

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

Syllabus

Effective from June 2016

B.Sc. SEMESTER III

SUBJECT: MARINE SCIENCE

| Paper no. | Name |
|------------------|---|
| CEMS-307 | Physical Oceanography |
| CEMS-308 | Biology of Marine Organisms-2 |
| CEMS-309 | Bio-statistics and its applications- 2 |
| CEMS-310 | Fundamentals of Marine |

| | |
|--|--------------------|
| | Chemistry-2 |
|--|--------------------|

B.Sc. SEMESTER III & IV - MARINE SCIENCE

SYLLABUS FOR MARINE SCIENCE SEMESTER - III

| TYPE OF SUBJECT | SUBJECT CODE/ PAPER NO. | SUBJECT/ PAPER NAME | ASSESSMENT TYPE | CREDIT | BRIEF INTRODUCTION OF SUBJECT |
|-------------------|-------------------------|------------------------------------|-----------------|--------|---|
| CORE ELECTIVE-1 | CEMS-307 | Physical Oceanography | Theory | 04 | Students will learn about basic concepts of Physical properties of Ocean. |
| | | | Practical | 03 | Practical related to Physics and Oceanography. |
| CORE ELECTIVE-2 | CEMS-308 | Biology of Marine Organisms-2 | Theory | 04 | Students will learn about animal physiology of Marine environment. |
| | | | Practical | 03 | Practical related to Biology. |
| CORE ELECTIVE-3 | CEMS-309 | BioStatistics and its applications | Theory | 04 | Student will learn about statistical analysis of data and its applications. |
| | | | Practical | 03 | Practical related to Biostatistics. |
| CORE ELECTIVE-4 | CEMS-310 | Fundamentals of Marine Chemistry-2 | Theory | 04 | Students will learn about key concepts of Marine Chemistry. |
| | | | Practical | 03 | Practical related to Chemistry |
| CORE COMPULSORY | USCCEN 001 | COMPULSORY ENGLISH | Theory | 03 | English literature and Grammar. |
| Foundation Course | USFC001 | RTI and Consumer Act | Theory | 01* | — |

KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester III
CORE ELECTIVE-I (CEMS-307) Physical Oceanography

Total Marks : 60

UNIT-1

- Fundamentals of Oceanography: Continent and Oceans
- Earth Coordinate System: Latitude, Longitudes
- Time Zone: Greenwich Mean Time (GMT), Indian standard time (IST), Local time.
- Characteristics of Ocean Water
- Major wind systems
- Air-Sea Interaction
- Ocean-atmosphere coupling
- Marine weather and climate - evaporation and precipitation processes in the ocean environment.

Unit- 2

- El Nino/La Nina - global change
- storms and hurricanes
- Ocean currents including wind driven systems - eddies –
- Geotrophic currents - upwelling and downwelling processes
- Tidal waves (tsunamis)

Unit- 3

- Waves and their properties
- Wave generation by wind
- Deep-water and shallow water waves
- Effects of waves on sediment and coastal structures
- Wave refraction and diffraction
- Winds- Large and small circulations.
- Impact of waves on beaches.

Unit-4

- 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.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEMS307 Physical Oceanography

(PRACTICALS)

1. Study of different Ocean and seas using maps.
2. Estimate salinity of Ocean water.
3. Estimate pH of Ocean Water.
4. 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 .
5. To study Argos and its principle.
6. Operation of sampling instruments-Niskin bottom samplers, Van Veen Grab, Plankton net.

Reference Books:

1. The Ocean: Their Physics, Chemistry and biology, 1962 - Sverdrup, H.U., Johnson, M.W. and Flemming, R.H., Asia Publ. House, New Delhi.
2. Descriptive Physical Oceanography : An introduction, 1989 - Pickard, G.B. and Emery, W.J., pergamon press, U.K.
3. Principles of physical oceanography, 1966 - pierson, W.J. and Newmann, G.S., Prentice Hall, Inc., New Jersey, U.S.A.
4. Meteorology today: An introduction to weather, climatic and the environment (2nd ed), 1985 -Ahrens, St. Paul, West Publ. House, U.K.
5. Meteorology : Forecasting the weather, 1973 - Wachter, H., Collins Publ., U.K.
6. The atmosphere and ocean: A physical introduction, 1986 - Wells, N., Taylor and Francis Ltd.,U.K.
7. General Climatology, 1960 - Critchfeild, H.J., Prentice Hall Inc., New Jersey, U.S.A.

