THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

B.SC. ENVIRONMENTAL MANAGEMENT

(With effect from 2020 - 2021)

The Course of Study and the Scheme of Examinations

S. No.	Part	Study Components / Course Title		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		SEMESTER I					**CIA**	**Uni. Exam**	**Total**
1.	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2.	II	English (CE)	Paper-1	6	4	**Communicative English I**	25	75	100
3.	III	Core Theory	Paper-1	6	4	Basics of Earth Science	25	75	100
	III	Core Practical	Practical-1	4	0	Basics of Earth Science	0	0	0
4.	III	Allied -1	Paper-1	4	3	Environmental Botany	25	75	100
	III	Allied- 1	Practical-1	2	0	Environmental Botany	0	0	0
5.	**III**	**PE**	**Paper 1**	**6**	**3**	**Professional English I**	**25**	**75**	**100**
6.	IV	Environmental Studies		2	2	Environmental Studies	25	75	100
		Sem. Total		**36**	**20**		**150**	**450**	**600**
		SEMESTER II					**CIA**	**Uni. Exam**	**Total**
7.	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
8.	II	English (CE)	Paper-2	6	4	**Communicative English II**	25	75	100
9.	III	Core Theory	Paper-2	5	4	Environment and Ecology	25	75	100
10.	III	Core Practical	Practical-1	3	2	Basics of Earth Science and Environment and Ecology	25	75	100
11.	III	Allied-1	Paper-2	4	3	Environmental Zoology	25	75	100
12.	III	Allied-1 Practical	Practical-1	2	2	Environmental Botany and Zoology	25	75	100
13.	**III**	**PE**	**Paper 1**	**6**	**3**	**Professional English II**	25	75	100
14.	IV	Value Education		2	2		25	75	100
15.	IV	Soft Skill		2	1		25	75	100
		Sem. Total		**36**	**25**		**225**	**675**	**900**
		SEMESTER III					**CIA**	**Uni. Exam**	**Total**
16.	III	CoreTheory	Paper-3	5	4	Environmental Chemistry	25	75	100
17.	III	CoreTheory	Paper-4	6	4	Natural Resource Management	25	75	100
18.	III	CoreTheory	Paper-5	6	4	Environmental Microbiology	25	75	100
	III	CorePractical	Paper-2	3	-	Environmental Chemistry and Environmental Microbiology	0	0	0
19.	III	Allied-2	Paper-3	5	3	Environmental Economics	25	75	100
20.	IV	SkillBased Subject	Paper-1	3	2	Remote Sensing and GIS	25	75	100
21.	IV	Non-MajorElective	Paper-1	2	2	Global Environmental Issues Management	25	75	100

		Sem.Total		**30**	**19**		**150**	**450**	**600**
		SEMESTER IV					**CIA**	**Uni. Exam**	**Total**
22.	III	CoreTheory	Paper-6	6	4	Environmental Pollution and Control Measures	25	75	100
23.	III	CoreTheory	Paper-7	5	4	Pollution Monitoring and Analytical Techniques	25	75	100
24.	III	CoreTheory	Paper-8	6	4	Energy and Environment	25	75	100
25.	III	CorePractical	Paper-2	0	3	Environmental Chemistry and Environmental Microbiology	25	75	100
26.	III	CorePractical	Paper-3	3	3	Energy and Environment, Environmental Pollution,Climatechange and Sustainable Management	25	75	100
27.	III	Allied-2	Paper-4	5	5	Environment and Eco-Tourism	25	75	100
28.	IV	Skill Based Subject	Paper-2	3	2	Aquaculture and Environment	25	75	100
29.	IV	Non-Major Elective	Paper-2	2	2	Occupational Safety ,Health and Management	25	75	100
		Sem.Total		**30**	**27**		**200**	**600**	**800**
		SEMESTER V							
30.	III	CoreTheory	Paper-9	6	5	Waste Management and Recycling	25	75	100
31.	III	CoreTheory	Paper-10	6	5	Environmental Safety, Health and Management	25	75	100
32.	III	CoreTheory	Paper-11	6	5	Biostatistics and Instrumentation	25	75	100
	III	CorePractical	Paper-4	3	0	Biostatistics and Instrumentation Waste Management and recycling	0	0	0
33.	III	Elective	Paper-1	6	3	Principles of Sustainable Development and Management	25	75	100
34.	IV	Skill based Subject	Paper-3	3	2	Forest Conservation & Management	25	75	100
		Sem.Total		**30**	**20**		**125**	**375**	**500**
		SEMESTER VI							
35.	III	CoreTheory	Paper-12	6	4	Natural Hazard and Disaster Management	25	75	100
36.	III	CoreTheory	Paper-13	5	4	Environmental Impact Assessment	25	75	100
37.	III	CoreTheory	Paper-14	5	4	Environmental Laws, Policies and Treaties	25	75	100
38.	III	CorePractical	Paper-4	0	3	Biostatistics and Instrumentation ,Waste Management and Recycling,	25	75	100
39.	III	CoreProject	Paper – 15	5	5	Group / Individual Project	25	75	100
40.	III	Elective	Paper-2	3	3	Climate change and Current issues	25	75	100
41.	III	Elective	Paper-3	3	3	Environmental Toxicology	25	75	100
42.	IV	Skill based subject	Paper-4	3	2	Environmental Biotechnology & Herbal Science	25	75	100

43.	V	Extension Activities		-	1		100	0	100
		Sem.Total		**30**	**29**		**300**	**600**	**900**
					140				**4300**

Part	Subject	Papers	Credit	Total Credits	Marks	Total Marks
Part I	Languages	2	4	8	100	200
Part II	Communicative English	2	4	8	100	200
Part III	Allied (Odd Semester)	2	3	6	100	200
	Allied (Even Semester)	2	5	10	100	200
	Allied Practical	1	2		100	100
	Electives	3	3	9	100	300
	Core	14	(3-5)	59	100	1400
	Core practical	4	(2-3)	11	100	400
	Professional English	2	3	6	100	200
	Compulsory Project (Group/Individual Project)	1	5	5	100	100
Part IV	Environmental Science	1	2	2	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others /NME	2	2	4	100	200
	Skill Based	4	2	8	100	400
Part V	Extension Activities	1	1	1	100	100
	Total	**43**		**140**		**4300**

CORE PAPER-3

NameoftheCourse:B.Sc.Environmental ManagementSemester:IIINameofthePaper:Environmental ChemistryCredits:4
Papertype:Core HoursofTeaching:6

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ENVIRONMENTALCHEMISTRY

Course Objectives

1.Tolearn about the fundamental ofEnvironmental Chemistry
2.To study the atmospheric structure and composition
3.Tounderstand the water chemistry and relation with environment
4.To learn about soil chemistry and characteristics
5.To study the pollutants and their interaction with environment

UNIT - I

FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY

Fundamental concepts in Environmental Chemistry - Environmental segments - PreparationofStandard Solutions -Molarity, Molality, Normality, Percent and PPM (mg/l) solutions -Acid-base Reactions -pH and pOH and Buffer Solutions - Solubility and Solubility Product - Solubility of Gases in Water - The Carbonate System - Unsaturated and SaturatedHydrocarbons -Radionuclides.

UNIT - II

ATMOSPHERIC CHEMISTRY

Structure and composition ofAtmosphere -Particles intheatmosphere -Physical behaviour ofparticles intheatmosphere -Formation ofInorganicandOrganic Particulate Matter - Composition ofinorganicparticles-Toxicmetals–Radioactive particles-Thecomposition oforganicparticles-Effectofparticles-Controlofparticulate emissions

UNIT - III

WATER CHEMISTRY

FormationofWater-WaterResources-SourcesandTypes-HydrologicalCycle-UniquePropertiesofWater-RoleofWaterintheEnvironment-Physical,ChemicalandBiologicalParametersofWater-DissolvedOxygen-BiochemicalOxygenDemand-ChemicalOxygenDemand.WaterPollutants - DistributionofChemicalSpeciesinWater-OrganicMatterandHumicMatter inWater.

UNIT - IV

SOIL CHEMISTRY

Formationofsoil-Typesofsoil-PhysicalandChemicalProperties ofSoil:Structure,Texture,Temperature,BulkDensity,Permeability, Moisture, Air, pH, Cation ExchangeCapacity,MacroandMicronutrients,HumusandOrganicMatter,C/NRatio.

UNIT - V

POLLUTANT CHEMISTRY

ChemistryofvariousOrganicandInorganicCompounds-Pesticides-BiochemicaleffectsofPesticides-Heavymetals-Cadmium-Itai-Itaidisease-Mercury-Minamatadisease-Lead-Chromium-Zinc-Impactofheavymetalsonmanand animals-Thalidomidetragedy-Bio-chemicalEffectsofCarbonmonoxideand Sulphurdi-oxide.

CourseOutcome

1.AfterstudiedUnitI,thestudentswillbeabletoknowtheconceptsinEnvironmentalChemistry.
2.AfterstudiedUnitII,thestudentswillbeabletounderstandthechemicalprocessintheair,waterandsoil.
3.AfterstudiedUnitIII,thestudentswillbeabletodescribethewaterqualityparametersandwaterpollutants.

4.AfterstudiedUnitIV,thestudentswillbeabletoanalyzeandrecognizethepropertiesofsoilandwater.
5.AfterstudiedUnitV,thestudentswillbeabletounderstandvarioustypesoforganicandinorganicpollutantstheireffectsonenvironment.

TextBooks

1.De,A.K.(2007)EnvironmentalChemistry,SeventhEdition,NewAgeInternationalPublishers.
2.Sharma,B.KandH.Kaur,(1994)EnvironmentalChemistry,GoelPublishingHouseLtd.,Meerut,UP
3.Pani,B.(2007)TextbookofEnvironmentalChemistry.IKinternationalPublishingHouse.

Reference

1.Girard,J.(2013)Principles of EnvironmentalChemistry(3rdedition).Jones&Bartlett.
2.De.A.K.(2003)EnvironmentalChemistry,WileyEasternLimited,NewDelhi.
3.BalramPani,(2007)TextBookofEnvironmentalChemistry,I.K.InternationalPublishingHousePVT. Ltd.
4.Manahan,S.E.(2010)EnvironmentalChemistry,NinthEdition,CRCPress
5.Dara,S.S.,Mishra,D.D.(2009)ATextBookofEnvironmentalChemistryandPollutionControl,10thEdition,S.Chand&Company.

