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

KAKINADA

XXII–BOARD OF STUDIES

AQUACULTURE TECHNOLOGY

DEPARTMENT OF

Zoology and Aquaculture

2022-23

(CHOICE BASED CREDIT SYSTEM)

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

Index

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.Vasantha 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

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

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 21st century student capable of facing challenges, adaptive to changes, creative and innovative.

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

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

The Chairmen are, therefore, requested to

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

- The Chairmen shall submit minutes of the meeting in the prescribed format only (Annexure – II) in triplicate to the Academic cell for onward submission to the IQAC, Examination cell and library within three days from the commencement of the examination.
- Each Chairman of BOS, shall get the rough draft of the curricula verified by the Principal, Academic Cell and IQAC before the actual BOS meetings to ensure uniformity among the departments.

- The Academic Cell coordinator shall be the Chief Coordinator for the BOS meeting activity and IQAC coordinator will be the additional coordinator.
- The Academic Coordinator and IQAC coordinator shall conduct a meeting with the Chairmen, BOS between 28-29 September 2022 and explain the structure of curricula, uniformity other modalities.
- The Controller of Examinations of the institution shall fund the BOS meeting expenditure from the available funds on the condition of reimbursement after receiving autonomous funds from UGC. Initially he shall pay Rs. 5,000/- uniformly as an advance to each Chairman towards each course (If BOS meetings for multiple courses are held under one Chairmanship, he/ she shall be given advance amount equivalent to the number of courses x Rs.500/-)
- The Chairman of each BOS shall apply to the principal for advance amount for meeting the BOS meetings with head-wise expenditure in the prescribed format (Annexure-III).

BOS document should contain the following contents in order

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

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

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

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

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

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.

Signature of the

Date: 05-11--2022

Chairperson

Members:

Sl No	Name and affiliation	Designation	Signature
01	B.Chakravarthi Lecturer in-charge Dept of zoology P.R.Govt College (A) Kakinada.	Lecture in-charge	

13

02	Dr.K. Ramesh Babu Prof. in Zoology Dept. of Zoology Andhra University Visakhapatnam	Vice-Chancellor's Nominee	Attended online
03	Dr. K. Ramaneswai Prof. in Zoology Adikavi Nannayya University Rajamahendravaram	Subject Expert	Attended online
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

MEMBER

Member

1. Dr. N. Srinivas
Lecturer in zoology
P.R.Govt College (A)
Kakinada

Member

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

3. Dr.P. Kiran Kumar
ordinator
Lecturer in Zoology
P.G Co-ordinator
P.R.Govt College (A)
Kakinada

Member& P.G Co-

4. B. Elia
Lecturer in Zoology
P.R.Govt College (A)
Kakinada

Member

5. SK. Madina Saheb
Lecturer in Zoology (Contract)
P.R.Govt College (A)
Kakinada

Member

6. P.Vijaya Chandrika
Lecturer in Zoology (Guest)
P.R.Govt College (A)
Kakinada

Member

7. B.Devi
Lecturer in Zoology (Guest)
P.R.Govt College (A)
Kakinada

Member

8. Y.Gowthami
Lecturer in Zoology (Guest)
P.R.Govt College (A)
Kakinada

Member

9. I.Shanthi Grace
Lecturer in Zoology (Guest)
P.R.Govt College (A)
Kakinada

Member

10. J.Anudeep
Lecturer in Zoology(Guest)
P.R.Govt College (A)
Kakinada

11. Y.Nagavalli
Member
Lecturer in Zoology(Guest)
P.R.Govt College (A)
Kakinada

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 inIII Semester.
10. Implementation of Community Service Project and Internship Programmes introduced from 2020-2021 admitted batch.
11. Continuous Internal Assessment pattern (CIA) introduced by APCCE from 2021-2022 admitted batch onwards
12. Designing and conduct of workshops and seminars
13. Arrangement of skill development, training programmes and MOUs.
15. Conduct of Bridge Course and Remedial Coaching.
16. 75% attendance compulsory for Mid and Sem End Exams.
17. Any other proposal with the permission of the Chair.

Discussion:

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

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

PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA

DEPARTMENT OF ZOOLOGY

BOARD OF STUDIESMEETING (2022-23) CONVENED ON 05TH NOVEMBER2022

Resolutions

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

The following resolutions are made.