The Structure of the Question Paper for the University exam

Semester III (Marine Science) Paper no : CEMS 307

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|---------------------|---------------------|--|-------------|
| Question 1 | A | Short question (No internal Option) | 05 |
| Unit I | B | Descriptive Questions with Internal Option | 10 |
| Question 2 | A | Short question (No internal Option) | 05 |
| Unit II | B | Descriptive Questions with Internal Option | 10 |
| Question 3 | A | Short question (No internal Option) | 05 |
| Unit III | B | Descriptive Questions with Internal Option | 10 |
| Question 4 | A | Short question (No internal Option) | 05 |

| | | | |
|---------|---|--|----|
| Unit IV | B | Descriptive Questions with Internal Option | 10 |
|---------|---|--|----|

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester III**

CORE ELECTIVE-II (CEMS-308) Biology of Marine Organisms-2

Total Marks : 60

Unit-1

Nervous System: Definition ; Types of Neurons- Motor Nerve, Sensory Nerve.

Comparitave study of Nervous System of Invertebrates (from Phylum Protozoa to Echinodermata) and Vertebrates (From Chondrychthus to Mammals)

General Account of Reflex Action.

Endocrine System: Definition, General Characters of hormone, General functions of Hormone.

Study of Endocrine Glands and their Hormone: Pitutary Gland, Peneal gland, Thyroid gland, Parathyroid gland, Adrenal Gland, Pancreas, Testis and overies.

Mechanism of Hormone action: Peptide hormone and steroid hormone.

Unit-2

Reprodction: Definition ; Types of Reproduction- Asexual and Sexual Reproduction.

General Process of Reproduction: Pre reproductive events, reproductive events and Post reproductive events.

Comparative study of Reproductive System of Invertebrates (from Phylum Protozoa to Echinodermata) and Vertebrates (From Chondrichthys to Mammals).

Role of Sex hormones in Reproduction.

Muscular System: Types- Striated muscles, Non striated Muscles and Cardiac Muscles.

Skeletal System: Parts of skeletal system- Axial skeletal system and Appendicular skeletal system.

Comparative study of skeletal system of class Fish, Amphibia, Reptilia, Aves and Mammals. (Any one example of Each.)

Unit-3

General study of Marine Vertebrate animals- Marine Amphibians, Marine Reptiles, Marine Birds, Marine Mammals- General characters and Examples.

Color change of Animals; General account of Chromatophores

Unit-4

Bioluminescence: Definition, Gland and organs, Process of production of light, Biological Importance.

Deep Sea: Environment in Deep Sea, Adaptation of Animals in Deep sea- Adaptation for food and feeding, light, temperature and Pressure.

Hydrothermal vent: General account

KSKV Kachchh University, Bhuj - Kachchh
Paper No. CEMS308 Biology of Marine Organisms-2

(PRACTICALS)

1. Comparative study of Nervous system of animals from Charts/ Photographs/ Specimens.
2. Study of Endocrine glands from Charts/ Photographs.
3. Comparative study of Male reproductive system of animals from Charts/ Photographs/ Specimens.
4. Comparative study of Female reproductive system of animals from Charts/ Photographs/ Specimens.
5. Study of General Characters of Marine Mammals. (Any two Animals)
6. Study of General Characters of Marine Amphibians. (Any two Animals)
7. Study of General Characters of Marine Reptiles. (Any two Animals)
8. Study of General Characters of Marine Birds. (Any two Animals)
9. Study of types of Chromatophores from Charts/ Photographs.