E-Materials

1. http://www.nptel.ac.in/courses/122106030/Pdfs/3_1.pdf
2.http://www.*crystal.med.upenn.edu/sharp-lab-pdfs/sharp_EncLifeSci.pdf*
3.http://www.fao.org/docrep/field/003/AC172E/AC172E04.htm
4.http://www.essentialchemicalindustry.org/materials-and-applications/surfactants.html
5.http://agriinfo.in/?page=topic&superid=5&topicid=174
6. http://www.*citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.800.8713&rep=rep1...pdf*
7.https://www.onlinebiologynotes.com/chemical-parameters-of-water-quality-chemicalcharacteristics-of-water/

COREPAPER-4

NameoftheCourse:B.Sc.Environmental ManagementSemester:III

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NATURALRESOURCEMANAGEMENT

CourseObjectives

1.Tolearnaboutthenaturalresourceandtheirimportance
2.Tostudytheforestresourcesanditsuseandconservation
3.Tostudywaterresourcesanditsmanagement
4.Tostudythelandresourcesandlanddegradationandprotection
5.Tounderstandvaluesofmineralresourceandtheirimpactonenvironment

UNIT - I

INTRODUCTION NATURAL RESOURCES

NaturalResources-Conceptsand Approaches of Natural Resources Conservation-Classification-RenewableResources,Non-RenewableResources-NaturalResourcesofIndia-RoleofIndividualinConservationofNaturalResources.

UNIT -II

FOREST RESOURCES MANAGEMENT

Conservationofforestresources-Distributionofforests,Woodproduction,Forestlandusechangesin India,Futuredemandofforestland,Carbonsequestration-Deforestation:Causesandimpacts-Forestmanagementtools:Socialforestry,Agro-forestryandUrbanforestry-Ecodevelopmentcommittees,Ecotourism,Climatechangereduction,Carbontrading.

UNIT - III

WATER RESOURCES MANAGEMENT

WaterResources-Source,distribution,OverExploitationandissues-IntegratedWaterresourcemanagement-ConservationandManagementofWater-RainWaterHarvesting-Interlinkingofriversandriverbasinmanagement-WetlandConservation-CoastalZoneManagementStrategies-EcologicalSignificanceofMangroves,Coralreefsanditsconservation

UNIT - IV

LAND AND SOIL RESOURCES MANAGEMENT

DistributionofSoilresources-RoleofAgriculturalPracticesinSoilDegradation-Soilerosion-SoilFertilityandNutrientManagement-DiagnosisofSoilNutrientDeficiencies-SoilConservation:Principles,BenefitsandMethodsofSoilConservation;GreenManuring,Animal ManuresandRestoration of Degraded and Wastelands.

UNIT - V

MINERALRESOURCESMANAGEMENT

MineralResourcesandReserves-Types,Sources,DistributionandUsesofvaluableminerals-ExplorationofMineralResourcesfromLandandOceans-StepsinMineralExploitation,ImpactofExploitationofMineralsonEnvironment-ConservationStrategiesofValuableMineralResources.

CourseOutcomes

1.AfterstudiedUnitI,thestudentswillbeabletoknowthetypesofnaturalresources.
2.AfterstudiedUnitII,thestudentswillbeabletounderstandtheimportanceofforestresources,usesandtheirconservation,
3.AfterstudiedUnitIII,thestudentswillbeunderstandthedifferenttypesofwaterresources,andhowtomanagethewaterresources.
4.AfterstudiedUnitIV,thestudentswillbeabletoanalyzeandrecognizethepropertiesofsoilandwater.
5.AfterstudiedUnitV,thestudentswillbeabletounderstandvarioustypesoforganicandinorganicpolluta

ntstheireffectsonenvironment.

TextBooks

1.JhaLK(1997)NaturalResourceManagement.APHPublishingCorporation,NewDelhi.
2.Sharma,J.P.(2011)EnvironmentalStudies.UniversityScience,Press,NewDelhi.

ReferenceBooks

1.MaDickenKGandVergoraNT(1990)Agroforestry:Classification&Management.JohnWiley&Sons,NewYork.
2.OwenOS&ChirasDD(1995)NaturalResourcesConservation.Prentice-HallIndia,NewDelhi.
3.SarahFehley(2011)NaturalResourceManagement,OrientalEnterprises,Dehradun,India.
4.NautiyalSandKaulAK(1999)ForestBiodiversity&itsConservationPracticesinIndia.
5.Taylor,RusselD.,Torquebiau,Emmanuel(2011)NaturalResourceManagementandLocalDevelopment,SpringerNetherlands.

E-Materials

1.https://www.india.gov.in/topics/environment-forest/natural-resources
2.http://cedindia.org/program-areas/natural-resource-and-environment-management/
3.http://www.icimod.org/?q=1258
4.https://www.sida.se/contentassets/320aedac0f1047daa30a1400af89c7a0/13185.pdf
5.https://www.un.org/esa/agenda21/natlinfo/countr/india/natur.htm
6.https://www.encyclopedia.com/environment/energy-government-and-defensemagazines/natural-resource-management

COREPAPER-5

NameoftheCourse:B.Sc.Environmental Management
Semester:IIINameofthePaper:EnvironmentalMicrobiology Credits:4
PaperType:CoreHoursofTeaching:6

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ENVIRONMENTALMICROBIOLOGY

CourseObjectives

1.Toimpartknowledgeaboutmicroorganisms,andtheirgrowthandreproduction
2.Tounderstandthemicrobialecologyandtheirinteractionswithenvironment
3.Tolearnabouttheroleofmicroorganimsinbiogeochemicalcycles
4.Tostudytheexistenceandroleofmicronswaterandsoilquality
5.Tostudyabouttheroleofmicrobeinenvironmentalbioprocesses

UNIT - I

INTRODUCTION OF MICROBIOLOGY

HistoryandDiscoveryofMicroorganisms-LouisPasteur'sContributionandDiscoveriesandKochPostulates-ScopeofMicrobiology-PhysicalandChemicalMethodsofSterilizationTechniquesusedinMicrobiology-MicrobialCultureMedia-IsolationandCulturingofMicroorganisms-GrowthandReproductionofBacteria,Virus,andBacteriophage.

UNIT - II

MICROBIAL ECOLOGY

ConceptofMicrobialEcology-SuccessionandColonizationofMicrobesinEnvironment-PositiveandNegativeRolesofMicrobesinEnvironment-Environmentalfactorsinfluencingthe GrowthandSurvivalofinMicroorganisms-Microbialinteractions-Mutualism,Commensalism,Competition,Amensalism,ParasitismandPredation.Plant-MicrobesInteractions.

UNIT - III

MICROBES AND ENVIRONMENT

RoleofMicrobesinBiogeochemicalCycles-Carbon,NitrogenCycle(NitrogenFixation,Ammonification,Nitrification,Denitrification),Sulphur,IronandPhosphorousCycles.Rhizosphere-RhizosphereMicroorganismsandtheirroleinNitrogenFixation-Anabaena,AzospirillumandRhizobium-Nitrogenase-Hydrogenase.MetalLeaching-PhosphateSolubilization.

UNIT - IV

WATER AND SOIL MICROBIOLOGY

MicrobiologicalWaterQualityStandards-DetectionOfFaecalMicrobialContamination-IndicatorOrganisms-DetectionofVirus-MicrobialIndicatorsofWaterPollution-WaterPurificationandRecyclingProcess-WaterborneDiseases.SoilMicrobiology:Humus,MicrofloraofSoil,MicrobialDegradationofLigninandPesticides.MicrobialCompostingofBiowastes

UNIT - V

ENVIRONMENTAL APPLICATIONS OF MICROBES

RoleMicrobesinEnvironmentalProcesses-Biodegradation-Biotransformation-Bioremediation-Biomining:Bioleaching,MetalExtraction-MicrobiallyEnhancedOilRecovery-MicroorganismsandSewageTreatment-TricklingFilters,ActivatedSludgeProcess,OxidationPonds-SludgeTreatment:AnaerobicDigestion,BiogasProduction-MicrobiologicalCoalDesulfurization.

CourseOutcomes

AfterstudiedEnvironmentalMicrobiologycourse,thestudentswillbeableto

1.Understandthemicrobialgrowth,reproduction,andculturingtechniques.
2.Understandtheinteractionsofmicrobesinanecosystemandtheirroleinbiogeochemicalcycles.
3.Understandandidentifytheenvironmentalmicrobialbioprocess.
4.Gainknowledgeinapplicationsofmicrobesforenvironmentremediation.
5.Developmicrobialbasedenvironmentaltreatmentprocesses.

TextBooks

1.Sharma,P.D.(2005)EnvironmentalMicrobiology,AlphaScienceInternational,Ltd.
2.DubeyandMaheshwari,1999,AtextbookofMicrobiology,1/e,Chandpublications,NewDelhi.
3.MohapatraPK(2008)TextBookofEnvironmentalMicrobiology,IKInternationalPublishingHouseLimited.

Reference Books

1. Subba Rao NS (2004) Soil Microbiology. 4th Edition, Oxford & IBH Publishing Co. Pvt.Ltd., New Delhi.
2. Subba Rao NS (1995) Biofertilizers in Agriculture and Forestry. 3rd Edition, Oxford andIBH Pub. Co. Pvt. Ltd., New Delhi.
3. Singh DP & SK Dwivedi (2005). Environmental Microbiology and Biotechnology. 1st Edition, NewAgeInternational (P)Ltd., Publishers, NewDelhi.
4. Brock TD, Madigan MT, Martinko JM and Parker **J** (1994) Biology of Microorganisms,VIIEd., Prentice-Hall, New Jersy, USA.
5. Ronald M.Atlas, Richard Bartha, (1997) Microbial Ecology, 4/e, Benjamin Cummings Publishing Company, USA.

E-Materials

1.https://microbenotes.com/category/environmental-microbiology/
2.https://microbewiki.kenyon.edu/index.php/MicrobeWiki
3.https://www.onlinebiologynotes.com/sewage-treatment-process-of-wastewater-treatment/
4.https://www.jsps.go.jp/english/e-plaza/e-sdialogue/data/Slide_C.pdf
5.https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-89-environmental-microbiology-fall-2004/lecture-notes/
6.https://www.uvi.edu/files/documents/Research_and_Public_Service/WRRI/Introduction_to_Environmental_Microbiology.PDF
7.https://www.geoengineer.org/education/web-class-projects/cee-549-geoenvironmental-engineering-winter-2013/assignments/bioremediation#applicability-to-soil-and-contaminant-types
8.http://www.pollutionissues.com/A-Bo/Bioremediation.html
9.https://fac.ksu.edu.sa/sites/default/files/lecture_2microbial_interactionsppt.pdf
10.https://www.onlinebiologynotes.com/bioremediation-concept-types-advantages-and-limitations/
11. https://www.onlinebiologynotes.com/microbial-ecology-and-role-of-microorganism-in-ecosystem/

ALLIEDPAPER-3

NameoftheCourse:B.Sc.Environmental Management Semester:III
NameofthePaper:Environmental Economics Credits:4
PaperType:Allied HoursofTeaching:5

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ENVIRONMENTALECONOMICS

CourseObjectives

1.Inculcatetheknowledgeinecologicalandeconomicsystem
2.Impartprinciplesofecologicaleconomics
3.Understandrootcauseofenvironmentalissuesandmeansofeconomicsolution

UNIT - I

INTRODUCTION TO ENVIRONMENTAL ECONOMICS

EnvironmentalEconomics:environmentalpolicy;Ecologicaleconomics;resourceeconomics;positiveandnormativeeconomics.Importantissuesinenvironmentaleconomics.