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

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

Resolution-2

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

Resolution-3

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

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

Resolution-4

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

Resolution-5

It is resolved to adopt newly introduced Skill Enhancement Courses (SEC's) in Zoology for the academic year 2022-2023 by 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 6 & 7	Name of Course	Hours/ Week	Credits	Marks	
				IA – 20 Filed Work 05	Sem End
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) between1stand2ndyear, II Phase of Internship between2ndand3rd yearand III phase of internship during entire 6th Semester from 2020-2021 admitted batch onwards.

Resolution-11

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

Resolution-12

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

Resolution-13

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

Resolution-14

It is resolved to conduct Co- curricular activities like Student Seminars, 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.

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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.	Lecture in-charge	
02	Dr.K. Ramesh Babu Prof. in Zoology Dept. of Zoology Andhra University Visakhapatnam	Vice-Chancellor's Nominee	
03	Dr. K. Ramaneswai Prof. in Zoology Adikavi Nannayya University Rajamahendravaram	Subject Expert	
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DEPARTMENTAL STAFF	MEMBERS
1. Dr. N. Srinivas Lecturer in zoology P.R.Govt College (A) Kakinada	Member
2. B.Ahmad Ali Baba Lecturer in zoology P.R.Govt College (A) Kakinada	Member
3. Dr.P. Kiran Kumar Lecturer in Zoology P.R.Govt College (A) Kakinada	Member
4. B. Elia Lecturer in Zoology P.R.Govt College (A) Kakinada	Member
5. SK. Madina Saheb Lecturer in Zoology (Contract) P.R.Govt College (A) Kakinada	Member
6. P.Vijaya Chandrika Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member
7. B.Devi Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member
8. Y.Gowthami Lecturer in Zoology (Guest) P.R.Govt College (A) Kakinada	Member

PITHAPUR RAJAH'S GOVT COLLGE (A), KAKINADA

ACTION PLAN 2022-23

DEPARTMENT OF ZOOLOGY & Aquaculture

	MONTH & YEAR	ACTIVITY	Tentative Date	Remarks
1.	June 2022	Annual Curricular Plans & Department Plan of Action Community Service Project NAAC- Orientation Programme	June -2022 June-2022 3rd Week of June	
2.	July - 2022	Guest Lectures Mendel's Birth Day celebrations Student Seminars 1st mid Exams (II&IV Sem)	Ist week of July 20th July 4th week of July 27-30th July	
3.	August – 2022	Field trip/Training programme – BZC FDP/TOT on Dairy Technology World Mosquito Day	1st Week of August 2nd week of August 20th August	
4.	September2022	Academic Audit Remedial classes	Ist week of September 3rd week of September	
		Extension Lecture	4th Week of September	
		2nd mid exams (II&IV Sem) 1st mid exams Isem	26th -30th September	
5.	October 2022	Earn While You Learn/EDP for Girl Students Sem end practical exams Prefinal exams	First week of October 2nd week of October 3rd week of October 14-26 October	
6.	November2022	1. II&IV Sem end exams 2. Commencement of Internship Programme for V Sem students 3. National Seminar on Biodiversity	27th to 12th of November 3rd Week of November 4th Week of November	

7.	December2022	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	2rd week of December 20th -23rd Dec	
8.	January 2023			
		Hands-on training to B.Voc students at SIFT, Kakinada	2ndweek of Jan-2023	
		Field Visit to III-year BZC students II Mid Exam to III/V Sem	Third week of Jan-2023 27th to 30th Jan	
9.	February 2023	Certificate Course on Basic Digital Literacy – Work shop on Career opportunities, Prospects in Higher Education with biology background National Science Day	Feb - 2023 4th week of February 2023 28th February	
10	March 2023	Practical exams Student Projects for Final year students. Prefinal exams Sem end exams	1-13 March 3rd week of March 14 to 23 March 27th to 18th April	
11	April 2023	World Earth Day Sem end exams	22nd April 27th to 18th April	
12	May 2023	One week Training Programme at CIFE, Kakinada World Biodiversity Day	Ist week of May 2023 22nd May	

