

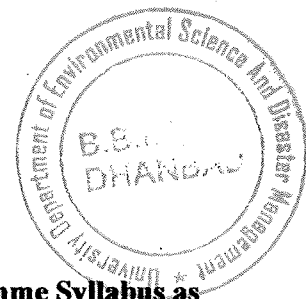
Syllabus for
Bachelor of Science in Environmental Science (Honours)
Four Year Under Graduate Programme

Academic Session

w.e.f. 2022-2026



For
All Constituent/Affiliated Colleges under
BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY,
DHANBAD



**Members of Board of studies of Four Years Under Graduate Programme Syllabus as
per Guidelines of The Binod Bihari Mahto Koyalanchal University, Dhanbad**

Sl no		Name	Designation	Signature
1.	Chairman	Dr. Shailendra Kumar Sinha	Head, University Department of Env Science and Disaster management, BBMKU, Dhanbad	
2.	External Expert	Dr. Anjani Kumar	Scientist, (Retired) CIMER, Dhanbad	
3.	Member	Dr. L. B Singh	Head, University Department of Zoology, BBMKU, Dhanbad	
4.	Member	Dr. Navita Gupta	Head, University Department of Lifesciences, BBMKU, Dhanbad	
5.	Member	Dr. Rupam Mallick	Assistant Professor, University Department of Zoology, BBMKU, Dhanbad	
6.	Member	Dr. Sarita Murmu	Assistant Professor, University Department of Zoology, BBMKU, Dhanbad	

Couse Structure
For Practical Subjects

Semester	Paper Code	Name of Paper	Credit	Marks Distribution		
				Full marks	Semester Internal	End Semester
I	MJ-1(Diciplinary/ Interdisciplinary Major) Theory	Biosphere & Environmental Factors	4	75	15	60
	MJ-1(Diciplinary/ Interdisciplinary Major) Practical		2	25		25
	CC-1 Common Courses	Languages and Communication Skills (Mordern Indian Language including TRL)	6	100		100
	CC-2	Understanding	2	100		100

	Common Courses	India				
	CC-3	Health & Wellness, Yoga Education, Sports & Fitness	2	100		100
	IRC-1	Introductory Regular Course-1	3	100		100
	IVS-1A	Introductory Vocational Studies-1	3	100		100
	MJ-2(Dicipinary/ Interdisciplinary Major) Theory	Productivity, Biogeochemical Cycles & Environmental Chemistry	4	75	15	60
	MJ-2(Dicipinary/ Interdisciplinary Major) Practical		2	25		25
	CC-4 Common Courses	Language and Communication Skills (English)	6	100		100
	CC-5 Common Courses	Mathematical & Computational Thinking Analysis	2	100		100
II	CC-6	Global Citizenship	2	100		100

		Education & Education for Sustainable Development				
	IRC-2	Introductory Regular Course-2	3	100		100
	IVS-1B	Introductory Vocational Studies-2	3	100		100
III	MJ-3(Diciplinary/ Interdisciplinary Major) Theory	Biomes & Habitat	4	75	15	60
	MJ-3(Diciplinary/ Interdisciplinary Major) Practical		2	25		25
	CC-7 Common Courses	Environmental Studies	3	100		100
	CC-8 Common Courses	Digital Education (Elementary Computer Applications)	3	100		100
	CC-9	Community Engagement & Services (NSS/NCC/ Adult	3	100		100

		Education)				
	IRC-3	Introductory Regular Course-3	3	100		100
	IAP	Inturnship/ Apprenticeship/ Project	4	100		100
IV	MJ-4(Diciplinary/ Interdisciplinary Major) Theory	Conservation of biodiversity & Wildlife Management	4	75	15	60
	MJ-5(Diciplinary/ Interdisciplinary Major) Theory	Water Ecology, Soil environment, Rock, Remote Sensing and GIS	4	75	15	60
	Practical based on MJ-4 and MJ-5(Diciplinary/ Interdisciplinary Major) Practical		4	25		25
	MN-1(Diciplinary/ Interdisciplinary Minor) Theory	Resources & Its Management	4	75	15	60
	MN-1(Diciplinary/		2	25		25

	Interdisciplinary Minor) Practical					
	VS-1 (Vocational Studies Minor)		4	100		100
V	MJ-6(Diciplinary/ Interdisciplinary Major) Theory	Environmental Pollution	4	75	15	60
	MJ-7(Diciplinary/ Interdisciplinary Major) Theory	Waste Management	4	75	15	60
	Practical based on MJ-6 and MJ-7(Diciplinary/ Interdisciplinary Major) Practical		4	25		25
	MN-2(Diciplinary/ Interdisciplinary Minor) Theory	Biological Instruments	4	75	15	60
	MN-2(Diciplinary/ Interdisciplinary Minor) Practical		2	25		25

	VS-2 (Vocational Studies Minor)		4	100		100
VI	MJ-8(Diciplinary/ Interdisciplinary Major) Theory	Environmental Laws & Environmental Impact Assesment	4	75	15	60
	MJ-9(Diciplinary/ Interdisciplinary Major) Theory	Population & Community	4	75	15	60
	Practical based on MJ-8 and MJ-9(Diciplinary/ Interdisciplinary Major) Practical		4	25		25
	MN-3(Diciplinary/ Interdisciplinary Minor) Theory	Ecological Statistics	4	75	15	60
	MN-3(Diciplinary/ Interdisciplinary Minor) Practical		2	25		25
	VS-3 (Vocational Studies Minor)		4	100		100

VII	AMJ-1 Advance Major Paper-1(Diciplinary/ Interdisciplinary Major) Theory	Bioremediation and Clean up of Environment	4	75	15	60
	AMJ-2 Advance Major Paper -2 (Diciplinary/ Interdisciplinary Major) Theory	Natural catastrophes and Disaster Management	4	75	15	60
	AMJ-2 Advance Major Paper -2 (Diciplinary/ Interdisciplinary Major) Practical		4	25		25
	RC-1(Research Methodology)		6	75	15	60
	RC-2 (Research Proposal)		4	100		100
	AMJ-3 Advance Major Paper -3 (Diciplinary/	Toxicology and their case studies	4	75	15	60

VIII	Interdisciplinary Major) Theory					
	AMJ-4 Advance Major Paper (Disciplinary/ Interdisciplinary Major) Theory	Environmental Economy and Green Chemistry	4	75	15	60
	Practical based on papers AMJ- 3 and AMJ-4 Advance Major Paper (Disciplinary/ Interdisciplinary Major) Practical		4	25		25
	RC-3 (Research Internship/Field Work)		4	100		100
	RC-4 (Research Report)		4	100		100
	VSR (Vocational Studies Associated with Research)		2	100		100
	Total			176		

