Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science and Commerce

(Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Course: Environmental Science

(Applied Component)

Syllabus for T.Y.B.Sc

Program: B.Sc. Zoology & Botany

Program Code: RJSUEVS

(CBCS 2021-22)

DISTRIBUTION OF TOPICS AND CREDITS

APPLIED COMPONENT- ENVIRONMENTAL SCIENCES SEMESTER V

Course code	Nomenclature	Credits	Topic
RJSUEVS505	Indian ecological issues, Environmental pollution, Sustainable energy resources and green chemistry	2	1. Ecological issues of India 2. Environmental Pollution 3. Alternate Energy Resources 4. Green chemistry and Sustainability
RJSUEVSP505	---	2	Practicals based on Course RJSUEVSP505

APPLIED COMPONENT- ENVIRONMENTAL SCIENCES SEMESTER VI

Course code	Nomenclature	Credits	Topic
RJSUEVS605	Ecological restoration and conservation, ecotourism, climate change and disaster management	2	1. Ecological restoration 2. Biodiversity conservation & ecotourism 3. Climate change 4. Disaster management
RJSUEVSP605	---	2	Practicals based on Course RJSUEVSP605

	SEMESTER-V (THEORY)	L	Cr
	Paper Code: RJSUEVS505	**60**	**2**
	UNIT I	**15**	
	Ecological issues of India		
1	**1.1 Introduction** **1.2 Environmental challenges of India:** • Population, poverty & environmental degradation. • Water crisis-Groundwater depletion in India. • Land degradation-Land use pattern. • Human settlement. • Energy crisis. **1.3 Efforts to meet environmental challenges in India.** • Sustaining life support system. • Urbanization and industrialization. • Capacity building for sustainable development. • India and the world or Global issues. **1.4 Case studies:** • Jhum cultivation or shifting cultivation in North east region of India. • Chipko movement.		
	UNIT II	**15**	
	Unit 2: Environmental Pollution		
2	**2.1. Types of pollution:** • Causes, effects, control measures and Pollution control standards: • Water pollution. • Air pollution. • Nuclear pollution. • Noise pollution **2.2. Case studies related to pollution:** • Bhopal gas tragedy, India. • Fukushima Daiichi nuclear disaster, Japan		
	UNIT III	**15**	
	Unit 3: Alternate Energy Resources		
3	**3.1 Solar energy, wind energy, tidal energy, nuclear energy.** **3.2 Energy from Biomass, bio-fuels & petro crops.** **3.3 Energy from solid waste.** **3.4. Case study:** • Shirdi Devasthan. (Solar cooker) • Jaitapur power plant		

	UNIT IV	15	
	Green chemistry and Sustainability		
	4.1 The Twelve Principles of Green Chemistry. **4.2 Sustainable Development- Principles, characteristics and sustainable development indicators.** **4.3 Areas highlighted by Agenda 21.** **4.4 Case studies:** • Ibuprofen (green synthesis). • Green paint.		

T.Y.B.Sc	**Semester V Theory**
RJSUEVS505 **Indian ecological issues, Environmental pollution, Sustainable energy resources and green chemistry**	**Course Objectives:** 1. To make learner acquainted with environmental degradation and capacity building for sustainable development at national and global level. 2. To make learner understand different types of pollution its causes, effects and various control measures. 3. To expose learner to various alternate energy resources, energy technology and its advantages. 4. To educate learner about the principles of Green Chemistry, sustainable development indicators, and areas highlighted by Agenda 21. **Learning Outcomes:** 1. Learners would understand various aspects of environmental degradation and efforts taken to meet the related challenges. 2. Learners would get to know the types and effects of environmental pollution and different measures to control it. 3. Learners would be able to understand the significance of alternate energy resources and learn about related technologies. 4. Learners would become aware about principles of green chemistry, sustainable development indicators, and areas highlighted by Agenda 21. 5. Case studies would aid the learners to relate with the actual situation in field.

SEMESTER-V (PRACTICALS)		L	Cr
Paper Code: RJSUEVSP505			**1**
	1. Study of Physico-chemical properties of sewage/ effluent water: • Conductivity. • Dissolved oxygen. • BOD. • COD.		
	2. Microbiological parameters: MPN.		
	3. Measurement of intensity of light by Lux meter.		
	4. Study of application of alternative energy resources (Solar panel, Biogas plant, Photovoltaic cell, Windmill).		
	5. Study of indoor plants for reduction of pollution (Adiantum, Cactus, Chlorophytum, Pachira,).		
	6. Photographic documentation of environment related issues/ conservation. Submission of soft & hard copy of 5 original photographs taken by the learner.		
	7. Study of air & noise pollution monitoring device.		

T.Y.B.Sc	**Semester V Practical**
RJSUEVSP505	**Course Objectives:** 1. To equip learners with the skill's necessary to measure of physico-chemical properties of sewage/ effluent water. 2. To make the learner understand use of luxmeter and various pollution monitoring devices. 3. To make the learner acquainted with pollution controlling plants. 4. To educate learners to observe various environmental issues in his/her reach. **Learning Outcomes:** 1. The learner will be able to measure the quality of water and will be able understand the criteria for safe drinking water. **2.** The learner will be able to demonstrate the use of luxmeter and would acquire knowledge about pollution monitoring devices. **3.** The learner will get the knowledge about role of indoor plants in controlling pollution. **4.** The learner will develop skill to observe and stay aware about various environmental issues.

