

**KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH  
UNIVERSITY,  
BHUJ**

**Academic Year: 2024 - 2025**



**Syllabus (NEP – 2020)**  
**B.Sc. (Honours) MARINE SCIENCE**  
(with Research /without Research)

**Semesters: III and IV**  
(with Multiple exit-entry options)

**FACULTY OF SCIENCE**

**A Curriculum of Marine Science**  
**Faculty of Science framed as per UGC Guidelines and norms of**  
**National Education Policy (NEP) – 2020.**

**With effect from June – 2024**



# **B.Sc. (Honours) Marine Science Programme**

**(With Research/without Research)**

**As per NEP-2020**

**With effect from June – 2024**

**FACULTY OF SCIENCE**

**Subject: Marine Science**

**B. Sc. Semesters: III & IV**



## AIM OF THE COURSE:

Aims of the B.Sc. (Honours) Course in Marine Science:

- Foster a hands-on learning approach that encourages students to explore and discover the wonders of marine science.
- Embrace modern educational trends like e-learning, flipped classrooms, and hybrid learning to create an engaging and interactive learning environment.
- Cultivate environmentally responsible citizens who play a pivotal role in shaping the future of marine science subject and contribute their knowledge to sustainable development.
- Provide comprehensive theoretical and practical knowledge in Marine Science, equipping graduates with the necessary skills for further studies or exciting careers in marine-related fields.
- Prepare students for national and international competitive examinations, empowering them to pursue advanced research opportunities or secure prestigious positions in marine science and related fields.



## COURSE INTRODUCTION

The new curriculum of B.Sc. in Science (Marine Science) offers the essential knowledge and technical skills to study marine science in a holistic manner. Students would be trained in all areas of marine science using a unique combination of Major, Minor, MDC, AEC, SEC and VAC papers with significant inter-disciplinary components. Students would be exposed to cutting-edge technologies that are currently being used in the study of marine life forms, their evolution, and interactions with other organisms within the ecosystem. Students would also become aware of the social and environmental significance of marine life and its relevance to the national economy. B.Sc. Marine Science Programme covers academic activities within the classroom sessions along with practical concepts at laboratory sessions. Infield, outstation activities, and projects would also be organized for real-life experience and learning. Candidates who have curiosity in the field of Marine, Nature, Ecosystems and eager to exploring various exotic places, and wish to work as researchers or professionals like Marine Scientists, conservationists, Ecologists, etc. can choose the B.Sc. Marine Science course.



## Programme outcomes (POs)

This curriculum in B.Sc. Marine Science aims to cultivate well-rounded individuals who are not only equipped with knowledge in the field of marine science but are also driven to contribute to their nation's progress and shape the future. By studying marine science, students will develop a deep understanding of the oceanic world and its potential for transformative impact on various sectors.

### **Programme specific objectives (PSOs): B.Sc. III Year Certificate Course in Basic Marine Science**

- Dive into the fascinating realm of marine science through this certificate course that covers a wide range of topics.
- Prepare yourself for cutting-edge research in frontier areas of marine sciences by gaining a solid foundation in the subject.
- Explore the diverse habitats, morphologies, anatomies, and reproductive processes of various marine organisms.
- Develop the skills of competent marine biologists who can apply their knowledge to address critical issues in aquaculture, Fishery industry, Marine Pharmacology, and Marine environment sustainability.
- Unlock your potential for self-entrepreneurship and self-employability through the certificate and diploma courses, which offer multiple exit options.
- Embrace lifelong learning by delving into the vast wealth of knowledge surrounding marine science and related subjects.
- Enhance critical thinking abilities, foster a scientific attitude, hone problem-solving skills, and promote effective communication and social interaction in the field of Marine Science.
- Cultivate an awareness of the ethical considerations in the responsible and sustainable use of marine resources.