UNIT - II

ENVIRONMENT AND ECONOMIC DEVELOPMENT

ImportantissuesintheEnvironment-pollution, depletionofnon-renewable,degradationofnaturalresources-tragedyofcommons,climatechange,outbreakofnewdiseases,degradedecosystem.

UNIT - III

ENVIRONMENTAL REGULATION

Regulatoryapproachandeconomicincentives(USA,EuropeanUnion,theRussianfederation).ChoicesforEnvironmentalprotectionandcost-Biocentrism,Anthropocentrismandsustainability.

UNIT -IV

BASIC REGULATORY INSTRUMENTS

Command&controlandincentives.Economicinstrumentsofenvironmentalprotection:direct instruments-pollutioncharges,tradablepollutionpermits,permitsVcharges,otherdirecteconomicinstruments;indirectinstruments-taxes/charges,pricereforms.

UNIT - V

ECONOMIC PLANNING AND SUSTAINABLE DEVELOPMENT

Market,Efficiencyandmarket;Externalities.TheCoasetheorem;singlepolluter-Pigovianfees;Themultiplepolluters-TheEquimarginalPrinciple.Benefitcostanalysis.Ecoefficiencyandnewtechnologies-valuingenvironmentalresources,optionvalueandwillingnesstopayeconomic.

CourseOutcomes

1.Thelinkagebetweeneconomicactivitiesandenvironmentalquality.
2.ImpactsofeconomicactivitiesonEarth'sresources.
3.Importanceofeconomicinstrumentsinenvironmentalregulation.
4.Significanceofenvironmentalprotection.

TextBooks

1.TomTietenbergandLewis(2010).EnvironmentalEconomics&Policy,Pearson,6thEdition,
2.Field,B.CandField,M.K.(2006).EnvironmentalEconomics: anintroduction.McGraw-HillSeries
3.CharlesD.Kolstad(2004).Environmentaleconomics, new York, oxford universitypress.

Reference Books

1.UlaganathanSankar(2001)DevelopmentandtheEnvironment.In:EnvironmentalEconomics,OxfordIndia333-446pp.
2.Nayudu,G.S.(2008).EconomicplanningandsustainableDevelopment.In:EnvironmentalEconomics,AdhyayanPublishers&Distributers,NewDelhi.

E-Material

1. https://globalisation-and-the-environment.blogspot.com/2007/08/top-10-environmental-economics-blogs.html
2. http://www.planetarc.com

Skil Based Elective Course – 0 1

NameoftheCourse: B.Sc.Environmental Management Semester:I I I
NameofthePaper: Remote Sensing and GIS Credits: 2
PaperType:CoreHoursofTeaching: 2

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REMOTE SENSING AND GIS

Objectives

- To facilitate to gain the basic knowledge of distantly sensing devises.
- To give insight on mapping technology
- To grasp the basic principles and applications of RS &GIS

UNIT - I

Introduction to Remote Sensing process

Key concepts and components of Remote sensing (RS), electromagnetic radiation, spectrum and divisions, image characteristics, RS system, photographic sensors.

UNIT - II

Digital data and image processing

Digital Data, data formats, image structure, processing overview, components, and software, image interpretation mage resolution: variables, operating conditions, measurement of resolution

UNIT - III

Image pre-processing and image classification

Feature extraction, geometric correction, Map projection for representing satellite images and ground truthing, image classification, kinds of field data, measurement of accuracy

UNIT - IV

GeographicalInformation system (GIS)

Basics of GIS,terminologies,concepts and components for GIS,GIS software, data and data entry, spatial query,thematicmap,buffer analysis Mobile GIS, Web based GIS

UNIT - V

Application of RS

RS in Air pollution, natural resources monitoring ,Agriculture, Forest management, watershed management, Natural hazards assessment and Health GIS.

CourseOutcomes

Ability to interpret the remotely sensed images
Basic knowledge of how can RS &GIS be used for environmental management

TextBooks

1. Kumar,S.(2016)Basics of Remote Sensing and GIS.Laxmi Publications (P)Ltd.
2. Chandra,M. andGhosh,S.K.(2015). Remote Sensing and Geographic Information (2nd ed.)Narosa Publishing House

ReferenceBooks

1. Lillesand ,T.M. and Kiefer, R.W.(2015). Remote Sensing and Image Interpretation (7th ed.).New York, John Wiley &Sons.
2. Lillesand ,T.M. ,Kiefer, R.W. Chipman,J.W.(2004). Remote Sensing and Image Interpretation (5th h ed.).New York, John Wiley &Sons.
3. Longley, P.A. Goodchild, M.F., Manguire,D.J., Rhino, D.W.(eds) Geographical Information System, Volume I: Principal and Technical Issues, John Wiley & Sons

E-Materials

1. https://dayinterpreting.com/?gclid=EAIaIQobChMI1MSCodKo6AIV2BwrCh3OQAOBEAAYAyAAEgLEC_D_BwE
2. http://rsgislearn.blogspot.com/2007/06/digitization-basics-and-right-methods.html
3. https://www.geospatialworld.net/

Non-Major Elective Paper 01

NameoftheCourse: B.Sc.Environmental Management **Semester: III**

NameofthePaper: Global Environmental Issues and Management **Credits: 2**

HoursofTeaching: 2

Course Objectives:

The purpose of this course is to learn about the major global environmental issues including population explosion, biodiversity loss, pollution, energy use, and climate change and how they are managed around the world.

UNIT I

Human Population and Environment

Basic demographic concepts: Growth, fertility, mortality and migration -Population distribution and Urbanization - Poverty, food security and environmental degradation.

UNIT II

Global Atmospheric Changes

Regional and global Air Quality and CO_2 emission - Air pollutants and climate change - Sources of greenhouse gases - Ozone depleting substances - Global warming - El Niño and La Niña

UNIT III

Overexploitation of Natural Resources

Overexploitation of natural resources: Ecological footprint - Earth Overshoot Day - Water resources: Status of groundwater quality in India - Soil Resources: Global threats for soil quality - Loss of organic carbon. Biodiversity Resources: Deforestation, Biodiversity Loss.

UNIT IV

Global Disasters

Geological Disasters: Earthquake, Effects of earthquake; Volcanoes: Types of volcanic eruptions - Active volcanic belts in the world; Hydrological hazards: Flash flood - Flood management strategies - Flood prone zones in India - Flood forecasting and warning - Man-made disasters: Oil spills - Forest fire.

UNIT V

Sustainable Environmental Management

Sustainable utilization of renewable energy resources - Solar, Wind, Hydroelectric and Biomass energy resources. Sustainable agricultural practices: Biofertilizers and Biopesticides - National Action Plan on Climate Change - UNDP Sustainable Development Goals 2030 Agenda

Learning Outcomes

After completing this course, students will be able to:

- Clearly identify important global, national, and local issues relating to population, food, and the environment
- Explain the causes and consequences of the issues identified above.
- Communicate environmental issues in a professional manner.

Text Books

1. Frances Harris (2012) Global Environmental Issues, 2nd edition, John Wiley & Sons Ltd., UK.
2. Stavros G. Poulopoulos and Vassilis J. Inglezakis (2016) Environment and Development: Basic Principles, Human Activities, and Environmental Implications. Elsevier, Netherlands.

References

1. Donald Hyndman and David (2005) Hyndman Natural Hazards & Disasters, Cengage Learning, USA.
2. John V. Walther (2014) Earth's Natural Resources, Jones & Bartlett Learning, USA.
3. Prasad Modak (2018) Environmental Management towards Sustainability, CRC Press, FL, USA.
4. PrasenjitMondal and Ajay K. Dalai (2017) Sustainable Utilization of Natural Resources, CRC Press, FL, USA.
5. Rajeev Pratap Singh, Anita Singh, VaibhavSrivastava (2017) Environmental Issues Surrounding Human Overpopulation, IGI Global, USA.
6. Raveendranathan D (2018) Development lead to Pollution and Depletion of Natural Resources, Notion Press, Chennai.
7. Serge Morand, Claire Lajaunie, RojchaiSatrawaha (2017) Biodiversity Conservation in Southeast Asia: Challenges in a Changing Environment, Earthscan from Routledge, UK.
8. Thangavel P and Sridevi G (2015) Environmental Sustainability: Role of Green Technologies, Springer, India.

Web References

1. https://www.stateofglobalair.org/sites/default/files/soga-2018-report.pdf
2. www.who.int/airpollution/
3. https://unfccc.int/
4. re.indiaenvironmentportal.org.in/files/part%20II%20groundwater%20CPCB.pdf
5. https://www.footprintnetwork.org/our-work/earth-overshoot-day
6. https://www.elsevier.com/_data/assets/pdf.../ElsevierDisasterScienceReport-PDF.pdf
7. siteresources.worldbank.org/INTDISMGMT/Resources/0821363328.pdf
8. https://link.springer.com/chapter/10.1007/978-981-10-1866-4_2
9. www.ipcc.ch/
10. https://climate.nasa.gov/
11. https://sdgs.un.org/goals

COREPAPER-6

NameoftheCourse:B.Sc.Environmental Management **Semester:IV**

NameofthePaper:EnvironmentalPollutionandControlStrategies **Credits:4**

PaperType:Core **HoursofTeaching:6**

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ENVIRONMENTALPOLLUTIONANDCONTROLSTRATEGIES

Course Objectives

1.Tolearnaboutmajorairpollutantsandtheirsourcesandcontrolmethods
2.Tostudyaboutwaterpollutantandcontrolmeasures
3.Tostudyaboutsoilpollutionandsoilremediationtominimizeenvironmentaldegradation
4.Tounderstandthenoisepollutionanditscontrolmeasures
5.Toknowaboutthermalandradioactivepollutionandtheireffects

UNIT - I

AIRPOLLUTION&CONTROL

Natural&AnthropogenicSourcesofAirPollution.PrimaryPollutants-Hydrocarbon.CO,SO2,Lead,Aerosols-SecondaryPollutants-PAN,PhotochemicalSmogandOzone,AcidRain-GreenhouseEffect-GlobalWarming-OzoneDepletion.AirPollutionControl&Management-AmbientairQualityStandardsofCPCB.

UNIT - II

WATERPOLLUTION

Physical,Chemical&BiologicalCharacteristicsofWasteWater-WaterPollutants-Sources&EffectsofWaterPollution-WaterborneDiseases-Eutrophication-WasteWaterTreatment-Primary-Secondary-Tertiary-PollutioninRiverGanges-RiverCleaning-NamamiGangeProgramme.