	SEMESTER-VI (THEORY)	L	Cr
	Ecological restoration and conservation, ecotourism, climate change and disaster management. **Paper Code: RJSUEVS605**	**60**	**2**
	UNIT I	**15**	
	Unit 1: Ecological restoration		
1	1.1 Domestic waste water treatment. 1.2 Industrial waste water treatment. 1.3 Bioremediation. 1.4 Alternatives to conventional resources: biodegradable plastic, biodiesel, bio ethanol& bio pesticides. **1.5 Case studies**: • Developing effluent treatments. • Ice Stupa-Sonam Wangchuk.		
	UNIT II	**15**	
	Unit 2: Biodiversity Conservation & Ecotourism		
2	2.1 Hotspots of biodiversity and biosphere reserve. 2.2 Strategies for biodiversity conservation (in-situ and ex-situ). 2.3 Commercial wildlife photography. 2.4 Ecotourism–definition, policies and practices. **2.5 Case studies**: • Govardhan Eco village • Thennamala Ecopark		
	UNIT III	**15**	
	Climate Change		
3	3.1 Introduction to climate change, global warming and its effects. 3.2 Greenhouse substances: Sources & effects. 3.3 Remote Sensing & GIS. 3.4 Role of IPCC in climate change monitoring; Kyoto Protocol, Montreal Protocol, Earth Summit & UN Convention on Climate Change. **3.5 Case studies**: Climate change and apple farming in Indian Himalayas. The case of ozone depletion.		
	UNIT IV	**15**	
	Disaster management		
4	4.1 Introduction. 4.2 Disaster prone regions of India, major disasters of India. 4.3 Impact of disasters. 4.4 Disaster management plan for schools and colleges. 4.5 Cause, effects and control measures of disasters: • Floods • Earthquakes		

	• Cyclones • Landslides **4.6 Case studies**: • Mumbai flood, 26th July, 2005. • Odisha cyclone Fani, May, 2019.		

T.Y.B.Sc	Semester VI Theory
RJSUEVS605 **Ecological restoration and conservation, ecotourism, climate change and disaster management.**	**Course Objectives:** 1. To acquaint learners with the details of waste water treatment and bioremediation. 2. To enhance the knowledge of the learners about biodiversity conservation and ecotourism. 3. To update the learners about climate change and global efforts in combating with it. 4. To introduce the concept and strategies of disaster management. 5. To introduce case studies on topics for enhanced learning. **Learning Outcomes:** 1. Learners will get an idea on steps involved in waste water treatment and bioremediation. 2. Learners will be able to understand importance of biodiversity conservation and also be able to promote ecotourism. 3. Learners will be able to understand need of efforts to combat with global climate change. 4. Learners will get an insight into disaster management and be prepared for taking correct steps during an event of disaster. 5. Case studies will help the learners to understand the concepts in a more practical manner.

SEMESTER-VI (PRACTICALS)		L	Cr
Paper Code: RJSUEVSP605			**1**
	1. Study of physical properties of soil: Temperature (for demonstration), moisture, & texture of soil.		
	2. Study of chemical properties of soil: Organic matter and Calcium carbonate.		
	3. Detection of heavy metal cation: Lead from water sample.		
	4. Study of logistic services for medical, toxic waste (Incinerator, Autoclave).		
	5. Observation & study of indicator species.		
	6. Visit to any waste treatment plant/ industry/laboratory/national park and submission of report. (Ref: Annexure II).		
	7. Group project and submission of report (group of 5).		

T.Y.B.Sc	Semester VI Practical
RJSUEVSP605	**Course Objectives:** 1. To familiarize the learner with practical techniques for evaluation of significant environmental parameters. 2. To make the learner understand concepts of environmental remediation. 3. To make the learner participate in group activity. **Learning Outcomes:** 1. The learner will be able to analyse different parameters associated with quality of environment. **2.** The learner will be able to gain field knowledge on areas of environmental significance. **3.** The learner will be able to comprehend the skill of working in group and team spirit.

ANNEXURES

Annexure I: Suggested topics for assignment Semester V

(Teachers are expected to develop additional innovative topics, varying every year, to be assigned to the students).

1. List out the instruments or funding agencies or permits required for setting up an environment testing laboratory.

2. Survey of NGO's working in the environmental field in your area.

3. Preparation of proposal for green building and sustainable development.

4. Prepare a cost sheet for setting up a bio degradable plastic unit.

5. Make an inventory of the water bodies presently existing/which existed in the urban/rural area of about 5kms.

6. Find out information regarding pollution testing booths that the Government proposes to set up.(List out the personnel who will man the booths and the indigenous equipment that these booths will have).

7. Make a report on amenities, trees, dimensions of open spaces in your locality. Assess their role in maintaining the ecological balance in the region.