Reference Books:

1. Biological oceanography 1999 – Lalli, C.M.
2. An introduction to marine sciences, 1988 – Meadows, P.S. & Campbell, J.J.
3. Marine biology, 1984 Thurman, H.V. and Webber, H.H.
4. Methods for the study of marine benthos, 1984 – Holme, N.A. & Melntyre, A.D.
5. The ecology of rocky coasts, 1964 – Lewis, J.R.
6. The shore environment, 1980 – Irvine, J.H., Price, D.E.C. and Farnham, W.F.
7. Life between tidemark on rocky shores, 1972 – Stephenson, T.A. & Stephenson, A.
8. The invertebrates (5th Edn.), 1986 – Barnes, R.D.
9. Modern Text Book of Zoology- Vertebrates by R.L.Kotpal Rastogi Publication.

**The Structure of the Question Paper for the
University exam**

Semester III (Marine Science) Paper no : CEMS 308

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|---------------------|---------------------|--|-------------|
| Question 1 | A | Short question (No internal Option) | 05 |
| Unit I | B | Descriptive Questions with Internal Option | 10 |
| Question 2 | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal | 10 |

| | | | |
|------------|---|--|----|
| Unit II | | Option | |
| Question 3 | A | Short question (No internal Option) | 05 |
| Unit III | B | Descriptive Questions with Internal Option | 10 |
| Question 4 | A | Short question (No internal Option) | 05 |
| Unit IV | B | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester III
CORE ELECTIVE-III (CEMS-309) Bio-Statistics and its
Application-2**

Total Marks : 60

Unit-1 TIME SERIES:

Definition and Meaning of time series. Components of time series. Trend, Seasonal, Cyclic and Random components, Elimination of trend by the method of Moving average, method of curve fitting, using or ordinary least squares principle only, curve fitting for numerical data for linear, quadratic and exponential case only.

Unit-2 LARGE SAMPLE TEST:

Statement of a hypothesis, null hypothesis, level of significance, critical region or rejection region, testing of hypothesis, two types of errors, standard error of statistic, significance of mean(s) and proportion(s) in case of one and two samples.

SMALL SAMPLE TEST:

Definition of t and F statistics, degree of freedom, properties of t and F distributions, use of t and F tests. Z-test.

Unit-3 CHI-SQUARE TEST:

Definition of Chi-square test as large sample Statistic. Properties of Chi-square distribution without proof. Application of Chi-square test. Test of independence of attributes up to 3x3 contingency table. Derivation of Chi-square in 2x2 contingency table. Goodness of fit test.

Unit-4 ANALYSIS OF VARIANCE:

Concept of analysis of variance, Example on One way and Two way analysis of variance.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEMS309 Bio-Statistics and Its Applications-2

(PRACTICALS)

THE PRACTICALS IS DERIVED FROM THE ABOVE SYLLABUS

References:

Bhat BR, Modern Probability theory, 1985, Wiley Eastern Ltd.

Rohatgi VK and Md.Ehsanes saleh AK, An Introduction to Probability & Statistics, 2009, Wiley India..

Rao CR. Linear Statistical Inference and its Applications, 1973, John Wiley, NY. 5. Johnson NL and Kotz 4. Dutta, N. K. (2004). Fundamentals of Biostatistics, Kanishka Publishers.

Gurumani N. (2005) . An Introduction to Biostatistics, MJP Publishers.

Daniel, W. W. (2007). Biostatistics- A Foundation for Analysis in the Health Sciences,Wiley.

Rao, K. V. (2007). Biostatistics - A Manual of Statistical Methods for use in Health Nutrition and Anthropology.

Pagano, M.& Gauvreau, K. (2007). Principles of Biostatistics.