UNIT - III

SOILPOLLUTION

SoilPollutants-Biodegradable-Non-Biodegradable-CausesofSoilPollution-ImpactsofSoilPollution-PesticidesinSoilEnvironmentandtheirEffects-SoilDegradation-NeedforSoilConservationandRestorationofSoilFertility-ControlofSoilPollution.

UNIT - IV

NOISEPOLLUTION

NaturalandManmadeSourcesofNoisePollution-TypesofNoise-IndustrialNoise-TransportNoise-NeighborhoodNoise-EffectsofNoisePollutiononHumanHealth-WorkingEfficiency.Physical&MentalHealth-NoiseExposureLevelsandStandards-NoisePollutionControlandAbatementMeasures.

UNIT - V

THERMALANDRADIOACTIVEPOLLUTION

ThermalPollution:Definition-Sources-ChemicalandBiologicalEffects-ThermalPollutionfromPowerPlantsandtheirControlMeasures-RadioactivePollution: Definition,Sources,RadioactiveDecay,UnitsofRadioactivityandRadiationDose-EffectsofRadiationonEnvironment.

Courseoutcomes:

1.AfterstudiedUnitI,thestudentswillbeabletounderstandandexplaintheairpollution,sources,andcontrolmethods.

2.AfterstudiedUnitII,thestudentswillbeabletounderstandandanalyzetheimpactofwaterpollutiononenvironment,andexplainthetreatmentofwastewater.
3.AfterstudiedUnitIII,thestudentswillbeabletorecognizethesourcesofsoilpollution,soildegradation,andrealizerestorationofsoilfertility.
4.AfterstudiedUnitIV,thestudentswillbeabletounderstandNoisepollution&theirimpactonhumanhealth&takestepstoreducenoisepollution.
5.AfterstudiedUnitV,thestudentswillbeabletogainknowledgeaboutthermalandradioactivepollutionandtakeprecautionmeasures.

TextBooks

1.B.K.Sharma&H.Kaur,1999,Airpollution,GoelPublishingHouse,Meerut.
2.V.P.Kudesia,1985,waterpollution,PragatiPrakashan,Meerut.
3.S.S.Dara,2001,EnvironmentalChemistry&Pollutioncontrol,S.chand&company,Ramnagar,NewDelhi.
4.De.A.K,EnvironmentalChemistry,WileyEasternLtd,NewDelhi.
5.S.A.Abbasi,1998,Environmental&itscontrol,Congentpublication(p)Limited,NewDelhi

Reference

1.BhatiaH.S,1998,EnvironmentalPollution&itscontrol,Golgotiapublications(p)limited,NewDelhi.
2.Khopkar,S.M,1993,EnvironmentalpollutionAnalysis,WileyEasternlimited,NewYork.
3.Downtoearth,centerforscience&Environment.
4.RaoM.N&H.V.N.Rao,1989,Airpollution,TataMcGrawHillpublishingcoltd,NewDelhi.

E-MATERIALS

1.https://www.nrdc.org.
2.https://www.epa.gov.
3.https://data.gov.in.
4.https://orfonline.org.
5. https://www.ncbi.nim.nih.govpmc

COREPAPER-7

NameoftheCourse:B.Sc.Environmental ManagementManagement **Semester:IVCredits:4**

NameofthePaper: PollutionMonitoringandAnalyticalTechniques **HoursofTeaching: 6**

PaperType: Core

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POLLUTIONMONITORINGANDANALYTICALTECHNIQUES

CourseObjectives

1.Toimpartknowledgeaboutpollutionmonitoringmethods
2.Tolearnaboutthewaterandwastewaterqualityanalyticalmethods
3.Tostudythesoilqualityparametersandanalyticalmethods
4.Tolearntheairsamplecollectionandqualityanalysesmethods
5.Tounderstandtheprinciplesandmethodsofanalyticinstruments

UNIT - I

INTRODUCTION TO POLLUTION MONITORING

EnvironmentalQuality-Definition-PollutionMonitoring-WaterSampling-CollectionofWaterSamples-HandlingandPreservation-AnalyticalDevices-MethodsforSamplingParticulatesandGaseousEmission-MeasurementofNoise-NationalEnvironmentalStandards.

UNIT - II

WATER QUALITY ANALYSIS

PhysicalParameters-Colour-Temperature-Turbidity.ChemicalParameters-pH-ElectricalConductivity-TotalSolids-DissolvedOxygen-TotalAlkalinity-Iron-Nitrate-BiochemicalOxygenDemand-ChemicalOxygenDemand.BiologicalParameters-MPN(MostProbableNumber)andMFT(MembraneFilterTechniques) - SPC(StandardPlateCount)-NationalWaterandWaterQualityStandards.

UNIT - III

SOIL QUALITY ANALYSIS

CollectionofSoilSamples-Physico-ChemicalAnalysisofSoil-Density-Specificgravity-Texture-pH-ElectricalConductivity-Chlorides-Nitrate-Phosphate-Organicmatter-StandardSoilQualityStandards.

UNIT - IV

AIR QUALITY ANALYSIS

EnvironmentalStandards-AmbientAirQualityStandards - Drinking WaterQualityStandards-EffluentStandardsforLandDisposal-DisposalonInlandWater-Noise LevelStandards.

UNIT - V

POLLUTION ANALYTICAL EQUIPMENTS

Colorimetric-pHmeter-ElectricalConductivityMeter-Nephlometer-HighPressureLiquidChromatography(HPLC)-GasChromatographywithMassSpectroscopy-FlameAtomicAbsorptionSpectrometry-Chemiluminiscence-BioluminescenceTest-SoundLevelMeter-X-rayDiffraction.

CourseOutcomes

1.AfterstudiedUnitI,thestudentswillbeabletounderstandtheair,water,soilsamplecollectionmethodsforpollutionmonitoring.
2.AfterstudiedUnitII,thestudentswillbeabletounderstandandanalyzethewaterqualityparametersandmethodsofanalysis.
3.AfterstudiedUnitIII,thestudentswillbeabletohandlethequalityanalysisanddeterminepollutedsoil.
4.AfterstudiedUnitIV,thestudentswillbeabletounderstandairsamplingmethodsandanalysisofairpollutionmethods.
5.AfterstudiedUnitV,thestudentswillbeabletogainknowledgeaboutthermalandradioactivepollutionandtakeprecautionmeasures.

TextBooks

1.KrishnanKannan,K.,1997.FundamentalsofEnvironmentalPollution, S.ChandCompany,NewDelhi.
2.MuraliKrishna,K.V.S.G.(2015)AirPollutionandControl,UniversitySciencePress.
3.Goel,P.K.(2006)WaterPollutionCauses,EffectsandControl,NewAgeInternationalPublishers.

Reference Books

1.Dara,S.S.,2000.Atextbookofenvironmentalchemistryandpollutioncontrol.S.ChandCompany,New Delhi.
2.ChristianGD(2001),AnalyticalChemistry,5thedition,JohnWileyandSonsInc.,India
3.Wilson,K,Walker,**J**(2010)PrinciplesandTechniquesofBiochemistryandMolecularBiology,7thedition,CambridgeUniversityPress.

COREPAPER-8

NameoftheCourse:B.Sc.EnvironmentalManagement Semester:IV
NameofthePaper:EnergyandEnvironment Credits:4
PaperType:CoreHoursofTeaching:6

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ENERGYANDTHEENVIRONMENT

CourseObjectives

1.Tounderstandtheconventionalenergyresources
2.Tounderstandthesustainableuseofenergyresources
3.Tolearnthepresentenergyscenarioandtheneedforenergyconservation
4.Toexplaintheconceptofalternativeenergyresources
5.Toanalyzetheenvironmentalaspectsofrenewableenergyresources

UNIT - I

ENERGYSOURCES

IntroductiontoNexusbetweenEnergy,EnvironmentandSustainableDevelopment;Energytransformationfromsourcetoservices;Energysources,sunasthesourceofenergy;biologicalprocesses-photosynthesis-Classificationofenergysources-Conventional,Non-conventionalenergyResources-Fossilfuelreserves-estimates,duration;theoryofrenewability,renewableresources.

UNIT - II

NON-RENEWABLEENERGYSOURCES

Firstandsecondlawsofthermodynamics-EnergyConversion-GlobalEnergyCrisis-Non-RenewableEnergySources:Fossilfuels-CompositionandClassificationofcoal,CrudeOilandNaturalGas-ConsumptionandDemandsofCoal,CrudeOilandnaturalgas-EnvironmentalImpactsofFossilFuelConsumption-Atomicenergysources.

UNIT - III

ENVIRONMENTALEFFECTSOFNON-RENEWABLEENERGYSOURCES

EnvironmentalPollutionfromEnergySources-CausesandEffects-AirPollution,WaterPollution,Solid,Soil/landPollution,NoisePollution,RadioactivePollutionandThermalPollution.

UNIT - IV

RENEWABLEENERGYSOURCES

AlternativeEnergySources-SolarEnergy,Geothermal,Tidal,WindEnergy,Hydro-ElectricPower-OceanThermalEnergyConversion-BiomassEnergyResources-TypesofbiomassEnergy-PhysicochemicalcharacteristicsofbiomassasFuel-Biomassconversionroutes-Biomethanation,Biofuels,Biohydrogen,andBioelectricity.

UNIT - V

RENEWABLEENERGYANDSUSTAINABLEDEVELOPMENT

Renewableenergyservicesandtheirimplicationsforsustainabledevelopment-Economy-Environmental-HumanHealth-EnergyandEconomy-EmissionReduction-InternationalConventionsonEnergyandSustainability-UnitedNationsFrameworkConventiononClimateChange(UNFCC)-UNsustainableDevelopmentGoals.

CourseOutcome

1.AfterstudiedUnitI,thestudentswillbeabletoknowthemajorsourcesandusesforenergyandtheiradvantagesanddisadvantages.
2.AfterstudiedUnitII,thestudentswillbeabletoexplainvariousnon-renewableenergysources.
3.AfterstudiedUnitIII,thestudentswillbeabletoknowtheimpactsoffossilfuelsonenvironmentandhumanhealth.
4.AfterstudiedUnitIV,thestudentswillbeabletounderstandandjustifytheneedofrenewableenergysourcesalternativetothefossilfuels.
5.AfterstudiedUnitV,thestudentswillbeabletounderstandtheconceptofrenewableenergyandsustainabledevelopment.

TextBooks

1.BoyleGF(2004)RenewableEnergy-PowerforaSustainableFuture,Secondedition,OxfordUniversityPress,UK.
2.Dhupper,R.(2015)TextbookonEnergyResourcesandManagement. CBSPublication.

ReferenceBooks

1.RobertA.Ristinen,JackJ.Kraushaar(2015)EnergyandtheEnvironment,3rdEdition.WileyPublications.
2.Kothari,D.P.,Singal,K.C.,Rnajan,R.(2011)RenewableEnergySourcesandEmergingTechnologies,PrenticeHallIndiaLearningPrivateLimited.
3.JohnAndrewsandNickJelly(2007)EnergyScience:Principle,Technologies,andImpacts-OxfordUniversityPress,UK.