Year	Semester	paper	COURSE TITLE	Marks		credits
				CIA	SEE	
I	I	I	BASIC PRINCIPLES OF AQUACULTURE	50	50	03
			Practical - I		50	02
	II	II	BIOLOGY OF FIN FISH & SHELL FISH	50	50	03
			Practical - II		50	02
II	III	III	FISH NUTRITION & FEED TECHNOLOGY	50	50	03
			Practical - III		50	02
	IV	IV	FRESHWATER & BRACKISHWATER AQUACULTURE	50	50	03
			Practical - IV		50	02
		V	FISHERIES EXTENSION, ECONOMICS & MARKETING	50	50	03
			Practical - V		50	02
III	V	VI	MARINE BIOLOGY	40	60	03
			MARINE BIOLOGY- LAB		50	02
		VII	MARINE FISHERIES	40	60	03
			MARINE FISHERIES LAB		50	02
	VI		APPRENTICE SHIP			

P .R.GOVERNMENT COLLEGE (A) KAKINADA

DEPARTMENT OF ZOOLOGY & AQUACULTURE

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

As per the **National Education Policy, 2019 the outcomes of Higher Education** include increased critical thinking abilities, higher order thinking and deeper learning ,mastery of content, problem solving, team work and communication skills besides general engagement and enjoyment of learning including systematic research in India.

The overall objectives of the learning outcomes-based curriculum framework are to:

- Help formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes that are expected to be demonstrated by the holder of a qualification;
- Enable prospective students, parents, employers and others to understand the nature and leveloflearningoutcomes(knowledge,skills,attitudesandvalues)orattributesagraduate of a programmed should be capable of demonstrating on successful completion of the programmers of study.
- Programme Educational Objectives(PEOs):

PEO1Higher Education: Empower students to pursue higher studies in various fields of Biology and Chemistry.

PEO2Career: Enable students to pursue careers in Chemical, Biological and related fields as demonstrated by professional success at positions within industry, government, or academia.

PEO3Social responsibility: Enable students to exhibit professionalism, ethical attitude , communication skills and team work in their profession.

Program Outcomes (POs):

The Learning Outcomes of the programme could be in consonance with the **Bloom's Taxonomy**, which includes–

1. Remember (Lower order)
2. Understand (Lower Order)
3. Apply (Lower Order)
4. Analyze (Higher Order)
5. Evaluate &Problem Solving (Higher Order)
6. Create (Higher Order)

PO1 Critical thinking: Able to understand and utilize the principles of scientific enquiry, think analytically, clearly and evaluate critically while solving problems and making decisions during biological study.

PO2 Effective communication: Able to formally communicate Scientificideasandinvestigationsofthebiologydisciplinetoothersusingbothoraland written communication skills.

PO3 Social interaction: Able to develop individual behavior and influence society and social structure.

PO4 Effective citizenship: Able to work with a sense of responsibility towardssocial awareness and follow the ethical standards in the society.

PO5 Ethics: Ability to demonstrate and discuss ethical conduct in scientific activities.

PO6Environment and Sustainability: Able to understand the impact of biological science in societal and environmental contexts and demonstrate the knowledge for sustainable development.

PO7Self-directed and life-long learning: Able to recognize the need of life-long learning and engage in research and self-education.

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

CourseObjectives:

1. Describe general taxonomic rules on animal classification
2. Classify Protozoa to Coelenterate with taxonomic keys
3. Classify Phylum Platy helminthes to Annelida phylum using examples from parasitic adaptation and vermin composting
4. Describe Phylum Arthropods to Mollusca using examples and importance of insects and Mollusca's
5. Describe Echinodermata to Hemi chordata with suitable examples and larval stages in relation to the phylogeny

CourseOutcomes:

OnCompletion of thecourse, the students willbeable to-	
CO1	Describe the concept of blue revolution and different aqua culture systems
CO2	Explain the pond ecosystem
CO3	Describe the different types of fish ponds
CO4	Explain the steps of pond preparation
CO5	Describe the pond management practices

Learning objectives

1. To understand the concept of blue revolution and different aqua culture systems .
2. To understand the pond ecosystem .
3. To understand the different types of fish ponds.
4. To understand steps of pond preparation.
5. To understand the pond management practices

Course with focus on employability / entrepreneurship / Skill Development modules :

Skill Development		Employability		Entrepreneurship		knowledge	

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 ponds –temperature, depth, turbidity, light, water, PH, DOD, CO_2 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