Sundaram, K.R.(2010) Medical Statistics-Principles & Methods, BI Publications,New Delhi

The Structure of the Question Paper for the University exam

Semester III (Marine Science) Paper no : CEMS 309

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Questi | Sub | Question Type | Mark |
|---------------|------------|----------------------|-------------|
|---------------|------------|----------------------|-------------|

| on No. | Question | | |
|------------------------|----------|--|----|
| Question 1 Unit I | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 2 Unit II | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 3 Unit III | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 4 Unit IV | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester III
CORE ELECTIVE-III (CEMS-310) Fundamentals of Marine
Chemistry-2**

Total Marks : 60

UNIT-I

Metallic and Non-metallic resources from sea water- Oil and manganese nodules-Major and minor elements of seawater-residence time of elements in seawater-Biological control of trace metals in seawater

UNIT-II

Chemistry of dissolved Oxygen in oceans and its biological importance-Inter-relationship of Dissolved oxygen with salinity, temperature and other physical factors-Chemistry of carbonates in seawater- pH and its influencing factors.

UNIT- III

Distribution of gases in the sea. Distribution of nutrients and their cycles. Eutrophication. Dissolved and particulate organic matter in the sea, its chemical nature and properties.

UNIT-IV

Nutrients and Aerobic Carbon Production and Consumption-Aerobic and Anaerobic digenesis in sediments-Biogenic production- Geochemistry of Ocean sediments.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEMS310 Fundamentals of Marine Chemistry-2

(PRACTICALS)

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.

References:

- 1, Introduction to marine chemistry, 1981 – Riley, J.P. and Chester, R.
2. Chemical oceanography (Vol.1,2, 3 & 8), 1975 – Riley, J.P. & Skirrow, G.
3. Marine Chemistry, 1969 – Horne, R.A.
4. Chemical oceanography, 1982 – Broecker and Peng.
5. Marine geochemistry 1990 – Chester.
6. Chemical oceanography, 1992 – Millero and Saha, M.L.
7. Dynamic processes in the chemistry of the upper ocean, 1986 - Burton et al., Plenum Press.
8. Environmental chemistry, 1994 - De, A.K., Wiley – Eastern Ltd.
9. Geosphere – Biosphere Interactions and climate, 2001 – L.O. Bengtsson and C.U. Hammer.
10. Oceanography of the Indian Ocean, 1992 – B.N. Dessai (Ed.)
11. Chemical Oceanography of the Indian Ocean, North of Equator. Deep Sea Res. 1984, 31A, 671-706.
12. Chemical Oceanography, 1996 – F.J. Millero
13. The Sea Surface and Global Change, 1997, 2005 – P.S. Liss and R. Duce.

**The Structure of the Question Paper for the
University exam**

Semester III (Marine Science) Paper no : CEMS 310

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|------------------------|---------------------|--|-------------|
| Question 1 Unit I | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 2 Unit II | A | Short question (No internal Option) | 05 |
| | b | Descriptive Questions with Internal Option | 10 |
| Question 3 Unit III | a | Short question (No internal Option) | 05 |
| | b | Descriptive Questions with Internal Option | 10 |
| Question 4 Unit IV | a | Short question (No internal Option) | 05 |
| | b | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

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

Syllabus

Effective from June 2016

B.Sc. SEMESTER IV

SUBJECT: MARINE SCIENCE

| Paper no. | Name |
|------------------|--|
| CEMS-411 | Fundamentals of Marine Botany-2 |
| CEMS-412 | Marine Food Technology |
| CEMS-413 | Fundamentals of Fishery Science |
| CEMS-414 | Marine Geology |