E-Materials

1.http://www.indiaenvironmentportal.org.in
2.http://www.cpcb.nic.in
3. http://www.gpcb.gov.in

ALLIEDPAPER-4

NameoftheCourse:B.Sc.Environmental Management Semester:IV
NameofthePaper:EnvironmentandEcotourism Credits:4
PaperType:Allied HoursofTeaching:5

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ENVIRONMENTANDECOTOURISM

CourseObjectives

1.Tounderstandtheilleffectsoftourismonenvironment
2.Togiveinsightonecologicaltourism
3.Tohighlightheareasofemploymentopportunitiesinecotourism
4.Toevokeecologicaltourism

UNIT - I

INTRODUCTION TO TOURISM

Tourism:Meaning,etymology,history,typesoftourisminIndia,Socio,Economicanden vironmentalbenefitsanddrawbacksoftourismindustryw.r.tIndiaandneedforecofriendlytouri sm

UNIT - II

ECOTOURISM

Ecotourism:definition,history,principles(asperWorldWideFundforNature),element sandgoals,importanceofecotourism,positiveimpactofecodevelopmentprojectsonecotouris m

UNIT - III

RESOURCES FOR ECOTOURISM

Biosphererereserves,nationalparks,sanctuaries,wetlands,coastalandfreshwater,mangr oves,coralreefs,deserts,mountainsandforestsincludinguniquefloraandfauna.

UNIT - IV

ECOTOURISM PLACES IN INDIA

MajorEcotourismplacesinIndia:Kerala,Sunderban,Goa,Himalayas,Andaman,Coorg,Sikim ,Shimla,Kodaikanal,StatespromotingecotourisminIndia

UNIT - V

PROMOTION OF ECOTOURISM

Eco-TourisminIndia:SomeMajorIssuesandchallengesIndia'sinitiativesNationalEco-TourismPolicyandGuidelinesoftheMinistryofTourism,GovernmentofIndia,NatureConserv ationFoundation,CentreforResponsibleTravel(CREST),EquitableTourismOptions(EQUA TIONS),responsible travel awards

SKILL BASED SUBJECT
PAPER – 2
AQUACULTURE AND ENVIRONMENT

UNIT I

Culture System – Fresh Water – Brackish Water – Extensive - Intensive - Semi Intensive – Pokkali – Cage – Pen Culture – Mono – Monosex – Poly – Paddy cum Fish – Fish cum Poultry – Fish cum Dairy Fish cum Pig – Fish cum Duck – Fish Ponds – Breeding – Nursery – Rearing – Stocking – Dry and Wet Bunth – Construction and Maintenance of Fish Farm.

UNIT II

Induced Breeding – Hypophysation – Definition – Principles Hypophysation – Procedure of Hypophysation – Collection – Preparation – Injection – Mechanism of Pituitary Action – Advantages of Hypophysation – Seed Collection – Collection from Natural Habitat – Bundh Breeding – Hypophysation – Transport of Fish Seed – Open System – Closed System.

UNIT III

Preservation of Fishes – Fish Spoilage – Chemical Action – Autolysis – Microbial Action – Principles of Fish Preservation – Cleaning – Low Temperature – High Temperature – Dehydration – Salts – Methods of Preservation – Curing – Drying – Freezing – Fish diseases – White Spot Diseases – Costiasis – Whirling Diseases – Knot Diseases – Gill Rot – Pin Head – Rickets – Causes – Symptoms – Treatment.

UNIT IV

Pearl culture-Definition-Types-Composition of pearl-Pearl producing animals-Cultivable species-Biology of pearl oysters-Pearl formation-Culture of pearls-Fresh water pearl culture.

UNIT V

Sewage fed fish culture- Definition- Harmful effects of sewage-Beneficial effects of sewage- Sewage treatment for fish culture- suitable fishes for sewage fed fish culture-Production in sewage fed fish culture.

REFERENCE

1. Jhingaran, C.G. 1981. Fish and Fisheries of India, Hindustan Publishing Corporation.
2. Pillay, T.V.R. 1990. Aquaculture.Principles and Practices. Blackwell Publishing, Oxford.
3. Srinivasalu Reddy, M. and K.R.S SambasivaRao. 2004. A Textbook of Aqua Culture. Discovery Publishing House, NewDelhi.
4. Talwar, P.K. and Jhingaram, A.G. 1991. Inland Fisheries of India and adjacent countries, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. N. Arumugam. 2008. Aquaculture, Saras Publications, Nagercoil, Tamilnadu.

NON-MAJOR ELECTIVE
PAPER - 2
OCCUPATIONAL SAFETY HEALTH AND MANAGEMENT

UNIT I

Occupational Hazards- Types of Occupational Hazards – Health – Definition – Need for Good Health – Factors Affecting Health – Malnutrition – Deficiency Diseases-Balanced diet-Food adulterants-Personal Hygiene.

UNIT II

Health problems due to Air and Water Pollution - Communicable Disease - Mode of transmission (Epidemic and Endemic diseases)-Water borne - Air borne - Food borne Diseases.

UNIT III

Occupational health hazards-Physical-Chemical and Biological hazards-Occupational diseases –Silicosis-Asbestosis-Byssinosis-Hearing loss-Prevention and Control of Occupational diseases.

UNIT IV

Industrial safety standards- Causes of Accidents-Definition-Accident Reporting System-First aid-Frequency rate-Prevention and Control-Health education-Safety awareness.

UNIT V

Environmental Management System (EMS)-ISO14000 and ISO14001-OSHA-The Public Liability Insurance Rules, 1991. Compensation Act.

REFERENCE

1. Scoot, R, M, 1997 concepts of industrial hygine, lewis publisher, New York.
2. Diberardins L.J., 1998. Hand Book of Occupational safety and health, john Willey, New York.
3. Park J.E, and Park Preventive and social medicine.
4. Schilling R.S.E 1973. Occupational health practices, Buffer Worth, London,
5. Gurjar, B.R., Molina, L.T. &Ojha C.S.P. 2010. Air Pollution: Health and Environmental Impacts. CRC Press, Taylor & Francis.

COREPAPER-09

NameoftheCourse:B.ScEnvironmentalManagement Semester:V
NameofthePaper:WasteManagementandRecycling Credits:5

PaperType:CoreHoursofTeaching:6

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WASTEMANAGEMENTANDRECYCLING

CourseObjectives

1.Tolearnaboutdifferenttypesofsolidwastesandtheirproblems
2.Toimpartknowledgeaboutsolidwastecollectionanddisposal
3.Tolearntheprocessesofsolidwastetreatmentandrecycling
4.Tostudyaboutthehazardouswasteandmanagement
5.Tolearnaboutbiomedicalwasteandhandling.

UNIT - I

MUNICIPALSOLIDWASTE

DefinitionofSolidWaste-Typesandsourcesofsolidwaste-Domestic,Municipal,Agricultural,Industrial,andMining-Physico-ChemicalCharacteristicsofSolidWaste-SolidWasteGeneration-ProblemandImpactofMunicipalSolidWaste-MethaneGasEmissionduetoMSW.

UNIT - II

SOLIDWASTECOLLECTIONANDDISPOSAL

DisposalofSolidWaste-Collection-ProcessofCollection-SegregationofWaste-TheRoleofRagPickers-Biodegradable-Non-biodegradable-Reusable-Recyclable-Non-Recyclable-Combustible-Noncombustible-Hazardous-SolidWasteManagement(SWM)Rules,2016-SwachhBharatAbhiyan.

UNIT - III

WASTEPROCESSINGANDRECYCLING

SolidWasteProcessingTechnologies-Recycling,RecoveryofMaterialsforRecycling-OpenDumping-Incineration-TypesofIncinerators-WastetoEnergy-SewageSludgeOnsiteIncinerators-Pyrolysis-Landfill-LandfillRegulation-Emission,LeachateandMonitoring-Composting-AerobicComposting-AnaerobicComposting-VermiComposting.

UNIT - IV

HAZARDOUSWASTE

`HazardousWaste-Definition,Types,CharacteristicsandHealthImpacts,WasteDumpingSite,Storage,Transport-HandlingofWastes-Packing,LabellingandTransport,Disposal-ImportandExportofHazardousWaste,TreatmentMethods-Neutralization,OxidationReduction,Precipitation,Solidification,Stabilization,IncinerationandFinalDisposal.HazardousWaste(managementandhandling)Rule1989.

UNIT - V

BIOMEDICALWASTE

BiomedicalWaste:Definition-Collection,Packing,Transportation andStorage-CategoriesofBiomedicalwaste-ColourCodingandTypesofContainerforDisposalofBiomedicalWaste(ManagementandHandling)Rule1988.

CourseOutcomes

1.AfterstudiedUnitI,thestudentswillbeabletounderstandthedifferenttypesofsolidwastesandtheirsourcesandcharacteristics.

2.AfterstudiedUnitIIthestudentswillbeabletorecognizedifferenttypesofwastecollection,transportmethodandfollowproperdisposalmethod.

3.AfterstudiedUnitIII,thestudentswillbeabletoexplainvariouswasterecyclingmethods.

4.AfterstudiedUnitIVthestudentswillbeabletodistinguishhazardouswastesand

5.AfterstudiedUnitV,thestudentswillbeabletogainknowledgeaboutthermalandradioactivepollutionandtakeprecautionmeasures.

TextBooks

1.Kinnaman,T.CandTakeuchi,K.(2014).HandbookonWasteManagement,EdwardElgarPublishing,UK.

2.RameshaChandrappaandJeffBrown,(2012).SolidWasteManagement:PrinciplesandPractice,SpringerScienceandBusinessMediaPublishers.

ReferenceBooks

1.Asnani,P.U.2006.Solidwastemanagement.IndiaInfrastructureReport570.

2.Bagchi,A.2004.DesignofLandfillsandIntegratedSolidWasteManagement.JohnWiley&Sons.

3.Blackman,W.C.2001.BasicHazardousWasteManagement.CRCPress.

4.McDougall,F.R.,White,P.R.,Franke,M.&Hindle,P.2008.IntegratedSolidWasteManagement:ALifeCycleInventory.JohnWiley&Sons.

5.USEPA.1999.GuideforIndustrialWasteManagement.WashingtonD.C.

