

Re-Accredited B++ 2.86 CGPA by NAAC

**VEER NARMAD SOUTH GUJARAT UNIVERSITY**

University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.

**વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી**

યુનિવર્સિટી કેમ્પસ, ઉદ્ધના-મગદલા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

Tel : +91 - 261 - 2227141 to 2227146, Toll Free 1800 2333 011, Digital Helpline No.- 0261 2388888

E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

ક્રમાંક :ઓથો./પરિપત્ર/૨૩૬૩૭/૨૦૨૫  
તા.૦૩/૦૮/૨૦૨૫

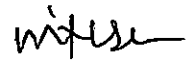
પ્રતિ,  
વડાશ્રી,  
એકવેટિક બાયોલોજી ડિપાર્ટમેન્ટ,  
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,  
સુરત.

**વિષય:— M.Sc. Aquatic Biology Sem.-3 & 4 નો અભ્યાસક્રમ અને PO, PSO, CO અંગે.**

સુજાશ્રી,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૫-૨૬ થી અમલમાં આવનાર M.Sc. Aquatic Biology Sem.-3 & 4 નો અભ્યાસક્રમ અને PO, PSO, CO અંગે એકવેટિક બાયોલોજી વિષયની અભ્યાસ સમિતિની તા.૧૩/૦૮/૨૦૨૫ ની સભાના ઠરાવ ક્રમાંક:૦૨ થી કરેલ ભલામણને વિજ્ઞાન વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ વિજ્ઞાન વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણને એકેડેમિક કાઉન્સિલની તા.૨૪/૧૨/૨૦૨૪ની સભાનાં ઠરાવ ક્રમાંક:૩૫૩ અન્વયે માનનીય કુલપતિશ્રીને આપેલ સત્તા અંતર્ગત માનનીય કુલપતિશ્રી ધ્વારા મંજૂર કરેલ છે. જેની આથી જાણ કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ

  
કુલસચિવ

પ્રતિ,

૧) ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા.

૨) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારું.

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

1/1/15

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-III						
Theory Paper /Practical	Teaching schedule Hrs./week	Exam Schedule			Total marks	Credit	
		Duration (Hrs.)	Internal marks	External marks			
<b>Theory papers :</b>							
<b>Core papers</b>							
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04	
AQB 302: Aquaculture Practices	04	03	30	70	100	04	
AQB 303: Planktonology	04	03	30	70	100	04	
<b>Elective papers</b>							
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04	
<b>Practical :</b>							
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06	
<b>Skill-based elective paper</b>							
AQB 306: Entrepreneurship development in Fisheries Or swayam/ Mooc/ Other Courses (Course can be taken from any faculty)	02	02	15	35	50	02	
<b>Total</b>	<b>30</b>	<b>26</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>	

*(Signature)*

## Semester 3

Course Code	301						
Course Title	Aquatic Microbiology and Disease Management						
Credit	4						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	16 (Including Classwork, examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to make the student able of implementing the concepts and techniques of Aquatic microbiology and develop the skill to identify fish diseases and its associated organisms as well as to find out its remedies for disease management.						
Course Objective	To make students familiar about microorganisms associated with aquatic environment and its role in biogeochemical cycle, different methods of studying microorganisms, quality control of fish, fish diseases and health management and etiology.						
Course Outcomes	<p><b>CO1:</b> Students will be able to understand about structure of microorganisms which provides insights into their physiology, pathogenicity and evolutionary adaptations in aquatic environment.</p> <p><b>CO2 :</b> The enumeration and identification techniques like SPC, MPN and Qualitative methods help to determine the importance and safety level of bacterial population in concern to public health and environment.</p> <p><b>CO3:</b> This paper helps student to develop the skill for health and disease management in fish farming sector. Understanding the causes, prevention and treatment of fish diseases, students can minimize losses in aquaculture and improve fish production.</p> <p><b>CO4:</b> This paper gives idea about how fish respond to disease and how disease manifests at a cellular level which provides information for maintaining healthy fish populations and protecting aquatic ecosystem.</p> <p>Explain and train students to deal with post mortem changes of fish, microbial quality control of fish products and HACCP that declines contamination in fish as well as improving quality of fishery products.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
Pre-requisite	Basics of Microbiology, Zoology and Fisheries						
Course Content	<p><b>Unit – I</b>  <b>Microorganisms associated with Aquatic Ecosystem</b>  General structure and classification of microbes (bacteria, fungi, virus and parasites) in aquatic environment.</p> <p><b>Unit - II</b></p>						

	<p><b>Methods of Studying Microorganisms</b>          Sampling, isolation, cultivation, preparation media and sterilization, enumeration, characterization and identification techniques.          Nutrition, growth and preservation of aquatic microorganisms.</p> <p><b>Unit - III</b>  <b>Fish Diseases and Health Management</b>          Nonpathogenic diseases: symptoms and control - Environmental, Nutritional deficiency and Hereditary diseases.          Pathogenic diseases: symptoms and control - Bacterial, Fungal, Viral and parasitic diseases in fin fishes and shell fishes.          Parasitic diseases: symptoms and control - Protozoan, Crustacean and Helminth diseases in fin fishes and shell fishes.</p> <p><b>Unit - IV</b>  <b>(a) Etiology</b>          Defence mechanisms in fishes, methods of pathological examination in fish, Disease diagnosis: Histopathological, biotechnological (PCR) and immunological (ELISA) methods.  <b>(b) Quality Control of Fish</b>          Postmortem changes (Hyperemia, rigor mortis, autolysis, microbial spoilage and auto oxidation) in fishes, microbial quality control of fish products and HACCP guidelines.</p>
Reference Books	<ol style="list-style-type: none"> <li>1. Patel R.J. and Patel R.K. (2016). Experimental Microbiology Vol. I, 9th Edition, Aditya Publications, Ahmedabad.</li> <li>2. Patel R.J. and Patel R.K. (2017). Experimental Microbiology Vol. II, 9th Edition. Aditya Publications, Ahmedabad.</li> <li>3. Willey, J., Sherwood, L. and Woolverton, J. (2017). Prescott's Microbiology. McGraw Hill Education.</li> <li>4. Tortora, G. J., Funke, B. R. and Case, C. L. (2007). Microbiology. Dorling Kindersley (India) Pvt. Ltd., New Delhi, India.</li> <li>5. Cheesbrough, M. (2002). District Laboratory Practice in Tropical Countries. Cambridge University press, USA.</li> <li>6. Pelezar, M. J., Cahn, E. C. S. and Krieg, H. R. (1981). Elements of Microbiology. McGraw Hill Book Co., NY.</li> <li>7. Frazier, W. C and Westhoff, D. C. (2008). Food Microbiology. Tata McGraw Hill Publishing Company, New Delhi.</li> <li>8. Modi, H. A. (1995). Elementary Microbiology. Ektar Prakashan, Nadiyad.</li> <li>9. Surendran, P. K., Thampuran, N., Nambiar, N. V. and Laliha, K. V. (2009). Microbiological Examination of Seafood. Central Institute of Fisheries Technology, Cochin.</li> <li>10. Mukundan, M. K. and Balasubramaniam, S. (2007). Seafood Quality Assurance. Central Institute of Fisheries Technology, Cochin.</li> <li>11. Sigee, D. C. (2005). Freshwater Microbiology. John Wiley and Sons, England.</li> </ol>

