

AC:.....

Item NO.:.....

# UNIVERSITY OF MUMBAI

## Ratnagiri Sub-Campus



### Program:

## DIPLOMA IN INDUSTRIAL SAFTY AND MANAGEMENT (DISM)

### Syllabus

(Diploma Course of one year w.e.f. academic Year 2020-21)

AC:.....

Item NO.:.....

**UNIVERSITY OF MUMBAI**  
**Ratnagiri Sub-Campus**



**Syllabus for approval**

<b>S. No.</b>	<b>Heading</b>	<b>Particulars</b>
1	Title of the course	Diploma in industrial safety and management (DISM)
2	Eligibility for admission	Any Science Graduate or Degree / Diploma in Engineering from recognized Statutory University / Board.
3	Passing Marks	40%
4	Ordinances / Regulations (if any)	
5	No. of Years / Semester	One year part time
6	Level	<del>PG / UG</del> / Diploma / Certificate (Strike out which is not applicable)
7	Pattern	Yearly / Semester (Strike out which is not applicable)
8	Status	New / <del>Revised</del> (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year – 2020 -21

**Date**

**Signature**

**Name of BOS Chairperson / Dean -**

**University of Mumbai  
Ratnagiri Sub-Campus**

**Draft ordinance, Regulations and Syllabus related to the  
DIPLOMA IN INDUSTRIAL SAFETY AND MANAGEMENT  
(DISM)**

**COURSE CONTENT AND CREDITS**

**DISM 101: INDUSTRIAL SAFETY, HYGIENE & OCCUPATIONAL HEALTH (04 Credits)**

<b>UNIT</b>	<b>TITLE</b>	<b>CREDITS</b>
I	Introduction to Industrial Safety	01
II	Hazard identification, Risk assessment and control	01
III	Industrial Hygiene	01
IV	Occupational Health	01

**DISM 102: CHEMICAL AND PROCESS SAFETY MANGEMENT (04 Credits)**

<b>UNIT</b>	<b>TITLE</b>	<b>CREDITS</b>
I	Process Safety Management (PSM)	01
II	Unit operations and process hazards	01
III	Safety in plant operation and maintenance	01
IV	Safe Handling of chemicals	01

**DISM 103: HAZARDS AT WORKPLACE (04 Credits)**

<b>UNIT</b>	<b>TITLE</b>	<b>CREDITS</b>
I	Fire and explosion	01
II	Electrical Hazards	01
III	Physical Hazards	01
IV	Pressure System Hazards	01

**DISM 104: SAFETY LEGISLATIONS & MANAGEMENT (04 Credits)**

<b>UNIT</b>	<b>TITLE</b>	<b>CREDITS</b>
I	Industrial Safety Management	01
II	Safety Awareness & Training:	01

III	Industrial Safety Legislations	01
IV	Accident Prevention	01

## **DISM 101: INDUSTRIAL SAFETY, HYGIENE & OCCUPATIONAL HEALTH**

### **UNIT I: INTRODUCTION TO INDUSTRIAL SAFETY: 20 Hrs.**

History and development of safety movement, Safety programs, Need for safety, Safety legislation: Acts and rules, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels. Accident sequence theory, Nature of Accident, Process of accident, Causes of accidents, Accident prevention and control techniques, Plant safety inspections, Job safety Analysis and investigation of accidents, First aid, Financial costs-direct and indirect, social costs of accidents, Compilation procedure for financial costs, Cost data, quality and its limitations-Budgeting.

### **UNIT II: HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL: 20 Hrs.**

Hierarchy of hazard control, Hazard Identification and Risk Assessment (HIRA), HAZard ANalysis (HAZAN), Hazard and operability (HAZOP) studies Maximum Credible Accident Analysis (MCAA)/Quantitative Risk Assessment (QRA) Hazard identification and risk control approaches and techniques: Reactive approach: Incident recall technique (after-the-event approach), Proactive approaches: Critical incident review technique (before-the-event approach), Deductive technique, Inductive technique

Hazard Risk Assessment, Cause/consequence finding techniques What-if, Fishbone, Why-Why, Root Cause Analysis (RCA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Cause-Consequence Analysis (CCA), Management Oversight and

Review Technique (MORT), Failure Mode and Effects Analysis (FMEA), Job Safety Analysis (JSA). Hazard Analysis Critical Control Points (HACCP).