8. Survey housing societies/institutions/ organizations to find out whether they are converting household/kitchen waste into anything utilizable like vermicomposting etc.

9. Meet entrepreneurs involved with manufacture of eco-friendly products/best out of waste etc. Make a report regarding how the entrepreneur decided to pursue such an initiative, its need, the process and benefits to the environment.

10. Calculate carbon footprint of your family/class-room or laboratory/housing society by visiting the appropriate site on internet.

11. Visit architectural /horticulturist firms that deal with vertical gardening /urban farming and prepare a first-hand report on the concept, where implemented and the advantages.

All topics mentioned above are suggestive, more creative and innovative topics are expected from the students, under the able guidance of the concerned teacher, to suit the expertise, human resources, infrastructure and local needs as also the interest of the students. The assignment may be submitted in a group not exceeding three students.

Annexure II: Suggested Field Visits for Semester VI

• There shall be various short and long excursions / study tours / field visits / industrial visits in every semester, at least one of which shall be financially affordable to every student in the class; and that assessment and marks of field trips shall be solely based upon such where no student was restrained for financial limitations.

• Field visits are to be organized to facilitate students to have first-hand experience & exposure to technology/production/functioning of organization/units or witness a relevant activity.

• Each student must make at least 01 (one) such visit to the units/treatment plants/aquatic or terrestrial habitat organized by the College.

• The list is suggestive and not exhaustive.

1. Visit to Sewage treatment plant.

2. Visit to Vermicomposting unit.

3. Visit to Air Monitoring Laboratory.

4. Visit to Environment Pollution Detecting Laboratory.

5. Visit to Cooling towers in industries.

6. Visit to Rain Water Harvesting System.

7. Visit to Biogas Plant.

8. Visit to Green Building/Ecotel Hotel.

9. Visit to Water Filtration Plant.

10.Visit to office of Pollution Control Board.

11.Visit to Greenhouse.

12.Visit to Solid Waste Management Plant.

13.Visit to hydro/thermal power plants.

14.Visit to Environmental Agencies-CITES

15.Visit to National Parks, Sanctuaries, Biosphere Reserves etc. in Maharashtra/India/abroad.

16.Visit to NEERI.

17.Visit to Enviro Vigil, CSM Hospital Campus, Kalwa (W), Thane.

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SCHEME OF EXAMINATION (FOR BOTH SEMESTERS)

Internal examination

The first internal class test comprising of 20 marks shall consist of 20 multiple choice questions with equal weightage.

The second class test of 20 marks will be in the form of an assignment that the student shall submit on notification.

Question paper pattern for external theory

Total: 60 marks

Note: 1. All questions to be attempted from Q.1 to Q.5

Q.1 Based on Unit I…… 12 M

a,b,c- Attempt any two questions out of three

Q.2 Based on Unit II……..12M

a,b,c- Attempt any two questions out of three

Q.3 Based on Unit III……..12M

a,b,c- Attempt any two questions out of three

Q.4 Based on Unit IV……..12M

a,b,c- Attempt any two questions out of three

Q.5 Short notes (Mixed from all units two questions from each unit)……. 12M (3M each)

Eight short notes of which the student is expected to attempt any four

Practical Skeleton Paper Semester V

Maximum Marks: 100

Q1.**Identification**: **20**

Identify spots 'a' to 'e' as per instructions

- Identify and describe the plant and its role in reducing pollution. (*Adiantum, Cactus, Chlorophytum, Pachira).* (any two)
- Study of air and noise pollution monitoring devices-sound level meter, photoionization detector (any one).
- Identify and describe the picture and give application of alternative energy resources (Solar panel, Biogas plant, Photovoltaic cell, Windmill) (any two)

Major Experiment

Q2. Estimate Biological Oxygen Demand/Chemical Oxygen Demand from the given effluent samples (2) and submit the report. **25**

Minor Experiment

Q3. Estimate Dissolved Oxygen from the given water sample and submit the report. **15**

OR

Q3. a. Determine the intensity of light using Lux meter. **08**

b. Estimate the conductivity of the given sample. / Determine the MPN of the given water sample. **07**

Q4. a. Submission of five environment related original photographs. **10**

b. Submission of assignment& viva based on it. **20**

Q5. Certified journal. **10**

Practical Skeleton Paper Semester VI

Maximum Marks: 100

Q1.**Identification**: **15 M**

Identify spots 'a' to 'c' as per instructions

a. Identify logistic services for medical, toxic waste (incinerator, Autoclave) (Any one)

b. Identify and describe the given indicator species (river otters, lichen, northern spotted owl) (Any two)

Major experiment

Q2. Estimate organic matter content from the given sample and submit a report. **25**

OR

Q2. Estimate calcium carbonate content from the given sample and submit a report**.**

OR

Q2. Investigate the given sample and report about the presence of any (or all) of the following heavy metal cations:-Pb (II) from the given water sample.

Minor experiment

Q3. Analyse the texture and moisture content of the given soil sample and submit a report. **20**

Q4. Project and viva based on it. **20**

Q5. Field report. **10**

Q6. Certified journal. **10**