	<p>12. Whitman, K. A. (2004). Finfish and Shellfish Bacteriology. CBS Publishers, New Delhi.</p> <p>13. Mitra, A. and Banerjee, K. (2004). Marine Microbiology. Narendra Publishing House, Delhi.</p> <p>14. Schaperclaus, W. (2001). Fish Diseases. Vol I &amp; Vol II, Oxonian Press Pvt. Ltd., New Delhi.</p> <p>15. Cornell, J. J. (1995). Control of Fish Quality. Fishing News Books.</p> <p>16. Duijn, C. V. (2000). Diseases of Fishes. Narendra Publishing House, Delhi.</p> <p>17. Wedemeyer, G. K. (1999). Environmental Stress and Fish Diseases. Narendra Publishing House, Delhi.</p> <p>18. Woo, P. T. K. and Leathelard, F. (1998). Fish Diseases and Disorders. CABI Publishers, Wallingford.</p> <p>19. Noga, E. J. (2010): Fish Disease Diagnosis and Treatment. Willey Blackwell.</p>
Teaching Methodology	Classwork, Discussion, Self-Study, Assignment, ICT
Evaluation Method	<p>Internal assessment (30%): Exam (12) Class test &amp; assignments (12) and Attendance (6)</p> <p>External assessment (70%): It will be based on university examination.</p>

*(Handwritten signature)*

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

*(Handwritten signature)*

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-III						
Theory Paper /Practical	Teaching schedule Hrs. /week	Exam Schedule			Total marks	Credit	
		Duration (hrs.)	Internal marks	External marks			
<b>Theory papers :</b>							
<b>Core papers</b>							
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04	
AQB 302: Aquaculture Practices	04	03	30	70	100	04	
AQB 303: Planktonology	04	03	30	70	100	04	
<b>Elective papers</b>							
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04	
<b>Practicals :</b>							
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06	
<b>Skill based elective paper</b>							
AQB 306: Entrepreneurship development in Fisheries Or Swayam/ Mooc/ Other Courses (Course can be taken from any faculty)	02	02	15	35	50	02	
<b>Total</b>	<b>30</b>	<b>26</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>	

11/1/15

[Subject code-2303081303020002]

**Semester 3**

Course Code	<b>302</b>						
Course Title	<b>Aquaculture practices</b>						
Credit	4						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	16 (Including Classwork, examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to gain knowledge about culture techniques for freshwater organisms for commercial purposes and farm construction.						
Course Objective	To gain knowledge for aquafarm design and construction. To acquire knowledge for culturing freshwater organisms for commercial purposes.						
Course Outcomes	CO1: Students will be familiar with advancements in aquaculture, pond farm preparation, criteria for selection of species for aquaculture, culture techniques for freshwater aquatic organisms and equipment used in aquafarm. CO2: Students will develop skills for freshwater culture techniques for freshwater animals, microalgae and vascular plants. CO3: Students will be aware of best aquaculture management practices, improvement in fish quality and more revenue generation. CO4: Students will be able to apply use of microalgae and higher vascular plants for wastewater treatment.						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
Pre-requisite	Basics of Biology and chemistry						
Course Content	<b>UNIT I</b> Introduction, culture methods, harvesting and marketing of important major carps, catfishes and freshwater prawn Fish culture practices with reference to Composite fish culture, Integrated fish culture and Sewage fed fish culture and Reservoir cage culture <b>UNIT II</b> Introductions, types and advances in brackish water aquaculture Introduction, culture methods, harvesting and marketing of important brackish water fin fishes and shell fishes (Mullet, Milk fish, Sea bass, pearl spot and shrimp) <b>UNIT III</b> Introductions, types and advances in Mariculture Introduction, culture methods, harvesting and marketing of Edible oyster, Pearl oyster and techniques of pearl production, Lobster and Clam. <b>Unit-IV</b>						

*(Handwritten signature)*

	<p>Taxonomy of economically important seaweeds: Distribution, morphology, reproduction, life cycle, growth physiology and Culture techniques of sea weeds (<i>Gracilaria</i>, <i>Kappaphycus alvarezii</i>)</p> <p>Taxonomy of economically important algae: Distribution, morphology, reproduction, life cycle, growth physiology and culture technique of <i>Spirulina sp.</i> and <i>Chlorella sp.</i></p>
Reference Books	<ol style="list-style-type: none"> <li>1. Bardach, E.J. Rhyther, J.H. and W.O. McLarney (1972): Aquaculture. The Farming and Husbandry of freshwater and Marine Organisms. John Wiley and Sons. New York</li> <li>2. Brown, E.E., Gratzek, J.B. (1980): Fish Farming Hand Book. AVI Publishing Company, West port USA</li> <li>3. Fast, A.W. and Lester, L.J. (1992): Marine Shrimp culture – Principles and Practices. Elsevier Science Publishers, Amsterdams</li> <li>4. James, P. McVey (1983): Handbook of Mariculture Vol. I. Crustacean Aquaculture. CRC Press. Inc. Florida; 442 pp.</li> <li>5. Korring, P. (1976): Farming of marine fishes and shrimp. Elsevier Science Publishers, NY</li> <li>6. Landau, M. (1992): Introduction to Aquaculture, John Wiley and Sons, New York.</li> <li>7. Mathew, L. (1992): Introduction to Aquaculture, John Wiley and sons, INC, New York</li> <li>8. Oren, O.H. (1981): Aquaculture of Grey Mulletts. Cambridge University Press, London</li> <li>9. Pillay, T.V.R. and Kutty, M.N. (2005): Aquaculture – Principles and Practices, Black Well Sciences, U.K.</li> <li>10. Takeo, I. (1978): Aquaculture in shallow seas. Progress in shallow. Sea culture, Amerind Publishing Co. Pvt. Ltd. New Delhi. 613 pp.</li> <li>11. Chapman, V.J. and Chapman, P.J. (1980): Seaweeds and their uses. Chapman and Hall with Methuen Inc., New York.</li> <li>12. Dawes, C.J. (1981): Marine Botany. John Wiley and sons.</li> <li>13. Dawson, R.Y (1966): Marine Botany. An Introduction Holt, Reinhart and Winston Inc., U.S.A.</li> <li>14. Desikachary, T.V. (1975): Marine Plants. C.S.I.R., New Delhi.</li> <li>15. Dring, M.J. (1982): The Biology of Marine Plants. Edward Arnold Publishers, London.</li> <li>16. Kapraun, D.F. (1980): An illustrated guide to the benthic marine algae of coastal North Carolina- Rhodophyta. University North Carolina Press.</li> <li>17. Levring, T. (1981): Proceedings of 10<sup>th</sup> International seaweed symposium, Goteborg, Sweden, Academic Press Walter de Guyter, Berlin</li> </ol>
Teaching Methodology	Classwork, Discussion, Self-Study, Assignment, ICT
Evaluation Method	<p>Internal assessment (30%):</p> <p>Exam (12) Class test &amp; assignments (12) and Attendance (6)</p> <p>External assessment (70%):</p> <p>It will be based on university examination.</p>

1/11/15

Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

1/1/19

**PSO2:** Develop the professional and entrepreneurship skills to be confident in the practical aspects.  
**PSO3:** Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.  
**PSO4:** Develop students for self-learning and challenging situations in aquaculture sectors and extension education.  
**PSO5:** Enable students to use recent technologies for analyzing the research and practical concepts.  
**PSO6:** Development for continuous learning and research for a successful academic and industrial career.

Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
PO6							

Medium of Instruction English

Programme structure Semester-III

Theory Paper /Practical	Teaching schedule Hrs /week	Exam Schedule			Total marks	Credit
		Duration (hrs)	Internal marks	External marks		
<b>Theory papers :</b>						
<b>Core papers</b>						
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04
AQB 302: Aquaculture Practices	04	03	30	70	100	04
AQB 303: Planktonology	04	03	30	70	100	04
<b>Elective Paper</b>						
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04
<b>Practicals :</b>						
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06
<b>Skill based elective paper</b>						
AQB 306:Entrepreneurship development in Fisheries Or Swayam/ Mooc/ Other Courses (Course can be taken from any faculty)	02	02	15	35	50	02
<b>Total</b>	<b>30</b>	<b>26</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>

*(Handwritten signature)*

[Subject code-2303081303030002]

**Semester 3**

Course Code	303						
Course Title	Planktonology						
Credit	4						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	16 (Including Classwork, examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to develop concepts of planktonology and learn their implementation in aquaculture sectors, commercial sector and aquatic resource management.						
Course Objective	To acquire skills in students to identify plankton and their implementation as bio-indicators. To measure productivity and its application in aquaculture sectors, commercial sector and aquatic resource management.						
Course Outcomes	<p><b>CO1:</b> Develop a concept among the students for the importance of plankton and Productivity. Different adaptations found in plankton and its application in science. Ecological and Commercial Importance of primary producers and secondary producers.</p> <p><b>CO2:</b> After learning this course, students will be able to develop skills to identify plankton and measure productivity and its application in aquaculture sectors and aquatic resource management as well as extracted material from plankton that has importance in the commercial sector.</p> <p><b>CO3:</b> Students will also be able to learn about the importance of plankton as one of the bio-indicators of the environmental condition and their use as one of the biomarkers.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of Fisheries Science						
Course Content	<p><b>Unit - I Introduction of plankton:</b> Introduction and General classification of plankton, general account of instruments and nets employed for collection of plankton, Methods of fixation and preservation of plankton.</p> <p><b>Unit - II Productivity:</b> Method of estimation of Primary, secondary and tertiary productivity, factors affecting productivity, Estimation of the standing crop: wet and dry weight estimation, plankton volume settling and displacement method. Estimation of carbon (organic matter), Ecological modelling of productivity (NPZ model – Nutrient-Phytoplankton-Zooplankton), Impact of climate change on aquatic productivity</p> <p><b>Unit - III Mechanisms in plankton:</b> Adaptation of plankton – structural (weight, increases of surface area, floatation) and physiological (specific gravity, water content, fat content, defensive vacuoles, gas, mono and divalent ions) mechanisms, Interrelation of phytoplankton and zooplankton,</p>						

	<p>Harmful algal blooms - their causes and effects, Plankton as bio-indicators of water quality.</p> <p><b>Unit – IV Ecological and Commercial Importance of Primary Producers:</b></p> <p>Effects of plankton production in the aquatic environment. Microalgae as a source of protein, Periphyton – Introduction and importance in aquatic environment, Biofuel and other commercial products from algae, Types of larvae in aquatic ecosystems and their ecological distribution. Chemical communication and settlement cues of marine benthic larvae. Introduction to plankton culture techniques for research and commercial applications.</p>
Reference Books	<ol style="list-style-type: none"> <li>1. Edmondson, W.T. (1976). Freshwater Biology. 2nd Ed. John Wiley (Ed) and sons Inc.</li> <li>2. Hutchinsn, G.E. (1976). A treatise on limnology. Vol. I &amp; II John Wiley &amp; Sons.</li> <li>3. Jhingran, V.G. (1985). Fish and fisheries of India. Hindustan Publication Corp., New Delhi.</li> <li>4. Nybakken, J.W. (2001). Marine Biology an Ecological Approach 4th edition. Addison Wesley Edu. Pub. Inc.</li> <li>5. Peter McRoy, C. and G. Helferich (1977). Sea grass Ecosystems. A scientific perspective. Marcel Dekker Inc. New York</li> <li>6. Sumich, J. I. (1999). Introduction to the biology of marine life 7th Edition. The McGraw hill Companies Inc.</li> <li>7. Welch. P.S. (1952). Limnology. 2nd Ed. McGraw Hill Book Co.</li> </ol>
Teaching Methodology	Classwork, Discussion, Self-Study, Assignment, ICT
Evaluation Method	<p>Internal assessment (30%):</p> <p>Exam (12) Class test &amp; assignments (12) and Attendance (6)</p> <p>External assessment (70%):</p> <p>It will be based on university examination.</p>

(17/11)

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the programme is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

*(Handwritten signature)*

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-III						
Theory Paper /Practical	Teaching schedule Hrs/week	Exam Schedule			Total marks	Credit	
		Duration (Hrs)	Internal marks	External marks			
<b>Theory papers:</b>							
<b>Core papers</b>							
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04	
AQB 302: Aquaculture Practices	04	03	30	70	100	04	
AQB 303: Planktonology	04	03	30	70	100	04	
<b>Elective Paper</b>							
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04	
<b>Practical :</b>							
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06	
<b>Skill based elective paper</b>							
AQB 306: Entrepreneurship development in Fisheries or Swayam/ Mooc/ Other Courses (Courses can be taken from any faculty)	02	02	15	35	50	02	
<b>Total</b>	<b>30</b>	<b>26</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>	

1/1/15

## Semester III

<b>Course Code</b>	<b>304 A</b>						
<b>Course Title</b>	<b>Fisheries Extension Education</b>						
<b>Credit</b>	4						
<b>Teaching per week</b>	4 Hrs						
<b>Minimum weeks per semester</b>	15 (Including Classwork, examination, preparation, holidays etc.)						
<b>Effective from</b>	2025-26						
<b>Purpose of course</b>	The purpose of the course is to develop the analysis methodology and dissemination methods of the innovations and regulations of the fisheries resources which would be helpful for the formation of the database and resources management.						
<b>Course objective</b>	To acquaint the students with the extension methods, innovation dissemination, and fisheries resources regulations.						
<b>Course Outcome</b>	<p><b>CO1:</b> The application of extension education in the field of aquatic biology helps for resource management.</p> <p><b>CO2:</b> The innovations are not essential but its application at the needful field are also useful and it would be possible to teach the students about fisheries extension education.</p> <p><b>CO3:</b> The fisheries extension education essential to develop communication skills, training strategies, contact methods etc. certainly helps to disseminate the innovation and technologies to beneficiaries.</p> <p><b>CO4:</b> The knowledge regarding inland fisheries policies implemented by the state and central government are elaborated to students to improve the knowledge and technical skill.</p> <p><b>CO5:</b> The dissemination of advanced technologies and awareness for fisheries management among the farmers.</p>						
<b>Mapping of COs with PSOs</b>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
<b>Course prerequisite</b>	Communication and contact tools and basic equipment's for aquaculture.						
<b>Course Content</b>	<p><b>UNIT I</b>  <b>Extension Education:</b> Definition, meaning, history, objectives, scope, concepts, philosophy and principles of fisheries extension education. Pioneering Extension efforts and their implications of Extension systems ICAR, SAU, State Departments and NGOs, FFPO</p> <p><b>UNIT II</b>  <b>Communication process:</b> concept, elements, functions and models of communication.  <b>Teaching strategies and models:</b> Meaning and various types of teaching strategies. Models of Teaching – Characteristics, Functions and elements.</p> <p><b>UNIT III</b>  <b>Diffusion and innovation:</b> concept and meaning, elements.</p>						

