Re-Accredited 'B++' 2.86 CGPA by NAAC
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
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ક્રમાંક :એસ./પરિપત્ર/૨૪૯૫/૨૦૨૩
તા.૦૧/૦૨/૨૦૨૩

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

**વિષયઃ—** એકવેટીક બાયોલોજી વિષયનાં સેમેસ્ટર—૩ અને ૪ ના અભ્યાસક્રમ બાબત.

મહોદયા,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩—૨૪ થી અમલમાં આવનાર એકવેટીક બાયોલોજી વિષયનાં સેમે.—૩ અને ૪ ના NEP ના Framework મુજબ અભ્યાસક્રમ અંગે એકવેટીક બાયોલોજી વિષયની અભ્યાસ સમિતિની તા.૧૩/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૨ અન્વયે કરેલ ભલામણ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખાવતી વિજ્ઞાન વિદ્યાશાખાનાં ડીનશ્રીએ મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૩૦/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૧૮ થી સ્વીકારી મંજુર કરેલ છે, તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

**<u>એકવેટીક બાયોલોજી વિષયની અભ્યાસ સમિતિની તા.૧૩/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૨</u>**

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૩—૨૪ અમલમાં આવનાર એમ.એસસી. એકેવેટીક બાયોલોજી વિષયનાં NEP ના Framework મુજબ મુજબ સેમે.—૩ અને ૪ ના નવા અભ્યાસક્રમ મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

**<u>એકેડેમિક કાઉન્સિલની તા.૩૦/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૧૮</u>**

:: આથી ઠરાવવામાં આવે છે કે,શૈક્ષણિક વર્ષ ૨૦૨૩—૨૪ થી અમલમાં આવનાર એકેવેટીક બાયોલોજી વિષયનાં સેમે—૩ અને સેમે. ૪ નાં NEP ના Framework મુજબ અભ્યાસક્રમ અંગે એકેવેટીક બાયોલોજી વિષયની અભ્યાસ સમિતિની તા.૧૩/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૨ અન્વયે કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાનાં ડીનશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ સ્વીકારી મંજૂર કરવામાં આવે છે.

(બિડાણઃ ઉપર મુજબ)

કુલસચિવ

પ્રતિ,
૧) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા,
૨) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....જાણ સારૂ.

Master of Aquatic Biology

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| 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 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Research and Project Development**<br>Development of factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skill prepares students for employable and industry ready environment.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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 technology enables acquaintances of the students with the practical aspects. |

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| Program Specific Outcomes | PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.<br>PSO2 : Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3 :Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4 : Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.<br>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 | | | | | | |

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| 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 | | |
| **Theory papers :** | | | | | | |
| 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 |
| Elective Paper<br>AQB 304: A-Fisheries Extension Education<br>AQB:304: B-Research methodology and Writing skill | 04 | 03 | 30 | 70 | 100 | 04 |
| **Practical :** | | | | | | |
| AQB 305: Aquatic Microbiology, Aquaculture, Planktonology and Extension Education | 12 | 10-15 | 50 | 100 | 150 | 06 |
| Skill based elective paper<br>AQB 306:Entrepreneurship development in Fisheries | 02 | 00 | 20 | 30 | 50 | 02 |
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| Total | 30 | Total | 190 | 410 | 600 | 24 |

**Semester 3**

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| 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 | June 2022 |
| 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 | CO1: Students will able to understand about type of microorganisms with biogeochemical cycle to understand their role in aquatic environment.<br>CO2 : The counting and identification techniques like SPC, MPN and Qualitative methods help to determine the importance and safety level of microorganisms in concern to aquatic production and environment. Explain and train students to deal with post mortem changes of fish, fish pathogens and their prevention and control, microbial quality control of fish products and HACCP to reduce contamination in fish as well as improving safety of fishery products.<br>CO3: This paper helps student to develop the skill for health and disease management in fish farming sector.<br>CO4: This paper gives idea regarding physical, chemical and physiological defense mechanisms in fishes, diagnostic tools like histopathological methods, PCR, ELISA and therapy of fish diseases which helps students to recognize the causes of diseases as well as prophylactic and therapeutic treatment. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
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| CO1 | | | | | | |
| CO2 | | | | | | |
| CO3 | | | | | | |
| CO4 | | | | | | |

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| Pre-requisite | Basics of Microbiology, Zoology and Fisheries |
| Course Content | **Unit – I**<br>**Microorganisms associated with Aquatic Ecosystem:** General structure and characteristics of microbes (bacteria, fungi, algae and virus).<br>General classification of microbes (conventional and modern methods) in Aquatic environment.<br>**Biogeochemical Cycles:** Carbon, Nitrogen, Phosphorus and |

