

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

**Syllabus**

**Effective from June 2016**

**B.Sc. SEMESTER-V**

**SUBJECT: MARINE SCIENCE**

<b>Paper no.</b>	<b>Name</b>
<b>CEMS-515</b>	<b>Marine Pollution</b>
<b>CEMS-516</b>	<b>Marine Pharmacology and Basic Genetics</b>
<b>CEMS-517</b>	<b>Marine Monitoring, MEIA &amp; GIS</b>

## **B.Sc. SEMESTER V & VI - MARINE SCIENCE**

### **SYLLABUS FOR MARINE SCIENCE SEMESTER - V**

<b>TYPE OF SUBJECT</b>	<b>SUBJECT CODE/ PAPER NO.</b>	<b>SUBJECT/ PAPER NAME</b>	<b>ASSESSMENT TYPE</b>	<b>CREDIT</b>	<b>BRIEF INTRODUCTION OF SUBJECT</b>
<b>CORE ELECTIVE-1</b>	<b>CEMS-515</b>	<b>Marine Pollution</b>	<b>Theory</b>	<b>04</b>	<b>Students will learn about pollution and its effects on Ocean.</b>
			<b>Practical</b>	<b>03</b>	<b>Practical related to Pollution and its effects.</b>
<b>CORE ELECTIVE-2</b>	<b>CEMS-516</b>	<b>Marine Pharmacology and Basic Genetics</b>	<b>Theory</b>	<b>04</b>	<b>Students will learn about pharmacological aspects of Ocean and learn about basic concepts of Genetic.</b>
			<b>Practical</b>	<b>03</b>	<b>Practical related to Pharmacology, genetics and biotechnology.</b>
<b>CORE ELECTIVE-3</b>	<b>CEMS-517</b>	<b>Marine Monitoring, MEIA &amp; GIS</b>	<b>Theory</b>	<b>04</b>	<b>Student will learn about Coastal safety and its monitoring using GIS and RS.</b>
			<b>Practical</b>	<b>03</b>	<b>Practical related to GIS and RS.</b>
<b>CORE COMPULSORY</b>	<b>USCCEN 005</b>	<b>COMPULSORY ENGLISH</b>	<b>Theory</b>	<b>03</b>	<b>English literature and Grammar.</b>

**KSKV Kachchh University, Bhuj – Kachchh**  
**Marine Science Syllabus as CBCS System**  
**Semester V**  
**CORE ELECTIVE-I (CEMS-515) Marine Pollution**

**Total Marks : 60**

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**UNIT-1**

Ocean pollution: kinds and quantities of pollutants entering oceans.

Ocean dumping: Definition, general Information of dumping, fate of pollutants.

Toxic effects of different pollutants on marine life: Imposéx.

**UNIT-2**

Oil spills and cleanup: sources, major accidental spills, fate of spilled oil on the sea, Impact and consequences of oil spills and Managing and treatment of oil spills.

Marine corrosion: Definition, corrosion reactions, classification of corrosion, factors affecting corrosion of metals in sea water and prevention of marine corrosion.

**UNIT-3**

Metal Pollution: Trace metals as pollutants, Important contaminant metals in marine systems – Mercury and Cadmium, Bioaccumulation-Case studies like Mina-mata disease. Thermal Pollution.

**UNIT-4**

Pollution by sewage and nutrients: Definition, sources of pollutants, discharges by rivers and estuaries, effects on marine life.

Sewage treatment: Definition, Primary- Secondary and Tertiary methods of treatment, Importance.

# **KSKV Kachchh University, Bhuj - Kachchh**

## **Paper No. CEMS515 Marine Pollution**

### **(PRACTICALS)**

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1. Determination of biochemical oxygen demand (BOD) from given water sample.
2. Determination of chemical oxygen demand (COD) from given water sample.
3. Determination of dissolved oxygen (DO) from given water sample.
4. Determination of hardness of water from given water sample.
5. Determination of total alkalinity of Water.
6. Determine pH and temperature of polluted water.