	<p>Adoption: adoption process, adopter categories and factors influencing adoption.</p> <p><b>UNIT IV</b></p> <p><b>Information communication technology:</b> Concept, role in fisheries development and types of ICTs (print and electronic media, video, teleconferencing, computer assisted instructions, touch screen and web technologies).</p> <p><b>Cooperatives:</b> Introduction, Concept of Co-operation, Objectives of Co-operative Movement, Models of Co-operatives and types of Co-operatives.</p>
<b>References</b>	<ol style="list-style-type: none"> <li>1. Dahama, O.P. (1983): Extension and rural welfare. Ramprasad and Son's, Agra</li> <li>2. Dhote, A.K. (1989): Fisheries Management and Extension: Inland fisheries, instructional cum practical manual (VI) NCERT, New Delhi</li> <li>3. Lynton P.R. and Pareek, U. (1978): Training for development, Kumarian Press, 29 Bishop Road, West Hartford, Connecticut 06119</li> <li>4. Ray, G.I. (1991): Extension communication and management, Naya Prakash, Kolkatta</li> <li>5. Srivastva, U. K. and Vathsals, S. (1985): Strategy for development of Inland fishery resources in India: Key issues in production and marketing concept Pub. Co. New Delhi.</li> <li>6. Supe, S.V. (1986): An introduction to extension education, Oxford and IBH Publishing Co., New Delhi.</li> <li>7. Gupta CB. 2001. Management Theory and Practice. Sultan Chand &amp; Sons. Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy</li> <li>8. Gallagher K. 1999. Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods. Global EPM Facility, FAO.</li> <li>9. Ganesan R, Iqbal IM &amp; Anandaraja N. 2003. Reaching the Unreached: Basics of Extension Education. Associated Publishing Co.</li> <li>10. Jalihal KA &amp; Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept Publ.</li> <li>11. Khan PM. 2002. Textbook of Extension Education. Himalaya Publ. Ray GL. 2006. Extension Communication and Management. Kalyani Publ</li> <li>12. Dahama O P and Bhatnagar OP. 2005. Education and Communication for Development. Oxford &amp; IBH.</li> <li>13. Grover I, Kaushik S, Yadav L &amp; Varma SK. 2002. Communication and Instructional Technology. Agrotech Publ. Academy</li> <li>14. Sharma, O. P. 2012. Development Perspectives of Extension Education, Agrotech Publishing Academy, Udaipur-313001</li> </ol>
<b>Teaching methods</b>	Classwork, Discussion, Self-Study, Assignment, ICT
<b>Evaluation methods</b>	<p>Internal assessment (30%):</p> <p>Exam (12) Class test &amp; assignments (12) and Attendance (6)</p> <p>External assessment (70%):</p> <p>It will be based on university examination.</p>

(17/12)

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

1/1/5

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-III						
Theory Paper /Practical	Teaching schedule Hrs /week	Exam Schedule Duration (Hrs.) Internal marks External marks			Total marks	Credit	
<b>Theory papers :</b>							
<b>Core papers</b>							
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04	
AQB 302: Aquaculture Practices	04	03	30	70	100	04	
AQB 303: Planktonology	04	03	30	70	100	04	
<b>Elective papers</b>							
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04	
<b>Practical :</b>							
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06	
<b>Skill-based elective paper</b>							
AQB 306: Entrepreneurship development in Fisheries Or swayam/ Mooc/ Other Courses (Course can be taken from any faculty)	02	02	15	35	50	02	
<b>Total</b>	<b>30</b>	<b>26</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>	

17/5

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	<b>AQB</b>
Duration	<b>2 Years (Four Semester)</b>
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the programme is to prepare the students for productive career in Aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries department etc.
Program Outcome	<p><b>PO1 : Basic Knowledge Enhancement</b> The designed Program enhances students with the basic knowledge of the subject matter in order to capable students develop research skills which include laboratory techniques, aqua farm field techniques, disease management in aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2 : Skill Development</b> The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.</p> <p><b>PO3 : Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that is being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects to identify aquatic problems in the natural environment.</p> <p><b>PO4 : Skill in analysis technique with Extension Education</b> The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.</p> <p><b>PO5 : Professional skill Development through personal experience</b> Placement and training enhance confidence of students, gain practical knowledge and experience of work in the aquatic sector related industries. The professional skill prepares students for employable and industry ready environment.</p> <p><b>PO6 : Group discussion, field visits, presentation and confidence Development</b> The designed syllabi enable students be capable of group discussion, sharing ideas and views. This enables to develop confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments and fisheries</p>

*(Handwritten signature)*

	Technology enables acquaintances of the students with the practical aspects.						
Program Specific Outcomes	PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources. PSO2: Develop the professional and entrepreneurship skills to be confident in the practical aspects. PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution. PSO4: Develop students for self-learning and challenging situation in aquaculture sectors and extension education. PSO5: Enable students to use recent technologies for analysing the research and practical concepts. PSO6: Development for continuous learning and research for successful academic and industrial career.						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-III						
Theory Paper /Practical	Teaching schedule Hrs./week	Exam Schedule			Total marks	Credit	
		Duration (Hrs)	Internal marks	External marks			
<b>Theory papers:</b>							
<b>Core papers</b>							
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04	
AQB 302: Aquaculture Practices	04	03	30	70	100	04	
AQB 303: Planktonology	04	03	30	70	100	04	
<b>Elective papers</b>							
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04	
<b>Practical :</b>							
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06	
<b>Skill-based elective paper</b>							
AQB 306: Entrepreneurship development in Fisheries Or	02	02	15	35	50	02	

swayam/ Mooc/ Other Courses (Course can be taken from any faculty)						
Total	30	26	180	420	600	24

(1/11/15)

[Subject code-2303081303040003]

**Semester III**

Course Code	<b>304 B</b>						
Course Title	<b>Research methodology and Writing skill</b>						
Credit	4						
Teaching per Week	4 Hrs						
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to acquaint knowledge on research methodology and problem selecting methods of the research. Students would be capable of drawing inferences of the research and write the scientific literatures.						
Course Objective	To acquaint the students about the research methods, research design and formulation along with skill of scientific writing.						
Course Outcomes	<p>CO1: The application of different research methods for research work and analysis</p> <p>CO2: To help students acquire knowledge on different methods of sample collection and hypothesis formulation for research studies.</p> <p>CO3: The course would help students to apply statistical analysis tools, data presentation, interpretation and predict the outcomes of the research for future aspects.</p> <p>CO4: The course would help students capable of writing scientific literatures</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
Pre-requisite	Basics of biology and chemistry						
Course Content	<p><b>Unit – I</b></p> <p><b>Research:</b> Meaning, definitions, objectives, characteristics of Research  Criteria of Good Research  Types of Research</p> <p><b>Research Problem &amp; Formulation</b>  Selecting the Problem, Sources of the Problem, Defining a Problem, Statement of a Problem</p> <p>Hypothesis: Qualities of a good Hypothesis –Types of Hypotheses, Hypothesis Testing and interpretation</p> <p><b>Research Design:</b> Features of a good research design, Concept, types and application of Exploratory Research Design, Descriptive Research Design and Experimental research Design</p> <p><b>Unit – II</b></p> <p><b>Data Collection and analysis:</b> Methods of data collection, Sampling Methods, Sampling Errors</p>						