E-Material

1.http://mohua.gov.in/upload/uploadfiles/files/Part2.pdf

2.https://globalrec.org/wp-content/uploads/2014/03/Hazardous-Wastes-Management-andHandling-Rules-1989.pdf

3.http://www.hp.gov.in/dhsrhp/pdf/Biomedical_waste.pdf

4.http://www.cpeo.org/techtree/ttdescript/pyrols.html

5.www.satavic.org/vermicomposting.html

6.http://web.mit.edu/urbanupgrading/urbanenvironment/sectors/solid-waste-landfills.html

7.www.cement.org/waste/wt_apps_radioactive.asp

8. www.ipma.co.in/recycle.asp

COREPAPER-11

NameoftheCourse:B.Sc.EnvironmentalManagement Semester: V
NameofthePaper: Environmental Safety, Health and management Credits:5
PaperType:CoreHoursofTeaching:6

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Environmental Safety, Health and management

CourseObjectives

1.Toknowtheconceptandimportanceofenvironmentalsafetyandhealth

2.Tostudyandunderstandaboutcommunicablediseases

3.Tounderstandtheoccupationaldiseasesandtheircauses

4.Toknowthesafetymeasurestobetakenatoccupationsites

5.Toimpartknowledgeonenvironmentmanagementsystem

UNIT - I

ENVIRONMENTALHEALTH

EnvironmentalHealth-ConceptandScope-Needforgoodhealth-Factorsaffectinghealth-Malnutrition-Deficiencydiseases-Kwashiorkor-Marasmus-Balanceddiet-Foodadulterants.

UNIT - II

PUBLICHEALTH

PublicHealth-Communicablediseases-Modeoftransmission(EpidemicandEndemicdiseases)Bacterialdiseases-Tuberculosis-Typhoid-Filariasis-Viraldiseases-Hepatitis-AIDS-Rabies-WaterborneandAirbornediseases.

UNIT - III

OCCUPATIONALHAZARDS

OccupationalHealthHazard-ConceptsandScope-OccupationalHazard-Physical-ChemicalandBiologicalhazards-OccupationalDiseases-Pneumoconiosis-Silicosis-Anthracosis-Byssinosis-Farmer’slungs-Leadpoisoning-SkinDiseases-PreventionandControlofOccupationalDiseases.

UNIT - IV

OCCUPATIONALSAFETY

IndustrialSafetyandManagementTechniques-Accidents-Causes-Firstaid-PreventionandControl-Riskanalysisandassessment-Healtheducation-SafetyMeasuresinIndustry.

UNIT - V

ENVIRONMENTMANAGEMENTSYSTEM

EnvironmentalManagementSystem(EMS)-ISO14000andISO14001-CompensationAct-PublicLiabilityInsuranceAct-HealthOrganization-NIOH(NationalInstituteofOccupationalHealth)AIHPH(AllIndiaInstituteofHygieneandPublicHealth)NHO(NationalHealthOrganization)WTO(WorldTradeOrganization)OSHA(OccupationalSafetyandHealthAdministration)-Standards.

CourseOutcome

1.AfterstudiedUnitI,thestudentswillbeabletounderstandtheconceptandscopeofEnvironmentalHealth.

2.AfterstudiedUnitII,thestudentswillbeabletorecognizedifferenttypesofpublichealthissues.

3.AfterstudiedUnitIII,thestudentswillbeabletoundemandoccupationalhealthhazards,andtakestepstocontrolmeasures.

4.AfterstudiedUnitIV,thestudentswillbeabletoidentifythesuitablesafetymeasurestopreventindustrialoccupationalhazards.

5.AfterstudiedUnitV,thestudentswillbeabletoutilizetheenvironmentalmanagementsystem.

TextBooks

1.Shaw,J.Chadwick(1998)PrinciplesofEnvironmentalToxicology,Taylor&FrancisLtd.

2.AnnaleeYassi,TordKjellstr"om,TheodeKok,TeeGuidotti(2001).BasicEnvironmentalHealth,OxfordUniversityPress.

ReferenceBooks

1.Scoot,R,M,(1997)conceptsofindustrialhygine,lewispublisher,NewYork.
2.DiberardinsL.J.,(1998).HandBookofOccupationalsafetyandhealth,johnWilley,NewYork.
3.ParkJ.E,andParkPreventiveandsocialmedicine.
4.SchillingR.S.E(1973).Occupationalhealthpractices,BufferWorth,London,
5.Gurjar,B.R.,Molina,L.T.,OjhaC.S.P.(2010).AirPollution:HealthandEnvironmentalImpacts.CRC Press,Taylor&Francis.
6.MonroeT.Morgan(2003)EnvironmentalHealth,ThirdEdition,Thomson/WadsworthPublishers.
7.Koren,H.(2002).HandbookofEnvironmentalHealthandSafety-PrincipleandPractices,FourthEdition,LewisPublishers,CRCPress.

E-Material

1.https://dgfasli.gov.in/sites/default/files/service_file/Nat-OSH-India-Draft%281%29.pdf
2.www.ehs.ucsb.edu/
3.http://safety.ucanr.edu/Safety_Notes/
4.https://doresearch.stanford.edu/policies/research-policy-handbook/environmental-health-andsafety/health-and-safety-principles
5.https://www.cdc.gov/niosh/docs/98145/pdfs/98145.pdf?id=10.26616/NIOSHPUB98145
6.https://www.gooduniversitiesguide.com.au/careers-guide/occupational-health-and-safety-officer
7.https://doresearch.stanford.edu/policies/research-policy-handbook/environmental-health-andsafety/health-and-safety-principles

COREPAPER-10

NameoftheCourse: B.Sc. Environmental Management Semester:V
NameofthePaper: Biostatistics andInstrumentation Credits:5
PaperType: CoreHoursofTeaching:6

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BIOSTATISTICSANDINSTRUMENTATION

CourseObjectives

1.Tohelpstudentsunderstandthebasicconceptaboutcomputerandcomputer Programmes,hardwareandsoftwares.
2.Toimpartknowledgeonstatisticaldataanalysiswithcontextofenvironmentalstudies.
3.ToapplyBiostatisticaltoolsinenvironmentalproblems.

UNIT - I

BASICSOFCOMPUTER

IntroductionandBasicConceptsofComputer,PartsofComputer,TypesofComputerNumberSystem.ComputerOrganization,Software,ComputerVirusLanguageanditsApplication.

UNIT - II

BASICCOMPUTERPROGRAMMES

Basicprinciplesofadigitalcomputer.Compressionofhardwareandsoftware.Computer operatingsystems-WINDOWS-MSWord,Excel-powerpoint.Network-

Internet,WorldWideWeb,SearchEngines,E-mail.ApplicationsofComputerinEnvironmentalScience;useofComputerinEnvironmentalModelling.

UNIT - III

DATAANDDATACOLLECTION

Data-MethodsofCollection-Classification-Tabulation-Typesoftables.DiagrammaticandGraphicalrepresentation.

UNIT - IV

DATAANALYSIS

MeasuresofCentralTendency-CalculationofMean,MedianandMode,Moments,SkewnessandKurtosis.MeasuresofDispersion-RangeandDeviation,MeanDeviation,StandardDeviationandStandardError.

UNIT - V

MATHEMATICALMODELLINGINENVIRONMENT

MathematicalEcology-ClassificationofMathematicalModelling-ProcessofModellingPopulationGrowthModel-PopulationInteraction-LotkaandVolteraPreyPredatorSystem,PointSourceStreamPollutionModel,BoxModelEnergyFlowinMultiEcosystem.

CourseOutcome

1. AfterstudiedUnitI,thestudentswillbeabletolearnthefunctionofcomputers,hardware'sandsoftwares.
2. AfterstudiedUnitII,thestudentswillbeabletogetcomputeroperationskillsanddocumentprocessing.
3. AfterstudiedUnitIII,thestudentswillbeabletodistinguishthedatatypesandcollectthedata.
4. AfterstudiedUnitIV,thestudentswillbeabletoanalyzethedatathroughvariousstatisticalmethods.
5. AfterstudiedUnitV,thestudentswillbeabletoapplythestatisticalmodelingtoenvironmentandecosystemstudies.

TextBooks

1. Palanisamy.M(1989)ATextbookofstatistics,paramountpublication,palani.
2. Vittal,R.R(1986)BusinessMathematicsandStatistics,MuruganPublications.
3. Sanjaysaxena(2003)AFirstCourseincomputers,VikaspublishinghousePvt.Ltd,NewDelhi

ReferenceBooks

1. Arumugam.N.(2015)BasicconceptsofBiostatistics,SarasPublication.
2. Gurumani.N.(2010)AnIntroductiontoBiostatistics,M.J.Publishers.
3. Marden,M.P.(2011)ResearchMethodsforScienceIEdition.
4. McKillup,S.(2006)StatisticsExplained.AnIntroductoryGuideforLifeScientists.
5. CambridgeUniversityPress,Cambridge,UK.
6. Zar,J.H.(1998)BiostatisticalAnalysis.PrenticeHall,N.J.

E-Material

1.www.stat.cmu.edu/~brian/701/notes/paper-structure.pdf
2.www.cengage.com/resource_uploads/downloads/1133629601_397200.pdf
3. https://www.scribd.com/document/.../Statistical-Analysis-of-Data-with-report-writing

ELECTIVE
PAPER – 1
PRINCIPLES OF SUSTAINABLE DEVELOPMENT AND MANAGEMENT

UNIT – I

Function of Management – Planning Organizing and Controlling, Systems approach to Management, Patterns of Analysis, Economic, Social Political and Ethical factors affecting Management practice.

Unit – II

Steps in the Planning Process Management.By objectives, Programme Budgeting, Capital budgeting, Economic Analysis – Marginal Analysis, Benefit / Cost Analysis etc. Decision Analysis – Risk and Uncertainty decision tress, Strategy and Policy Analysis, Limitation of Planning.

Unit – III

Organizational Structure, Formal and Informal Organization, Line and Staff relations, relations with the public , Principles of delegation, Performance appraisal motivation, Communication and leadership aspect, Theories of Organization.

Unit – IV

Green buildings – History of Green buildings – Need and Relevance of Green buildings – Associated cost and benefits –Outlined examples of Green buildings – LEED certified building - Eco mark certification – Establishment of Eco mark in India, Its importance and implementation.

Unit – V

Public transportation for Sustainable development – Green belts – Introduction to UNEP's – Green Economy Initiative, inclusive Economic growth of the society –

REDD+ initiative and cap and trade concept – Green banking – Setting environmental goals, resource mobilization use of Natural resource and Environmental indicators, Output budgeting, Monitoring and Evaluating Environmental Programme.

REFERENCE

1. Sharma ,R.D.(1976), Organizational Management, Light and life publishers, New Delhi
2. Chakraborthy. S.K (1976) Management by objection Macmillan Co .of India Ltd, New Delhi
3. Varma and Agarwal, theory & practice of Management Forward Book Depot, New Delhi.
4. Anastas, P.T. & Warner, J.C. 1998. Green Chemistry: Theory & Practice. Oxford University Press.
5. Arceivala, S.L. 2014. Green Technologies: For a Better Future. Mc-Graw Hill Publications.

SKILL BASED SUBJECT
PAPER – 3
FOREST CONSERVATION AND MANAGEMENT

UNIT I

Forest-Types-Moist Deciduous-Dry Deciduous-Evergreen – Semi green- Grassland-Thorny Forest - mangrove forest -utilization of forest products-Timber, firewood, pulp, fodder and medicinal plants.