B.Sc. SEMESTER III & IV - MARINE SCIENCE

SYLLABUS FOR MARINE SCIENCE SEMESTER - IV

| TYPE OF SUBJECT | SUBJECT CODE/ PAPER NO. | SUBJECT/ PAPER NAME | ASSESM ENT TYPE | CRED IT | BRIEF INTRODUCTION OF SUBJECT |
|---------------------------|--------------------------------|--|------------------------|----------------|---|
| CORE ELECTIVE-1 | CEMS-411 | Fundamentals of Marine Botany-2 | Theory | 04 | Students will learn about fundamental concepts of marine algae and their various uses. |
| | | | Practical | 03 | Practical related to Botany |
| CORE ELECTIVE-2 | CEMS-412 | Marine Food Technology | Theory | 04 | Students will learn about Sea food and its importance |
| | | | Practical | 03 | Practical related to Biology. |
| CORE ELECTIVE-3 | CEMS-413 | Marine Geology | Theory | 04 | Student will learn about sediments of ocean and its various applications and uses. |
| | | | Practical | 03 | Practical related to Geology. |
| CORE ELECTIVE-4 | CEMS-414 | Fundamentals of fishery science | Theory | 04 | Students will learn about basic and applied concepts of fishery science |
| | | | Practical | 03 | Practical related to Zoology and Fishery |
| CORE COMPULSORY | USCCEN 001 | COMPULSORY ENGLISH | Theory | 03 | English literature and Grammar. |
| Foundatio n Course | USFC001 | Disaster Management | Theory | 01* | — |

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester IV**

CORE ELECTIVE-I (CEMS-411) Fundamentals of Marine Botany-

2

Total Marks : 60

UNIT-1

Physiology: Definition

Mineral Nutrition: Micro and Macro nutritions, their source and its importance in plant life.

Phytohormones: Definition, Brief history, discovery and Bio essay of Auxins, Gibberlines, Cytokinins, Ethylene, Abscesic acids.

Photosynthesis: General process of light and dark reaction, Factors affecting Photosynthesis.

Respiration: General process of Glycolysis, Krab's cycle and Electron transport system, Factors affecting respiration.

UNIT-2

Water Potential - biological significance, water relationship of the plants, osmosis, permeability, diffusion, water potential, apoplast and symplast concept, Translocation of solutes.

UNIT-3

Economic Importance of algal products: Brief Introduction, Source and Economic Importance of Agar-Agar, Carragenin, Kiesalguhr, Algin, Laminarin.

UNIT-4

Cultivation of Algae: Definition, Need for cultivation,

Brief Introduction of Mass cultivation, Mass cultivation of Ulva and Porphyra.

Single cell Protein: Definition, Importance, Large cultivation of Spirullina.

KSKV Kachchh University, Bhuj - Kachchh
Paper No. CEMS411 Fundamentals of Marine Botany-2

(PRACTICALS)

1. To demonstrate effect of CO₂ on Photosynthesis through Charts/ Specimens/ Photographs.
2. Write down bio-assay of Phytohormones: Auxins, Gibberellins, Cytokinins, Ethylene, ABA.
3. To demonstrate effect of light intensity on Photosynthesis through Charts/ Specimens/ Photographs.
4. To demonstrate process of respiration.
5. To demonstrate aerobic respiration by respiroscope through charts/ Specimens/ Photographs.
6. To demonstrate net cultivation method of algae through charts/ Photographs.

References:

1. Plant physiology by Salisbury and Ross CBS publication.
2. Introduction to plant physiology by Mandal and Basu.
3. Plant Physiology by Iqbal Hussain ABD Publication.
4. Plant Physiology by Verma S.Chand publication
5. Marine Botany 2nd edition by Clinton J Dawis John Wiley & Sons
6. An introduction to marine sciences, 1988 - Meadows, P.S. & Campbell, J.J.
7. Marine biology, 1984 Thurman, H.V. and Webber, H.H.
8. The biology of Algae by F.E. Round, Arnold Publishers, London, 1965.
9. Marine Botany by E.Yale Dawson, Holt, Rinehart and Winston, inc, 1966.
10. Structure and Reproduction of Algae Vol. I & II by FE. Fritsch, Cambridge University Press, 1935.

11. Physiology & Biochemistry of Algae by R.A. Lewin, Academic Press, New York, 1962.
12. Smith, G.M. 1965. Cryptogamic Botany, Vol. I Algae & Fungi, McGraw Hill, New York, 1965.