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

TITLE: BASIC PRINCIPLES OF AQUACULTURE
(WITH EFFECTIVE FROM 2020-2021)
MODEL QUESTION PAPER

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

SECTION –I

Answer any FIVE of the following **5X4= 20Marks**

(Draw labelled diagrams wherever necessary)

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

SECTION –II

Answer Any THREE of the following each question carries 10 marks **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
13. Write an essay on Fish hatchery design

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 4 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	02	20
MODULE – III	01	02	20
MODULE – IV	02	02	30
Total no.of Questions	05 Of which 3 to be answered	08 Of which 5 to be answered	90 marks including choice Of which 50 marks to be answered

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

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

QUESTION BANK

- **ESSAYS**

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

SHORTS

15. Definition of aquaculture
16. Aqua culture in AP state
17. Extensive ,Intensive,semi intensive
18. Poly culture and monosex culture
19. Pond cage and pen culture
20. Carrying capacity and food chain
21. Lentic systems
22. Carbon and nitrogen cycles
23. Algal blooms and culture ponds
24. Importance of planktons and bethos
25. Classification of ponds
26. Nursery ponds raring
27. Site selection and water resources
28. Quarantine ponds
29. Need of fertilizer and manure applications
30. PH,BOD,COD
31. Aquatic weeds
32. Toxins used for weed control
33. Control of predators
34. Weed plants and culture ponds

SEMESTER - I – PAPER-1

BASIC PRINCIPLES OF AQUACULTURE

PRACTICALS: (Any 8 of the following)

1. Estimation of Carbonates, Bicarbonates in water samples
2. Estimation of Chlorides in water samples
3. Estimation of dissolved oxygen
4. Estimation of ammonia in water
5. Field visit to nursery, rearing and stocking ponds of aqua farms or hatchery
6. Field visit to Study of algal blooms and their control
7. Collection & identification of zooplankton and phytoplankton (6 each)
8. Study of aeration devices
9. Determination of soil nitrogen and phosphorus
10. Collection and study of aquatic weeds (Any Five)

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. Elsivier Scientific Publishing Company.
4. Bose AN et.al., 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.

SEMESTER - I – PAPER-I

BASIC PRINCIPLES OF AQUACULTURE

PRACTICAL MODEL QUESTION PAPER

MaxMarks50 **Time2hrs**

I.	Estimate carbonate levels in given water samples.	10marks
II.	Identification of given spotters a) Zooplankton b) Phytoplankton c) Aquatic weeds d) Aeration device	20marks
III.	Record	05marks
IV.	Field Notebook	05marks
V.	Viva voice	10marks
Total		**50marks**

P.R.GOVERNMENT COLLEGE (A), KAKINADA I B.Sc., (Fisheries),

SEMESTER – II PAPER-II

BIOLOGY OF FIN FISH & SHELL FISH

Course Outcomes: By the completion of the course the graduate should able to –

CO1: Describe the general characters and classification of cultivable fishes

CO2: Explain the food, feeding and growth of fish

CO3: Describe the reproductive biology of fishes

CO4: Explain the parental care and development of fishes

CO5: Describe the parental care and development of fishes

Learning objectives

1. To understand the general characters and classification of cultivable fishes .
2. To understand the food, feeding and growth of fish.
3. To understand the reproductive biology of fishes.
4. To understand the parental care and development of fishes.
5. To understand the parental care and development of fishes.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship		knowledge	

SEMESTER – II PAPER-II

BIOLOGY OF FIN FISH & SHELL FISH

	P .R. OVERNMENT COLLEGE (A) KAKINADA	**Program & Semester**			
CourseCode	**TITLE OF THE COURSE** **BIOLOGY OF FIN FISH & SHELL FISH**	**SEMESTER -II PAPER-II**			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		4	1	2	5

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
1.2 Fish, Crustaceans and Molluscs of commercial importance
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.
2.2 Principles of Age and growth determination; Growth rate measurement – scale method, otolith method, skeletal parts as age indicators
2.3 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/ Ponderal index, relative 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 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 – Neuro secretary cells, androgenic gland, ovary,
4.3 Y-organ, chromate phores, pericardial glands and cuticle.
4.4 Molting, molting stages, metamorphosis in crustacean shell fish

CO-POMapping:

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

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

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 4 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	02	20
MODULE – III	02	02	20
MODULE – IV	01	02	30
Total no.of Questions	05 Of which 3 to be answered	08 Of which 5 to be answered	90 marks including choice Of which 50 marks to be answered

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

Paper II - BIOLOGY OF FIN FISH & SHELL FISH
MODEL QUESTION PAPER

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

SECTION –I

Answer any FIVE of the following 5x4 = 20 Marks
(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 carries 10 marks 3x10=30 Marks
(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 Endrocrine system in fishes
13. Write an essay on Environmental factors effective reproduction

QUESTION BANK

ESSAYS

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.