UNIT II

Sacred groves-Values- Scared groves in Tamil Nadu - Shrines of symbols-Character of deities-festivals-Beliefs, Taboos associated with sacred groves-key stone species-ethical dilemma in sacred groves-conservation.

UNIT III

Forest movement-and Peoples participation - Tribal community symbiotic relationship between tribal and Forest, community participation - Chipko movement, Apiko movement. India`s bishnoi community and their conservation practices.

UNIT IV

Social forestry, Afforestation, Ecological significance of Forests, plant indicators, Forests as carbon sinks.

UNIT V

Forest conservation-Protection from fire, Prevention of Fire, Protection from wild animals-Raise ofawareness, through tourism, Role of government in forest conservation, Forest conservation ACT 1980.

REFERENCE

1. Kormondy, E.J. 2005. Concepts of Ecology.Prentice hall of India Pvt Ltd. New Delhi
2. Calrke, G.L.1954. Elements ecology , John Wiley and Sons, New York.

3. Champman, R.N.1928. The Quantitative analysis of environmental factors Ecology 9:111-122
4. Champion H.G &seth, 1965 A revised Survey of the forest types of India, Manager of publishers New Delhi.
5. S. Karthikeyan and A.C. Thangavelou 2011.Journey through Sacred Grooves.Bio-Science Research Foundation, Pondicherry, India.

COREPAPER-12

Name of the Course: B.Sc.Environmental Management Semester:VI
Name of the Paper: Natural Hazard and Disaster Management Credits:4
Paper Type: Core Hours of Teaching:6

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NATURAL HAZARD AND DISASTER MANAGEMENT

Objectives

To know about the natural and anthropogenic hazards, their impacts on environment & mitigation strategies andto train the people for their preparedness to face disaster.

UNIT- I

NATURAL HAZARDS

Natural Hazards-Types of Natural Hazards- Hydrological- Atmospheric- Geological Hazard-Earthquake- Causes, Impactson Environment- Control Measures- Tsunami- Cyclones -Landslides-Causes , Impactson Environment- Preventive Measures.

UNIT- II

ANTHROPOGENIC HAZARDS

Anthropogenic Hazards- Impacts of Anthropogenic Activities – Rapid Urbanization –Injudious Ground water Extraction –Sand Mining From River Bank -Deforestation -Mangroves Destruction- Warfare- Chemical Weapons -Biological Weapons -Major Accidents From Industries-Lov Canal Disaster-London Smog-Chernobyl Accident-Bhopal Gas Tragedy.

UNIT-III

DISASTER

Disaster- Definition of Hazard ,Natural, Technological Hazard, Concept of Risk & Vulnerability –Reasons of Vulnerability- Industrial Accidents –Two Components of Risk-Likelihood And Consequences, Qualitative Likelihood, Measurement Index(LMI)-Categories of Direct Losses, Indirect Losses, Tangible Losses & Intangible Losses-Applications of Geoinformatics in Hazard ,Risks And Vulnerability Assessment.

UNIT- IV

DISASTER MANAGEMENT SYSTEM

Disaster Impacts & Response- Identification of Dead- Search Rescue- Fist Aid- Relief Phase-Vaccination ,Basic Sanitation and Personal Hygiene- Environmental Disaster -Assessment-Planning- Resettlement – Rehabilitation –Role of NGOs And GOs -ReliefCamp-Psychotherapy-Simplified Yoga and Meditation- Stress Management.

UNIT- V

DISASTER MANAGEMENT IN INDIA

Policy For Disaster Reduction –Disaster Management Act 2005 –National Guidelines and Plans on Disaster Management –National Disaster Management Authority (NDMA) –NIDM (National Institute of Disaster Management) – State Disaste Management Authorities-National Disaster Response force.

Course Outcomes

1.The students will be able to differentiate vulnerability,risk & hazard.
2.To gainknowledge about the different types of Natural Disasters.
3.To impart knowledge on anthropogenic hazards & its impacton environment.
4.To know about the national & international agencies, NGOs for major role in disaster management.
5.Knowledge gained will enable the students to volunteer themselves in disaster management programs thus helping affected community.

Text Books

1.Natural hazards,Edwards B(2005) ,Cambridge University Press, UK.
2.Natural Disaster, Sharma R.K&Sharma G.(2005), A.P.HPublishing Corporation, NewDelhi.
3.Disaster Management:A Disaster Manager's Hand book ,Carter ,N.W .(1992), Asian Development Bank ,Manila.
4.A Manual On Disaster Management, Diwan , P.(2010) ,Pentagon Earth, NewDelhi.
5.Early Warning Systems For Natural Disaster Reduction ,Zschau, Jand Kuppers ,N.(2003), Springer-Verlag ,Berlin , Heidelberg.

Reference Books

1.Natural Hazards & Disaster Management-Vulnerability & mitigation, SinghR.B,(2006), Rawat Publications.
2.Disaster Planning: The Preservation of Life & Property ,Foster ,H.D,(1980) ,SpringerVerlay ,NewYork.
3.Disaster Management, SinghS.K,S.C .& SinghS (1998) Mittal Publications ,NewDelhi.

4.Natural Disaster Reduction ,Mishra G.K&Mathur G.C,(1993), Reliance Publishing House, NewDelhi.

E-Materials

1.https://www.GIS.Development.net
2.https://iirs.nrsa.org
3. https://quake.usgs.gov

CORE PAPER-13

Name of the Course : B.Sc. Environmental Management Semester:VI
Name of the Paper: Environmental Impact Assessment Credits:4
Paper Type:Core Hours of Teaching:5

ENVIRONMENTAL IMPACT ASSESSMENT

Course Objectives:

1.To impart knowledge about Environmental Impact Assessment
2.To identify methods and parameters to be included to EIA
3.To learn about the methods and steps involved in EIA
4.To repot the EIA study report and post EIN management system
5.To access the case studies of major developmental projects

UNIT- I

INTRODUCTION TO EIA

EIA- Introduction – Concept of EIA- Scope and objectives of EIA-EMP-Historical perspectives of EIA –Organization responsible for EIA- Pre-project analysis-Site selection and Area classification –Sitting and Setting Criteria for EIA Projects.

UNIT- II

EIA ASSESSMENT PARAMETERS

Environmental Indicators – Abiotic and Biotic factors – Socio and Economic aspects - Environmental quality- Air, Water, Soil, Flora and Fauna -Field survey anddata collection-Environmental auditing.

UNIT -III

EIA METHODLOGIES

Various Steps of EIA – Content of EIA –Analytical and Integrated Approach Assessment Methodology-Adhoc,Overlay Network ,Matrix and Checklist-Environmental Values and Technique – Cost benefit Analysis –Environmental Clearance.

UNIT- IV

ENVIRONMENTAL IMPACT STATEMENT

Environmenta Impact Statement(EIS) and Environmental Management Plan(EMP) Environmental Management System Standards (ISO14000series). EIA Notification ,2006 and 2020 amendments. Eco-labeling schemes.

UNIT- V

EIA CASE STUDIES

Case Studies for Major Developmental Projects :Hydro electric and Thermal PowerPlants ,Mining ,Highway Roads, Airport, Cement Industries.

Course outcomes

1.After studied UnitI, the students will be able to explain the importance and principles of EIA processes.

2.After studied UnitII, the students will be able to identify and list out the parameter to be evaluated fo rEIA.

3.After studied UnitIII,the students will be able to understand follow the methods of EIA .

4.After studied UnitIV, the students will be able to summarize the EIA report and appropriate environmental management plan.

5.After studied UnitV,the students will be able to access and analyze EIA cases studies report of different developmental projects.

Text Books

1.EIA Manual (2001) Ministry of Environment, Forest and Climate Change ,NewDelhi.

2.Barthwal ,R.R. (2012) EnvironmentalImpact Assessment,New Age Internationa Publishers.

3.Khandeshwar, S.R.,Raman,N.S. ,Gajbhiye,A.R.(2019) Environmental Impact Assessment ,I.K.International Publishing HousePvt.Ltd.

ReferenceBooks

1.Barrow, C.J.(2000)Social Impact Assessment: An Introduction.Oxford UniversityPress.

2.Glasson,J.,TheRivel,R.,Chadwick,A.(1994) Introduction to Environmental Impact Assessment. London ,Research Press,UK.

3.Judith,P.(1999) Hand book of Environmental Impact Assessment.Black well Science.

4.Marriott,B.(1997) Environmental Impact Assessment:A Practical Guide .McGraw .Hill,NewYork,USA.

5.Canter,L.W.(1997) Environmental Impact Assessment.McGraw-Hill, NewYork.
6.Peter Wathern(2015) Environmental Impact Assessment: Theory and Practice, Taylor &Francis, London.

E-Materials

1.http://environmentclearance.nic.in/
2.http://environmentclearance.nic.in/writereaddata/Draft_EIA_2020.pdf
3.www.fao.org/docrep/V8350E/v8350e06.htm
4.http://www.moef.nic.in/division/eia-manual
5.http://www.moef.nic.in/circulars
6.https://www.adb.org/documents/adb-environmental-assessment-guidelines
7.https://www.iaia.org/eia-index-of-websites.php
8.https://www.csaocean.com/services/environmental-impact-assessment-eia
9. https://www.elaw.org/files/mining-eia-guidebook/Chapter2.pdf

CORE PAPER-14

Name of the Course : B.Sc.Environmental Management **Semester:VI**
Name of the Paper : Environmental Laws,Policies and Treaties **Credits:4**
Paper Type:Core **Hours of Teaching:5**

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ENVIRONMENTAL LAWS ,POLICIES AND TREATIES

Course Objectives

To impart knowledge about Environmental Laws, regulations ,policies and treaties of India and International.

UNIT-I

INTRODUCTION TO ENVIRONMENTAL LAW

Fundamental Rights-Evolution and Development of Environment Laws with Reference to Stockholm Conference 1972 – Environmental Legislation – Legal Definition _Article 48A – Article 51G-National Green Tribunal- Environmental Ethics- Principle -Importance.

UNIT-II

LEGISLATION FOR ENVIRONMENTAL PROTECTION

The Wildlife (Protection) Act,1972 – The Water (Prevention and Control of Pollution) Act ,1974 -The Air (Prevention and Control of Pollution) Act, 1981-The Environment (Protection) Act, 1986 - The Forest (Conservation) Act, 1980 –The Noise pollution (Regulation and Control) Rules2000-The Biological Diversity Act, 2002-The National Green TribunalAct,2010-Solid Waste(Management and Handling) Rules, 2000 –Biomedical Waste (Management and Handling) Rules1998- Solid Waste Management Act2016.