### **References**

1. Chemical Oceanography (Vol: 3) 1975- Riley J.P and Skirrow, G.
2. The health of the oceans. 1976 Goldberg, E.D
3. Marine Pollution. 1986 Clark, R.B.
4. Quantitative aquatic biological indicators. 1980 Phillips J.D.H.
5. Thermal and radioactive pollution. 1994. Sharma, B.K and Kaur, H.
6. Water Pollution. 1994. Sharma, B. K and Kaur, H.
7. Marine and offshore corrosion. 1985. Chandler, K.A.
8. A practical hand book of sea water analysis, 1972 strickland, J.D.H. and parsons, T.R.
9. Marine chemistry (vol.1), 1972 – Martin, D.F.
10. Methods of seawater analysis, 1983 – Grasshoff, K., Ehrhardt, M and kremling, K.
11. A manual of chemical and biological methods of seawater analysis, 1972 – Parsons T.R. Mritz, Y and Lalli, C.H.
12. Geochemistry, 1962 – Goldschmidt, V.M., Clarendon press.
13. Principles of geochemistry 1956 – Mason, B. and Moore, B.
14. Chemical oceanography (Vol. 1 & 3), 1975 – Riley, J.P. and Skirrow, G.
15. Introduction to geochemistry, 1995 – Krauskopf, K.B. and Bird, Mc-Graw Hill.
16. The geochemistry of natural waters, 1982 – Drever, J.I.
17. Estuarine chemistry, 1976 – Burton, J.D. and Liss, P.S., Academic Press.
18. Aquatic chemistry, 1996 – Stumm, W. and Morgan, J.J., Wiley- Interscience, New York.
19. Aquatic surface chemistry, 1987–Stumm, W., Wiley–Interscience, New York.
20. Marine Chemistry, 1969 – Home, R.A.

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

**Semester V (Marine Science) Paper no : CEMS 515**

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

**Total Number of Question: 04**

<b>Question No.</b>	<b>Sub Question</b>	<b>Question Type</b>	<b>Mark</b>
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)

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**KSKV Kachchh University, Bhuj – Kachchh**  
**Marine Science Syllabus as CBCS System**  
**Semester V**

**CORE ELECTIVE-II (CEMS-516) Marine Pharmacology and Basic Genetics**

**Total Marks : 60**

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**UNIT-1 Marine Pharmacology**

Marine Pharmacology: Definition, Therapeutic compounds from marine environment  
Importance of marine microbes in drug production - Antiviral and antimicrobial agents-  
Marine toxins: Cephalosporins, Fish and Shellfish toxins.

**UNIT-2 Marine Pharmacology**

Steps involved in Marine Pharmacology (Separation of bioactive compounds) : extraction of crude drugs, screening, isolation, purification and structural characterization of bioactive compounds.

**UNIT-3 Basic Genetics**

Genetics: Definition, Mendel's experiments of hybridization and Laws of Inheritance, Chromosomal basis of Inheritance, Incomplete dominance, Co-Dominance.  
Linkage: Definition, Complete and Incomplete Linkage, coupling and repulsion hypothesis  
Crossing Over: Definition, Basic Concept.

**UNIT-4 Basic Genetics**

Mutation: Definition, types, Causes of Mutation. A case study of the effects of mutation: Sickle cell anemia  
Biotechnology: Definition, DNA- as genetic material, RNA and its types, DNA replication, Transcription, Protein synthesis, Genetic code, Gene expression in prokaryotic cell.

# **KSKV Kachchh University, Bhuj - Kachchh**

## **Paper No. CEMS516 Marine pharmacology and Basic genetics**

### **(PRACTICALS)**

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1. Extraction of bioactive compounds from marine flora and fauna using organic solvents.
2. Screening of the bioactive compounds for antibacterial and antifungal activities.
3. Genetical problems related with Mendel's law of inheritance. (Mono & Di Hybrid cross, Incomplete dominance, Co-dominance)
4. To demonstrate DNA structure by using Model/ Chart/ Photograph.
5. To demonstrate DNA replication by using Model/ Chart/ Photograph.
6. To demonstrate Transcription by using Model/ Chart/ Photograph.
7. To demonstrate Gene regulation using Model/ Chart/ Photograph.
8. Prepare Karyotype of Chromosome.