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| | Sulphur cycles and their significance.<br>**Unit - II**<br>**Methods of Studying Microorganisms**<br>Quantitative estimation of microorganisms in aquatic ecosystems.<br>Collection, isolation, cultivation and characterization of microorganisms.<br>Introduction and significance of Biofilm.<br>Nutrition, growth and preservation of aquatic microorganisms.<br>**Quality Control of Fish**<br>Post mortem changes (Hypermia, Riger mortis, Autolysis, Microbial Pultrification, Auto oxidation) in fishes, Prevention and control of fish pathogens, Microbial quality control of processed fish products, HACCP.<br>**Unit - III**<br>**Fish Diseases and Health Management**<br>Non-pathogenic diseases: symptoms and control - Environmental, Nutritional and Hereditary diseases.<br>Pathogenic diseases: symptoms and control - Bacterial, Fungal, Viral and Algal diseases in fin fishes and shell fishes.<br>Parasitic diseases: symptoms and control - Protozoan, Crustacean, and Worm diseases in fin fishes and shell fishes.<br>**Unit - IV**<br>**Etiology**<br>Physical, chemical and physiological defence mechanisms in fishes, Methods of pathological examination of fish, Disease diagnosis: Histopathological and Biotechnological (PCR and ELISA) methods. |
| Reference Books | 1. Frazier, W. C and Westnoff, D. C. (2008). Food Microbiology. Tata McGraw Hill Publishing Company, New Delhi.<br>2. Modi, H. A. (1995). Elementary Microbiology. Ekta Prakashan, Nadiyad.<br>3. Mukundan, M. K. and Balasubramaniam, S. (2007). Seafood Quality Assurance. Central Institute of Fisheries Technology, Cochin.<br>4. Rheinheimer, G. C. (1974). Aquatic Microbiology. John Wiley and sons, England.<br>5. Sigee, D. C. (2005). Freshwater Microbiology. John Wiley and Sons, England.<br>6. Surendran, P. K., Thampuran, N., Nambiar, N. V. and Laliha, K. V. (2009). Microbiological Examination of Seafood. Central Institute of Fisheries Technology, Cochin.<br>7. Whitman, K. A. (2004). Finfish and Shellfish Bacteriology. CBS Publishers, New Delhi.<br>8. Mitra, A. and Banerjee, K. (2004). Marine Microbiology. Narendra Publishing House, Delhi.<br>9. Pelezar, M. J., Cahn, E. C. S. and Krieg, H. R. (1981). Elements of Microbiology. McGraw Hill Book Co., NY.<br>10. Tortora, G. J., Funke, B. R. and Case, C. L. (2007). |

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| | Microbiology. Dorling Kindersley (India) Pvt. Ltd., New Delhi, India.<br>11. Willey, J., Sherwood, L. and Woolverton, J. (2017). Presscot, Harley and Klein's Microbiology. McGraw Hill Education.<br>12. Patel, R. J. (2000). Experimental Microbiology. Aditya, Ahemdabad, India, Vol. I & II.<br>13. Cheesbrough, M. (2002). District Laboratory Practice in Tropical Countries. Cambridge University press, USA.<br>14. Holt, J. G., Krieg N. R., Sneath, P. H. A., Staley, J. T. and Williams, S.T. (1994). Bergey's Manual of Determinative Bacteriology (9th ed.). Williams and Wilkins, USA.<br>15. Schaperclaus, W. (2001). Fish Diseases. Vol I & Vol II, Oxonian Press Pvt. Ltd., New Delhi.<br>16. Cornell, J. J. (1995). Control of Fish Quality. Fishing New Books.<br>17. Duijn, C. V. (2000). Diseases of Fishes. Narendra Publishing House, Delhi.<br>18. Wedemeyer, G. K. (1999). Environmental Stress and Fish Diseases. Narendra Publishing House, Delhi.<br>19. Woo, P. T. K. and Leatheland, F. (1998). Fish Diseases and Disorders. CABI Publishers, Wallingford. |
| Teaching Methodology | Classwork, Discussion, Self-Study, Assignment, ICT |
| Evaluation Method | 30% Internal assessment based on class attendance, assignment and internal examination, 70% External based on University examination. |

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 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Research and Project Development**<br>Development of factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skill prepares students for employable and industry ready environment.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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 Technology enables acquaintances of the students with the practical aspects. |

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| Program Specific Outcomes | PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.<br>PSO2: Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4: Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.<br>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 | | | | | | |

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|---|---|---|---|---|---|---|
| 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 | | |
| **Theory papers :** | | | | | | |
| 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 |
| Elective Paper<br>AQB 304: A-Fisheries Extension Education<br>AQB:304: B-Research methodology and Writing skill | 04 | 03 | 30 | 70 | 100 | 04 |
| **Practicals :** | | | | | | |
| AQB 305: Aquatic Microbiology, Aquaculture, Planktonology and Extension Education | 12 | 10-15 | 50 | 100 | 150 | 06 |
| Skill based elective paper<br>AQB 306:Entrepreneurship development in Fisheries | 02 | 00 | 20 | 30 | 50 | 02 |
| Total | 30 | Total | 190 | 410 | 600 | 24 |

**Semester 3**

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|---|---|
| Course Code | 302 |
| Course Title | Aquaculture practices |
| Credit | 4 |
| Teaching per Week | 4 Hrs |
| Minimum weeks per Semester | 16 (Including Classwork, examination, preparation, holidays etc.) |
| Effective From | June 2023 |
| Purpose of Course | The purpose of the course is to gain knowledge about culture techniques for freshwater organism for commercial purpose and farm construction. |
| Course Objective | To gain knowledge for aquafarm design and construction.<br>To acquire knowledge for culturing freshwater organisms for commercial purposes. |
| Course Outcomes | CO1: Students will be familiar about advancement in aquaculture, pond farm preparation, criteria for selection of species for aquaculture, culture techniques for freshwater aquatic organisms, equipment used in aquafarm.<br>CO2: Student will develop skill for freshwater culture techniques for freshwater animal, microalgae and vascular plants.<br>CO3: Students will be aware regarding best aquaculture management practices, improvement in fish quality and about more revenue generation.<br>CO4: Student will be able to apply use of microalgae and higher vascular plants for waste water treatment. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | | | | | | |
| CO2 | | | | | | |
| CO3 | | | | | | |
| CO4 | | | | | | |

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| Pre-requisite | Basics of Biology and chemistry |
| Course Content | **UNIT I**<br>Introduction, culture methods, harvesting and marketing of important major carps, catfishes and freshwater prawns<br>Fish culture practices with reference to Composite fish culture, Integrated fish culture and Sewage fed fish culture<br>**UNIT II**<br>Introductions, types and advances in brackish water aquaculture<br>Introduction, culture methods, harvesting and marketing of important brackish water fin fishes and shell fishes (Mullet, Milk fish, Sea bass, peal spot and shrimp)<br>**UNIT III**<br>Introductions, types and advances in Marin water aquaculture.<br>Introduction, culture methods, harvesting and marketing of Edible oyster, Pearl oyster and techniques of pearl production, Lobster and Clam.<br>**Unit-IV**<br>Taxonomy of economically important seaweeds. Distribution, morphology, reproduction, life cycle, growth physiology and Culture |