UNIT-III

RULES FOR ENVIRONMENTAL PROTECTION IN INDIA

Bio-Medical Waste (Management & Handling) Rules,1998; Recycled Plastics Manufacture and Usage Rules, 1999; Noise Pollution (Regulation and Control) Rules,2000 ;Municipal Solid

Waste (Management and Handling Rules)2000; The Hazardous Wastes(Management, Handling and Transboundary Movement) Rules,2008; Wetland Rules2009; Coastal Regulation Zones(CRZ)Rules2011;E-waste Management and Handling Rules2011 ;Plastics Manufacture ,Saleand Usage Rules,2011

UNIT-IV

ENVIRONMENTAL POLICY

Definition –Benefits of developing an Environmental Policy- International Agreements-Montreal Protocol 1987 –Kyoto Protocol 1997- Copenhagen –Pairssummits Conventionon Climate Change –Carbon Credit and Carbon Trading .The National Forest Policy,1998-Policy Statement for the Abatement of Pollution 1992.

UNIT-V

ENVIRONMENTAL TREATIES

United Nations Conference of Environmentand Development 1992- Rio-de-Janerio (RioDeclaration,Agenda21) Scheme and Labelling of Environment Friendly Products-Indus Water Treaty- Ganges Water Treaty -Vienna Convention for the Protection of Ozone Layer1985.

Course Outcomes:

1.To know about the constitution of India environmental legislation and Environmental ethics.
2.To impart knowledge on legislation for environmental protections.
3.To knowabout the National Green Tribunal Act and bio medical waste management rules.
4.To understand about the environmental policies and internationa lagreements.
5.To gain knowledge about environmental treaties.

Text Books

1.TNPCB Pollution Control Legislation – TNPCB, Vol-1&2 ,Chennai,1999.
2.Agarwal VK 2005, Environmental Laws in India ,Challenges for Enforcement, Bulletin of The National Institute of Ecology.
3.JadhavH&BhosaleY.M,1995 ,Environmental Protection & Laws ,Himalayan Publications ,NewDelhi.
4.DiwanS&RosencranzA ,2002 ,Environmental Law and Policy in India ,Cases ,Materials & Statues ,Oxford University Press.

Reference

1.Nandithakrishna,Environmental Laws of India-AIntroduction ,C.P.R. environmental Education Center,Chennai, 1998.
2.Center for Science & Environment, The State of India's environment,The Second Citizen, Report,C.S.E NewDelhi,2018.
3.Abraham,C.M,1999,Environmental juris prudence in India ,Kluwer Law International.

E-Materials

1.https://www.sciencedirect.com
2.https://www.epd.gov.hk.

3.https://www.gsa.gov.
4.https://www.iced.cag.gov.in.
5. https://www.unece.org.

Elective Paper 02

Name of the Course: B.Sc.Environmental Management **Semester: III**
Name of thePaper:Climate Change and Current Issues **Credits: 3**
PaperType:Elective **Hours of Teaching:3**

CLIMATE CHANGE AND CURRENT ISSUES

Course Objectives:

The purpose of this course is to focus on improving understanding of the climate system and climate science and the impacts of climate change, mitigation and/or adaptation to climate change and related issues.

UNIT I

Meteorological Elements for Climate Change

Structure of atmosphere: Vertical structure of atmosphere - Atmospheric stability: Adiabatic process – Air Temperature, Humidity, Condensation: Dew and Frost, Fog, and clouds – Clouds: Classification of clouds - Precipitation processes: Collison and Co-alescence process and Ice-crystal or Bergeron process – Cloud seeding – Precipitation types.

UNIT II

Atmospheric Circulation, Air masses and Fronts

Atmospheric circulation: Hadley circulation – Intertropical Convergence Zone (ITCZ) – Jet streams - Global wind patterns: Trade winds, Westerlies and Polar Easterlies - Air masses: Classification and characteristics of air masses – Types of air masses – Fronts: Type of fronts: Stationary fronts, cold fronts, warm fronts, occluded fronts

UNIT III

Air Quality and Consequences of Climate Change

Global Air Quality and CO2 concentration scenario - Role of air pollutants in climate change – Sources of greenhouse gases: Coal burning, Transportation sectors (vehicle, railways, shipping and aviation) - Ozone depleting substances – Facts and figures of current global

warming scenarios in the world – Extreme events of climate change.

UNIT IV

Climate Classification, Measurement of Climate

Classification of climate: Koppen's and Thornthwaite' scheme - The measurement of climate change: Tree rings, ice cores, ocean sediments, pollen records, Boreholes and other proxy measurements.

UNIT V

Global/National Action Plans to Combat Climate

Key steps taken by UNFCCC to combat climate change: Kyoto Protocol – Copenhagen Accord 2009 - Cancun Agreements 2010 to establish Green Climate Funds – Paris Climate Agreement 2015 – Montreal Protocol for ODS, Kigali Amendment 2016 to phase out hydrofluorocarbons (HFC) – Green climate funds – Clean Development Mechanism (CDM).

Text Books

1. Donald Ahrens C and Robert Henson (2016) Meteorology Today: An Introduction to Weather, Climate, and the Environment. Eleventh Edition, Brooks/Cole, Cengage Learning, USA.
2. Galvin JFP (2016) An Introduction to the Meteorology and Climate of the Tropics. John Wiley & Sons Ltd., UK.

Reference Books

1. Alberto Troccoli, Laurent Dubus and Sue Ellen Haupt (2014) Weather Matters for Energy.Springer, New York.
2. Cowie J (2007) Climate Change: Biological and Human Aspects, Cambridge University Press, UK. 32
3. Dogra N and Srivastava S (2012) Climate Change and Disease Dynamics in India, TERI, New Delhi.
4. Filho WL (2012) Climate Change and the Sustainable Use of Water Resources, Springer-Verlag, Berlin, Heidelberg.
5. Friel S (2019) Climate Change and the People's Health (Vol. 2). Small Books Big Ideas in Popul.
6. Lawrence A. Palinkas (2020) Global Climate Change, Population Displacement, and Public Health.The Next Wave of Migration.Springer Nature Switzerland.
7. Newman J, Anand M, Henry H, Hunt S and Gedalof Z (2011) Climate Change Biology, CAB International, Cambridge, MA, USA.
8. Marselle MR, Stadler J, Korn H, Irvine KN & Bonn A (2019) Biodiversity and health in the face of climate change (p. 481). Springer Nature.

Web References

1. http://www.un-redd.org/
2. http://unfccc.int/
3. https://www.ipcc.ch
4. https://www.co2.earth/
5. http://www.climatecentral.org/

6. http://climate.nasa.gov/
7. http://www.who.int/mediacentre/news/
8. http://aqicn.org/map/

Elective Paper 01

Name of the Course: B.Sc.Environmental Management **Semester: V**
Name of the Paper: Environmental Toxicology **Credits: 3**
Paper Type:Elective **Hours of Teaching: 6**

ENVIRONMENTAL TOXICOLOGY

Course Objectives:

The objective of this course is to focus on understanding the role of pollutants, xenobiotics in the natural environment and to understand the basics of environmental toxicology and risk assessment.

UNIT I - Basics of Toxicology

Introduction to toxicology, scope and types - Classification of toxic agents. Routes of exposure, duration and frequency of exposure, Dose response relationship - LC_{50} LD_{50}.

UNIT II - Toxicity Testing

Toxicity testing (i) laboratory animals, (ii) toxicity testing in animals, (iii) toxicological field studies,Concepts of Bioassay, Types and characteristics - Immunotoxicity, histotoxicity and cell toxicity.

Unit III - Environmental RiskAssessment

Environmental Risk – Definition, Risk Characterization - Hazard Identification, Exposure Assessment Methods, Risk Assessment – National and International guidelines. Environmental Risk – Mitigation measures.

UNIT IV - Xenobiotics

Xenobiotics– Bioaccumulation and Biomagnifications - mechanisms of toxicity. - food toxicity,genotoxicity, Molecular neurotoxicity.

UNIT V - Pesticide toxicology

Bioaccumulation and Biomagnifications of toxic materials in food chain, Types, mechanism and Toxicology of major pesticides - Environmental impacts of pesticides, biotransformation, biomonitoring, concept of bioindicator groups and examples.

Reference Books

1.Alberts B, Bray D, Hopkin K et al. (2009) Essential Cell Biology, 3rd edition,

2.Alberts B, Johmson A, Lewis J, Raff M, Roberts K and Walter P (2002) Molecular Biology of the Cell, Garland Science, New York.

3.Buchanan BB, Gruissem W and Jones RL (2002) Biochemistry and Molecular Biology of Plants, ASPB, USA.

4.Cooper GM and Hausman RE (2013) The Cell: A Molecular Approach, 6th edition, Sinauer Associates, Sunderland, MA, USA.

5.David L. Nelson, Michael M. Cox (2004) Lehninger Principles of Biochemistry (1970) by Albert L. Lehninger Published April 23rd 2004 by W. H. Freeman (first published).

6.Gerald Karp (2002) Cell and Molecular Biology: Concepts and Experiments, 7th edition.

7.Klaassen, Curtis D; Casarett, Louis J; Doull, John, (2013). Casarett and Doull'stoxicology: the basic science of poisons (8th Edition)McGraw Hill Publishers.

SKILL BASED SUBJECT
PAPER – 4
ENVIRONMENTAL BIOTECHNOLOGY AND HERBAL SCIENCE

UNIT I

Environmental Biotechnology: Basic Concept, Aim and Scope – Pollution Monitoring – Biotechnological Methods – Biosensors – Biological Treatment of Waste Water.

UNIT II

Agricultural Biotechnology – Micro Propagation – Techniques – Application – Bio Fertilizers – Mass Cultivation Techniques of Rhizobium, Azolla and Phospho bacteria – Bio-Pesticides – Petroleum Plants.

UNIT III

Mushrooms Technology – Nutritive Value of Edible Mushrooms – Medicinal Value of Mushrooms – Advantages of Mushrooms Cultivation – Cultivation of Oyster Mushrooms.

UNIT IV

Herbal Science – Traditional System of Medicine – Siddha – Ayurveda – Homeopathy – Common Medicinal Plants – Zingiberofficinale– Aloe vera – Ocimum sanctum – Asafoetida – Honey.

UNIT V

Conservation Methods for Herbal Plants – Insitu and Ex-situ Conservation – Herbal Farms – Biotechnology in Conservation of Medicinal Plants – Adulteration of Herbal Products – Reason – Types – Disadvantages.

REFERENCE

1. N. Arumugam, V. Kumaresan, Applied Plant Biotechnoloy. 2016, Saras Publication, Nagarcoil.
2. V.Kumaresan, Herbal Biotechnology &Pharmacography, 2015, Saras Publication, Nagarcoil.
3. Gupta B.K. Elements of Biotechnology, 1997, Tata McCraw Hill Pub. New Delhi.
4. Scagg, A.H. 2005. Environmental Biotechnology.Oxford University Press.
5. Wainwright, M. 1999. An Introduction to Environmental Biotechnology.Springer.