SHOTS

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 /pearl oyster
16. Ovo – vivi parity , vovi parity and oviparity
17. Nest building, brooding
18. Y – Organ and chromatophores
19. Moulting and stages
20. Neuro secretory cells androgenic gland and ovary

SEMESTER – II PAPER-II
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
6. Study of eggs of fishes, prawns
7. Types of scale in fishes
8. Embryonic and larval development of fish
9. Observation of crustacean larvae
10. Study of nest building and brooding of fishes

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

SEMESTER – II PAPER-II

BIOLOGY OF FIN FISH & SHELL FISH

MODEL QUESTION PAPER

I. Gut content analysis in fishes 10marks

II. Identification of spotters 5X5 = 25marks

A Crustacean of larva

B. Study of eggs prawns

C. Study of eggs (fish)

D. Appendages of shrimp

E. Nest building

III. Record 5marks

IV. Viva voice 10 marks

TOTAL **5O M**

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

P .R.GOVERNMENT COLLEGE (A), KAKINADA CHOICE BASED CREDIT SYSTEM
AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2018-2019 onwards) SEMESTER III – PAPER-1II

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

TITLE - FISH NUTRITION & FEED TECHNOLOGY

UNIT-I: NUTRITIONAL REQUIREMENTS OF CULTIVABLE FISH

1-1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns

1-2 Essential amino acids and fatty acids, protein to energy ratio, nutrient interactions and protein sparing effect

1-3 Dietary sources of energy, effect of ration on growth, determination of feed ingredients, check tray

1-4 Factors affecting energy partitioning and feeding

UNIT-II: FORMS OF FEEDS & FEEDING METHODS

2-1 Fed conversion efficiency, feed conversion ratio and protein efficiency ratio

2-2 Wet feeds, moist feeds, dry feeds, mashes, pellet feeds, floating and sinking pellets, advantages of pelletization.

2-3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding & tray feeding

UNIT-III: FEED MANUFACTURE & STORAGE

3-1 Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients

3-2 Feed formulation – extrusion processing and steam pelleting, grinding, mixing and drying, pelletization, and packing

3-3 Water stability of feeds, farm made aqua feeds, micro-coated feeds, micro-encapsulated feeds and micro-bound diets.

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

storage methods

UNIT-IV: FEED ADDITIVES & NON-NUTRIENT INGREDIENTS

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

PRESCRIBED BOOK(S):

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

CO-POMapping:

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

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

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 4 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	02	20
MODULE – III	02	02	20
MODULE – IV	01	02	30
Total no.of Questions	05 Of which 3 to be answered	08 Of which 5 to be answered	90 marks including choice Of which 50 marks to be answered

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

Paper III - FISH NUTRITION & FEED TECHNOLOGY
MODEL QUESTION PAPER

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

SECTION –I

Answer any FIVE of the following 5x4 = 20 Marks
(Draw labelled diagrams wherever necessary)

1. Micro-encapsulated feeds

2. Micronutrients

3. Determination of feed ingridients, check tray

4. Factors affecting energy partitioning and feeding

5. Fed conversion efficiency

6. Feed conversion ratio

7. Protein efficiency ratio

8. Water stability of feeds

SECTION –II

Answer any THREE the questions each question carries 10 marks 3x10=30 Marks
(Draw diagrams wherever necessary)

9. Write an essay on Essential amino acids and fatty acids, protein to energy ratio
10. Write an essay on Feed formulation
11. Write an essay on, floating and sinking pellets, advantages of pelletization (Types of feeds).
12. Write an essay on Dietary sources of energy, effect of ration on growth
13. Write an essay on Anti-metabolites, afflatoxins