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| | techniques of sea weeds (*Gracilaria, Caulerpa*), Products from seaweeds, *Spirulina, Chlorella* |
| Reference Books | 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<br>2. Brown, E.E., Gratzek, J.B. (1980): Fish Farming Hand Book. AVI Publishing Company, West port USA<br>3. Fast, A.W. and Lester, L.J. (1992): Marine Shrimp culture – Principles and Practices. Elsvier Science Publishers, Amsterdams<br>4. James, P. McVey (1983): Handbook of Mariculture Vol. I. Crustacean Aquaculture. CRC Press. Inc. Florida; 442 pp.<br>5. Korring, P. (1976): Farming of marine fishes and shrimp. Elsvier Science Publishers, NY<br>6. Landau, M. (1992): Introduction to Aquaculture, John Wiley and Sons, New York.<br>7. Mathew, L. (1992): Introduction to Aquaculture, John Wiley and sons, INC, New York<br>8. Oren, O.H. (1981): Aquaculture of Grey Mullets. Cambridge University Press, London<br>9. Pillay, T.V.R. and Kutty, M.N. (2005): Aquaculture – Principles and Practices, Black Well Sciences, U.K.<br>10. Takeo, I. (1978): Aquaculture in shallow seas. Progress in shallow. Sea culture, Amerind Publishing Co. Pvt. Ltd. New Delhi. 613 pp.<br>11. Chapman, V.J. and Chapman, P.J. (1980): Seaweeds and their uses. Chapman and Hall with Methuen Inc., New York.<br>12. Dawes, C.J. (1981): Marine Botany. John Wiley and sons.<br>13. Dawson, R.Y (1966): Marine Botany. An Introduction Holt, Reinhart and Winston Inc., U.S.A.<br>14. Desikachary, T.V. (1975): Marine Plants. C.S.I.R., New Delhi.<br>15. Dring, M.J. (1982): The Biology of Marine Plants. Edward Arnold Publishers, London.<br>16. Kapraun, D.F. (1980): An illustrated guide to the benthic marine algae of coastal North Carolina- Rhodophyta. University North Carolina Press.<br>17. Levring, T. (1981): Proceedings of 10th International seaweed symposium, Goteborg, Sweden, Academic Press Walter de Guyter, Berlin |
| Teaching Methodology | Classwork, Discussion, Self-Study, Assignment, ICT, Field visit |
| Evaluation Method | 30% Internal assessment based on class attendance, assignment, internal examination, etc. 70% External based on University examination |

Master of Aquatic Biology

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|---|---|
| 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 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Research and Project Development**<br>Development of factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skill prepares students for employable and industry ready environment.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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 Technology enables acquaintances of the students with the practical aspects. |

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|---|---|
| Program Specific Outcomes | PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.<br>PSO2: Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4: Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.<br>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 | | | | | | |

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|---|---|---|---|---|---|---|
| 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 | | |
| **Theory papers :** | | | | | | |
| 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 |
| Elective Paper<br>AQB 304: A-Fisheries Extension Education<br>AQB:304: B-Research methodology and Writing skill | 04 | 03 | 30 | 70 | 100 | 04 |
| **Practicals :** | | | | | | |
| AQB 305: Aquatic Microbiology, Aquaculture, Planktonology and Extension Education | 12 | 10-15 | 50 | 100 | 150 | 06 |
| Skill based elective paper<br>AQB 306:Entrepreneurship development in Fisheries | 02 | 00 | 20 | 30 | 50 | 02 |
| Total | 30 | Total | 190 | 410 | 600 | 24 |

**Semester 3**

<table>
<tr><td>Course Code</td><td>303</td></tr>
<tr><td>Course Title</td><td>Planktonology</td></tr>
<tr><td>Credit .</td><td>4</td></tr>
<tr><td>Teaching per Week</td><td>4 Hrs</td></tr>
<tr><td>Minimum weeks per Semester</td><td>16 (Including Classwork, examination, preparation, holidays etc.)</td></tr>
<tr><td>Effective From</td><td>June 2023</td></tr>
<tr><td>Purpose of Course</td><td>The purpose of the course is to develop concepts of planktonology and learn their implementation in aquaculture sectors, commercial sector and aquatic resource management.</td></tr>
<tr><td>Course Objective</td><td>To acquire skill in students to identify plankton and their implementation as bioindicators. To measure productivity and its application in aquaculture sectors, commercial sector and aquatic resource management.</td></tr>
<tr><td>Course Outcomes</td><td>CO1: Develop 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.<br>CO2: After learning this course, students will be able to develop skill to identify plankton and measure productivity and its application in aquaculture sectors and aquatic resource management as well as extracted material from plankton has importance in commercial sector.<br>CO3: 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.</td></tr>
<tr><td>Mapping between COs with PSOs</td><td>
<table>
<tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Pre-requisite</td><td>Basics of Fisheries Science</td></tr>
<tr><td>Course Content</td><td>Unit - I<br>Introduction of plankton:<br>Introduction and General classification of plankton, general account of instruments and nets employed for collection of plankton, Methods of fixation and preservation of plankton.<br>Unit - II<br>Productivity:<br>Method of estimation of Primary productivity, secondary and tertiary productivity, factors affecting productivity. Estimation of standing crop: wet and dry weight estimation, plankton volume setting and displacement method. Oxidation as carbon. (as organic matter)<br>Unit - III<br>Mechanisms in plankton:<br>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,</td></tr>
</table>