### **UNIT III: INDUSTRIAL HYGIENE: 20 Hrs.**

Definition of Industrial Hygiene, Phases of industrial hygiene Industrial Hygiene: Control Methods, Substitution, Changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures.

Introduction to chemical hazards, dangerous properties of chemical, dust, gases, fumes, mist, vapours, smoke and aerosols, MSDS(Material Safety Data Sheets).

Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose response relationship, bio-chemical action of toxic substances. Evaluation of toxicity and noise, Personal Sampler, High Volume Sampler, Midget impinger Tubes, Rotameter and its Calibration , concept of threshold, limit values TLV-TWA/PEL/OEL, STEL, IDLH, LC<sub>50</sub>, LD<sub>50</sub> and air sampling strategies, personal exposure monitoring

### **UNIT IV: OCCUPATIONAL HEALTH: 20 Hrs.**

Concept of health and occupational health, Spectrum of health, Occupational and work related diseases, Levels of prevention, History of occupational health, Characteristics of occupational diseases, Essentials of occupational health service, personal protective equipments (respiratory and non-respiratory),

Various Occupational health hazards : Adverse health effects of noise vibration, cold, heat stress, improper illumination, thermal radiation, ionizing and non-ionizing radiations. Permissible threshold exposure limits - short term and long term effects of exposures Preventive and control measures.

## **CISM 102: CHEMICAL AND PROCESS SAFETY MANGEMENT**

### **UNIT I: PROCESS SAFETY MANAGEMENT (PSM): 20 Hrs.**

Purpose of PSM, its elements and Risk-Based Process Safety Management (RBPSM): (1) Process safety culture, (2) Compliance with standards, (3) Process safety competency, (4) Workforce involvement, (5) Stakeholder outreach, (6) Process

knowledge management, (7) Hazard Identification and Risk Assessment (HIRA), (8) Operating procedures, (9) Safe work practices, (10) Asset integrity and reliability, (11) Contractor Management, (12) Training and Performance Assurance, (13) Management Of Change (MOC), (14) Operational readiness, (15) Conduct of operations, (16) Emergency management, (17) Incident investigation, (18) Measurement and metrics, (19) Auditing, (20) Management review and continuous improvement.

Major Industrial Disasters (Case Studies) Bhopal disaster (1984), Chernobyl Disaster, Fukushima Daiichi Disaster etc.

## **UNIT II: UNIT OPERATIONS AND PROCESS HAZARDS: 20 Hrs.**

Piping and Instrumentation Diagrams (P&ID), Various unit operations and their associated hazards, Control, precautions and prevention, specific safety measures for certain chemical industries like fertilizers, insecticides/pesticides, chlor-alkali, explosives, paints, petrochemicals, petroleum refineries, pharmaceuticals, etc., Sampling techniques for toxic and flammable chemicals, pharmaceuticals, etc., Precautions in the processes and operations involving explosives, flammables, toxic substances, dusts, gases, vapour cloud formations and combating to a Loss of containment, Prevention strategy.

## **UNIT III: SAFETY IN PLANT OPERATION AND MAINTENANCE: 20 Hrs.**

Safe procedures for plant start-up and shut-down, Pipeline colour coding for identification of contents, Safety precautions for working on pipelines, Safety in preventive and emergency maintenance work, Pressure relief systems and breather valves, Flare system, Mechanism of Mechanical Failure that lead to a Loss of containment. Prevention strategy.

## **UNIT IV: SAFE HANDLING OF CHEMICALS: 20 Hrs.**

Safety in receiving, storage and handling of chemicals Nitrogen blanketing of flammable liquid storage tanks, Hazardous material classification, Use of Material Safety Data Sheets (MSDS) and understanding the terminology used in MSDS, Chemical compatibility considerations Transportation of hazardous materials, HAZMAT placards, Safety Precautions for transporting hazardous/ toxic/ flammable/explosive/ radioactive substances by all modes, U.N. classification of dangerous goods Transfer of chemicals by pipelines within and outside the installation (aboveground, underground and submarine), Pigging operation of pipelines including intelligent pigging, Cathodic protection of underground pipelines

### **DISM 103: HAZARDS AT WORKPLACE**

#### **UNIT I: FIRE AND EXPLOSION: 20 Hrs.**

Industrial fires, Dispersion modeling, Chemistry of fire, Fire Triangle, Flammability characteristics of liquids and gases, Classification of fires, Deflagration and detonation, Vapour Cloud Explosion (VCE), Runaway reaction and control methods, Boiling-Liquid Expanding Vapour Explosion (BLEVE), Common causes of industrial fires, Dust explosion, factors of pentagon, causes of dust explosions and controls Fire and Explosion prevention methods.