Abbreviations:

CC	Common Courses
IRC	Introductory Regular Courses
IVS	Introductory Vocational Studies
IAP	Internship/Apprenticeship/ Project
VS	Vocational Studies
MJ	Major Disciplinary/Interdisciplinary Courses
MN	Minor Disciplinary/Interdisciplinary Courses
AMJ	Advance Major Disciplinary/Interdisciplinary Courses
RC	Research Courses
VSR	Vocational Studies associated with Research

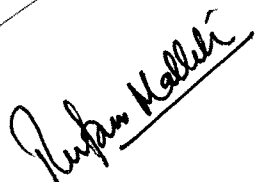
SEMESTER I

MJ-1(Disciplinary/ Interdisciplinary Major) Theory	Biosphere & Environmental Factor	(04 CREDITS) F.M :75, Int: 15, Ext: 60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit-I Ecosphere and their units

1. Biosphere
 - 1.1 History and importance of environmental science and Disaster management.
 - 1.2 Global concept of biosphere.
 - 1.3 Subdivision of Biosphere;
Lithosphere, Atmosphere, Hydrosphere.
 - 1.4 Impact of Man on Biosphere.

Unit-II Ecosystem Concept

- 2.1 Concept pertaining to ecosystem.
 - 2.1.1 Ecosystem – terrestrial & aquatic.
- 2.2 Ecosystem organization.
 - 2.2.1 Structure
 - 2.2.2 Function
 - 2.2.3 Concept of trophic level.
- 2.3 Food chain, food web, ecological pyramid.
 - Comparison of Ecosystem through biomass, number & energy.
- 2.4 system concept, system analysis, system measurement, concept of ecosystem dynamics, stability of ecosystem and control mechanism-homeostasis &

Unit-III Environmental factors

- 3.Environmental factors:
 - 3.1- Light - Response to plants & animals.
 - 3.2- Oxygen- Response to plants & animals.
 - 3.3- Heat – Response to plants & animals.

Unit-IV Light and Matter

- 4.1- Basic concepts of light & matter.
- 4.2- Relationship between energy, wavelength & frequency of Black body radiation.
- 4.3- Scattering of light – Rayleigh scattering, Mie scattering.

SEMESTER I

MJ-1(Diciplinary/ Interdisciplinary Major) Practical	Practical based on paper MJ-1	(02 CREDITS) F.M -25 External -25
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Sl no	Practical	Marks Distribution
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1	Ecological Instruments	2.5x2=5
2	Graphical representation	5
3	Mathematical analysis	10
4	Practical Record	2
5	Viva Voce	3
Total		25

1. **Ecological Instruments:** Studying of function and operation of important instrument and equipment: thermometer ,pH, conductivity meter, sampling bottle, plankton net , swedgewick rafter, noise level meter
2. **Graphical Representation:** Determine the area species curve by quadrat method, transect method.
3. **Mathematical Analysis:** Frequency, density, dominance calculation of the vegetation in nearby area quadrat, calculate important value index (IVI), by quadrat method and transect method.
4. Particle record.
5. Viva voice.

Reference Books:

1.E.P.Odum and G.W.Barrett.2005. Fundamentals of Ecology .

Cengage Learning India Pvt. Ltd.

2.J.S.Singh,S.P.Singh and S.R.Gupta.2008.Ecology,Environment & Resource Conservation.
Anamaya Publications.

Rupam Mallick

JS

Debul

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Anjan Kumar

SEMESTER II

MJ-2(Diciplinary/ Interdisciplinary Major) Theory	Productivity, Biogeochemical Cycles & Environmental Chemistry	4 credits F.M: 75, Int:15, Ext:60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit -I Productivity and their concept

- 1.1. Productivity in ecosystem- concept of Gross Primary Production, Net Primary Production, & Respiration
- 1.2. Production
 - 1.2.1 – primary production,
 - 1.2.2 – Factors affecting primary production
- 1.3 Secondary production-
 - 1.3.1 –Factors affecting secondary production.
 - 1.3.2- Efficiency of production at various levels, change in productivity.

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Unit-II Biogeochemical Cycle

2. Gaseous and Sedimentary cycle

2.1 Hydrological cycle.

2.2 Carbon cycle and oxygen cycle.

2.3 Nitrogen cycle

2.4 Phosphorus cycle.

2.5 Sulphur cycle.

Unit-III Ecosystem function

3.1 Energy flow through ecosystem-

Concept of energy, energy reaching the earth, light as an energy carrier, laws of thermodynamics with respect to light, concept of Entropy & Enthalpy

3.2- Energy fixation and production-

3.3 Energy model – single channel, and Y-shaped

3.4 Lindemann trophic Dynamic model and aspect.

Unit-IV : Environmental Chemistry

4.1- Environmental chemistry- Stoichiometry, Gibb's energy, chemical potential, chemical equilibrium, acid- base, solubility product, solubility of gases in water, carbonate and Bicarbonate systems, unsaturated and saturated hydrocarbons.

4.2- Principles of analytical method- Titration, and gravity method.

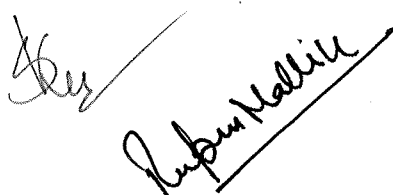
4.3- Molarity, Normality and Molality.

Reference Books:

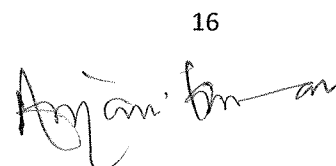
1. E.P. Odum and G.W. Barrett. 2005. Fundamentals of Ecology .

Cengage Learning India Pvt. Ltd.

2. J.S. Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment & Resource Conservation.
Anamaya Publications.


Ruben Mallik


Nand Lal


Anjan Kumar

SEMESTER II

MJ-2(Diciplinary/ Interdisciplinary Major) Practical	Practical based on paper MJ-2	2 credits F.M : 25, Ext : 25
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Sl no	Practical	Marks Distribution
1	Water analysis	10
2	Soil Analysis	5
3	Identification of common biota	2.5x2=5
4	Practical Record	2
5	Viva Voce	3
Total		25

1. **Water Analysis:** Analysis of common aquatic parameters: Oxygen, Carbon dioxide, pH, alkalinity.
2. **Soil Analysis:** Analysis of common soil parameters: physical Characters of soil, pH, alkalinity, water holding capacity of soil.
3. **Identification of common biota :** Common soil and aquatic biota
4. Practical record.
5. Viva-voice.