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| | Harmful algal blooms - its causes and effects<br>**Unit – IV**<br>**Ecological and Commercial Importance of primary producers:** Effects of plankton production in aquatic environment. Microalgae as a source of protein. Periphyton - Importance of Periphyton in aquatic environment, Biofuel and other commercial products from algae. Types of larvae and their distribution, chemical communication and settlement of larvae of marine benthic organisms. |
| Reference Books | 1. Edmondson, W.T. (1976). Freshwater Biology. 2nd Ed. John Wiley (Ed) and sons Inc.<br>2. Hutchinsn, G.E. (1976). A treatise on limnology. Vol. I & II John Wiley & Sons.<br>3. Jhingran, V.G. (1985). Fish and fisheries of India. Hindustan Publication Corp., New Delhi.<br>4. Nybakken, J.W.(2001). Marine Biology an Ecological Approach 4th edition. Addison Wesley Edu. Pub. Inc.<br>5. Peter McRoy, C. and G. Helferich (1977). Sea grass Ecosystems. A scientfic perspective. Marcel Dekker Inc. New York<br>6. Sumich, J. l. (1999). Introduction to the biology of marine life 7th Edition. The McGraw hill Companies Inc.<br>7. Welch. P.S. (1952). Limnology. 2nd Ed. McGraw Hill Book Co. |
| Teaching Methodology | Classwork, Discussion, Self-Study, Assignment, ICT, Field visit |
| Evaluation Method | 30% Internal assessment based on class attendance, assignment and internal examination, 70% External based on University examination. |

**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 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Professional skill Development through personal experience**<br>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.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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 Technology enables acquaintances of the students with the practical aspects. |

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|---|---|
| Program Specific Outcomes | PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.<br>PSO2: Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4: Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.<br>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 | | | | | | |

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|---|---|---|---|---|---|---|
| Medium of Instruction | English | | | | | |
| **M. Sc. Sem III** | | | | | | |
| Theory Paper /Practical | Teaching schedule Hrs/week | Exam Schedule | | | Total marks | Credit |
| | | Duration (Hrs) | Internal marks | External marks | | |
| **Theory papers:** | | | | | | |
| 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 |
| Elective Paper<br>AQB 304: A Fisheries Extension Education<br>AQB:304: B Research methodology and Writing skill | 04 | 03 | 30 | 70 | 100 | 04 |
| **Practical :** | | | | | | |
| AQB305:Aquatic Microbiology, Aquaculture, Planktonology and Extension Education | 12 | 10-15 | 50 | 100 | 150 | 06 |
| Skill based elective paper AQB 306: Entrepreneurship development in Fisheries | 02 | 00 | 20 | 30 | 50 | 02 |
| Total | 30 | Total | 190 | 410 | 600 | 24 |

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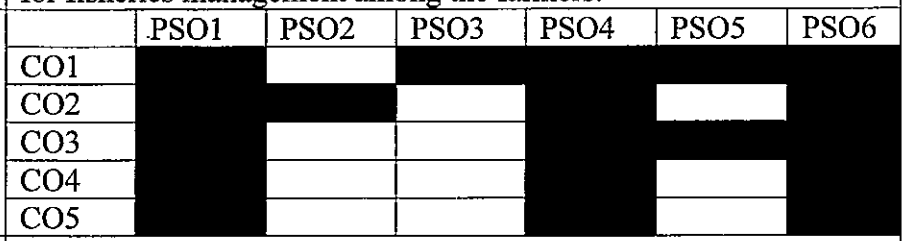
|---|---|
| **Course Code** | 304 A |
| **Course Title** | Fisheries Extension Education |
| **Credit** | 4 |
| **Teaching per week** | 4 Hrs |
| **Minimum weeks per semester** | 15 (Including Classwork, examination, preparation, holidays etc.) |
| **Effective from** | June 2023 |
| **Purpose of course** | The purpose of the course is to develop the analysis methodology, dissemination methods of the innovations and regulations of the fisheries resources which would be helpful for the formation of the database and resources management. |
| **Course objective** | To acquaint the students about the biostatical methods, innovation dissemination and fisheries resources regulations. |
| **Course Outcome** | **CO1:** The application of extension education in the field of aquatic biology help for resource management.<br>**CO2:** The innovations are not essential but its application at needful field are also useful and it would be possible to teach the students about fisheries extension education.<br>**CO3:** The fisheries extension education essential to develop the communication skill, training strategies, contact methods etc. certainly help to disseminate the innovation and technologies to beneficiaries.<br>**CO4:** The knowledge regarding inland fisheries policies implemented by the state and central government are elaborated to students to improve the knowledge and technical skill.<br>**CO5:** The dissemination of advanced technologies and awareness for fisheries management among the farmers. |
| **Mapping of COs with PSOs** |  |
| **Course prerequisite** | Communication and contact tools and basic equipment's for aquaculture. |
| Course Content | **UNIT I**<br>Extension Education – 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.<br>**UNIT II**<br>Communication process: concept, elements, functions and models of communication.<br>Teaching strategies and models: Meaning and various types of teaching strategies. Models of Teaching – Characteristics, Functions and elements.<br>**UNIT III**<br>Diffusion and innovation: concept and meaning, elements.<br>Adoption: adoption process, adopter categories and factors influencing adoption.<br>**UNIT IV**<br>Information communication technology: Concept and role in |