**Fire protection:** Fire PPEs, Design of building, plant, exits, etc. for fire safety, Fire-resistance of building materials, Fire-doors and firewalls, Determination of fire load, Dow Fire and Explosion Index, Salient features of fire, explosion and toxicity index

**Fire detection and alarm system:** Various types of fire detection and alarm system, Special safety measures for control of fire and explosion in handling / processing of flammable gases, liquids, vapours, mists, solids, dusts and flying.

#### **UNIT II: ELECTRICAL HAZARDS: 20 Hrs.**

Hazards of electrical energy, Safe limits of amperages, voltages. Safe distance from lines. Capacity and protection of conductor, Joints and connections, Means of cutting

off power. Overload and short circuit protection. No load protection, Earth fault protection, Earth insulation and continuity tests, Earthing Standards. Protection against voltage fluctuation, Hazards arising out of 'borrowed' neutrals, Types of protection for electrical equipment in hazardous atmosphere, Hazardous area classification, Criteria for selection, installation, maintenance and use of equipment in hazardous area.

**Fire-fighting systems:** Different types of portable fire extinguishers, their installation, periodic inspection and operation, Replacement of Halon with safer substitutes, Fire hydrant system, Fire monitors, sprinkler system and deluge system, Carbon-dioxide flooding system, Foam Pourer system

### **UNIT III: PHYSICAL HAZARDS: 20 Hrs.**

Physical and Chemical hazards (toxic compounds, sterilizers, expired drugs, heavy metals, volatile, plastics etc.), Purpose of lighting, Advantages of good illumination, Lighting and safety, Lighting and the work, Sources and types of artificial lighting. Principles of good illumination. Recommended minimum standards of illumination. Design of lighting installation, Lighting and colour, Purpose of ventilation Classification of Ventilation as General Ventilation (Natural and Mechanical modes), Local Exhaust Ventilation, Special methods for Thermal Stress control such as Air conditioning, Radiant Heat Control, Engineering Control of noise, Vibration damping, Noise isolation, Noise absorption. Silencers.

### **UNIT IV: PRESSURE SYSTEM HAZARDS: 20 Hrs.**

Principle of pressure system, Pressure, Hazards of steam, Mechanism of Steam explosion, Properties of Liquid Petroleum Gas, Liquefaction of gases for bulk storage under pressure, Pressure system, meaning of relevant fluids, key components and safety features of pressure system, Failure of pressure system, Hazards of overpressure and over temperature in pressure system Corrosion causes and protection Corrosion and erosion, location, causes inspection and prevention,



Cathodic protection of underground tanks/pipelines, Sacrificial anode, Protective cladding and lining.

## **DISM 104: SAFETY LEGISLATIONS & MANAGEMENT**

### **UNIT I: INDUSTRIAL SAFETY MANAGEMENT: 20 Hrs.**

Management Principles, Levels of Management-Lower, Middle and Top, Types of Management –Line and Staff, Authority, Accountability and Responsibility of Management. Span of Management, Delegation and decentralization of authority.

**Role of Management in Industrial Safety:** Planning for Safety- Definition, Purpose, Nature, Scope and Procedure. Range of planning, Types of plans, Management By Objectives (MBO), Policy formulation and implementation

**Organizing for Safety:** Definition, need, nature and principles, Health and Environment, Organization structure, functions and responsibilities,

**Directing Safety:** Definition, process, principles and techniques, Leadership–Styles, Role, functions and attributes of a good leader.

### **UNIT II: SAFETY AWARENESS & TRAINING: 20 Hrs.**

Element of training cycle, Training Need Assessment (TNA), Techniques of training, design and development of training programs/module, Training methods and strategies, Types of training, Evaluation and review of training programs, Competence Building Technique (CBT),

Employee Participation Purpose, nature, scope and methods, Safety committee and union participation Trade Unions: History of trade unions in India, Role of trade unions in safety and health, Collective bargaining and safety.