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Anjani Kumar

SEMESTER III

MJ-3(Diciplinary/ Interdisciplinary Major) Theory	Biomes & Habitat	4 Credits F.M : 75, Int:15, Ext :60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit-I Biomes and their Concept

- 1.1. Basic concepts of Biomes
 - 1.1.1 Principle Biomes of world.
 - 1.1.2. Principle Biomes of India.
 - 1.1.3. Factors affecting Biomes.
 - 1.1.4. Regional distribution of Biomes.

Unit-II Tropical and Temperate Biomes

2.1. Tropical Biomes

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Aditya

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2.1.1. Tropical rain forest – Tropical Wet Rainforest, Tropical Dry Rainforest, Nutrient Availability.

2.1.2. Tropical Desert.

2.1.3. Coastal Biomes.

2.2-Grassland Biomes

2.2.1. Tropical grasslands- savanna, chaparral.

2.2.2. Temperate grasslands- prairies and steppes.

Unit-III Tundra and Aquatic Biomes

3.1- Tundra & Taiga Biomes.

3.1.1 – Characteristics – Abiotic & Biotic.

3.1.2- Coniferous Forests- Alpine and sub-alpine.

3.1.3- Cold Desert.

3.2- Aquatic Biomes

Unit-IV Habitat and Niche

4.1. Habitat- Aquatic & Terrestrial,

4.2. Cause of Destruction of habitat

4.3. Niche Concept –Fundamental, Realized.

4.4. Habitat Management.

Reference Books:

- Begon, M., Townsend, C. R., and Harper, J. L..*Ecology from Individuals to Ecosystems*. Wiley-Blackwell, USA. 2005.
- Botkin, Daniel B. and Keller, Edward A. *Environmental Science: Earth as a Living Planet*. 6th ed. John Wiley & Sons, USA, 2007.
- Chapman, J. L. and Reiss, M. J. *Ecology: Principles and Applications*. Cambridge University Press, UK., 1998.
- Cunningham, W. P. and Cunningham, M. A. *Principles of Environment Science. Enquiry and Applications*. 2nd ed. Tata McGraw Hill, New Delhi, India, 2004

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SEMESTER III

MJ-3(Dicipinary/ Interdisciplinary Major) Practical	Biomes & Habitat	2 credits F.M :25, Ext : 25
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Sl no	Practical	Marks Distribution
1	Instrumental Analysis	2.5x2=5
2	Identification Analysis	5
3	Quantitative Analysis	5
4	Microbial Analysis	5
5	Practical Record	2
6	Viva Voce	3
Total		25

1. **Instrumental Analysis** - Principles of working of a spectrophotometer and chromatography, centrifuge.
2. **Quantitative Analysis** - Quantitative estimation of plankton using Sedgwick rafter.
3. **Identification analysis**- Identification of Common Planktons.
4. **Microbial analysis**- Introduction to microbiological lab, sterilization techniques, preparation of solid and liquid media, adjustment of pH of media.
5. Practical Record.
6. Viva voice

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SEMESTER IV

MJ-4(Dicipinary/ Interdisciplinary Major) Theory	Conservation of biodiversity & Wildlife Management	4 credits F.M :75, Int:15, Ext:60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit-I Biodiversity Conservation Concept

1.1 Biodiversity conservation

1.1.1 Concepts of Biodiversity.

1.1.2. Levels of Biodiversity.

1.1.3 Types of Biodiversity.

1.1.4- Distribution of Biodiversity.

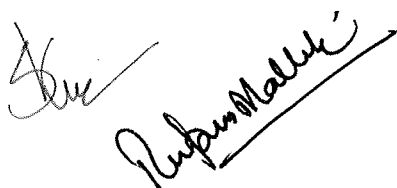
1.2- Loss of Biodiversity.

1.2.1- Cause of loss of Biodiversity –

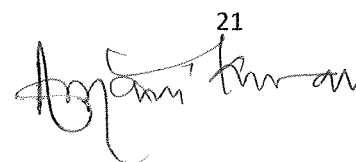
- Natural Causes.
- Anthropogenic Causes.

1.2.2- Needs for conservation of Biodiversity.

Unit- II Biodiversity Management







- 2.1 . Biodiversity Management.
- 2.1.1. Concept of Biodiversity Management.
- 2.1.3. Conservation of Biodiversity & its strategies.
- 2.1.4- In-situ conservation, ex-situ conservation.

Unit-III Threat on Biodiversity

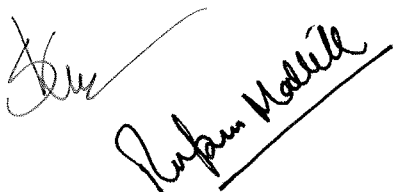
- 3.1- Threats of Biodiversity.
- 3.1.1- Natural & Anthropogenic.
- 3.1.2- Species Extinctions.
- 3.1.3- IUCN threatened categories.
- 3.1.4. Red Data Book, Invasion; causes and impact,
- 3.1.5. Biodiversity Hotspots; concept, distribution & importance.
- 3.1.6. Use of Biodiversity; Sources of food, Medicines, Raw material, Aesthetic, cultural, Biodiversity prospecting.

Unit- IV Wild management

- 4.1. Wildlife management.
- 4.2. National Park, Biosphere reserve, Sanctuary.
- 4.3. Concept of various conservation, project implemented in India.
- 4.3.1-Project Tiger.
- 4.3.2- Project Rhino.
- 4.3.4- Project Elephant.

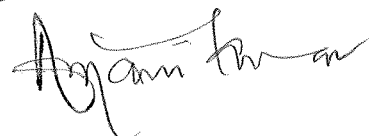
Suggested Readings:

- Begon, M., Townsend, C. R., and Harper, J. L..*Ecology from Individuals to Ecosystems*. Wiley-Blackwell, USA. 2005.
- Botkin, Daniel B. and Keller, Edward A. *Environmental Science: Earth as a Living Planet*. 6th ed. John Wiley & Sons, USA, 2007.
- Chapman, J. L. and Reiss, M. J. *Ecology: Principles and Applications*. Cambridge University Press, UK., 1998.
- Cunningham, W. P. and Cunningham, M. A. *Principles of Environment Science. Enquiry and Applications*. 2nd ed. Tata McGraw Hill, New Delhi, India, 2004.