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| | fisheries development.<br>Information communication technology – print and electronic media, video, teleconferencing, computer assisted instructions, touch screen and web technologies.<br>Cooperatives: Introduction, Concept of Co-operation, Objectives of Co-operative Movement, Models of Co-operatives and types of Co-operatives. |
| **References** | 1. Dahama, O.P. (1983): Extension and rural welfare. Ramprasad and Son's, Agra<br>2. Dhote, A.K. (1989): Fisheries Management and Extension: Inland fisheries, instructional cum practical manual (VI) NCERT, New Delhi<br>3. Lynton P.R. and Pareek, U. (1978): Training for development, Kumarian Press, 29 Bishop Road, West Hartford, Connecticut 06119<br>4. Ray, G.I. (1991): Extension communication and management, Naya Prakash, Kolkatta<br>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.<br>6. Supe, S.V. (1986): An introduction to extension education, Oxford and IBH Publishing Co., New Delhi.<br>7. Gupta CB. 2001. Management Theory and Practice. Sultan Chand & Sons. Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy<br>8. Gallagher K. 1999. Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods. Global EPM Facility, FAO.<br>9. Ganesan R, Iqbal IM & Anandaraja N. 2003. Reaching the Unreached: Basics of Extension Education. Associated Publishing Co.<br>10. Jalihal KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept Publ.<br>11. Khan PM. 2002. Textbook of Extension Education. Himalaya Publ. Ray GL. 2006. Extension Communication and Management. Kalyani Publ<br>12. Dahama OP & Bhatnagar OP. 2005. Education and Communication for Development. Oxford & IBH.<br>13. Grover I, Kaushik S, Yadav L & Varma SK. 2002. Communication and Instructional Technology. Agrotech Publ. Academy<br>14. O. P. Sharma, 2012. Development Perspectives of Extension Education, Agrotech Publishing Academy, Udaipur-313001 |
| **Teaching methods** | Chalk and talk, Discussion, Videos, Self-study, Seminars and Assignments |
| **Evaluation methods** | Internal assessment (30%) based on the internal exam, attendance and assignments. External assessment (70%) based on the university examination at the end of the semester. |

**Semester 3**

<table>
<tr><td>Course Code</td><td>304- B</td></tr>
<tr><td>Course Title</td><td>Research methodology and Writing skill (Elective Paper)</td></tr>
<tr><td>Credit</td><td>4</td></tr>
<tr><td>Teaching per Week</td><td>4 Hrs</td></tr>
<tr><td>Minimum weeks per Semester</td><td>15 (Including Classwork, examination, preparation, holidays etc.)</td></tr>
<tr><td>Effective From</td><td>June 2022</td></tr>
<tr><td>Purpose of Course</td><td>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.</td></tr>
<tr><td>Course Objective</td><td>To acquaint the students about the research methods, research design and formulation along with skill of scientific writing.</td></tr>
<tr><td>Course Outcomes</td><td>CO1: The application of different research methods for research work and analysis<br>CO2: To help students acquire knowledge on different methods of sample collection and hypothesis formulation for research studies.<br>CO3: The course would help students to apply statistical analysis tools, data presentation, interpretation and predict the outcomes of the research for future aspects.<br>CO4: The course would help students capable of writing scientific literatures</td></tr>
<tr><td>Mapping between COs with PSOs</td><td>
<table>
<tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Pre-requisite</td><td>Basics of biology and chemistry</td></tr>
<tr><td>Course Content</td><td>Unit – I<br>Research: Meaning, definitions, objectives, characteristics of Research<br>Criteria of Good Research<br>Types of Research<br>Research Problem & Formulation<br>Selecting the Problem, Sources of the Problem, Defining a Problem, Statement of a Problem<br>Hypothesis: Qualities of a good Hypothesis –Types of Hypotheses, Hypothesis Testing and interpretation<br>Research Design: Features of a good research design,<br>Concept, types and application of Exploratory Research Design, Descriptive Research Design and Experimental research Design<br>Unit – II<br>Data Collection and analysis: Methods of data collection, Sampling Methods, Sampling Errors<br>Data Processing and Analysis strategies: Data presentation, statistical analysis and interpretation of data, types of analysis, simple regression analysis, correlation, coefficient of determination, ($r^2$), z-test, t-test, ANOVA, Chi-square test, multi-variate analysis of data and multiple regression.</td></tr>
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| | **Unit - III**<br>Report and thesis writing: Structure and components of scientific reports, types of report<br>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.<br>The Review of Literature: Meaning, need, objectives, sources and the functions of Review of Literature, pattern of writing review of Literature<br>Oral presentation - planning, software tools, creating and making effective presentation, use of visual aids<br>**Unit - IV**<br>Research Paper Writing: Layout of a Research Paper, Journal selection, Impact factor of Journals, Ethical issues related to publishing, Plagiarism and Self-Plagiarism.<br>Use of Encyclopaedias, Research Guides, Handbook etc. for paper writing<br>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 |
| Reference Books | 1. Bhattacharyya D. K (2006) Research Methodology, Excel Books.<br>2. Gurumani. N. (2006) Research Methodology for Biological Sciences, MJP Publishers, Chennai<br>3. Day Robert (.2002) How to write and publish a scientific paper, Cambridge University Press<br>4. Janice Matthews and Robert Matthwes (2008). Successful Scientific Writing, Cambridge University Press<br>5. Matt Young (2006). The Technical Writer's Handbook, Viva Books Private Limited, India<br>6. Fisher, R. A. (1970) Statistical Methods for Research Workers, l4th Edition, Oliver and Boyd Publ.<br>7. Cohen, L. Lawrence, M., & Morrison, K. (2005). Research Methods in Education (5th edition)., Oxford: Oxford University Press.<br>8. Denscombes, M. (2010). The Good Research Guide: For small-scale social research projects. Maiden-Read: Open University Press.<br>9. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford University Press.<br>10. Kothari, C. R. (1980). Research Methodology: Research and techniques, New Delhi: New Age, International Publishers. |
| Teaching Methodology | Classwork, Discussion, Self-Study, models and Assignment |
| Evaluation Method | 30% Internal assessment based on class attendance, assignments, internal examination, etc. 70% External based on University examination |

**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 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Research and Project Development**<br>Development of factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skill prepares students for employable and industry ready environment.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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 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.<br>PSO2: Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4: Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.<br>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 | | |
| **Theory papers :** | | | | | | |
| AQB 301: Aquatic Microbiology &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 |
| Elective Paper<br>AQB 304: A-Fisheries Extension Education<br>AQB:304: B-Research methodology and Writing skill | 04 | 03 | 30 | 70 | 100 | 04 |
| **practical :** | | | | | | |
| AQB 305: Aquatic Microbiology, Aquaculture, Planktonology and Extension Education | 12 | 10-15 | 50 | 100 | 150 | 06 |
| Skill based elective paper<br>AQB 306: Entrepreneurship development in Fisheries | 02 | 00 | 20 | 30 | 50 | 02 |
| Total | 30 | Total | 190 | 410 | 600 | 24 |