Safety Promotion and Safety Awards and Suggestion Schemes

**Human behavior and safety:** Human behavior - Individual differences, behavior as function of self and situation, perception of danger and acceptance of risk,

knowledge, and responsibility vis-a-vis safety performance, theories of motivation and their application to safety, role of supervisors and safety departments in motivation

**UNIT III: INDUSTRIAL SAFETY LEGISLATIONS: 20 Hrs.**

Legislative measures in industry: Factories Act, 1948, the factories rules, History, Provisions under the factories Act and rules made there under with amendments, Electricity act 2003, Functions of safety management. Workman's Compensation Act, 1943, Employees State Insurance Act, 1948, Air Pollution (Prevention and control) Act, 1981, Water Pollution (Prevention and Control) Act, 1974, Boiler Vessels Act, Child Labour and Women Employee Act., EPA 1986.

**UNIT IV: PLANT LAYOUT DESIGN AND HOUSEKEEPING: 20 Hrs.**

Plant layout, design and safe distance, Need for planning and follow-up, Inspections and check-lists, Safety Check list for buying new machinery for the plant, Role of preventive maintenance in safety and health, Importance of standards and codes of practice for plant and equipment, Case study on building Plant layout.

Safety and good house-keeping, Typical accidents due to poor house-keeping, Disposal of scrap and other trade wastes, Prevention of spillage, Marking of aisles space and other locations. Use of colour as an aid for good housekeeping, Cleaning methods, Benefits of good housekeeping, '5S' system.

## DISM 105: PRACTICAL COURSE

Suggested list of lab experiments. Any other experiment based on syllabus which will help to the students to understand any topic can be performed

Sr. No.	Name of Experiment
1	Measurement of Static Charge/Electricity with the help of Static Charge Meter.
2	Continuity test for Electrical Circuits
3	Measurement of earth resistance
4	Measurement of soil resistivity
5	Study of electrical earthing
6	Measurement of illumination level at working place with the help of digital Lux meter
7	<b>Noise Level Measurement.</b> (a) Measurement of Sound pressure level in dBA and dB linear. b) Frequency analysis of noise.
8	Demonstration of Personal Protective Equipment (PPE)
9	Sampling and Estimation of Gases in Work Environment by Colorimetric Method Oxides of Nitrogen, Ammonia & Chlorine
10	Sampling and Estimation of Dust by Gravimetric Method.
11	Detection of Carbon Monoxide, NO <sub>x</sub> Hydrogen Sulphide, Ammonia, Aromatic Hydrocarbons, SO <sub>2</sub> by Gas Detectors and other direct reading instruments.
12	Toxicity :Determination LDL, UDL
14	Sampling and analysis of SO <sub>2</sub> using Colorimetric method.

### Demonstration and Hands on training (compulsory)

1	Demonstration, Calibration of Sampling Equipment
2	Demonstration of Fire fighting equipments
3	Demonstration of First aid

### REFERENCE BOOKS

- 1 Industrial Accident Prevention, H.W. Heinrich, Dan Petersen, and Nestor Roos, McGraw-Hill Book Company, New York / New Delhi
- 2 Techniques of Safety Management (ISBN: 978-18-8-558139-6), Dan Petersen, McGraw-Hill Book Co. Ltd., New York, N.Y. USA,
- 3 Industrial Safety and Environment, A.K.Gupta, Laxmi Publications, New Delhi
- 4 Industrial Safety: Concepts and Practices , K.T. Kulkarni, Pune Vidyarthi Griha Prakashan, 1786, Sadashiv Peth, Pune
- 5 Hazardous Chemical Data Book ISBN:081-551072-1), G. Weiss , Noyes Data Corporation, Park Ridge, New Jersey, N.Y. (USA)
- 6 Risk Based Process Safety , By Center for Chemical Process Safety (CCPS), American Institute of Chemical Engineers (AIChE) (ISBN: 978-0-470-16569-0), John Wiley & Sons Inc., Somerset, NJ (USA)
- 7 Handbook of Environmental Risk Assessment and Management, Peter Calow, Blackwell Science, Ltd. USA (1998).
- 8 Environment Management in India, R K Sapru, Ashish Publishing House, New Delhi
- 9 Accident Prevention Manual for Industrial Operations (ISBN: 978-08-7-912024-5) , National Safety Council , 1121, Spring Lake Drive, Itasca, Illinois 60143 USA
- 10 Chemical Process Quantitative Risk Analysis , (ISBN-13: 978-08-1-690720-5), Center for Chemical Process Safety, American Institute of Chemical Engineers, New York
- 11 Environmental Health & Safety Management, Nicholas & Madelyn , Jaico Publishing House, Mumbai
- 12 Industrial Accident Prevention, H.W. Heinrich, Dan Petersen, and Nestor Roos, McGraw-Hill Book Company, New York / New Delhi
- 13 The Factories Act, 1948 & Factory Rules
- 14 Environment (Protection) Act, 1986 and Rules
- 15 Indian Boilers Act, 1923 with allied Regulations, 1961
- 16 Industrial Safety, Health and Environment Management Systems, R.K.Jain and Sunil S.Rao, Khanna publishers , New Delhi (2006)