The Structure of the Question Paper for the University exam

Semester IV (Marine Science) Paper no : CEMS 411

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|---------------------|---------------------|--|-------------|
| Question 1 | A | Short question (No internal Option) | 05 |
| Unit I | B | Descriptive Questions with Internal Option | 10 |
| Question 2 | A | Short question (No internal Option) | 05 |
| Unit II | b | Descriptive Questions with Internal Option | 10 |
| Question 3 | a | Short question (No internal Option) | 05 |
| Unit III | b | Descriptive Questions with Internal Option | 10 |

| | | | |
|------------|---|--|----|
| Question 4 | a | Short question (No internal Option) | 05 |
| Unit IV | b | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester IV
CORE ELECTIVE-II (CEMS-412) Marine Food Technology
Total Marks : 60**

UNIT-1

Introduction, history and development of marine food technology

Status of marine food technology industry in India

General Harvesting and Post Harvesting methods of seafood products such as fish, shellfish, crustaceans, and other types.

UNIT-II

Processing and By-products of Fish :Types of processing-Salting and Canning

Commercially important by-products of fish and shellfish

Nutritive composition of fish : Classification of Lipids and Classification of Proteins, Vitamins-definition, types and importance.

UNIT-III

Commercial and Industrial uses of Microalgae: Commercial uses- as food, as cosmetics, as bio-fuel.

Commercial importance of Macroalgae: General uses of Macroalgae.

Importance and Uses of Algal products: Carragienine, Algin, Agar, B-carotene

UNIT-IV

Processing and packaging of seafood: freezing, canning, Salting, Smoking, Marinating, fermentation

Assessment and management of seafood safety and quality

Case studies in the seafood industry.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEMS412 Marine food technology

(PRACTICALS)

1. To study any six by-products of fish processing through photographs/ charts.
2. To demonstrate presence of lipid from given material by Sudan-III test.
3. To demonstrate presence of protein from given material by Biuret test / Ninhydrin test.
4. To study commercial uses of microalgae (Spirullina and Chlorella) through specimens/ photographs/ charts.
5. To study Commercial uses of Algin, Agar-Agar and Carragienine through specimens/ photographs/ charts.
6. To demonstrate processing and packaging methods of sea food (freezing, Salting, Canning) through Photographs and charts.

References:

1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004
2. B. Srilakshmi, Food science, New Age Publishers, 2002
3. Meyer, Food Chemistry, New Age, 2004
4. Potter, Norman. M., Food Science, CBS Publication, 1996
5. Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004
6. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003

7. Jenkins WA and Harrington JP, Packaging Foods with Plastics, Technomic Publishing Company Inc., USA, 1991
8. Meyer LH, Food Chemistry, CBS Publication, New Delhi, 1987
9. Potter NH, Food Science, CBS Publication, New Delhi, 1998
10. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press,
11. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd ed. TMH Education Pvt. Ltd, 1986

The Structure of the Question Paper for the University exam

Semester IV (Marine Science) Paper no : CEMS 412

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|-----------------------|---------------------|--|-------------|
| Question 1 Unit I | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 2 Unit II | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |

| | | | |
|------------|---|--|----|
| Question 3 | A | Short question (No internal Option) | 05 |
| Unit III | B | Descriptive Questions with Internal Option | 10 |
| Question 4 | A | Short question (No internal Option) | 05 |
| Unit IV | B | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester IV
CORE ELECTIVE-III (CEMS-413) Fundamentals of fishery
science**

Total Marks : 60

UNIT-1

Morphology: General outline of morphological characters of fish

Classification of fishes: Classification fishes (Class Agnatha, Class Chondrychthys, Class Oiestychthys) up to Order, their characteristics

Identification and Characteristics of any ten fishes of Gujarat.

UNIT II

Basic Anatomy of fish: General account of Digestive system, Circulatory system, Respiratory system, Nervous system of Fish

General account of Reproductive system of fish, Maturation and spawning in marine fishes

Biotic and abiotic factors affecting spawning in fishes.

UNIT- III

Marine fisheries of India: General information

Methods of fishery resources survey: Definition, general account and acoustic method, survey of fish eggs and larvae

Population Dynamics theory of fishing- unit stock- recruitment- mortality.