➤ Equip students with the necessary training to pursue careers in government and private sectors, including academia, research, and industry. Additionally, prepare them for national and international competitive examinations and encourage self-employment opportunities.



## EVALUATION METHODS:

Evaluation Methods for Marine Science: To assess the achievement of students in the Marine Science subject and ensure their desired learning outcomes, a variety of assessment methods will be adopted. These methods will provide a comprehensive evaluation of the student's academic performance. Here are the innovative assessment methods for Marine Science:

1. **Engaging Examinations:** Both oral and written examinations, including scheduled and surprise tests, will be conducted. These exams will test students' theoretical knowledge, critical thinking, and problem-solving skills related to marine science concepts.
2. **Diverse Testing Approaches:** Closed-book and open-book tests will be administered to assess students' understanding and application of marine science principles. These tests will challenge their ability to think critically and apply concepts to real-world scenarios.
3. **Practical Assignments and Reports:** Students will be assigned practical assignments and laboratory reports to evaluate their hands-on skills and understanding of marine science experiments and techniques. These assignments will provide insight into their ability to collect, analyze, and interpret data in the context of marine environments.
4. **Observation of Practical Skills:** Practical skills, such as field sampling techniques or data collection methods, will be directly observed and evaluated. This assessment method allows instructors to assess students' competency in executing practical tasks related to marine science.
5. **Collaborative Projects:** Both individual and group project reports will be assigned to encourage collaborative learning and foster teamwork. These projects will assess



students' ability to conduct research, analyze data, and present findings on various marine science topics.

6. **Innovative Seminar Presentations:** Students will deliver seminar presentations on specific marine science subjects. This method will not only test their understanding and communication skills but also encourage them to explore cutting-edge research and advancements in the field.
7. **Viva Voce Interviews:** Viva voce interviews will be conducted to assess students' comprehensive understanding of marine science concepts and their ability to articulate their knowledge effectively. This interactive assessment method will provide insights into their depth of understanding and critical thinking skills.
8. **Computerized Adaptive Testing:** Utilizing computerized adaptive testing methods will enable personalized assessment and help identify individual learning needs. These tests can adapt the difficulty level based on the student's responses, ensuring a tailored evaluation.
9. **Literature Surveys and Evaluations:** Students will be required to conduct literature surveys and evaluations on marine science topics. This assessment approach will develop their research skills, and ability to critically analyze scientific literature, and synthesize information from various sources.
10. **Comprehensive Continuous Assessment (CCA):** Students will undergo continuous assessment throughout the course, including internal evaluations. The weightage of CCA will be 30% of the overall evaluation, ensuring a holistic evaluation of their progress.
11. **End of Semester Examination:** The semester-end examination, comprising 70% of the evaluation, will assess students based on their knowledge, understanding, skills,





application, and higher-order thinking skills related to marine science concepts. The assessment will be conducted by the university.

Additionally, to enhance their learning experience, students will be required to participate in at least one Marine Science Excursion, where they will study marine ecosystems and biodiversity in their natural state. Laboratory work must be recorded in certified journals, which will be presented during practical examinations to showcase the students' hands-on expertise.

These innovative and varied assessment methods will enable a comprehensive evaluation of student's knowledge, skills, and understanding of Marine Science, fostering their growth and development in this field.



## Paper and Credit Scheme for Marine Science Semester - 3

Year	Semester	Paper Code	Paper Name	Credits	Marks		Total		
					CA	UA			
2 <sup>nd</sup> Year	III	MJMR-301 (Theory)	Biological Oceanography Major - 1	3	35	40	75		
		MJMR-302 (Practical)	Biological Oceanography Major - 1	1	10	15	25		
		MJMR - 303 (Theory)	Marine Food Technology Major - 2	3	35	40	75		
		MJMR - 304 (Practical)	Marine Food Technology Major - 2	1	10	15	25		
		MJMR - 305 (Theory)	Chemical Oceanography Major - 3	3	35	40	75		
		MJMR - 306 (Practical)	Chemical Oceanography Major - 3	1	10	15	25		
		MDMR (Theory)	MDC - 3**	3	35	40	75		
		MDMR (Practical)	MDC - 3**	1	10	15	25		
		<b>TOTAL</b>				<b>12</b>	<b>90</b>	<b>110</b>	<b>300</b>