QUESTION BANK

ESSAYS

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

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

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

4. Feeding methods

5. Feed formulation

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

7. Binders, anti-oxidants, probiotics

8. Enzymes, hormones

9. Anti-metabolites, afflatoxins

SHORTS

1. Proteins

2. Micronutrients

3. Determination of feed ingridients, check tray

4. Factors affecting energy partitioning and feeding

5. Fed conversion efficiency

6. Feed conversion ratio

7. Protein efficiency ratio

8. Water stability of feeds

9. Micro-coated feeds, micro-encapsulated feeds

10. Chemical spoilage during storage period

11. Feed attractants

12. Feed stimulants

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

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

TITLE - FISH NUTRITION & FEED TECHNOLOGY PRACTICAL SYLLABUS

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

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

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

MaxMarks50 **Time2hrs**

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

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

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

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

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

UNIT-1: INTRODUCTION TO FRESHWATER AQUACULTURE AND CARP CULTURE

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

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

2.1 Recent developments in the culture of clarius, anabas, murrels,
2.2 Advantages and constraints in the culture of air-breathing and cold water fishes-seed resources, feeding, management and production
2.3 Special systems of Aquaculture- brief study of culture in running water, re-

circulatory systems, cages and pens, sewage-fed fish culture

UNIT-III: CULTURE OF PRAWN

3.1 Fresh water prawns of India - commercial value

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

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

UNIT-IV: CULTURE OF BRACKISHWATER SPECIES

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

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

4.3 Mixed culture of fish and prawns

PRESCRIBED BOOK(S):

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi 2.Sena de silva, trevor a anderson 1995. Fish nutrition in aquaculture**.** Chapmann& Hall,

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

4. Barrington FJW 1971. Invertebrates: Structure andFunction.ELBS

5. Parker F &Haswell 1992. The text book of Zoology, VolI.Invertebrates

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),

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

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

MODEL QUESTION PAPER

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

SECTION –I

Answer any FIVE of the following **5x4 = 20Marks**

(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 poly culture
13. Explain about Nursery, rearing and grow out in ponds

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 4 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	02	02	20
MODULE – II	02	02	20
MODULE – III	01	02	20
MODULE – IV	01	02	30
Total no.of Questions	06 Of which 3 to be answered	08 Of which 5 to be answered	90 marks including choice Of which 50 marks to be answered

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

P.R.GOVERNMENT COLLEGE (A),

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

FRESH WATER, BRACKISH WAQUACULTURE

QUESTION BANK

ESSAY ANSWER QUESTIONS:

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

SHORT ANSWER QUESTIONS:

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

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

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

PRACTICALS SYLLABUS

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

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards)

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

MaxMarks50 **Time2hrs**

6x5=30M

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

II. Record 10marks

III. Viva voice 10marks

Total **50marks**

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

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

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS

(Effective from 2020-2021 onwards)

SEMESTER IV – PAPER-V
FISHERIES EXTENSION, ECONOMICS & MARKETING

UNIT – 1 INTRODUCTION

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

UNIT – I1 FISHERIES MARKETING

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

UNIT-III FISHERIES ECONOMICS

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

UNIT-IV FISHERIES EXTENSION & TRANSFER OF TECHNOLOGY

4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension Education; Fisheries extension methods and rural development
4-2 Adoption and diffusion of innovations; ICAR programs – salient features of, LLP,

IRDP, ITDA, KVK, FFDA, FCS, FTI,TRYSEM
4-3 Training – meaning, training vs. education and teaching
4-4 DAATT centreis and their role in tot programs, video conferencing, education of farmers through print and electronic media

CO-POMapping:

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

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

PRACTICAL:

50M

Project work/on-job training at industry 40m

Viva voice 10m

PRESCRIBED BOOK(S):

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

REFERENCES:

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

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

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

P.R.GOVERNMENT COLLEGE (A),

KAKINADA III B.Sc., SEMESTER-IV

TITLE: FISHERIES EXTENSION, ECONOMICS & MARKETING

(WITH EFFECTIVE FROM 2020-2021)

MODEL QUESTION PAPER

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

PART – 1

Note: Answer any **FIVE** question **5x4=20M**

Draw the diagrams where ever necessary

1. Goods and services
2. Law of diminishing
3. Types of economics
4. Market functions
5. Price determination
6. NABARD
7. Fishermen cooperative
8. Fisheries rural development
9. DAATT Centres
10. ORP and NDS

Answer any <u>THREE</u> questions .