#### References:

1. Fingerman M., Recent advances in Marine Biotechnology, Science Publishers, 2000.
2. Morris H. Baslow, 1969. Marine Pharmacology. The Williams & Wilkins Co., Baltimore.
3. Natural Toxins; Characterization, Pharmacology and Therapeutics – Ownkey et al., 1989.
4. Marine toxins: Origin, Structure and Molecular Pharmacology - Hall, S and G.Strichartz, 1990.
5. Bacteria in Biology, Biotech and Medicine, 5th edition – Paul Singleton, 1999.
6. Treves - Brown, K.M., 2000. Applied Fish Pharmacology. Kluwer Academic Publishers, The Netherlands.
7. Introduction to molecular medicine – 3rd edition – Dennis W. Ross, 2002.
8. Biotech and Biopharmaceuticals – Rodney J.Y. Ho et al., 2003.
9. Herbal Drugs and Biotechnology – P.C. Trivedi, 2004.
10. Genetics by by Strickberger Pearson India publication.

11. Genetics: Analysis and Principles by Robert J. Brooker McGraw-Hill Higher Education; 4 edition
12. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology by P.S. Verma S Chand; Reprint Edn. 2006 edition

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

**Semester V (Marine Science) Paper no : CEMS 516**

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

**Total Number of Question: 04**

<b>Question No.</b>	<b>Sub Question</b>	<b>Question Type</b>	<b>Mark</b>
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	A	Short question (No internal Option)	05



Unit IV	B	Descriptive Questions with Internal Option	10
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**KSKV Kachchh University, Bhuj – Kachchh  
Marine Science Syllabus as CBCS System  
Semester V**

**CORE ELECTIVE-III (CEMS-517) Marine Monitoring, MEIA & GIS**

**Total Marks : 60**

**UNIT-1**

Introduction to marine monitoring

Legal and ecological requirement of marine monitoring

Goals and objectives of marine monitoring

Types of marine monitoring

Marine Monitoring approaches.

**UNIT-2**

Role of Marine monitoring in environmental management

Marine monitoring design and execution

Limitations of marine monitoring

Environmental Issues of Coastal Development

National marine monitoring programs like COMAPS,

**UNIT-3**

Components and process of Environmental Impact Statement

Different EIA Methodologies

Prediction and Assessment of Impacts on marine Resources: Biota, Surface Waters

Different maritime activities and their impact assessment

#### **UNIT-4**

Introduction, Concepts and foundations of remote sensing.

Image interpretations-RS application to study marine ecosystems mangroves, corals, coastal water quality

Introduction and definition of GIS- INCOIS Programme.

## **KSKV Kachchh University, Bhuj - Kachchh**

### **Paper No. CEMS517 Marine Monitoring, MEIA & GIS**

#### **(PRACTICALS)**

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1. Choose a major industry in Kachchh and list out the nature of marine monitoring studies required based on the process and operation of the industry.
2. Mark on a GIS map indicating important coastal industries along Kachchh coast
3. Predict and list out the major impacts of Ports and Jetties in Kachchh coast based on their operation and elaborate on the kind of MEIA needed for ports and jetties.
4. Mark all major zones of CRZ in Kachchh on a google map
5. Mark on a google map important coastal natural resources such as mangroves, mudflats, sandy shores, creeks and saline swamps.
6. Predict and assess major impacts of jetty construction in the vicinity of mangroves

#### **References:**

1. Environmental Impact Assessment, Canter, L.W., (1996) Mc Graw Hill, New York
2. S.E. Nielsen: Tropical Pollution, 1982.
3. A.M. Chakravarthy: Biodegradation and detoxification of Environmental pollutants, CRC Press, 1928.
4. O. Kinne: Marine Ecology, Vol. V. Ocean Management 3&4 John Wiley & Sons.1984.

5. Johnston R. (Ed.): Marine Pollution, Academic Press, 1976.
6. Patin S.A.: Pollution and Biological resources of the Oceans. Butterworth & Co.Ltd., 1982.
7. Venugopalan, V.K. : Pollution and Toxicology, CAS in Marine Biology, 1991.
8. Prakash P.: Textbook of Marine Pollution.
9. Environmental Impact Statements, Bregman, J.I., (1999) Lewis Publishers, London.
10. Environmental Impact Assessment- A Comprehensive Guide to Project and Strategic Planning, Eccleston, C.H., (2000) John Wiley and Sons.