(\*\*Note - Students will study the Multi-disciplinary course (MDC) of Basics of Ecology - MDES 307 of environment science. There is no separate course for marine science in semester - 3)



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 3**  
**PAPER CODE: MJMR 301**  
**PAPER NAME: BIOLOGICAL OCEANOGRAPHY**  
**KSKV Kachchh University, Bhuj - Kachchh**

UNIT	SEMESTER – 3 MARINE MAJOR – 1	NO. OF LECTURES
1	<p style="text-align: center;"><b>Sea as a biological environment</b></p> <p><b>Sea as a biological environment:</b> Classification of Marine environment (Vertical and Horizontal Zones/ layers of Ocean)            Intertidal zone, Subtidal zone, Interstitial zone and deep-sea zone: their Environment, organisms and their characters/ adaptations.  <b>Coastal features/Ecologically Important Habitats:</b> Mangroves, Seagrasses, Coral reefs, Kelp Forest, Wetlands, Salt Marshes  <b>Extreme environments:</b> Polar regions and hydrothermal vents, Oxygen minimum zones, Mud Banks.</p>	15
2	<p style="text-align: center;"><b>The world of Planktons</b></p> <p><b>Planktons, Nektons and Benthos:</b> Brief account of organisms, their characters and distribution. <b>Classification of Plankton:</b> based on their size, Mode of life and Habitat. <b>Phytoplankton and Zooplankton:</b> their characters, methods of collection, estimation of standing crop, wet and dry weight estimations, plankton volume, settling and displacement methods. <b>Plankton Adaptation:</b> Structural Adaptation (Weight, Floatation and increase of surface area) and Physiological adaptation (Specific gravity, Water content and gas vacuoles).</p>	15
3	<p style="text-align: center;"><b>Oceanic biology</b></p> <p><b>Ocean &amp; organism:</b> Biological Clock, Circadian rhythm, Lunar Cycle, Impact of lunar cycle on marine organisms, Tide &amp; Tide table, Effect &amp; Causes of tide on marine organisms, Red tides, Bioluminescence, Vertical migration, <b>Organic production</b> – primary and secondary productions, Methods of estimation of primary production, factors affecting primary production.</p>	15



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 3**  
**PAPER CODE: MJMR 302**  
**PAPER NAME: BIOLOGICAL OCEANOGRAPHY (Practical)**  
**KSKV Kachchh University, Bhuj - Kachchh**

Practical	Aim of Practical
1	To study vertical and horizontal layers/ zones of ocean using charts/ photographs.
2	To study distribution of Mangroves, corals and salt marsh of India using Maps. (At least two examples of each)
3	To study the characteristics of the animals of intertidal zones and deep-sea zones using specimens/ photographs. (Any four animals of each.)
4	To study the adaptation of organisms of extreme environments like polar regions and hydrothermal vent through charts/ photographs.
5	Study of Planktons and Nektons with their characters using Specimens/ Charts/ Photographs/ Slides. (Any three Specimens of Each).
6	Study of Zooplankton (Eg. Diatoms, Dinoflagellates, Blue green algae and Coccolithophores) using Specimens/ Charts/ Photographs/ Slides.
7	Study of Phytoplankton (Eg. Copepods, Hydromedusae, Pteropods, Chaetognatha and Planktonic larvae) using Specimens/ Charts/ Photographs/ Slides.
8	To study the adaptations of planktons – structural and physiological using specimens/ charts/ photographs.
9	Demonstrate the collection and estimation method of planktons.
10	To study the ocean organisms having the bioluminescence property using photographs/ charts.