**Semester 3**

| | |
|---|---|
| Course Code | **305** |
| Course Title | **Aquatic Microbiology, Aquaculture, Planktonology and Extension Education** |
| Credit | 6 |
| Teaching per Week | 12 Hrs |
| Minimum weeks per Semester | 16 (Including laboratory work, examination, preparation, holidays etc.) |
| Effective From | June 2022 |
| Purpose of Course | 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.<br>2. The purpose of the course is to make students capable of identifying and culture of aquatic organisms.<br>3. The purpose of the course is to develop skills of the students regarding writing research paper and preparation of AV aids. |
| Course Objective | 1. To make students familiar about Preparation of media, 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.<br>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.<br>3. To make the students understand about Collection, preservation and Identification of plankton (freshwater and marine water), Quantitative estimation of plankton (counting method) & chlorophyll estimation.<br>4. To make the student capable of understanding about Preparation of AV aids (Pamphlets and folders) and research paper. |
| Course Outcomes | CO1: The counting and identification of microorganisms through SPC, MPN, and Gram's staining technique aids to determine the importance and safety level of microorganisms in concern to aquatic production and environment.<br>CO2: 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 |

<table>
<tr><td></td><td>fishes, shell fishes, predatory and weed fishes which are closely related to Aquaculture management.<br>CO3: The paper gives detail idea about culture of Artesia which gives different food alternatives for fishes during culture and more revenue generation.<br>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.<br>CO5: Preparation of AV aids and research paper writing improves learning, teaching and writing skill.</td></tr>
<tr><td>Mapping between COs with PSOs</td><td>
<table>
<tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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</td></tr>
<tr><td>Pre-requisite</td><td>Basics of Microbiology, Zoology and Fisheries</td></tr>
<tr><td>Course Content</td><td>Unit I<br>Preparation of media<br>Isolation methods for bacteria<br>Identification of bacteria by Gram's staining technique<br>Assessment of microbiological quality of water bodies, fish and fish products using SPC technique<br>Assessment of microbiological quality of water bodies using MPN technique<br>Demonstration: Isolation and identification of pathogenic bacteria from fish<br>Study of diseased specimens/images<br>Unit II<br>Identification fresh water higher vascular plants<br>Identification of sea weeds<br>Identification of aquatic insects and prawn larvae<br>Identification of seed stages (eggs, spawns, fry and fingerlings)<br>Identification of cultivable fin fishes, shell fishes, predatory and weed fishes<br>Hatching and culturing of Artemia<br>Culture of Microalgae<br>Unit III<br>Collection, preservation and Identification of plankton (freshwater and marine water)<br>Quantitative estimation of plankton (counting method) & chlorophyll estimation<br>Unit IV<br>Preparation of AV aids (Pamphlets and folders)<br>Preparing of research paper</td></tr>
<tr><td>Reference Books</td><td>1. Patel, R. J. (2000). Experimental Microbiology. Aditya, Ahmedabad, India, Vol. I & II.<br>2. Surendran, P. K., Thampuran, N., Nambiar, N. V. and Laliha, K. V. (2009). Microbiological Examination of</td></tr>
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|---|---|
| | Seafood. Central Institute of Fisheries Technology, Cochin.<br>3. Pelezar, M. J., Cahn, E. C. S. and Krieg, H. R. (1981). Elements of Microbiology. McGraw Hill Book Co., NY.<br>4. Tortora, G. J., Funke, B. R. and Case, C. L. (2007). Microbiology. Dorling Kindersley (India) Pvt. Ltd., New Delhi, India.<br>5. Cheesbrough, M. (2002). District Laboratory Practice in Tropical Countries. Cambridge University press, USA.<br>6. Pillai, N.K. (1986). Introduction to Planktonology. Himalaya Publishing House, Bombay.<br>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.<br>8. FAO, (1992). Manual of seed production of carps.<br>9. Jhingran, V. G. (1991). Fish and Fisheries of India, Hindustan Publishers.<br>10. Pillay, T.V.R. and Kutty, M.N. (2005): Aquaculture – Principles and Practices. Black Well Sciences, U. K<br>11. Sher Singh, B. and Sikarwar, T. K (2014): Hand book for writing research paper. Bharati Publications, New Delhi. |
| Teaching Methodology | Practical performance and demonstration, Discussion, Self-Study, ICT |
| Evaluation Method | 30% Internal assessment based on class attendance, assignment and internal examination, 70% External based on University examination. |

**Master of Aquatic Biology**

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|---|---|
| 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 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Professional skill Development through personal experience**<br>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.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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 Technology enables acquaintances of the students with the practical aspects. |

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| Program Specific Outcomes | PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage aquatic resources.<br>PSO2: Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4: Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.<br>PSO6: Development for continuous learning and research for successful academic and industrial career. |
| Mapping between POs and PSOs | |
| Medium of Instruction | English |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| PO1 | | | | | | |
| PO2 | | | | | | |
| PO3 | | | | | | |
| PO4 | | | | | | |
| PO5 | | | | | | |
| PO6 | | | | | | |

**M. Sc. Sem III**

| Theory Paper /Practical | Teaching schedule Hrs /week | Exam Schedule | | | Total marks | Credit |
|---|---|---|---|---|---|---|
| | | Duration (Hrs) | Internal marks | External marks | | |
| Theory papers : | | | | | | |
| AQB 301: Aquatic Microbiology &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 |
| Elective Paper<br>AQB 304: A-Fisheries Extension Education<br>AQB:304: B-Research methodology and Writing skill | 04 | 03 | 30 | 70 | 100 | 04 |
| **practical :** | | | | | | |
| AQB 305: Aquatic Microbiology, Aquaculture, Planktonology and Extension Education | 12 | 10-15 | 50 | 100 | 150 | 06 |
| Skill based elective paper<br>AQB 306:Entrepreneurship development in Fisheries | 02 | 00 | 20 | 30 | 50 | 02 |
| Total | 30 | Total | 190 | 410 | 600 | 24 |