103 A (1) 1/11/15

	<p>Data Processing and Analysis strategies: Data presentation, statistical analysis and interpretation of data, types of analysis, simple regression analysis, correlation, coefficient of determination, (<math>r^2</math>), z-test, t-test, ANOVA, Chi-square test, multi-variate analysis of data and multiple regression.</p> <p><b>Unit - III</b> <b>Report and thesis writing:</b> Structure and components of scientific reports, types of report Thesis writing - different steps and software tools (LaTeX.) in the design and preparation of thesis, layout, structure (chapter plan) and language of typical thesis, Illustrations and tables, bibliography, referencing and footnotes. The Review of Literature: Meaning, need, objectives, sources and the functions of Review of Literature, pattern of writing review of Literature Oral presentation - planning, software tools, creating and making effective presentation, use of visual aids</p> <p><b>Unit - IV</b> <b>Research Paper Writing:</b> Layout of a Research Paper, Journal selection, Impact factor of Journals, Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Use of Encyclopaedias, Research Guides, Handbook etc. for paper writing Use of tools and techniques for Research: methods to search required information effectively, Reference Management Software like Zotero and Mendeley, paper formatting tools, Software for detection of Plagiarism</p>
Reference Books	<ol style="list-style-type: none"><li>1. Bhattacharyya D. K (2006) Research Methodology, Excel Books.</li><li>2. Gurumani. N. (2006) Research Methodology for Biological Sciences, MJP Publishers, Chennai</li><li>3. Day Robert (.2002) How to write and publish a scientific paper, Cambridge University Press</li><li>4. Janice Matthews and Robert Matthwes (2008). Successful Scientific Writing, Cambridge University Press</li><li>5. Matt Young (2006). The Technical Writer's Handbook, Viva Books Private Limited, India</li><li>6. Fisher, R. A. (1970) Statistical Methods for Research Workers, 14th Edition, Oliver and Boyd Publ.</li><li>7. Cohen, L. Lawrence, M., &amp; Morrison, K. (2005). Research Methods in Education (5th edition), Oxford: Oxford University Press.</li><li>8. Denscombes, M. (2010). The Good Research Guide: For small-scale social research projects., Maiden-Read: Open University Press.</li><li>9. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford University Press.</li><li>10. Kothari, C. R. (1980). Research Methodology: Research and techniques, New Delhi: New Age, International Publishers.</li></ol>

101 101 101 101

Teaching Methodology	Classwork, Discussion, Self-Study, Assignment, ICT
Evaluation Method	Internal assessment (30%): Exam (12) Class test & assignments (12) and Attendance (6) External assessment (70%): It will be based on university examination.

*(Handwritten signature)*

## Semester 3

Course Code	305
Course Title	Aquaculture management and Extension Education
Credit	6
Teaching per Week	12 Hrs
Minimum weeks per Semester	16 (Including laboratory work, examination, preparation, holidays etc.)
Effective From	2025-26
Purpose of Course	<ol style="list-style-type: none"> <li>1. The purpose of the course is to make the student able of implementing the methods of planktonology and microbiology as well as develop the skill to count and identify plankton and microorganisms in the field of Aquatic Biology.</li> <li>2. The purpose of the course is to make students capable of identifying and culture of aquatic organisms.</li> <li>3. The purpose of the course is to develop skills of the students regarding writing research paper and preparation of AV aids.</li> </ol>
Course Objective	<ol style="list-style-type: none"> <li>1. To make students familiar about Preparation of media and sterilization, Isolation methods for bacteria, Identification of bacteria by Gram's staining technique, Assessment of microbiological quality of water bodies, fish and fish products using SPC technique, Assessment of microbiological quality of water bodies using MPN technique, Isolation and identification of pathogenic bacteria from fish and Study of diseased specimens/images.</li> <li>2. To acquaint the students about Identification fresh water higher vascular plants, sea weeds, aquatic insects, prawn larvae, seed stages (eggs, spawns, fry and fingerlings), cultivable fin fishes, shell fishes, predatory and weed fishes, Hatching and culturing of Artemia and Culture of Microalgae.</li> <li>3. To make the students understand about Collection, preservation and Identification of plankton (freshwater and marine water), Quantitative estimation of plankton (counting method) &amp; chlorophyll estimation.</li> <li>4. To make the student capable of understanding about Preparation of AV aids (Pamphlets and folders) and research paper.</li> </ol>
Course Outcomes	<p><b>CO1:</b> The counting and identification of microorganisms through SPC, MPN, and Gram's staining technique aids to determine the importance and safety level of microorganisms and implementation of preventative measures to protect public health.</p> <p><b>CO2:</b> Students will be able to identify sea weeds, fresh water higher vascular plants, aquatic insects and prawn larvae, seed stages (eggs, spawns, fry and fingerlings), cultivable fin fishes, shell fishes, predatory and weed fishes which are closely related to Aquaculture management.</p>

1/1/5

**CO3:** The paper gives detail idea about culture of Arteria which gives different food alternatives for fishes during culture and more revenue generation.  
**CO4:** Students will be develop skill for production of live feeds, seeds and microalgae in the field of Aquatic biology which can be helpful for entrepreneurship and business development.  
**CO5:** Preparation of AV aids and research paper writing improves learning, teaching and writing skill.

Mapping between COs with PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						
CO5						

**Pre-requisite** Basics of Microbiology, Zoology and Fisheries

**Course Content**

**Unit I**  
 Cleaning and Sterilization of glassware and media.  
 Preparation of Bacteriological media:  
 General media: Nutrient agar medium/Zobell marine agar  
 Selective and Differential media: Mac Conkey's agar medium, EMB agar medium, TCBS agar medium and TSA agar medium  
 Biochemical test media

**Unit II**  
 Isolation methods for bacteria (streak plate, spread plate and pour plate method).  
 Assessment of microbiological quality of water bodies, fish and fish products using SPC technique.  
 MPN technique.  
 Identification of bacteria by Gram's staining technique.  
 Demonstration: Isolation and identification of pathogenic bacteria from fish.  
 Visual identification of fish diseases.