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 3**  
**PAPER CODE: MJMR 303**  
**PAPER NAME: MARINE FOOD TECHNOLOGY**  
**KSKV Kachchh University, Bhuj - Kachchh**

UNIT	SEMESTER – 3 MARINE MAJOR – 2	NO. OF LECTURES
1	<p style="text-align: center;"><b>Introduction to Marine food technology</b></p> <p><b>Marine Food Technology:</b> Definition, Introduction, history, development and current status of marine food technology in India and World, Marine food technology-based Industries of Gujarat and India.</p> <p><b>Harvesting Methods:</b> General Harvesting and Post Harvesting methods of seafood products such as fish, shellfish, crustaceans, and other types, Sea food industries of Gujarat and India.</p>	15
2	<p style="text-align: center;"><b>Marine products and their nutrition values</b></p> <p><b>Fish By – products:</b> Introduction to fish and shellfish by – products, their commercial importance/ uses.</p> <p><b>Microalgae and Macroalgae:</b> Definition, their industrial and commercial uses – as a food product, as a medicine, as an industrial raw material etc. Importance and Uses of Algal products such as Carrageenin, Algin, Agar, B-carotene</p> <p><b>Nutritive composition of marine food products:</b> Classification of Carbohydrates, Classification of Lipids, Classification of Proteins; Vitamins- definition, source, types and importance.</p>	15
3	<p style="text-align: center;"><b>Processing and packaging Methods</b></p> <p><b>Processing and packaging of seafood:</b> freezing, canning, Salting, Smoking, Marinating, fermentation, Assessment and management techniques of seafood safety and quality, Current status of processing and packaging methods.</p> <p><b>Case studies in the seafood industry:</b> Any two case studies of sea food industries regarding their post-harvest processes and packaging methods.</p>	15



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 3**  
**PAPER CODE: MJMR 304**  
**PAPER NAME: MARINE FOOD TECHNOLOGY (Practical)**  
**KSKV Kachchh University, Bhuj - Kachchh**

Practical	Aim of Practical
1	To study the general harvesting and post harvesting methods of sea food products through charts and photographs.
2	Visit and prepare report on any one sea food industry of Gujarat state.
3	To study fish by – products using specimens/ charts and photographs.
4	To demonstrate presence of lipid from given material by Sudan-III test.
5	To demonstrate presence of protein from given material by Biuret test / Ninhydrin test.
6	To study commercial uses of microalgae (Spirulina and Chlorella) through specimens/ photographs/ charts.
7	To study Commercial uses of Algin, Agar-Agar and Carrageenin through specimens/ photographs/ charts.
8	To demonstrate processing and packaging methods of sea food (freezing, Salting, Canning) through Photographs and charts.
9	To demonstrate processing and packaging methods of sea food (Smoking, Marinating, fermentation) through Photographs and charts.
10	Prepare a report on case study of any one sea food industry of India.



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 3**  
**PAPER CODE: MJMR 305**  
**PAPER NAME: CHEMICAL OCEANOGRAPHY**  
**KSKV Kachchh University, Bhuj - Kachchh**

UNIT	SEMESTER – 3 MARINE MAJOR – 3	NO. OF LECTURES
1	Chemistry of sea water: Chemical composition of sea water Salinity, Major and Minor elements with their distribution, Interaction of major and minor elements with marine organisms. Trace elements concept, Types of Distribution, Inputs and cycling of trace elements in coastal waters, Dissolved and particulate organic matters.	15
2	Radio nuclides in the sea, origin, Distribution and use as tracers of water masses. Dissolved gases Origin, Distribution & Importance: carbon dioxide & Oxygen, Other gases: nitrogen, hydrogen sulphide, methane, methane hydrate. Eutrophication. Dissolved and particulate organic matter in the sea, its chemical nature and properties.	15
3	Origin, Distribution and Important role of Nutrients – Inorganic & Organic nutrient, Role in fertility of sea; Isotope chemistry: carbon isotope, oxygen isotope, Sulphur isotope, hydrogen isotope, classification, estimation, uses of these isotopes in chemical oceanography.	15