SEMESTER IV

MJ-5(Diciplinary/ Interdisciplinary Major) Theory	Water Ecology, Soil environment, Rock, Remote Sensing and GIS	4 Credits F.M :75, Int.-15, Ext:-60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit- I Fresh, Marine & Estuaries.

- 1.1. Fresh habitat, lentic & lotic habitat.
- 1.2. Physical, chemical & Biological characteristics of fresh water & Marine.
- 1.3. Marine habitat, Zonation, Types of shores, Deep Sea adaptations.

Unit- II Estuaries & Soil habitat

- 2.1. Estuaries, formation, characteristics, adaptations of organisms living in it.
- 2.2. Important Estuaries in India.
- 2.3. Soil: Formation, profile, Zonation, Classification and types of soil found in India.

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2.4. Physical, Chemical and biological Characteristics, C:N ratio, Soil indicator factors affecting soil quality – harvesting fertilizer.

Unit –III Rocks

3.1. Structure of Earth, Composition of Earth.

3.2. Rocks: Definition, Formation, Types of rocks, distribution of rocks in India.

Unit- IV Remote sensing and GIS.

4.1. Remote sensing, Physical basis for remote sensing, Remote sensing process, Platforms and sensors for Remote sensing, Remote sensing satellite, Ground station, systems for data collection, Passive system and active system.

4.2. Microwave Remote sensing.

4.3. Applications of Remote sensing.

4.4. Geographic Information system: Basic concepts, GIS tools and components, data for GIS procedure perspective for GIS.

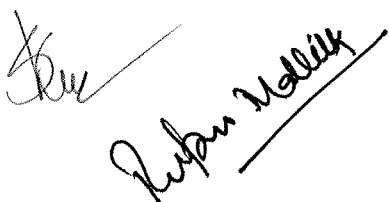
4.5. Information of related system in GIS, Application of GIS.

Suggested Readings Books:

1. Anne E. Magurran. 2003. Ecological diversity and its measurements. Blackwell Publications.
2. J.S.Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment and Resource Conservation. Anamaya Publications (New Delhi).
3. V.H. Heywood and Watson R.T. (Ed). 1995. Global Biodiversity Assessment: UNEP.

SEMESTER IV

MJ-4 &MJ-5(Dicipinary/ Interdisciplinary Major) Practical	Practical Based on paper MJ-4 and MJ-5 (Major Paper)	4 credits, F.M -50, Ext: 50
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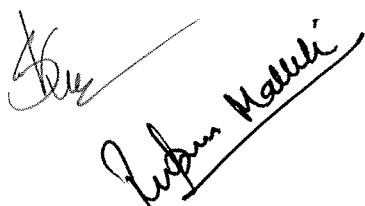
Sl no	Practical	Marks Obtained
1	Water analysis	15
2	Soil forming rocks analysis	10
3	Microbiological analysis	10
3	Project of nearest habitat visited	5
4	Practical record	5
5	Viva voce	5
Total		50

1. Measurement of chloride in water sample.
2. Measurement of phosphate in a water sample.
3. To Analysis the physiological characters of soil forming rocks.
4. Microbiological analysis- Inoculation of bacteria from soil and water, growth of bacteria, Identification of bacteria by gram staining.
5. Preparation of project on a habitat visited.
6. Viva- voce and Practical Record.

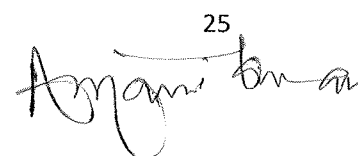
Semester IV

MN-1(Dicipinary/ Interdisciplinary Minor) Theory	Resources & Its Management	4 Credits F.M -75, Int-15, Ext-25
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.





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Unit-I Traditional Resource

- 1.1- Concept of conventional & non-conventional resources.
- 1.2- India's present generation of energy from various source & future planning.
- 1.3- Thermal energy.
- 1.4- Hydroelectrical electricity.
- 1.5- Nuclear power generation.

Unit-II Green resource

- 2.1- Wind power
- 2.2- Water power.
- 2.3- Solar power.
- 2.4- Biomass power.
- 2.5- Geo-thermal energy, OTEC, Hydrogen power.

Unit-III Mineral Resources and Agriculture


- 3.1- Mineral resources- Types of minerals, Distribution of minerals in India & Jharkhand.
- 3.2- Agricultural resources- Farm system & their types of farming.
- 3.3- Agricultural development in India.
- 3.4- Human resources.



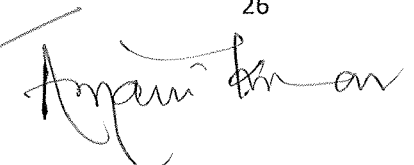
Unit-IV Conservation of Resources

- 4.1- Conservation of resources- Basic concept
- 4.2- Carrying capacity & Optimum capacity.
- 4.3- Conservation of Non- renewable resources.
- 4.4- Conservation of water resources.
- 4.5- Conservation of Forest resources.

Suggested Readings Books:

1. Anne E. Magurran. 2003. Ecological diversity and its measurements. Blackwell Publications.
2. J.S.Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment and Resource Conservation. Anamaya Publications (New Delhi).
3. V.H. Heywood and Watson R.T. (Ed). 1995. Global Biodiversity Assessment: UNEP.


Ruban Mallik

SEMESTER IV

MN-1(Diciplinary/ Interdisciplinary Minor) Practical	Practical Based on paper MN-1 (Minor Paper)	2 credits, F.M -25, Ext: 25
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SI no	Practical	Marks Obtained
1.	Forestry Management	10
2	Vermicomposting	5
3	Seed balls preparation/ Analysis of Carbon Content	5
4	Practical Record	3
5	Viva Voce	2

1. Demonstration of Forestry management: pisciculture, sericulture, apiculture.
2. Preparation of vermicompost.
3. Preparation of seed balls for planting trees.
4. Analysis of carbon content in vermiculture.
5. Practical Record
6. Viva Voce

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SEMESTER V

MJ-6(Diciplinary/ Interdisciplinary Major) Theory	Environmental Pollution	4 credits F.M : 75, Ext: 60, Int: 15
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit – I- Water pollution.

