College(A) , Vizag
03	Dr.Y. Poli Naidu	Zoology	GDC, Srikakulam
04	Dr. P. John Kiran	Zoology	GDC, Perumallapuram
05	Smt. M. Vasantha Lakshmi	Zoology	A.S.D Women's College (A)
06	Dr. P Jaya	Zoology	Dr. VSK College(A), Vizag.
07	Dr. G. Mani	Zoology	GDC (M) Srikakulam
08	D. K. Rama Rao	Zoology	Dr. VSK (A) Vizag
09	P.S.C.H.P Deepika Rani	Zoology	SKRCollge(W),Rajahmandri
10	Dr. G Vijaya Prathap	Zoology	GDC,Yalamanchala
11	A. Arjun Apparao	Zoology	GDC,Yalamanchala
12	Dr. Praveen Dathu	Zoology	GDC,Thiruvuru
13	Dr. V Sandhya	Zoology	GDC,kaikaluru
14	Dr.G.Sithamma	Zoology	GDC,Thiruvuru

Lecturer in charge- Dept of Zoology