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 3**  
**PAPER CODE: MJMR 306**  
**PAPER NAME: CHEMICAL OCEANOGRAPHY (Practical)**  
**KSKV Kachchh University, Bhuj - Kachchh**

Practical	Aim of Practical
1	Estimation of Salinity from given water sample.
2	Estimation of pH from given water sample.
3	Estimation of Turbidity of given water sample.
4	Estimation of Temperature of given Water sample.
5	Estimation of Total dissolved salts (TDS) from given water sample.
6	Determination of Nitrate from given sample.
7	Determination of Nitrite from given sample.
8	Determination of Phosphate from given sample.
9	Estimation of Chloride from given water sample.
10	Estimation of BOD (Biological oxygen Demand) from given water sample.
11	Estimation of COD (Chemical Oxygen Demand) from given water sample.
12	Estimation of DO from given water sample.
13	Estimation of Ca, MG and Cl from given water sample.





## Paper and Credit Scheme for Marine Science Semester - 4

Year	Semester	Paper Code	Paper Name	Credits	Marks		Total
					CA	UA	
2 <sup>nd</sup> Year	IV	MJMR – 401 (Theory)	Physical Oceanography Major – 1	3	35	40	75
		MJMR – 402 (Practical)	Physical Oceanography Major – 1	1	10	15	25
		MJMR – 403 (Theory)	Fundamentals of Fishery Science Major – 2	3	35	40	75
		MJMR – 404 (Practical)	Fundamentals of Fishery Science Major – 2	1	10	15	25
		MJMR – 405 (Theory)	Analytic techniques in Marine Science Major – 3	3	35	40	75
		MJMR – 406 (Practical)	Analytic techniques in Marine Science Major – 3	1	10	15	25
		MNMR – 407 (Theory)	Physical Oceanography Minor – 1	3	35	40	75
		MNMR – 408 (Practical)	Physical Oceanography Minor – 1	1	10	15	25
<b>TOTAL</b>				<b>12</b>	<b>90</b>	<b>110</b>	<b>300</b>



DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR

SEMESTER - 4

PAPER CODE: MJMR 401

PAPER NAME: PHYSICAL OCEANOGRAPHY

KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 4 MARINE MAJOR – 1	NO. OF LECTURES
1	<p align="center"><b>Fundamentals of Oceanography</b></p> <p><b>Fundamentals of Oceanography:</b> Continent and Oceans. <b>Earth Coordinate System:</b> Latitude, Longitudes. <b>Time Zone:</b> Greenwich Mean Time (GMT), Indian standard time (IST), Local time. Major wind systems, Air-Sea Interaction, Ocean-atmosphere coupling, El Nino/La Nina - global change.</p>	15
2	<p align="center"><b>Oceanic Waves</b></p> <p>Waves and their properties, Wave generation by wind, Deep-water and shallow water waves, Wave refraction and diffraction, Winds- Large and small circulations, Impact of waves on beaches, Effects of waves on sediment and coastal structures, Ocean currents including wind driven systems, Geotrophic currents - upwelling and downwelling processes, Tidal waves (tsunamis), storms and hurricanes.</p>	15
3	<p align="center"><b>Physical properties of Ocean water</b></p> <p>Physical properties of seawater – Temperature, Pressure, Density and Salinity, Vertical and horizontal distributions of salinity and temperature, Identification and significance of water masses, Oceanic Mixed Layers and Thermocline, Sound in Sea: Propagation of sound in sea, Light in sea, states of water, specific heat capacity, latent heat.</p>	15



DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR

SEMESTER - 4

PAPER CODE: MJMR 402

PAPER NAME: PHYSICAL OCEANOGRAPHY (Practical)