1.1.1. Concept of pollution: types of pollutants


1.1.2. Entry into the environment and biological systems.

1.1.3. Bioaccumulation, Biomagnification, stress & strain.

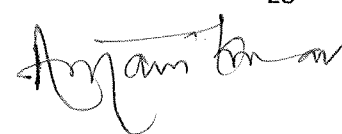
1.2. Water pollution: definition standards of potable and drinking water, sources of water, Eutrophication, effects, prevention and control, treatment

1.3-Standards of water; Drinking water, effluent water, sewage water and world health organization guideline.

Unit- II- Air pollution.


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2.1. Air pollution- Definition, Ambient standards, Air pollution types; Primary(SO_x, NO_x, hydrocarbons, CO_x, and SPM), secondary pollutant (Acid rain, Photochemical smog, greenhouse gases and Ozone depletion) Automobile pollution & it's effect and control measures,

2.2. classification of pollutant on the basics on criteria air pollutants.

Unit- III: Soil pollution

3.1. Soil pollution: Definition, sources, types, effects and control.

3.2. Factors affecting soil quality –harvesting, fertilizers and insecticides and pesticides.

3.3. Standards of soil quality.

Unit-IV. Soil, Noise and Radiation pollution.

4.1. Noise- Sources, effects and control measures, Types of diseases due to noise pollution.

4.2. Noise quality standards.

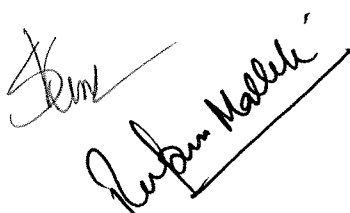
4.3. Basic concepts, Types of Radioactive pollutants, Hazards.

4.4. Control measures.

4.5. Case study of Nagasaki & Hiroshima, Chernobyl disaster.

Suggested Readings:

- 1. A. K. De. (3rd Ed). 2008 Environmental Chemistry. New Age Publications India Ltd.
- 2. I. C. Shaw and J. Chadwick. 1997. Principles of Environmental Toxicology. Taylor& Francis Ltd.
- 3. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
- 4. Ira. S. Richards. 2008. Principles and Practices of Toxicology in Public Health. Jones and Barlett Publications


Anurag Mallik






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SEMESTER V

MJ-7(Diciplinary/ Interdisciplinary Major) Theory	Waste Management	4 credits F.M : 75, Int: 15, Ext: 60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit- I Waste concepts.

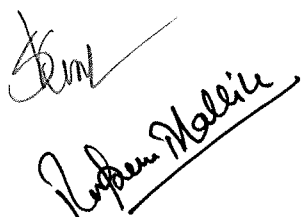
1.1-Basic concepts of waste – types, sources and separation of wastes
; solid waste, liquid waste, hazardous wastes.

1.2-Characteristics of municipal solid waste, Biomedical waste, effects of solid waste on environment, human health, Aquatic bodies, Mines wastes.

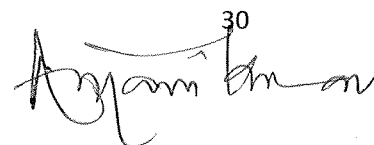
Unit- II Waste management.

2.1- Different techniques on collection, storage, transformation and disposal of solid waste.

2.2. Waste water treatment.


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G.S. Nandani


Anjan Kumar

2.3. Common effluent Treatment Plant.

Unit-III Waste recycle and their treatment

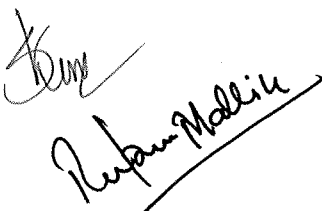
- 3.1. Concept of 3 R's- Reuse, reduce & recycle.
- 3.2. Biological processing – Composting, Aerobic & Anaerobic digestion.
- 3.3. Physical processing- Incineration, Pyrolysis.

Unit-IV Biomedical waste

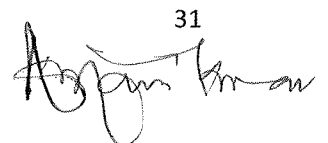
- 4.1. Biomedical wastes- Types of solid waste, liquid waste, Blood and Blood tissue, sharp medical tools.
 - 4.1.1. Biomedical waste management-Transportation and storage of waste.
 - 4.1.2. Decomposition of biomedical wastes.
- 4.2. Radioactive waste
 - 4.2.1-Basic concepts and types.
 - 4.2- Storage & transportation of radioactive wastes.
- 4.3- Decomposition of Radioactive wastes.

Suggested Reading

- Acharya, D.B. and Singh, M. *Hospital Waste Management*. Minerva Press, Delhi. 2003.
- Alleman, J. E. and Karanagh, J. T. *Industrial Waste*. Ann Arbor Science.1982.
- Bhatia, S.C. *Solid and Hazardous Waste Management*. Atlantic Publishers.2007.
 - Blackman, W.C. *Basic Hazardous Waste Management*. CRC Press, USA. 2001.
 - Evans, G. *Biowaste and Biological Waste Treatment*. James and James (Science Publishers) Ltd, U.K. 2005.
 - Hasan Syed E. *Geology and Hazardous Waste Managemet*, Prentice Hall, USA, 1996.
 - Kreith, F. *Handbook of Solid Waste Management*. McGraw Hill Publishers, USA. 22,1999
 - LaGrega M.D., Buckingham, P.L. and Evans J.C., *Hazardous Waste Management*, McGraw Hill International Publications, Singapore, 1994 – Revised Edition Available – ISBN 0-07-113454-9.








- Moore, J. W. *The changing Environment*. Springer-Verlag. 1986.

SEMESTER V


MJ-6 &7(Diciplinary/ Interdisciplinary Major) Practical	Practical Based on paper MJ-6 and MJ-7 (Major Paper)	4 credits F.M -50, Ext : 50
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Sl no	Practical	Marks Distribution
1	Capillary rise experiment	10
2	Ion exchange analysis	15
3	Soil Temperature analysis	5
4	Chemical Analysis	10
5	Practical Record	5
6	Viva Voce	5
Total		50

1. Determination of capillary rise phenomenon of water in soil column.
2. Determination of soil temperature by using soil thermometer
3. Determination of Organic carbon from soil sample.
4. Determination of anion exchange capacity of soil.
5. Determination of cation exchange capacity of soil
6. Project .Report
7. Practical record.
8. Viva- voice.