- 17 Model Code of Safety Regulation for Industrial Establishments, International Labour Office (ILO), Geneva (Switzerland)
- 18 The Merck Index – An Encyclopedia of Chemicals (ISBN: 978-1-84973-670-1) Merck & Company, Rahway, New Jersey, N.Y. (USA)
- 18 Supervisors' Safety Manual (ISBN: 978-08-7-912288-1)  
National Safety Council 1121, Spring Lake Drive, Itasca, Illinois 60143 (USA)
- 19 Method for computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents' IS:3786 – 1983 Indian Standards Institution, New Delhi
- 20 Threshold Limit Values for Chemical Substances in Work Environment Adopted by ACGIH Published every year) American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (USA)
- 21 NIOSH Pocket Guide to Chemical Hazards By National Institute of Occupational Safety & Health (ISBN: 978-15-9-042586-2) U.S. Department of Health and Human Services, Washington, D.C. (USA)
- 23 Employees Compensation Act, 1923 and Rules , Bare Act
- 24 Indian Electricity Act, 2003 and Rules CEA guidelines, Indian Explosives Act, 1984 and Rules
- 25 The Maharashtra Fire Prevention and life Safety Measures Act 2006 and Rules
- 26 Handbook of Occupational Safety and Health, Slote.L, John Willey and Sons, NewYork
- 27 Industrial Safety and pollution control handbook: National Safety Council and Associate publishers Pvt. Ltd, Hyderabad(1993).
- 28 Publications from Inter National standard organizations like ISO, OSHA, IOSH, NEBOSH etc.
- 29 Radiation protection, Inter National Labor Office
- 30 The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai

उपकेंद्र रत्नागिरी

मुंबई विद्यापीठ,

पी-६९, एमआयडीसी, मिरजोळे,

रत्नागिरी - ४१५ ६३९

दूरध्वनी : ०२३५२-२३० ०८८, २३० ०८६

फॅक्स क्रमांक : ०२३५२-२३० ०४४/२३० ०८६

University of Mumbai



मुंबई विद्यापीठ

SUB-CENTRE, RATNAGIRI

University of Mumbai,

P-61, MIDC, Mirjole,

Rantagiri - 415 639

Tel. No. : 02352-230 088, 230 086

Fax No. : 02352-230 044/230 086

Ref. : UDC/

Date : \_\_\_\_\_

दिनांक :

Name of the Department :- Ratnagiri Sub Campus, University of Mumbai

Commencement from the Year 2021-22

Fee Structure of Diploma in Industrial Safety and Management (DISM)

Sr. No.	Fee Head	Amount (Rs.)
1	Tuition Fee	3500
2	Registration Fee	200
3	Admission Processing Fee	200
4	Examination Fee	700
5	Laboratory Fee	15000
6	Mark Sheet	100
7	Study Material & Updating	600
8	Library Fee	3000
9	Identity Card	100
10	Onsite Demonstration Charges	300
11	Computer / Internet Fee	500
12	Vice-Chancellor Fund	20
13	Student Welfare	20
14	University Sports & Cultural Activities	20
15	Disaster Relief Fund	10
16	Group Insurance	30
17	Miscellaneous	200
Total Fees :		24,500

Date : 06/02/2021



Dr. Kishor Sukhatankar

(I/c) Director

I/C Director

Ratnagiri Sub-Centre  
University of Mumbai

AC:.....

Item NO.:.....