KSKV Kachchh University, Bhuj – Kachchh

Practical	Aim of Practical
1	To study the Oceans of the world using Map.
2	To study the Seas of the world using Map.
3	To study the Continents of the world using Map.
4	To study the major wind system using Map.
5	To study El nino and La nina using Map.
6	To study the measuring instruments used in Oceanography. (Principle and Function) Thermometer: Temperature; Dry and Wet bulb: Humidity; Anemometer: Wind speed and direction; Barometer: Pressure; Pyranometer: Solar radiation.
7	To study other Operation of sampling instruments-Niskin bottom samplers, Van Veen Grab, Plankton net.
8	Estimation of salinity of Ocean water.
9	Estimation of pH of Ocean Water.
10	Prepare a report on given topic from teacher – Unit – 2 and submit it.
11	Prepare a report on given topic from teacher – Unit – 3 and submit it.



**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 4**  
**PAPER CODE: MJMR 403**  
**PAPER NAME: FUNDAMENTALS OF FISHERY SCIENCE**  
**KSKV Kachchh University, Bhuj - Kachchh**

UNIT	SEMESTER – 4 MARINE MAJOR – 2	NO. OF LECTURES
1	<p style="text-align: center;"><b>Morphology and Classification</b></p> <p><b>Morphology:</b> General outline of morphological characters of fish,  <b>Classification of fishes:</b> Classification fishes (Class Agnatha, Class Chondrichthyes, Class Oeistychthus) up to Order, their characteristics            Identification and Characteristics of any ten fishes of Gujarat.</p>	15
2	<p style="text-align: center;"><b>Anatomy and Physiology</b></p> <p><b>Basic Anatomy and physiology of fish:</b> General account of Digestive system, Circulatory system, Respiratory system, Nervous system of Fish            General account of Reproductive system of fish, Maturation and spawning, Biotic and abiotic factors affecting spawning in fishes.</p>	15
3	<p style="text-align: center;"><b>Marine fishery in India</b></p> <p><b>Marine fisheries of India:</b> General information  <b>Methods of fishery resources survey:</b> Definition, general account and acoustic method, survey of fish eggs and larvae  <b>Population Dynamics theory of fishing:</b> Unit stock- recruitment- mortality  <b>Indigenous and modern crafts and gears-</b> General account</p>	15



DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR

SEMESTER - 4

PAPER CODE: MJMR 404

PAPER NAME: FUNDAMENTALS OF FISHERY SCIENCE (Practical)

KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To study classification of fishes of class Chondrichthus and class Osteichthys through photographs/ charts/ specimens. (up to order, one or two examples of each)
2	To study general digestive system of fish through Photographs/ Charts/ Specimens.
3	To study general respiratory system of fish through Photographs/ Charts/ Specimens.
4	To study general Male reproductive system of fish through Photographs/ Charts/ Specimens.
5	To study general Female reproductive system of fish through Photographs/ Charts/ Specimens.
6	To study general Nervous system of fish through Photographs/ Charts/ Specimens.
7	To study Indigenous and modern crafts through Specimens/ Photographs/ Charts.
8	To study Indigenous and modern Gears through Specimens/ Charts/ Photographs.
9	Identification of any five important edible fishes of Gujarat through specimens/ charts/ photographs.
10	Visit to nearest marine fish landing center and prepare a report of its functioning.
11	Prepare a report on given topic from teacher – Unit – 3 and submit it.
12	Visit to nearest marine fish landing center and prepare a report on its functioning.



DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR

SEMESTER - 4

PAPER CODE: MJMR 405

PAPER NAME: ANALYTIC TECHNIQUES IN MARINE SCIENCE

KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 4 MARINE MAJOR – 3	NO. OF LECTURES
1	<p style="text-align: center;"><b>On field Instruments</b></p> <p><b>Types of water and sediment samplers:</b> Niskin water sampler, Grab sampler, Sacchi disk, Plankton nets, Echo Sounders, GPS, Thermometer, Refractometer, pH meter, Tide gauges, Barometer, SONAR. Wind clock, Velocity meter, sunshine recorder, Evaporation pan, Humidity meter, current meters, Wave measurements, Flow meter.</p>	15
2	<p style="text-align: center;"><b>Laboratory Instruments</b></p> <p>High Volume sampler, low volume sampler Ovens, shakers, centrifuge, pH meter, Electronic Balance BOD, Laminar Flow hood, glass Beed sterilizers, Autoclave Microscopy – Definition, Principles and application.; brief introduction of compound and electron microscope</p>	15
3	<p style="text-align: center;"><b>Analytic Techniques</b></p> <p><b>Chromatography-</b> Principles, application methodology and types of planar and column chromatography HPLC, GC, Ion-exchange, Affinity and Gel chromatography. <b>Electrophoresis-</b> Principles and applications of paper, gel, SDS PAGE. <b>Centrifugation</b> – Principle, applications.</p>	15



DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR

SEMESTER - 4

PAPER CODE: MJMR 406

PAPER NAME: ANALYTIC TECHNIQUES IN MARINE SCIENCE (Practical)

KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To study the given On - field instruments with their principle, working and application through instrument/ photographs/ chart. Niskin water sampler, Grab sampler, Sacchi disk, Refractometer, Wind clock, Velocity meter, sunshine recorder, Evaporation pan, Humidity meter, current meters, Flow meter.
2	To study the principle, functioning and applications of High-Volume sampler, low volume sampler through instrument/ photographs.
3	To study the principle, functioning and applications of Ovens and shakers through instrument/ photographs.
4	To study the principle, functioning and applications of pH meter and Electronic Balance through instrument/ photographs.
5	To study the principle, functioning and applications of BOD and Laminar Flow hood through instrument/ photographs.
6	To study the principle, functioning and applications of Glass Beed sterilizers and Autoclave through instrument/ photographs.
7	To study the principle, functioning and applications of Compound microscope through instrument/ photographs.
8	To study the principle, functioning and applications of Electron - Scanning microscope through instrument/ photographs.
9	To study the principle, functioning and applications of Electron - Transmission microscope through instrument/ photographs.
10	To study separation of chlorophyll pigments by using paper chromatography.
11	To study principle and application of Electrophoresis through Instruments/ Photographs.
12	To study principle and application of Centrifuge through Instruments/ Photographs.



DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR

SEMESTER - 4

PAPER CODE: MNMR 407

PAPER NAME: PHYSICAL OCEANOGRAPHY

KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER - 4 MARINE MINOR - 1	NO. OF LECTURES
1	<p><b>Fundamentals of Oceanography</b></p> <p><b>Fundamentals of Oceanography:</b> Continent and Oceans. <b>Earth Coordinate System:</b> Latitude, Longitudes. <b>Time Zone:</b> Greenwich Mean Time (GMT), Indian standard time (IST), Local time. Major wind systems, Air-Sea Interaction, Ocean-atmosphere coupling, El Nino/La Nina - global change.</p>	15
2	<p><b>Oceanic Waves</b></p> <p>Waves and their properties, Wave generation by wind, Deep-water and shallow water waves, Wave refraction and diffraction, Winds- Large and small circulations, Impact of waves on beaches, Effects of waves on sediment and coastal structures, Ocean currents including wind driven systems, Geotrophic currents - upwelling and downwelling processes, Tidal waves (tsunamis), storms and hurricanes.</p>	15
3	<p><b>Physical properties of Ocean water</b></p> <p>Physical properties of seawater – Temperature, Pressure, Density and Salinity, Vertical and horizontal distributions of salinity and temperature, Identification and significance of water masses, Oceanic Mixed Layers and Thermocline, Sound in Sea: Propagation of sound in sea, Light in sea, states of water, specific heat capacity, latent heat.</p>	15