Draw the diagrams where ever necessary **3x10 =30M**

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

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

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BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 4 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	02	20
MODULE – III	02	02	20
MODULE – IV	01	02	30
Total no.of Questions	05 Of which 3 to be answered	08 Of which 5 to be answered	90 marks including choice Of which 50 marks to be answered

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

Question Bank

10 Marks

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

5 Marks

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

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

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

I. COURSE OUT COMES:

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

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

Unit – I Introduction:

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

Life in oceans – general account of major groups of phytoplankton, sea weeds, major zooplankton groups. Environmental factors affecting life in the oceans- salinity, temperature, light, currents, waves, tides, oxygen, and carbon dioxide.

Unit – II

2.1 Primary, secondary and tertiary production.

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

Unit – III

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

3.2 Mangroves Ecosystem and Ecological importance

3.3 Coral reefs ecosystem-ecological importance

Unit – IV

4.1 Boring and fouling organisms- examples with adaptations.

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

4.3 Bioluminescence and indicator species, red tides

Unit –V

5.1 Biology and classification of marine mammals,

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

III. References:

Reference Books

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

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

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

4. William, C., 1991. Seashore life between the tides. Dover Publication
5. Makoto, Omori and Tsutomu Ikeda, 1984. Methods in Marine Zooplankton Ecology, Wiley & Sons. Inc. Canada
6.Venkataraman, K., C. Raghunathan. R. Raghuramanand C.R. Sreeraj. 2012. Marine Biodiversity in India, Zoological Surv. India, Kolkata, 164pp.
7.Morrissey, J.F. and J.L. Sumich. 2012. Introduction to the Biology of Marine Life. Jones & Bartlett learning, U.K., 467pp.
8.Kathiresan, K and S.Z. Qasim 2005. Biodiversity of Mangrove Ecosystems. Hindustan Lever Limited.
9.Fish, J.D & S. Fish. 2010. A Students Guide to the Seashore. Cambridge University Press, 527pp.
10. Chapman, V.J. and D.J. Chapman, 1980. Seaweed and Their Use. Chapman & Hall, London.
11. Chapman, V.J., 1976. Mangrove Vegetation. J. Gramer, Berlin.
12. Balakrishnan Nair, N. and D.M. Thampy, 1980. A Text Book of Marine Ecology. The Macmillan Co. of India Ltd., New Delhi
13 Svedrup et al The Oceans Prentice Hall
14.Tait RV Elements of marine ecology Butterworths
15.Riley & Skirrow Chemical Oceanography Academic Press
16. Newell RC Biology of intertidal animals Logos Press
17. Kinne O (Ed) Marine ecology John Wiley & Sons
18. Marshall NB Aspects of Deepsea Biology Hutchinson
19. Ekman S Zoogeography of the sea. Sidgwick & Jackson
20. http://ecoursesonline.iasri.res.in/course/view.php?id=430

CO-POMapping:

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

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

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE BIOLOGY

SEMESTER -V PAPER-VI

MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

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

TITLE OF THE COURSE: MARINE BIOLOGY

SEMESTER -V PAPER-VI

Time: 2 ½ hrs. Max Marks: 60

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MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
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

TITLE OF THE COURSE: MARINE BIOLOGY

SEMESTER -V PAPER-VI

Course 6A: MARINE BIOLOGY

PRACTICAL (LAB) SYLLABUS

Lab work - Skills Outcomes:

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

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

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

Lab references

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

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

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

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

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

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

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

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE BIOLOGY

SEMESTER -V PAPER-VI

Course 6A: MARINE BIOLOGY
PRACTICAL (LAB) MODEL PAPER

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

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

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

5. Record 5 Marks

P.R. GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

MARKET ORIENTED COURESE- AQUACULTURE TECHNOLOGY

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

Semester – V Course 7 A: MARINE FISHSERIES

Learning Outcomes:

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

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

Unit – I

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

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

1.3 Marine capture fishery of Andhra Pradesh.

Unit – II

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

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

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

Unit – III

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

3.2 Features and trends in production of demersal fisheries.

3.3 Impact of trawling. Conservation of demersal fish stocks.

Unit – IV

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

4.2 History of deep-sea fishing.

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

Unit – V

5.1 GIS and remote sensing in marine capture fishery

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

III. References:

Text Books

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

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

Publishers.