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

**Semester V (Marine Science) Paper no : CEMS 517**

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

**Total Number of Question: 04**

<b>Question No.</b>	<b>Sub Question</b>	<b>Question Type</b>	<b>Mark</b>
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

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

## **Syllabus**

**Effective from June 2016**

**B.Sc. SEMESTER-VI**

## SUBJECT: MARINE SCIENCE

Paper no.	Name
<b>CEMS-618</b>	<b>Aquaculture</b>
<b>CEMS-619</b>	<b>Coastal zone Management</b>
<b>CEMS-620</b>	<b>Project Work/ Field visit/ Industrial Visit</b>

### B.Sc. SEMESTER V & VI - MARINE SCIENCE

#### SYLLABUS FOR MARINE SCIENCE SEMESTER - VI

TYPE OF SUBJECT	SUBJECT CODE/ PAPER NO.	SUBJECT/ PAPER NAME	ASSESSMENT TYPE	CREDIT	BRIEF INTRODUCTION OF SUBJECT
<b>CORE ELECTIVE-1</b>	<b>CEMS-618</b>	<b>Aquaculture</b>	Theory	04	<b>Students will learn about development and management of Aquaculture farm and other related cultivation methods.</b>
			Practical	03	<b>Practical related to Aquaculture and cultivation of marine biotic resources.</b>
<b>CORE ELECTIVE-2</b>	<b>CEMS-619</b>	<b>Coastal Zone Management</b>	Theory	04	<b>Students will learn about management of coastal areas.</b>
			Practical	03	<b>Practical related to management of coastal areas.</b>
<b>CORE ELECTIVE-3</b>	<b>CEMS-620</b>	<b>Project Work/ Field visit/ Industrial visit</b>	<b>Dissertation</b>	<b>07</b>	<b>Students will be provided a project work/ field visit/ Industrial visit by College. They have to prepare</b>

					<b>dissertation on it.</b>
<b>CORE COMPULS ORY</b>	<b>USCCEN 006</b>	<b>COMPULSORY ENGLISH</b>	<b>Theory</b>	<b>03</b>	<b>English literature and Grammar.</b>

**KSKV Kachchh University, Bhuj – Kachchh  
Marine Science Syllabus as CBCS System  
Semester VI  
CORE ELECTIVE-I (CEMS-618) Aquaculture**

**Total Marks : 60**

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**UNIT-1**

Aquaculture: Definition, Basic Introduction, Overview importance of aquaculture, Principles of aquaculture, global scenario, Present status and prospects of coastal aquaculture in India traditional aquaculture practices.

**UNIT-2**

Aqua-farming systems: Traditional, Extensive, Semi-intensive and Intensive  
Selection of site: topography, water availability and supply, soil conditions.  
Pond management

**UNIT-3**

Cultivable Species:

Fin fishes (Asian sea bass, groupers, pearl spot, mullets, milkfish and ornamental fishes):  
Basic Information of the species, cultivation methods, Importance/ Uses.

Shell fishes (shrimps, crabs, lobsters, mussels, edible oysters, pearl oysters, clams): Basic  
Information of the species, cultivation methods, Importance/ Uses.

#### **UNIT-4**

monoculture, polyculture – Definition, basic information

Culture techniques - pond, raceway, cages, pens, raft and rope culture.

Hatchery seed production techniques- breeding, hatchery and nursery phases.

## **KSKV Kachchh University, Bhuj - Kachchh**

### **Paper No. CEMS618 Marine pharmacology and Basic genetics**

#### **(PRACTICALS)**

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1. Identification and cultivation method of cultivable species: shrimps, mussels, oysters, fish, and sea weeds through specimens/ Charts/ Photographs.
2. To demonstrate reproductive system of shrimp through specimens/ Charts/ Photographs.
3. Demonstration and identification of larval stages of shrimp through specimens/ Charts/ Photographs and its commercial importance.
4. To determine DO (dissolved oxygen) from given water sample.
5. To determine BOD (Biological oxygen demand) from given water sample.
6. Visit to nearest aquaculture facility and report preparation on its functioning
7. Visit to nearest hatchery and report preparation on its function

**References:**

1. Aquaculture, 1989 – Pillai, T.V.R.
2. Fish and fisheries of India, 1982 – Jhingran, V.G.
3. Crustacean aquaculture, 1983 Mckey, J.P. CRC series.
5. Aquaculture, 1972 – Bardach.
6. Prawn and prawn fisheries of India, 1976 – Kurian, C.V. & sebastian, V.O.
7. Environmental management for aquaculture, 1998 – Midlen.
8. Nutrition and feeding of fish, 1999 – Lovell.
9. Pond aquaculture water quality management, 1998 – Tucker