Rupam Mallik


S. S. Nandi


Anjan Kumar

Semester V

MN-2(Dicipinary/ Interdisciplinary Minor) Theory	Biological Instruments	4 Credit F.M -75, Int-15, Ext-25
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit- I: Basic instrument and their concept

- 1.1- Basic concepts, Need for ecological & biological instruments.
- 1.2- Basic biological Instrument:
pH meter and autoclave.
- 1.3- Centrifuge & it's types.
- 1.4- Spectrophotometer & calorimeter.

Unit- II: Chromatography

- 2.1- Chromatography – and their types.
- 2.2- Technique & principle of chromatography.
- 2.3- Thin layer chromatography & paper chromatography.

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2.4- Ion- exchange chromatography.

2.5- Gas chromatography.

Unit- III: Air analysis instrument

3.1- High volume sampler

3.2- Respirable dust sampler.

3.3- BOD incubator, Sedgewick Rafter, Secchi Disk, Desiccator, laminar hood,

Unit IV: Sound and waste analysis instrument

4.1 Sound level meter

4.2 Incinerator

4.3 Microwave

4.5 Gasification & pyrolysis chamber

Suggested Readings Books:

- Handbook of Biological Instruments, S. Chand Publications
- APHA

SEMESTER V

MN-2(Dicipinary/ Interdisciplinary Minor) Practical	Practical based on paper MN-2	2 Credit F.M -75, Int-15, Ext- 25
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Sl no	Practical	Marks Distribution
1	Demonstration of Instruments	5
2	Noise analysis in College premises	10
3	Conclusion from noise sensitive zones	5
4	Practical Record	2
5	Viva voce	3

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Total	25
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1. Demonstration of Noise pollution measuring instruments
2. Calculation of noise level in your College.
3. Calculation of Noise level in Heavy Populated areas.
4. Calculation Of Noise level in Silence zones.
5. Practical Record.
6. Viva Voice.
7. Project.

SEMESTER VI

MJ-8(Diciplinary/ Interdisciplinary Major) Theory	Environmental Laws and Environmental Impact Assesment	4 Credits F.M -75, Int-15, Ext- 60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.



- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

- **Unit I -Environmental Laws & policies.**

- 1.1. The Air (prevention & control of pollution Act) ,1981.
- 1.2. The water (prevention & control of pollution Act) ,1974.
- 1.3. The motor vehicle, 1988.
- 1.4. The environmental protection Act ,1986.
- 1.5. The wildlife protection Act, 1972.
- 1.6. Hazardous waste management & handling rules,1989.
- 1.7. Biomedical waste management & handling rules, 1998.
- 1.8. Forest Protection Act 1980.

- **Unit- II Environmental Policies.**

- 2.1. Rio de Janeiro: earth Summit
- 2.1. Stockholm conference 1972.
- 2.2. National environmental policy 2006.
- 2.3. Establishment of National green Tribunal.
- 2.4. Duties of pollution control board.
- 2.5. Earth summit.
- 2.6. Montreal control & Kyoto protocol.
- 2.7. Vienna convention.
- 2.8. Case studies of – Sardar Sarovar Dam, Project Tehri, Project Narmada Bachao Anadola, Chipko movement, Silent Valley Project. National Heritage sites of India.

- **Unit-III Environment Impact Assessment.**

- 3.1.EIA- Introduction, definition and concepts.
- 3.2. Scope & methodologies of EIA, EIA Regulations, social impacts.
- 3.3. Role of Project proponents, developers & consultants.
- 3.4- Terms of Reference, Impact Identification, and Prediction, EIS and EMP.

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- **Unit-IV Life cycle Assessment and ISO series**
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- 4.1. Life cycle Assessment
- 4.2. Environmental planning & Environmental Audit.
- 4.3. ISO Guidelines.
- 4.4. ISO 14000 series.

Suggested Readings:

- 1) Edgar G. et al, 2008, Environmental education, Sense Publishers
- 2) J.M. Haris, 2017, Environmental & natural Resource Economics: A Contemporary approach, 4th Edition, Routledge Publishers.

SEMESTER VI

MJ-9(Diciplinary/ Interdisciplinary Major) Theory	Population & Community	4 Credit F.M -75, Int-15, Ext-60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.

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- Numbers in right indicates full marks of the questions.

Unit I Population.

- 1.1 . Population concept: Natality, Mortality, Immigration, Emigration and Carrying Capacity.
- 1.2. Age structure & significance.
- 1.3. Survivorship curves, Demographic transition.

Unit-II Population attribute

- 2.1. Population growth rate.
- 2.2. Pearls –verhulst equation.
- 2.3. Population Regulation
- 2.4. Human Population and Environmental Impact
- 2.5. Population and its Impact on Resources

Unit III Community

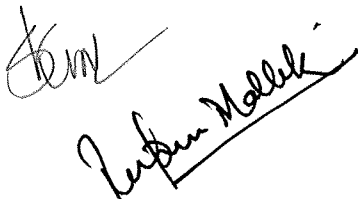
- 3.1. Community – Concepts
- 3.2. Factors affecting Community
- 3.3. Distribution of Community in Tropical and Sub- Tropical Regions
- 3.4. Community Organization and Stratification

Unit IV Biogeography and Succession

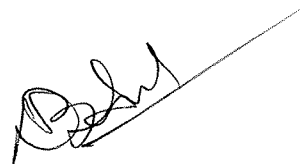
- 4.1. Concept of Biogeography
- 4.2. Biogeographic Regions and Continental Drifting
- 4.3. Community Development
- 4.4. Succession – Primary Successions, Secondary Succession, Climax with respect to different Ecosystem.

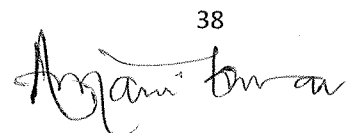
Suggested Readings:

- 1) Edgar G. et al, 2008, Environmental education, Sense Publishers
- 2) J.M. Haris, 2017, Environmental & natural Resource Economics: A Contemporary approach, 4th Edition, Routledge Publisher.


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SEMESTER VI

<p align="center">MJ-8 & MJ-9(Diciplinary/ Interdisciplinary Major) Practical</p>	<p align="center">Practical based on MJ-8 & MJ-9</p>	<p align="center">2 Credit F.M -50, Ext-50</p>
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Sl no	Practical	Marks Distribution
1	Air pollutant analysis	20
2	Microbial analysis	15
3	Air Pollutant analysis	5
4	Practical record	5
5	Viva voce	5
Total		50

- Calibration of High Volume Sampler
- Estimation of SPM, PM 2.5, PM10,
- Estimation of SO_x, NO_x, CO_x
- Culture of aeromicrobes from air.
- Microbial analysis- Standard plate count method, counting of bacteria..
- Practical Record
- Viva Voce

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SEMESTER VI

MN-3(Diciplinary/ Interdisciplinary Minor) Theory	Ecological Statistics	4 Credit F.M -75, Int-15, Ext-25
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit I: Data and structure

- 1.1 Data, sampling and structure
- 1.2 Data types and sampling
- 1.3 Data collection and organization

Unit II Central Tendency and Correlation

- 1.1 Central Tendency- Mean, Median and Mode.
- 1.2 Measure of Dispersion- Standard deviation, standard error, variance.
- 1.3 Co- relation and regression.