**UNIVERSITY OF MUMBAI**

**Ratnagiri Sub-Campus**



**Program:**

**CERTIFICATE COURSE IN AQUACULTURE**

**Syllabus**

(Certificate Course of 6 months with effect from the  
Academic Year 2020-21)

AC:.....

Item NO.:.....

## UNIVERSITY OF MUMBAI Ratnagiri Sub-Campus



### Syllabus for approval

S. No.	Heading	Particulars
1	Title of the course	Certificate Course in Aquaculture
2	Eligibility for admission	XII Science passed or Equivalent
3	Passing Marks	40%
4	Ordinances / Regulations (if any)	
5	No. of Years / Semester	Six Months
6	Level	<del>PG / UG</del> / certificate (Strike out which is not applicable)
7	Pattern	Yearly / Semester (Strike out which is not applicable)
8	Status	New / <del>Revised</del> (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year – 2020 -21

**Date**

**Signature**

**Name of BOS Chairperson / Dean -**



**University of Mumbai  
Ratnagiri Sub-Campus**

**Draft ordinance, Regulations and Syllabus related to the  
CERTIFICATE COURSE IN AQUACULTURE**

- Ordinance:**                   **Title of Course**  
‘Certificate Course in Aquaculture’
- Ordinance:**                   **Eligibility**  
A candidate for being eligible at admission to the Certificate Course in Aquaculture (DCA) must have passed XII standard examination in Science from Maharashtra State Board of Higher Education or as equivalent thereto.
- Regulation:**                 **Duration of Course**  
The duration of Certificate Course in Aquaculture will be of six months.
- Regulation:**                 **Intake Capacity:**  
35 candidates in one batch
- Teachers:**                   Post Graduate in Zoology, Fishery Science, Aquaculture.  
M-Phil, Ph.D. Sitting and Retired.  
Government Qualification Senior Officers and experts from Industries, and as per the norms laid down by the University of Mumbai.
- Regulation:**                 **Fees**

<b>S. N.</b>	<b>Heads</b>	<b>Amount (Rs.)</b>
1.	Tuition Fee	3500
2.	Registration Fee	200
3.	Admission Processing Fee	100
4.	Examination Fee	700
5.	Laboratory Fee	1500
6.	Mark Sheet	50
7.	Study Material & Updating	600
8.	Library Fee	200
9.	Identity Card	50
10.	Onsite Demonstration Charges	200
11.	Computer / Internet Fee	200
12.	Vice Chancellors Fund	20
13.	Student Welfare	20
14.	University Sports & Cultural Activities	20
15.	Disaster Relief Fund	10
16.	Group Insurance	30
17.	Miscellaneous	100
<b>Total Fees:</b>		<b>7500</b>

**Regulation:****Examination**

The examination of the Certificate Course will be held in ONE part - at the end of course.

**Regulation:****Standards of Passing of Examination**

To pass this six-month Certificate Course in Aquaculture, the candidate must obtain a minimum of 40% marks overall, in respective paper at the end of term exam.

Less than 40 % - Fail  
40 % to 50 % - Pass  
51 % to 59 % - Second Class  
60 % to 74% - First Class  
75 % & above - Distinction

**Regulation:****Pedagogy (Instructional System)**

The instructional system for DCA is based on theoretical lectures, Laboratory Practicals and field based visits, Audio – video program, case studies, group work, assignments and presentation. The course envisages active participation approach of the students.

**Regulation:****Course Evaluation**

Group work and presentation : 10 %  
Field, Visit and Report writing : 10 %  
Practical Exam / Viva etc : 30 %  
End-term test : 50 %

**Regulation:****Course Timing**

Two days in a week (4 hours a day)

The fees for the course are proposed to be Rs. 7500. With the intake capacity of 35 candidates the amount to be collected will be Rs. 262500.00. The recurring expenses are estimated to be Rs. 1,72,500. 00.

The sinking fund for collective expenditure of the center like publicity for the courses, purchase of the instruments, chemicals, glass wares, etc. will be Rs. 90,000.00.

**University of Mumbai  
Ratnagiri Sub-Campus**

**Draft Ordinance, Regulations and Syllabus related to the  
CERTIFICATE COURSE IN AQUACULTURE**

**Total Hours: 120 hours**

**PAPER I: Introduction to Aquaculture (25 hours)**

1. Definition and Principles of Aquaculture.
2. Different aquaculture systems (Fresh / Brackish / Sea water) with subtypes.
3. Cultivable species of freshwater fishes and prawns and their biology.
4. Culture of air breathing fishes, Sewage fed fish culture, sewage treatment.
5. Standard physico-chemical properties of water and soil required for fresh water aquaculture.