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

**Semester VI (Marine Science) Paper no : CEMS 618**

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

**Total Number of Question: 04**

<b>Question No.</b>	<b>Sub Question</b>	<b>Question Type</b>	<b>Mark</b>
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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

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**KSKV Kachchh University, Bhuj – Kachchh**  
**Marine Science Syllabus as CBCS System**  
**Semester VI**  
**CORE ELECTIVE-II (CEMS-619) Coastal Zone Management**

**Total Marks : 60**

**UNIT-1**

Scientific Expeditions for ascertaining the wealth of the sea.

The three-major Oceans-their relative importance.

Historical evolution of ideas on Ocean as a common heritage of mankind.

**UNIT-2**

Evolving the Law of the Sea: Geneva Conventions, UNCLOS series

The Exclusive Economic Zone (EEZ): its significance  
Water (Pollution) Act  
Coastal Zone Regulation (CRZ) 2011 and its importance in regulating coastal Industrial Development  
Sea level rise and its implications.

### **UNIT-3**

The Regional Seas Program of UN: their global significance  
Endangered marine animals  
CITES Convention- marine biosphere reserves- Marine National Parks and sanctuaries.

### **UNIT-4**

Role of National and international agencies and organizations in ocean management:  
FAO, UNEP, MoES, WOCE, WHOI, IOI Malta, IMO - IUCN, SCAR, SCOR,.  
Ocean policy of India.

## **KSKV Kachchh University, Bhuj - Kachchh**

### **Paper No. CEMS619 Coastal Zone Management**

#### **(PRACTICALS)**

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1. On a world map draw the sea route of Vasco Da Gama's journey to India
2. On a World map draw the sea route of Charles Darwin's *Beagle* expedition
3. Mark the most vulnerable coastal stretches of India due to sea level rise
4. Mark at least three Marine National Parks of India on a map

5. Plot all the four zones of CRZ of Gujarat on a map
6. Use a google map to draw the EEZ of India

**Reference:**

1. R.W.G.Carler, Coastal Environments, Academic press.
2. Ekman S., Zoogeography of the sea, Sidgwick
3. Mc Lusky D.S., Ecology of estuaries, Hinmann, 1971.
4. Kinns O.(Ed), Marine Ecology Vol. I to V, John Wiley & S.
5. Barnes, RSK, The Coastal line, John Wiley, (1977).
6. Coastanza, R, Ecological Economics : The Science and Management of Sustainability, Columbia Univ Press, NY, (1991).

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

**Semester VI (Marine Science) Paper no : CEMS 619**

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

**Total Number of Question: 04**

<b>Question No.</b>	<b>Sub Question</b>	<b>Question Type</b>	<b>Mark</b>
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

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

**CORE ELECTIVE-III (CEMS-620) Project Work/ Field Visit/ Industrial Visit**

**Total Marks : 60**

**Project Work/ Field Visit/ Industrial Visit:**

## **Assessment Criteria:**

1. Field Visit & Training based Project Report / Dissertation 50%
2. Project Report/ Dissertation based Viva-Voce 50%

### **Assessment type:**

#### **INTERNAL ASSESSMENT: 40 Marks**

- ❖ Project Report: 20 Marks
- ❖ Viva-Voce: 20 Marks

#### **EXTERNAL ASSESSMENT: 60 Marks**

- ❖ Project Report: 30 Marks
- ❖ Viva-Voce: 30 Marks

### **DISSERTATION TO VI SEMESTER STUDENTS**

- ❖ Individual dissertation will be allotted to all students of VI semester on different aspects of Marine Science by the College.
- ❖ Each student will carry out his/her dissertation studies under different faculties at Government Science College, Mandvi, K.S.K.V. Kachchh University's Earth & Environmental Department and Gujarat Institute of Desert Ecology, Bhuj.
- ❖ The dissertation work and the report should be submitted by the students before 10, April for the Assessment Year or the Date fixed by the College authority every Year. The Students who are not submitting his/her Report, his/her result will be kept withheld.