Reference Books

1. Carmelo, T.R., 1997. Identifying Marine Phytoplankton by Academic Press.
2. ICES Zooplankton Methodology Manual Ed. by Harrish. R., P. Wiebe., J. Leng., H.R. Skyoldal., M. Huntley. Academic Press 2000.
3. Biswas, K.P. 2011. Marine Prawns & Shrimps. Daya Publishing House, Delhi, 329pp.
4. ICAR 2011. Handbook of Fisheries and Aquaculture. ICAR, New Delhi, 1116 pp.
5. Jhingran, V.G. 1983. Fish and Fisheries of India. Hindustan Publ. Corpn. (India), Delhi, 666 pp.
6. Pillai, N.G.K. 2011. Marine Fisheries & Mariculture in India. Narendra Publishing House, Delhi, 352pp.
7. Aravind Kumar, 2004. Fishery Management. APH Publ. Corpn., New Delhi, 371 pp.
8. Belgrano & Andrea. 2011. Ecosystem Based Management for Marine Fisheries. Cambridge University Press, Cambridge, 402pp.
9. Dholakia, A.D. 2004. Fisheries and Aquatic Resources of India. Daya Publ. Hse., Delhi.
10.FAO (2012). The State of World Fisheries and Aquaculture. FAO Fisheries and Aquaculture Department, FAO, Rome (http://www.fao.org/docrep/016/i2727e/i2727e00.htm)
11 ICAR 2011. Handbook of Fisheries and Aquaculture. ICAR, New Delhi, 1116 pp.

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE FISHERIES

SEMESTER -V PAPER-VII

MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

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 fisery 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
14. Deep sea fishing policy
15. Red tide
16. GIS in capture fishery
17. Seaweed economic importance

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P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE BIOLOGY

SEMESTER -V PAPER-VI

Time: 2 ½ hrs. Max Marks: 60

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MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
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

MARKET ORIENTED COURESE- AQUACULTURE TECHNOLOGY

Course 7 A: MARINE FISHSERIES

PRACTICAL (LAB) SYLLABUS

IV. Lab work - Skills Outcomes:

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

Identify the commercially important marine products

Analyze the marine catches

Identify the potential marine landing centers

Understand the records related to catch data

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

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

VI. Lab References:

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

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

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

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

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

VII. Co-Curricular Activities

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

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

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

3. Max marks for Field Work Report: 05.

4. Suggested Format for Field work

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

5.Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Visit to fish landing center

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

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

4. Collection of web resources on the details of development of new fish landing centers in Andhra Pradesh 5.Seminar, Invited lecture, Assignment, Group discussion. Quiz, Collection of Material, Commissionerate of Collegiate Education

P. R. GOVERNMENT COLLEGE (A) KAKINADA

TITLE OF THE COURSE: MARINE FISHERIES

SEMESTER -V PAPER-VII

Course 7A: MARINE FISHERIES
PRACTICAL (LAB) MODEL PAPER

1. SPOTTERS 5 X 4 = 20 Marks
   A. MARINE FISH
   B. MARINE FISH
   C. MARINE ELASMOBRANCH
   D. MARINE ELASMOBRANCH
   E. MARINE CRUSTACEAN
2. Submission of Report on the filed 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	V. S. K(A) Vizag
15	Dr. P. R Vani	Zoology	V.S.K(A)Vizag
16	Smt. M. Vasantha Lakshmi	Zoology	ASD Women's(A) Kakinada
17	Dr. G. Sithamma	Zoology	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
21	Dr.U.D.V.P Pullarao	Zoology	SVKP and Dr. KS.Raju arts and science College , Penugonda
22	K.Lakshmi Kanthamma	Zoology	SVKP and Dr. KS.Raju arts and science College , Penugonda

Lecturer in charge

Dept. of Zoology & Aquaculture

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	VSK College(A), Vizag.
07	Dr. G. Mani	Zoology	GDC (M) Srikakulam
08	D. K. Rama Rao	Zoology	VSK (A) Vizag
09	P.S.C.H.P Deepika Rani	Zoology	SKRCollege(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

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