**Semester 3**

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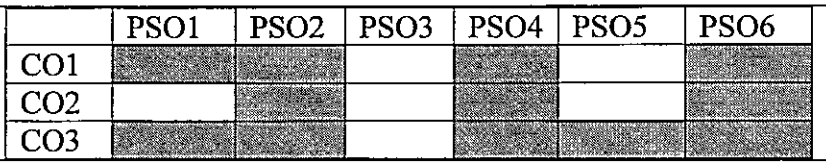
|---|---|
| Course Code | **306** |
| Course Title | Entrepreneurship development in Fisheries<br>(Skill based elective paper) |
| Credit | 02 |
| Teaching per Week | 2 Hrs |
| Minimum weeks per Semester | 15 (Including Classwork, examination, preparation, holidays etc.) |
| Effective From | June 20223 |
| 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<br>CO2: To help students know about different policies and incentive schemes in developing entrepreneurship in farm development and value-added products<br>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 |  |
| Pre-requisite | Basics of biology and chemistry |
| Course Content | **Unit – I**<br>Concept of entrepreneurship; entrepreneurial and managerial characteristics; motivation and entrepreneurship development; managing competition; entrepreneurship development programs; Entrepreneurship process.<br>Women entrepreneurship: concept, problems and development of women entrepreneurs<br>**Unit -II**<br>Government schemes and incentives for promotion of entrepreneurship, Government policy on Small and Medium Enterprises<br>Financial Management:<br>Financing procedure and financial incentives, Banking norms as in vogue.<br>Financial ratios & and their significance, Costing and Pricing.<br>Fund flow and Cash flow concept.<br>Preparation of enterprise budget for fish farming. Fiscal and monitory policies and its impact on entrepreneurship.<br>**Unit – III**<br>Infrastructural and other financial requirement for fishery entrepreneurship. Contract farming and joint ventures, public-private partnerships.<br>Overview of fisheries inputs industry. Characteristics of Indian fisheries processing and export industry. |

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| | Production Management: Elements of production process, Production Planning and control, Product development, Testing facilities, Patents, Quality Assurance, Total Quality Management<br>**Unit – IV**<br>Supply chain màngement- meaning, advantages, stages, process, drivers and scope of aqua-supply chain management |
| Reference Books | 1. Kumar A., Poornima. S., Mini S C., Abraham K. and Jayashree K. (2003). Entrepreneurship Development, New Age International Publishers, New Delhi.<br>2. Gupta, C.B. (2001). Management, Theory and Practice. Sultan Chand and Sons, New. Delhi.<br>3. Indu G. (2008). Handbook on Empowerment and Entrepreneurship. Agrotech, Public Academy, Udaipur.<br>4. Khanka, S.S. (1999). Entrepreneurial Development, S. Chand and Co., New Delhi.<br>5. Mary C. (2008). Entrepreneurship in Action. Prentice Hall of India Pvt. Ltd., New Delhi.<br>6. Mohanty S.K. (2009). Fundamentals of Entrepreneurship. Prentice Hall of India Pvt. Ltd., New Delhi.<br>7. Prasad R. (2003). Entrepreneurship - Concepts and Cases. ICFAI Publications, Hyderabad.<br>8. Mondal S. and Ray, G.L. (2009). Text Book of Entrepreneurship and Rural, Development. Kalyani publishers, Ludhiana.<br>9. Singh D. (1995). Effective Managerial Leadership. Deep and Deep Publications, New Delhi.<br>10. Desai, V. (1997). Small Scale Industries and Entrepreneurship. Himalaya Publishing House, New Delhi.<br>11. Desai. V. (2000). Dynamics of Entrepreneurial Development and Management. Himalaya Publishing House, New Delhi |
| Teaching Methodology | Classwork, Discussion, Self-Study, models and Assignment |
| Evaluation Method | 30% Internal assessment based on class attendance, assignments, internal examination, etc. 70% External based on University examination |

Master of Aquatic Biology

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|---|---|
| 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 degreein 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 | **PO1 : Basic Knowledge Enhancement**<br>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.<br>**PO2 : Skill Development**<br>The program develops the skills of managing aquatic resources and use of techniques and instruments to develop remedies to manage aquatic resources.<br>**PO3 : Familiar with Advanced Emerging Technologies**<br>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.<br>**PO4 : Skill in analysis technique with Extension Education**<br>The program capable students for analysis, conceptualizing the real-world problems. It also enables students understand the Regulation and Development in managing aquatic sources.<br>**PO5 : Research and Project Development**<br>Development of factual project provides the learner's exposure to work in the demanding environment of the industry. The research and project development skillprepares students for employable and industry ready environment.<br>**PO6 : Group discussion, field visits, presentation and confidence Development**<br>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<br>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. |

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|---|---|
| | PSO2 : Develop the professional and entrepreneurship skills to be confident in the practical aspects.<br>PSO3 :Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.<br>PSO4 : Develop students for self-learning and challenging situation in aquaculture sectors and extension education.<br>PSO5 :Enable students to use recent technologies for analysing the research and practical concepts.<br>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 | | | | | | |

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|---|---|---|---|---|
| Medium of Instruction | English | | | |
| Programme structure | Semester-IV | | | |
| Theory Paper /Practical | Exam Schedule | | Total marks | Credit |
| | Internal marks | External marks | | |
| AQB: 401 Dissertation | 90 | 210 | 300 | 12 |
| AQB:402 Research paper preparation and communication | 45 | 105 | 150 | 6 |
| AQB: 403 Licensing and certification of Aquaculture practices | 25 | 50 | 75 | 3 |
| AQB 404: Education tour/Field work/Project submission | 25 | 50 | 75 | 3 |
| Total | 185 | 415 | 600 | 24 |