**DETAILED SYLLABUS OF B.Sc. 2<sup>nd</sup> YEAR**  
**SEMESTER - 4**  
**PAPER CODE: MJMR 408**  
**PAPER NAME: PHYSICAL OCEANOGRAPHY (Practical)**  
**KSKV Kachchh University, Bhuj - Kachchh**

Practical	Aim of Practical
1	To study the Oceans of the world using Map.
2	To study the Seas of the world using Map.
3	To study the Continents of the world using Map.
4	To study the major wind system using Map.
5	To study El nino and La nina using Map.
6	To study the measuring instruments used in Oceanography. (Principle and Function) Thermometer: Temperature; Dry and Wet bulb: Humidity ; Anemometer : Wind speed and direction ; Barometer : Pressure ; Pyranometer : Solar radiation .
7	To study other Operation of sampling instruments-Niskin bottom samplers, Van Veen Grab, Plankton net.
8	Estimation of salinity of Ocean water.
9	Estimation of pH of Ocean Water.
10	Prepare a report on given topic from teacher – Unit – 2 and submit it.
11	Prepare a report on given topic from teacher – Unit – 3 and submit it.



**B.Sc. Marine Science Programme (NEP 2020)**

**Theory assessment**

**Pattern for Semester end Examination (For Semester – 3 & 4)**

Question	Question Type	Total Marks	Remarks
1 (From Unit – 1)	Descriptive Questions with Internal Option.	10 Marks	Question may be of 10 marks/ 5 + 5 marks
2 (From Unit – 2)	Descriptive Questions with Internal Option.	10 Marks	Question may be of 10 marks/ 5 + 5 marks
3 (From Unit – 3)	Descriptive Questions with Internal Option.	10 Marks	Question may be of 10 marks/ 5 + 5 marks
4 (From Unit – 1, 2, 3, 4)	Short Questions, Fill in the Blanks, MCQ, etc. 12 questions (4 questions x 3 units) will be asked with option (10 out of 12)	10 Marks	Total 12 questions from all units will be ask ; students have to attempt any 10

**Note:**

1. The descriptive questions i.e. Question 1, 2, 3 will be like *Explain, describe, discuss* etc. type which may be of 10 marks or 05 + 05 marks.
2. Examiner can ask two questions of 10 marks, of which one must be attempt or examiner can ask three questions of 05 marks, of which two must be attempt.
3. The forth question can ask from all three units. Total 12 questions (4 questions x 3 units) will be asked, of which 10 must be attempt. Each question carries 01 mark.

**For Internal / College theory assessment**

**Continuous evolution method will be applied for college assessment. Internal theory examination/ Unit test, Seminar, Assignments, Group discussions etc. will be the key part for the internal/ college assessment. The internal assessment will be of 35 marks.**

**The passing criteria for Internal/ college assessment are 40% i.e. students have to secure 14 marks out of 35 marks.**



**B.Sc. Environment Science Programme (NEP 2020)**  
**Practical assessment**  
**Pattern for Semester end Examination (For Semester – 3 & 4)**

For university assessment of practical's, 4 to 5 exercises will be arranged for students according to the prescribed syllabus.

The University Practical assessment is of 10 marks.

The passing criteria for practical assessment are 40% i.e. students have to secure 04 marks out of 10 marks.

**For Internal / College assessment**

For Internal/ college assessment of practical's, 4 to 5 exercises will be arranged for students according to the prescribed syllabus.

The Internal/ college Practical assessment is of 15 marks.

The passing criteria for practical assessment are 40% i.e. students have to secure 06 marks out of 15 marks.

**Dr. Paurav K Mehta**  
Chairmen, BOS,  
Marine Science

**Dr Subhash Bhandari**  
Dean Science faculty  
KSKV Kachchh University

**Member BOS**  
Marine Science

**Member BOS**  
Marine Science