**Unit III**  
 Identification freshwater higher vascular plants  
 Identification of aquatic insects  
 Identification of seed stages (eggs, spawns, fry and fingerlings) of IMC  
 Identification of cultivable freshwater fin fishes, shell fishes, predatory and weed fishes  
 Culture of Microalgae

**Unit IV**  
 Identification of sea weeds  
 Identification of shrimp larvae  
 Identification of cultivable brackish/marine water fin fishes, shell fishes and predatory fishes  
 Culture of Artemia hatching

**Unit V**  
 Collection, preservation and Identification of plankton (freshwater and marine water)

*(Handwritten signature)*

	<p>Quantitative estimation of plankton (counting method) &amp; Primary Productivity (chlorophyll estimation)  Collection and identification of periphyton  <b>Unit VI</b>  Drafting of farm literature (Leaflet, Pamphlet and Folder)  Drafting of research paper  Field visit/study tour of finfish hatchery/Krishi Vigyan Kendra/ ATIC</p>
Reference Books	<ol style="list-style-type: none"> <li>1. Patel, R. J. (2000). Experimental Microbiology. Aditya, Ahmedabad, India, Vol. I &amp; II.</li> <li>2. Surendran, P. K., Thampuran, N., Nambiar, N. V. and Laliha, K. V. (2009). Microbiological Examination of Seafood. Central Institute of Fisheries Technology, Cochin.</li> <li>3. Pelezar, M.J., Cahn, E. C. S. and Krieg, H. R. (1981). Elements of Microbiology. McGraw Hill Book Co., NY.</li> <li>4. Tortora, G.J., Funke, B. R. and Case, C. L. (2007). Microbiology. Dorling Kindersley (India) Pvt. Ltd., New Delhi, India.</li> <li>5. Cheesbrough, M. (2002). District Laboratory Practice in Tropical Countries. Cambridge University press, USA.</li> <li>6. Pillai, N.K. (1986). Introduction to Planktonology. Himalaya Publishing House, Bombay.</li> <li>7. Day, F. (1875-78). The fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma and Ceylon. Bernard Quaritch, London.</li> <li>8. FAO, (1992). Manual of seed production of carps. FAO Pub., Manila</li> <li>9. Jhingran, V.G. (1991). Fish and Fisheries of India, Hindustan Publishers.</li> <li>10. Pillay, T.V.R. and Kutty, M.N. (2005): Aquaculture -- Principles and Practices. Black Well Sciences, U. K</li> <li>11. Sher Singh, B. and Sikarwar, T. K (2014): Hand book for writing research paper. Bharati Publications, New Delhi.</li> <li>12. Patel R.J. and Patel R.K. (2016). Experimental Microbiology Vol. I, 9<sup>th</sup> Edition. Aditya Publications, Ahmedabad.</li> <li>13. Patel R.J. and Patel R.K. (2017). Experimental Microbiology Vol. II, 9<sup>th</sup> Edition. Aditya Publications, Ahmedabad.</li> <li>14. Cappuccino J.G. (2016). Microbiology; A Laboratory Manual, 11<sup>th</sup> Edition. Pearson Education (Singapore) Pvt. Ltd.</li> <li>15. Cheesbrough, M. (2002). District Laboratory Practice in Tropical Countries. Cambridge University press, USA.</li> <li>16. Surendran, P. K., Thampuran, N., Nambiar, N. V. and Laliha, K. V. (2009). Microbiological Examination of Seafood. Central Institute of Fisheries Technology, Cochin.</li> </ol>

*(Handwritten signature)*

	<p>17. Joanne Willey, Linda Sherwood and Christopher J. Woolverton (2017). Prescott's Microbiology. McGraw-Hill Education.</p> <p>18. Tortora, G.J., Funke, B. R. and Case, C. L. (2007). Microbiology. Dorling Kindersley (India) Pvt. Ltd., New Delhi, India.</p>
Teaching Methodology	Classwork, Discussion, Self-Study, Assignment, ICT
Evaluation Method	<p>Internal assessment (30%): Exam (12) Class test &amp; assignments (12) and Attendance (6)</p> <p>External assessment (70%): It will be based on university examination.</p>

(1/21/15)

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries. Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<p><b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.</p> <p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p>

1/1/15

	<p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-III						
Theory Paper /Practical	Teaching schedule Hrs /week	Exam Schedule			Total marks	Credit	
		Duration (Hrs)	Internal marks	External marks			
<b>Theory papers :</b>							
<b>Core papers</b>							
AQB 301: Aquatic Microbiology and Disease Management	04	03	30	70	100	04	
AQB 302: Aquaculture Practices	04	03	30	70	100	04	
AQB 303: Planktonology	04	03	30	70	100	04	
<b>Elective papers</b>							
AQB 304 A: Fisheries Extension Education AQB 304 B: Research methodology and Writing skill	04	03	30	70	100	04	
<b>Practical :</b>							
AQB 305: Aquaculture management and Extension Education	12	12	45	105	150	06	
<b>Skill-based elective paper</b>							
AQB 306: Entrepreneurship development in Fisheries Or swayam/ Mooc/ Other Courses (Course can be taken from any faculty)	02	02	15	35	50	02	
<b>Total</b>	<b>30</b>	<b>26</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>24</b>	

17/5

**Semester 3**

Course Code	<b>306</b>						
Course Title	<b>Entrepreneurship development in Fisheries</b>						
Credit	02						
Teaching per Week	2 Hrs						
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to develop entrepreneurship skill among the students in fisheries sector.						
Course Objective	To familiarize the students about the concept of entrepreneurship, different government schemes in the fisheries sector and scope in this sector to develop independent career						
Course Outcomes	CO1: The course will familiar the students with the knowledge of entrepreneurship development in the fisheries sector CO2: To help students know about different policies and incentive schemes in developing entrepreneurship in farm development and value-added products CO3: The course would help students to be familiar with the present condition and challenging situation in Indian fisheries sector						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of biology and chemistry						
Course Content	<p><b>Unit -I</b>  <b>Entrepreneurship and Financial Management</b>  Entrepreneurship: Definition and importance, Entrepreneurial and managerial characteristics, Motivation and entrepreneurship development, Entrepreneurship development programs (EDPs), Women entrepreneurship: Concept, significance, challenges and development of Women entrepreneurship, Government schemes and incentives for promotion of entrepreneurship.  Financial management: Financing procedures and financial incentives, Banking norms, financial ratios and their significance, costing and pricing.  Marketing management: Strategies, planning and execution, product labelling presentation and branding.</p> <p><b>Unit- II</b>  <b>Fishery Entrepreneurship and Production Management</b>  Infrastructural requirements for fishery entrepreneurship, Types of entrepreneurial farming: Contract farming, Joint ventures, Public-private partnerships, Preparation of an enterprise budget for fish farming, Characteristics of Indian fisheries processing and export industry.  Production Management: Elements of the production process, Production planning and control, Product development, Testing facilities, Patents, Supply chain management: Introduction, advantages, process, drivers, scope of aqua-supply chain management</p>						

Reference Books	<ol style="list-style-type: none"> <li>1. Kumar A., Poornima. S., Mini S C., Abraham K. and Jayashree K. (2003). Entrepreneurship Development, New Age International Publishers, New Delhi.</li> <li>2. Gupta, C.B. (2001). Management, Theory and Practice. Sultan Chand and Sons, New. Delhi.</li> <li>3. Indu G. (2008). Handbook on Empowerment and Entrepreneurship. Agrotech, Public Academy, Udaipur.</li> <li>4. Khanka, S.S. (1999). Entrepreneurial Development, S. Chand and Co., New Delhi.</li> <li>5. Mary C. (2008). Entrepreneurship in Action. Prentice Hall of India Pvt. Ltd., New Delhi.</li> <li>6. Mohanty S.K. (2009). Fundamentals of Entrepreneurship. Prentice Hall of India Pvt. Ltd., New Delhi.</li> <li>7. Prasad R. (2003). Entrepreneurship - Concepts and Cases. ICFAI Publications, Hyderabad.</li> <li>8. Mondal S. and Ray, G.L. (2009). Text Book of Entrepreneurship and Rural, Development. Kalyani publishers, Ludhiana.</li> <li>9. Singh D. (1995). Effective Managerial Leadership. Deep and Deep Publications, New Delhi.</li> <li>10. Desai, V. (1997). Small Scale Industries and Entrepreneurship. Himalaya Publishing House, New Delhi.</li> <li>11. Desai. V. (2000). Dynamics of Entrepreneurial Development and Management. Himalaya Publishing House, New Delhi</li> </ol>
Teaching Methodology	Classwork, Discussion, Self-Study, Assignment, ICT
Evaluation Method	Internal assessment (30%): Exam (12) Class test & assignments (12) and Attendance (6) External assessment (70%): It will be based on university examination.