UNIT-IV

Principle methods of exploitation of marine fishes, Sustainable Fishery, Marine Protected areas (MPAs)

Indigenous and modern crafts and gears- General account

Principle methods of fish preservation and processing in India: freezing, canning, pickling and smoking.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEMS413 Fundamentals of Fishery Science

(PRACTICALS)

1. To study classification of fishes of class chondrychthys and class oeistychthys through photographs/ charts/ specimens.
2. To study digestive system of fish through Photographs/ Charts/ Specimens.
3. To study respiratory system of fish through Photographs/ Charts/ Specimens.
4. To study Male reproductive system of fish through Photographs/ Charts/ Specimens.
5. To study Female reproductive system of fish through Photographs/ Charts/ Specimens.
6. To study Indigenous and modern crafts through Specimens/ Photographs/ Charts.
7. To study Indigenous and modern Gears through Specimens/ Charts/ Photographs.
8. Identification of any five important edible fishes of Gujarat through specimens/ charts/ photographs.
9. Visit to nearest marine fish landing center and prepare a report of its functioning.

References:

1. Nikolsky, G.V. Ecology of Fishes. Academic Press, NY, 1963.

2. Howar, W.S. & D.J. Randal. Fish Physiology, Vols. 1-4, Academic Press, NY, 1970.
3. Jhingran, V.G. Fish and Fisheries of India. Hindustan Publishing Co., 1975.
4. Norman, J.R. & P.H. Greenwood. A History of Fishes, 3rd Ed. Ernest Benn Ltd., 1975.
5. Fretter, V. & A. Graham. The functional anatomy of vertebrates. Academic Press Inc. (Lon.) Ltd., 1976.
6. Lagler, K.E. et. Al. Ichthyology. John Wiley, 1977.
7. Carl, B.E. Biology of Fishes. Saunders, 1979.
8. Moyle Peterb, Fishes : An Introduction to Ichthyology. Prentice Hall, 1979.
9. Low, M.S. & G.M. Calliet (eds.). Readings in Ichthyology. Prentice Hall, 1979.
10. Meyer & Ashlock. Principles of systematic Zoology.
11. Sedgewick. A Student's textbook of Zoology, Vol. I & II.
12. Usinger. General Zoology, Vols. I & II.
13. Marshall & Williams. Textbook of Zoology. Vol.I.
14. Parker and Hasswell. Textbook of zoology, Vertebrates. Vol.II.
15. Barnes. General Zoology
16. Day, F. The fishes of India.
17. S.S. Khanna. An introduction to fishes.

The Structure of the Question Paper for the University exam

Semester IV (Marine Science) Paper no : CEMS 413

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|---------------------|---------------------|-------------------------------------|-------------|
| Question 1 | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal | 10 |

| | | | |
|------------|---|--|----|
| Unit I | | Option | |
| Question 2 | A | Short question (No internal Option) | 05 |
| Unit II | B | Descriptive Questions with Internal Option | 10 |
| Question 3 | A | Short question (No internal Option) | 05 |
| Unit III | B | Descriptive Questions with Internal Option | 10 |
| Question 4 | A | Short question (No internal Option) | 05 |
| Unit IV | B | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.

**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester IV
CORE ELECTIVE-IV (CEMS-414) Marine Geology**

Total Marks : 60

Unit-1 Physical and Environmental Geology

Marine Geology: Definition, Introduction to Geology; Branches and scopes of Geology

Physical Geology: (Geomorphology, Seas and oceans, Weathering and erosion, Sedimentation, Rivers, Glaciers, Mountains)

Environmental Geology: Concepts, volcanoes, earthquakes, floods, tsunami as hazard, waste disposals, mining and its impact on environment.