**Practical Component: (15 hours)**

1. Identification of fishes used for aquaculture (Common Carps-Labeo, Catla, Cirrihina, Common Carp-Cyprinus, Tilapia-Oreochromis, Grass carp-Ctenopharyngodon, Silver carp-Hypophthalmichthys, Macrobrachium, etc.).
2. Identification of air breathing and sewage fed fishes (Channa, Heteropneustes, Clarius, Anabas).
3. Determination of transparency by Secchi disc, pH, Hardness, Dissolved oxygen of water.
4. Determination of pH and grain size of soil.
5. Visit to aquafarm (Fresh water or brackish water or fresh water pearl culture).

**PAPER II: Brackish (Estuarine) water fish culture and commercially important marine varieties of fish/ prawns/mollusc/sea weeds. (25 hours)**

1. Brackish water fin fish culture – species of Chanos, Mugil, Lates, etc.).
2. Molluscan culture – species of edible oysters, mussels and clams cultured.
3. Culture of various food materials required for different growth stages of fish.

4. Important species of marine pearl oysters for culture and method of artificial pearl production.
5. Culture of seaweeds, common cultivated species.

**Practical Component:**

**(15 hours)**

1. Identification of brackish water fishes (Chanos, Mugil, Lates, Hilsa).
2. Identification of oysters, mussels and clams (Crassostrea, Perna, Meritrix, Katelaysia, Gafrarium, Paphia, Anadara, etc.).
3. To prepare and maintain a culture of paramecium, daphnia, moina, artemia, etc.
4. Identification of pearl oyster and sea weeds (Pinctada, Gelidiella, Gracilaria, Sargassum, Tubinaria).
5. Visit to fish landing center, fish market, processing industry, etc.

**PAPER III: Fresh water aquarium fishes and its management.**

**(25 hours)**

1. Introduction to aquarium, ornamental fishes and aquarium accessories.
2. Design and construction of fresh water aquaria on commercial scale.
3. Setting up and maintenance of an aquarium.
4. Commercial production of goldfish, live bearers, gouramis, barbs and tetras, angel fish.
5. Introduction to aquatic plants used in aquarium.

**Practical Component:**

**(15 hours)**

1. Identification of ornamental fishes (Angel, Gourami, Neon Tetra, Siamese fighter, Danio, Guppy, Molly, etc.).
2. Identification to aquarium accessories like aerator, bubblers, feeding cup, food dispenser, filters-bottom, column and surface.
3. Identification with reference to breeding habits – i) Eggs layers - Gold fish, Angel. ii) Live bearers - Guppy, Molly, Sword tail. Iii) Nestling fish - Gourami, Siamese fighter, etc.).
4. Identification of aquatic plants (Cabomba, Ceratophyllum, Hydrilla, Ludwigia, Vallisneria, etc.).
5. Visit to Aquarium shop OR Aquarium fish breeding center.

## References:

1. Rath, A.K. Freshwater Aquaculture,
2. Santhanam, et.al. a Manual of Freshwater Aquaculture
3. Pillay, T.V.R. Aquaculture – Principles and Practices
4. Venkataraman GS - The Cultivation of Algae
5. Milne P H. – Fish and Shell fish farming in coastal waters
6. Iverson E.S. – Farming the edge of the sea
7. Bandach, Rhyster V McLarney – Aquaculture
8. Jhingwa V.A – Fish and Fisheries of India
9. Kurian, C.V and Sebastian V.O. – Prawn and Prawn fisheries of India
10. Biswas. S.P., J.N. Das, U.K. Sarkar and Lakra W.S. 2007 Ornamental fishes of North East India: An Atlas : NBFGR
11. Marine Aquarium keeping: The Sciences, Animals and Art. John Wiley & Sons, New York
12. Ramachandran. A, Breeding, Farming and Management of Fishes, CUSAT
13. Madhusoodanakurup et al. – Ornamental Fish - Breeding, Farming and Trade, CUSAT
14. Jhingran, V.G. Fish and Fisheries of India
15. Bijukumar, A. Rearing of Aquarium Fishes
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