Unit III Parametric test and Non-Parametric Test

- 3.1 T- Test
- 3.2 Chi- square test

3.3 ANOVA

3.4 F- test

Unit IV: Graph and its Application

4.1 Importance of Graph.

4.2 Construction of Bar graph.

4.3 Dendrogram.

4.4 Histogram.

4.4 Pie Chart.

Suggested Readings:

- S. Chand publications, Biostatistics.
- 1. A. K. De. (3rd Ed). 2008 Environmental Chemistry. New Age Publications India Ltd.
- 2. I. C. Shaw and J. Chadwick. 1997. Principles of Environmental Toxicology. Taylor& Francis Ltd.
- 3. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
- 4. Ira. S. Richards. 2008. Principles and Practices of Toxicology in Public Health. Jones and Barlett Publications

Semester VI

MN-3(Dicipinary/ Interdisciplinary Minor) Practical	Ecological Statistics	2 Credit F.M -25, Ext-25
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SI no	Practicals	Marks Distribution
1.	Sampling	5

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2	Central Tendency Calculation	5
3	Co-relation / T-test calculation	10
4	Practical record	2
5	Viva voce	3

1. Demonstration about sampling and its different types.
2. Demonstration about data and its types.
3. Calculation of central tendency- mean, median and mode.
4. Calculation of standard derivation and standard error from given data.
5. Calculation of co-relation of different data.
6. Calculation of t-test.
7. Calculation of one way ANNOVA.

SEMESTER VII

AMJ-1(Diciplinary/ Interdisciplinary Major) Theory	Bioremediation and clean up of environment	4 Credit F.M -75, Int-15, Ext-60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit I: Pollutant and their remediation

- 1.1. Basics concept of pollutant.
- 1.2. Bioremediation- Concept, need and scope

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1.2.1. Types of Bioremediations

1.3. Concept of Bioreactor and their types.

1.4. Environmental application on bioremediation and their case study.

Unit II: Phytoremediation and Medicinal Plants

2.1. Basics concept of Phytoremediation.

2.2. Biological cleanup of environment with plants and their case studies.

2.3. Medicine Plants and their roles.

2.4. Project on medicinal plants.

Unit III: Afforestation and Forestry

3.1 Afforestation

3.2 Forestry and their basics concept

3.3. Commercial forestry, production forestry, Social forestry and Argo forestry.

Unit IV: Eco-restoration

4.1. Eco-restoration- Basic Concepts and type.

4.2. Eco-restoration – process and Utilization.

4.3. Case study on eco restoration

Suggested Readings:

- 1. A. K. De. (3rd Ed). 2008 Environmental Chemistry. New Age Publications India Ltd.
- 2. I. C. Shaw and J. Chadwick. 1997. Principles of Environmental Toxicology. Taylor & Francis Ltd.
- 3. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
- 4. Ira. S. Richards. 2008. Principles and Practices of Toxicology in Public Health. Jones and Barlett Publications

SEMESTER VII

AMJ-2(Diciplinary/ Interdisciplinary Major) Theory	Natural Catastrophes and Disaster Management	4 (Credit) F.M -75, Int-15, Ext-60
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit I: Natural Catastrophes

1.1. Definition and types of natural Catastrophes

1.2. Geohazard – earthquakes

1.2.1. landslide

1.2.2. tsunami and

1.2.3. volcanoes

Unit II: Hydro Hazard

2.1 Basic concept of hydro hazard and

2.1.1. Flood and its types

2.1.2. Hazard associated with flood.

2.1.3. Atmospheric hazard: cyclones, drought and famines

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Unit III: Disaster management

3.1.1 Pre disaster & Post Disaster Management

3.2.2. Risk Assessment;

3.2.3. Role of administrator, Scientists, Planners, Volunteers, and community in disaster mitigation;

Unit IV: Awareness, Training and Alarming

4.1.1 Public awareness, drills and training,

4.2. Forecasting, Warning systems including tsunami warning system

4.3. Disaster management in relation to earthquakes and floods.

Suggested Readings:

- 1. A. K. De. (3rd Ed). 2008 Environmental Chemistry. New Age Publications India Ltd.
- 2. I. C. Shaw and J. Chadwick. 1997. Principles of Environmental Toxicology. Taylor& Francis Ltd. .
- 3. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
- 4. Ira. S. Richards. 2008. Principles and Practices of Toxicology in Public Health. Jones and Barlett Publications

SEMESTER VII

AMJ-1 & AMJ-2(Diciplinary/ Interdisciplinary Major) Practical	Practical Based on AMJ-1& AMJ-2	4 (Credit) F.M -50, Ext-50
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Sl no	Practicals	Marks distribution
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1.	Serial Dilution	10
2.	Microbial analysis Instruments	10
3.	Media preparation / Isolation of Bacteria	10
4.	Gram Staining	10
5.	Practical Record	5
6.	Viva voce	5
	Total	50

1. Demonstration of Serial Dilution of water/sample for microbial analysis.
2. Demonstration of different Microbiological Instruments for microbial analysis of water/soil sample.: Autocleave, Laminar Hood, BOD incubator, Shaker, Centrifuge.
3. Preparation of agar media for bacterial growth.
4. Gram staining for identification of gram positive/ gram negative bacteria growth.
5. Preparation of mother culture from water sample.
6. Inoculation of air borne / aeromicrobes from air.
7. Practical Record
8. Viva Voce








SEMESTER VIII

AMJ-3(Diciplinary/ Interdisciplinary Major) Theory	Toxicology and their case studies	4 (Credit) F.M -75, Int-15, Ext-25
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit I: Toxicology

- 1.1. Toxicology: Definition, Branches
- 1.2. Dose- Response relationship graded, quantal.
- 1.3. Different types of toxicants and their effects.