Unit-II Mineralogy and Petrology

Mineralogy: Basics of mineralogy, physical properties, classification of minerals

Igneous, sedimentary and metamorphic petrology (their origin, occurrence and common types, basic structures of sedimentary igneous and metamorphic rocks)

Unit-III Geotectonics and Structural Geology

Continental drift and plate tectonics, sea floor spreading, polar wandering, plate boundaries, hot spots, convection currents,

Internal structure of the earth; Fundamentals of structural Geology, folds, faults, joints

Unit-IV Marine Mineral Resources

Economic mineral resources, Exploration techniques of minerals, Geophysical explorations (Gravity, magnetic, seismic, electrical, GPR etc. methods)

Exploration and exploitation methods for marine minerals (petroleum and manganese)

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEMS414 Marine Geology

(PRACTICALS)

1. Physical (Megascopic) identification of minerals and rocks
 - a. **(Minerals)** Quartz (several types), orthoclase, muscovite, biotite, olivine, hornblende, augite, plagioclase, hypersthene, calcite, barite, gypsum, haematite, magnetite, chromite, pyrite, chalcopyrite, pselomelene, malachite, azurite, apatite, topaz, corundum, fluorite, cuprite, garnet, nepheline, kyanite, sillimanite, talc, tourmaline, beryl, bentonite, chaina clay, bauxite,
 - b. **(Rocks)** Sandstone, limestone, shale, conglomerate, fossiliferous limestone, granite, syenite, gabbro, dolerite, diorite, granodiorite, dacite, basalt, andesite, obsidian, pumice, lamprophyre, slate, schists, gneisses, phyllites, granitic gneiss, migmatite
2. Map sections (10 maps of simple geomorphology and geology)

3. Fossil identification (15 common invertebrate mega fossils and 6 microfossils)
4. Aerial photo interpretation

References:

1. Introductory oceanography (5th ed), 1988 Thurman, H.V., Merril Publ. Co, Ohio.
2. Oceanography (5th ed), 1990 – Grant Gross, M., Prentice Hall.
3. Coastal and estuarine sediment dynamics, 1986 – Dyer, K.R., John Wiley & Sons.
4. Beach processes and sedimentation, 1976 – Komar, P.D., Prentice Hall
5. Beaches and Coasts (2nd ed), 1972 – King, C.A.M., Edward Arnold
6. Introduction to marine micropaleontology, 1978 – Haq, B.U. and Boersma, A. (Eds.), Elsevier Publ.
7. Introduction to geophysical prospecting, 1976 – Dobrin, M.B., McGraw-Hill.
8. Gravity and magnetism in oil prospecting, 1976 – Nettleton, L.L., McGraw-Hill
9. The mineral sources of the sea, 1965 – Mcro, J.L., Elsevier, Amsterdam.
10. Earth resources. 1969 – Skinner, B.J., Prentice Hall
11. Structural Geology, 1972 - M.P. Billings, Third Edition
12. Marine minerals: advances in research and resource assessment, 1987 – Teleki, P.G. et al. D. Reidel Dordrecht.
13. The micropaleontology of oceans, 1971 – Funnell, B.M. and Reidel, W.R., Cambridge Univ. Press., U.K.
14. Marine geology and oceanography of the Arabian Sea and coastal Pakistan 1984 – Haq. B.U. and Milliman, J.D., Van Norstrand Reinhold Co.
15. Marine Geology, 1982 – James P. Kennet. Prentice Hall INC Englewood, 1. Cliffs, N.J. 07632.

The Structure of the Question Paper for the University exam

Semester IV (Marine Science) Paper no : CEMS 414

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

| Question No. | Sub Question | Question Type | Mark |
|---------------------|---------------------|----------------------|-------------|
| | | | |

| | | | |
|------------------------|---|--|----|
| Question 1 Unit I | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 2 Unit II | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 3 Unit III | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |
| Question 4 Unit IV | A | Short question (No internal Option) | 05 |
| | B | Descriptive Questions with Internal Option | 10 |

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

- The examination pattern of the university is 60% external and 40% internal
- Each theory paper will have 4 lecture in a week and a practical will have 6 lecture per batch in a week.