(1/1/15)

Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments and fisheries. Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

*(Signature)*

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
PO6							
Medium of Instruction	English						
Programme structure	Semester-IV						
Theory Paper /Practical	Exam Schedule			Total marks	Credit		
	Internal marks		External marks				
AQB 401: Dissertation work	100		200	300	12		
AQB 402: Viva-voce & presentation	25		75	100	4		
AQB 403: Seminar	25		25	50	2		
AQB 404: Licensing and certification of Aquaculture practices	25		25	50	2		
AQB 405: Educational tour/Field visit	25		25	50	2		
AQB 406: Project submission	25		25	50	2		
<b>Total</b>	<b>225</b>		<b>375</b>	<b>600</b>	<b>24</b>		

*(Handwritten signature)*

[Subject code-2603081304010004]

**Semester IV**

Course Code	401						
Course Title	Dissertation work						
Credit	12						
Teaching per Week	12 Hrs.						
Minimum weeks per Semester	16 (Including Dissertation (Research work), examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to make students capable of doing innovative research work. The course will provide experience of laboratory as well as fieldwork.						
Course Objective	The objective of the course is to enhance the skills of students regarding effective project management.						
Course Outcomes	<p><b>CO1:</b> Student will be capable of identifying his or her area of interest, able to explore a subject in depth, managing a research project, defining a suitable question and using the appropriate research tools.</p> <p><b>CO2:</b> Students will be able to develop research skills, communication, academic writing, data collation and analysis skills.</p> <p><b>CO3:</b> Dissertation helps in paper publications which make students an expert in their field of knowledge.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of biology and chemistry						
Course Content	Research work along with dissertation writing will be carried out in the related field of Aquatic Biology. That would be carried out at the research laboratory of the department <b>OR</b> laboratory of other institutes and organizations. The research work must be presented in front of the examiners.						
Reference Books	-----						
Teaching Methodology	Research guidance, Explanation, Discussion, Self-Study						
Evaluation Method	Internal assessment (30%) based on class attendance, Research presentation, viva based evaluation and External assessment (70%) based on university examination (Research presentation)						

(17/1/25)

## Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries. Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

*(Handwritten signature)*

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-IV						
Theory Paper /Practical	Exam Schedule				Total marks	Credit	
	Internal marks		External marks				
AQB 401: Dissertation work	100		200		300	12	
AQB 402: Viva-voce & presentation	25		75		100	4	
AQB 403: Seminar	25		25		50	2	
AQB 404: Licensing and certification of Aquaculture practices	25		25		50	2	
AQB 405: Educational tour/Field visit	25		25		50	2	
AQB 406: Project submission	25		25		50	2	
<b>Total</b>	<b>225</b>		<b>375</b>		<b>600</b>	<b>24</b>	

*(Handwritten signature)*

[Subject code-2603081304020004]

**Semester IV**

Course Code	402						
Course Title	Viva-voce & Presentation						
Credit	4						
Teaching per Week	8 Hrs.						
Minimum weeks per Semester	16 (Including Seminar, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to create an effective learning environment and develop confidence in students.						
Course Objective	The objective of the course is to bring students together in groups and focus on a particular subject with active participation.						
Course Outcomes	<p><b>CO1:</b> Viva voce provides an opportunity for students to discuss and interact with the examiners that will ideas and concepts.</p> <p><b>CO2:</b> This course is a great chance for the students to improve their language, interact with experts from the specific field, learn about the latest information and new skills related to the concerned research.</p> <p><b>CO3:</b> Presentation will develop creativity, speaking fluency and conversational skill.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of biology and chemistry						
Course Content	Presentation should be prepared explaining the concerned research work in front of examiners. Viva voce will be taken simultaneously.						
Reference Books	-----						
Teaching Methodology	Explanation, Discussion, Self-Study						
Evaluation Method	Internal assessment (30%) based on class attendance, Seminar presentation and External assessment (70%) based on university examination (Seminar presentation)						

Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation and confidence Development</b> The designed syllabi enable studentsto be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments and fisheries. Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

**PSO2:** Develop the professional and entrepreneurship skills to be confident in the practical aspects.  
**PSO3:** Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.  
**PSO4:** Develop students for self-learning and challenging situations in aquaculture sectors and extension education.  
**PSO5:** Enable students to use recent technologies for analyzing the research and practical concepts.  
**PSO6:** Development for continuous learning and research for a successful academic and industrial career.

Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						

Medium of Instruction English

Programme structure Semester-IV

Theory Paper /Practical	Exam Schedule		Total marks	Credit
	Internal marks	External marks		
AQB 401: Dissertation work	100	200	300	12
AQB 402: Viva-voce & presentation	25	75	100	4
AQB 403: Seminar	25	25	50	2
AQB 404: Licensing and certification of Aquaculture practices	25	25	50	2
AQB 405: Educational tour/Field visit	25	25	50	2
AQB 406: Project submission	25	25	50	2
<b>Total</b>	<b>225</b>	<b>375</b>	<b>600</b>	<b>24</b>

*(Handwritten signature)*

[Subject code-2603081304030004]

**Semester IV**

Course Code	403						
Course Title	Seminar						
Credit	2						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	16 (Including Seminar, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course is to create an effective learning environment and develop confidence in students.						
Course Objective	The objective of the course is to bring students together in groups and focusing on some particular subject with active participation.						
Course Outcomes	<p><b>CO1:</b> Seminar provides an opportunity for students to discuss and analyse a range of new material, ideas and concepts.</p> <p><b>CO2:</b> This course is a great chance for the students to improve their language, interaction with experts from the specific field, learn about latest information and new skills related to the concerned topic.</p> <p><b>CO3:</b> Students will be able to develop English speaking through fluency and conversational skill.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of biology and chemistry						
Course Content	Seminar should be prepared in the field of Aquatic Biology and presented in front of examiners						
Reference Books	-----						
Teaching Methodology	Explanation, Discussion, Self-Study						
Evaluation Method	Internal assessment (30%) based on class attendance, Seminar presentation and External assessment (70%) based on university examination (Seminar presentation)						

(17/15)

Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries. Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

*(Signature)*

**PSO2:** Develop the professional and entrepreneurship skills to be confident in the practical aspects.  
**PSO3:** Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.  
**PSO4:** Develop students for self-learning and challenging situations in aquaculture sectors and extension education.  
**PSO5:** Enable students to use recent technologies for analyzing the research and practical concepts.  
**PSO6:** Development for continuous learning and research for a successful academic and industrial career.

Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						

Medium of Instruction: English

Programme structure: Semester-IV

Theory Paper /Practical	Exam Schedule		Total marks	Credit
	Internal marks	External marks		
AQB 401: Dissertation work	100	200	300	12
AQB 402: Viva-voce & presentation	25	75	100	4
AQB 403: Seminar	25	25	50	2
AQB 404: Licensing and certification of Aquaculture practices	25	25	50	2
AQB 405: Educational tour/Field visit	25	25	50	2
AQB 406: Project submission	25	25	50	2
<b>Total</b>	<b>225</b>	<b>375</b>	<b>600</b>	<b>24</b>

*(Handwritten signature)*

[Subject code-2603081304040004]

**Semester IV**

Course Code	404						
Course Title	Licensing and certification of Aquaculture practices						
Credit	2						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	16 (Including Project formulation, Certification and Licensing for Aquaculture, examination, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	<ul style="list-style-type: none"> <li>• The purpose of introducing project formulation for Aquaculture is to make students capable of examining the project idea from the stand point of its objectives, social impacts as well as financial and technical viability.</li> <li>• The purpose of the certification system in Aquaculture is to create awareness among students to ensure the sustainability of aquaculture products.</li> <li>• The purpose of introducing licensing in Aquaculture is to know about legislative act and detail legal conditions that surround the setting up of an aquaculture farm.</li> </ul>						
Course Objective	<ul style="list-style-type: none"> <li>• The objective of the project formulation for aquaculture is to benefit from the desired outcomes and impact.</li> <li>• Certification programs in Aquaculture is to promote sustainable practices it is worthwhile to consider what sustainable aquaculture development, actually implies and how it might be objectively assessed.</li> <li>• The objective of licensing in Aquaculture is to aware students of this important tool in ensuring the orderly development of an aquaculture industry and providing rights.</li> </ul>						
Course Outcomes	<p><b>CO1:</b> Students will be capable of identifying and documenting specific project goals, outcomes, milestones, tasks, costs, and timeline dates specific to the project objectives.</p> <p><b>CO2:</b> Certification programs creates awareness about environmental, social, food safety, animal health, and welfare— each step of the aquaculture production chain.</p> <p><b>CO3:</b> Aquaculture Licence and the consenting process helps to regulate the aquaculture sector.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of biology and chemistry						
Course Content	The procedural report has to be prepared to receive either Certificates or Licenses for assigned aquacultural practice.						
Reference Books	-----						
Teaching Methodology	Explanation, Discussion, Self-Study						
Evaluation Method	Internal assessment (30%) based on class attendance, Report evaluation, Discussion and External assessment (70%) based on university examination (Report evaluation and Discussion)						

Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation, and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

*(Handwritten signature)*

01 22 0

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-IV						
Theory Paper /Practical	Exam Schedule			Total marks	Credit		
	Internal marks		External marks				
AQB 401: Dissertation work	100		200	300	12		
AQB 402: Viva-voce & presentation	25		75	100	4		
AQB 403: Seminar	25		25	50	2		
AQB 404: Licensing and certification of Aquaculture practices	25		25	50	2		
AQB 405: Educational tour/Field visit	25		25	50	2		
AQB 406: Project submission	25		25	50	2		
<b>Total</b>	<b>225</b>		<b>375</b>	<b>600</b>	<b>24</b>		



Master of Aquatic Biology

Name of Program	Master of Aquatic Biology
Abbreviation	AQB
Duration	2 Years (Four Semester)
Eligibility Criteria	A candidate who has obtained his/her bachelor's degree in science except maths and physics.
Objective of Program	The main objective of the program is to prepare the students for productive careers in aquatic resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed program. This structured course will facilitate a career in various institutions such as research and development centers of private limited, public companies, Aquaculture sectors, farms, fisheries departments etc.
Program Outcome	<p><b>PO1: Basic Knowledge Enhancement</b> The designed Program enhances students with basic knowledge of the subject matter to capable students developing research skills which include laboratory techniques, aqua farm field techniques, disease management in the aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p><b>PO2: Skill Development</b> The program develops the skills of managing aquatic resources and the use of techniques and instruments to develop strategies to manage aquatic resources.</p> <p><b>PO3: Familiar with Advanced Emerging Technologies</b> The program trains students with the latest technologies that are being used in the aquaculture sectors and aquatic pollution management. The designed syllabi enrich students with the technical aspects of identifying aquatic problems in the natural environment.</p> <p><b>PO4: Skill in analysis technique with Extension Education</b> The program is capable of preparing students for analyzing, and conceptualizing real-world problems. It also enables students to understand the regulation and development in managing aquatic sources.</p> <p><b>PO5: Research and Project Development</b> The Development of the factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skills prepare students for an employable and industry-ready environment.</p> <p><b>PO6: Group discussion, field visits, presentation and confidence Development</b> The designed syllabi enable students to be capable of group discussion, and sharing ideas and views. This enables to development of confidence among the students. Healthy discussion in recent technology and legislations, pollution amendments, and fisheries. Technology enables acquaintances of the students with the practical aspects.</p>
Program Specific Outcomes	<b>PSO1:</b> Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.

1/1/15

	<p><b>PSO2:</b> Develop the professional and entrepreneurship skills to be confident in the practical aspects.</p> <p><b>PSO3:</b> Raising the student's capability for handling instruments and use of the latest technology to find remedial measures concerning fisheries and pollution.</p> <p><b>PSO4:</b> Develop students for self-learning and challenging situations in aquaculture sectors and extension education.</p> <p><b>PSO5:</b> Enable students to use recent technologies for analyzing the research and practical concepts.</p> <p><b>PSO6:</b> Development for continuous learning and research for a successful academic and industrial career.</p>						
Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	PO1						
	PO2						
	PO3						
	PO4						
	PO5						
	PO6						
Medium of Instruction	English						
Programme structure	Semester-IV						
Theory Paper /Practical	Exam Schedule			Total marks	Credit		
	Internal marks	External marks					
AQB 401: Dissertation work	100	200		300	12		
AQB 402: Viva-voce & presentation	25	75		100	4		
AQB 403: Seminar	25	25		50	2		
AQB 404: Licensing and certification of Aquaculture practices	25	25		50	2		
AQB 405: Educational tour/Field visit	25	25		50	2		
AQB 406: Project submission	25	25		50	2		
<b>Total</b>	<b>225</b>	<b>375</b>		<b>600</b>	<b>24</b>		

1/1/19

[Subject code-2603081304060001]

**Semester IV**

Course Code	406						
Course Title	Project submission						
Credit	2						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	16 (Including Study Tour/Project work, preparation, holidays etc.)						
Effective From	2025-26						
Purpose of Course	The purpose of the course (study tour) is to help students open themselves to many possibilities that are not just contained in one geographical location or culture. Other purposes (project work) is to make students understand about specific tasks and how goals will be achieved, identify, what resources will be needed, associated budgets and timelines for completion.						
Course Objective	The objective of the course is to provide a learning experience in which students have the opportunity to synthesize knowledge from various areas of learning and apply it critically and creatively in research.						
Course Outcomes	<p><b>CO1:</b> Project work will make student to enhance the knowledge practically.</p> <p><b>CO2:</b> The course will help to gather knowledge about recent advancement in their chosen fields of study.</p> <p><b>CO3:</b> Project work-based learning not only provides opportunities for students to collaborate their own learning, but it also teaches them skills such as problem solving and helps to develop additional skills integral to their future, such as critical thinking and time management.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
Pre-requisite	Basics of biology and chemistry						
Course Content	Student has to submit the project work in related subject						
Reference Books	-----						
Teaching Methodology	Explanation, Discussion, Self-Study						
Evaluation Method	Internal assessment (30%) based on class attendance, tour report evaluation, discussion and External assessment (70%) based on university examination (Tour report evaluation and Discussion)						