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Semester IV

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|---|---|
| Course Code | **401** |
| Course Title | **Dissertation (Research Work)** |
| Credit | 12 |
| Teaching per Week | 12 Hrs |
| Minimum weeks per Semester | 16 (Including Dissertation (Research work), examination, preparation, holidays etc.) |
| Effective From | June 2023 |
| 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 field work. |
| Course Objective | The objective of the course is to enhance the skill of students regarding effective project management. |
| Course Outcomes | CO1: Student is capable of identifying his or her own area of interest, able to explore a subject in depth, manage a research project, define a suitable question and use the appropriate research tools.<br>CO2: Students will be able to develop research skills, communication, academic writing, data collation and analysis skills.<br>CO3: Dissertation helps in paper publications which make students an expert in their field of knowledge. |
| Mapping between COs with PSOs | |
| Pre-requisite | Basics of biology and chemistry |
| Course Content | ----- |
| Reference Books | ----- |
| Teaching Methodology | Demonstration, Explanation, Discussion, Self-Study |
| Evaluation Method | 30% Internal assessment based on class attendance, internal examination, etc.<br>70% External based on university examination |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | | | | | | |
| CO2 | | | | | | |
| CO3 | | | | | | |

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Semester IV

| | |
|---|---|
| Course Code | **402** |
| Course Title | Research paper preparation and communication |
| Credit | 6 |
| Teaching per Week | 6 Hrs |
| Minimum weeks per Semester | 16 (Including Seminar, preparation, holidays etc.) |
| Effective From | June 2023 |
| 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 | CO1: Seminar provides an opportunity for students to discuss and analyse a range of new material, ideas and concepts.<br>CO2: 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.<br>CO3: Students will be able to develop English speaking through fluency and conversational skill. |
| Mapping between COs with PSOs | |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | | | | | | |
| CO2 | | | | | | |
| CO3 | | | | | | |

| | |
|---|---|
| Pre-requisite | Basics of biology and chemistry |
| Course Content | ----- |
| Reference Books | ----- |
| Teaching Methodology | Explanation, Discussion, Self-Study |
| Evaluation Method | 30% Internal assessment based on class attendance, internal examination, etc.<br>70% External based on university examination |

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Semester IV

| | |
|---|---|
| Course Code | **403** |
| Course Title | Licensing and certification of Aquaculture practices |
| Credit | 3 |
| Teaching per Week | 3 Hrs |
| Minimum weeks per Semester | 16(Including Project formulation, Certification and Licensing for Aquaculture, examination, preparation, holidays etc.) |
| Effective From | June 2020 |
| Purpose of Course | • The purpose of introducing project formulationfor 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.<br>• The purpose of certification system in Aquaculture is to create awareness among students for ensuring the sustainability of aquaculture products.<br>• The purpose of introducing licensing in Aquaculture is to know about legislative act and detail legal conditions which surround the setting up of an aquaculture farm. |
| Course Objective | • The objective of the project formulationfor aquaculture is to get benefit from the desired outcomes and impact.<br>• 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.<br>• The objective of licensing in Aquaculture is to aware students about this important tool in ensuring an orderly development of an aquaculture industry and providing rights. |
| lCourse Outcomes | CO1:Students will be capable of identifying and documenting specific project goals, outcomes, milestones, tasks, costs, and timeline dates specific to the project objectives.<br>CO2:Certification programs creates awareness about environmental, social, food safety, animal health and welfare— each step of the aquaculture production chain.<br>CO3: Aquaculture Licence and the consenting process helps to regulate the aquaculture sector. |
| Mapping between COs with PSOs | |
| Pre-requisite | Basics of biology and chemistry |
| Course Content | ----- |
| Reference Books | ----- |
| Teaching Methodology | Demonstration, Explanation, Discussion, Self-Study |
| Evaluation Method | 30% Internal assessment based on class attendance, internal examination, etc.<br>70% External based on university examination |

| | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| CO1 | | | | | | |
| CO2 | | | | | | |
| CO3 | | | | | | |

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Semester IV

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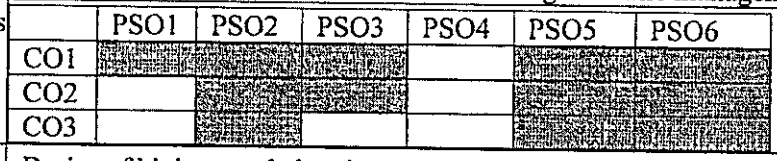
|---|---|
| Course Code | **404** |
| Course Title | Educational Excursion /Field work/ Project submission |
| Credit | 6 |
| Teaching per Week | 6 Hrs |
| Minimum weeks per Semester | 16 (Including Study Tour/Project work, preparation, holidays etc.) |
| Effective From | June 2020 |
| Purpose of Course | 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 purpose (project work) is to make students understand about specifies tasks and how goals will be achieved, identifies, what resources will be needed, associated budgets and timelines for completion. |
| Course Objective | The objective of the course (study tour) is to visit new places and new environment which are good ways to awaken students' interest and learn by actually doing a hands-on experience. Other objective (project work) is to provide a learning experience in which students have the opportunity to synthesise knowledge from various areas of learning and apply it critically and creatively in research. |
| Course Outcomes | CO1: Study tour will give exposure to students to visit different Fisheries Institutes, processing plants, landing centres and Aquaculture farms.<br>CO2: Study tour helps them better to realize the interaction between their chosen fields of study to the rest of the world.<br>CO3: 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. |
| Mapping between COs with PSOs |  |
| Pre-requisite | Basics of biology and chemistry |
| Course Content | ----- |
| Reference Books | ----- |
| Teaching Methodology | Explanation, Discussion, Self-Study |
| Evaluation Method | 30% Internal assessment based on class attendance, internal examination, etc.<br>70% External based on university examination |



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