Unit II: Effect of Toxicology and Measurement

- 3.4 . Types of effects:
 - 3.4.1. Physiological
 - 3.4.2. Behavioral
 - 3.4.3 Teratogenic,

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Rupam Malik
S. Nantoff
B. B. B.
Anjan Kumar

3.4.4. Mutagenic, carcinogenic: effect at cellular level.

3.4.5. Probit scale.

Unit III: Biomagnification

3.1. Biomagnifications

3.2. Bioaccumulation

3.3. Bio concentration

IV: Case studies

4.1. Diseases due to air born microbes

4.2. Disease due to water pollution: Dysentery, Cholera, Typhoid

4.3. Disease due to heavy metal – Minamata disease, blue baby syndrome and Etai – Etai

Suggested Readings:

- 1. A. K. De. (3rd Ed). 2008 Environmental Chemistry. New Age Publications India Ltd.
- 2. I. C. Shaw and J. Chadwick. 1997. Principles of Environmental Toxicology. Taylor & Francis Ltd.
- 3. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
- 4. Ira. S. Richards. 2008. Principles and Practices of Toxicology in Public Health. Jones and Barlett Publications

SEMESTER VIII

AMJ-4(Dicipinary/ Interdisciplinary Major) Theory	Environmental Economy and Green Chemistry	4 (Credit) F.M -75, Int-15, Ext-25
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- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (5x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x15).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit I : Environmental Economic

- 1.1. Environmental Economics.
- 1.2. Basic Concepts of environmental economics, its applications.
- 1.3. Cost Benefit Analysis, Morals & Ethics.
- 1.4. Environmental Protection, Ecology VS Economy.

Unit II: sustainable development and Environment Education

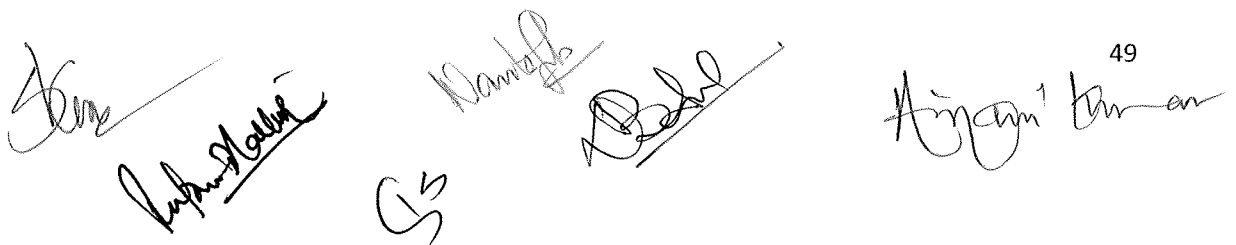
- 2.1. Sustainable Development: Concepts of Sustainable development.
- 2.2. Carrying Capacity- Definition & Scope of Development Planning.
- 2.3. Environmental Education.
- 2.4 Institutes & Research Centers in INDIA.

Unit III: Green Chemistry

- 3.1 Green chemistry basics concept.
- 3.2. Clean fuel: basic concept.
- 3.3 Clean coal technology.
- 3.4 Bio diesel.

Unit IV: Resource and their Initiative for Implementation.

- 4.1. Scenario for renewable resource in India


 The bottom of the page features several handwritten signatures and initials. From left to right, there is a signature that appears to be 'S. S.', followed by 'S. S.', 'Nandya', 'D. D.', and 'Anjan' with 'an' written below it.

4.2. Step taken by Indian government to mitigate energy need

4.3. National energy Policy

4.4. Energy audit.

Suggested Readings:

- 1. A. K. De. (3rd Ed). 2008 Environmental Chemistry. New Age Publications India Ltd.
- 2. I. C. Shaw and J. Chadwick. 1997. Principles of Environmental Toxicology. Taylor & Francis Ltd.
- 3. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
- 4. Ira. S. Richards. 2008. Principles and Practices of Toxicology in Public Health. Jones and Barlett Publications

SEMESTER VIII

AMJ-3 & AMJ-4(Dicipinary/ Interdisciplinary Major) Practical	Practical Based on AMJ-3& AMJ-4	4 (Credit) F.M -50, Ext-50
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Sl no	Practicals	Marks Distribution
1.	Biodegradable/ Nonbiodegradable pesticides	5
2.	Water analysis	10
3.	Microbiological analysis	15
3.	Soil analysis	10
4.	Practical Record	5
5.	Viva Voce	5

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1. Demonstration of Biodegradable and nonbiodegradable pesticides used in soil agriculture.
2. Estimation of Organic carbon load in water sample.
3. Estimation of Flouride concentration in water sample.
4. Standrad Plate count (SPC) count for bacterial growth of water sample.
5. Most Probable Number (MPN) count for biological analysis of water Sample.
6. Estimation of toxic heavy metals like Zinc, Chromium, Nickel, cobalt in water sample.
7. Estimation of pesticides in soil sample.

SKM

Rupam Halder

S

Kanishk

Debi

*Ayan*⁵¹

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD
FOUR YEAR UNDERGRADUATE PROGRAMME
INTRODUCTORY REGULAR COURSE - ENVIRONMENTAL SCIENCE
COMMON COURSE (ALL COURSES)

F. M- 100

Total Credits: 3

- There will be two groups Group A and Group B.
- Group A will be compulsory questions. Q.1 will be very short answer types/ multiple choice questions carrying 1 marks each (10x1). Q.2 and Q.3 will be of short answer type carrying 5 marks each. (5x2).
- Answer four out of six questions subjective / descriptive questions given in group B (4x20).
- Answer in your own words as far as practicable.
- Answer all sub parts of a question at one place.
- Numbers in right indicates full marks of the questions.

Unit- I: Environment Concept

1.Environment

1.1 .1. Physical elements- light, Temperature, soil, Rainfall.

1.1.2. Chemical elements- Carbon, oxygen, hydrogen.

1.1.3. Biological elements- Floras & Faunas.

1.2. Atmospheric environment--Definition, layers of atmosphere.

1.5- Lithosphere: Structure of Earth.

1.6-Hydrosphere: Sources & distribution.

Unit-II: Ecology and Ecosystem.

2.1. Definition of ecology.

2.2. Abiotic & Biotic factors.

2.3. Ecosystem.

2.3.1-Types of Ecosystems.

2.3.2- Components of ecosystem.

2.4. Food chain, Food web & Trophic level.

2.5. Ecological Pyramids.

Unit-III: Resources and their conservation

3.1- Resources & their types.

3.1.1-Renewable resources- solar, wind & Geothermal

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- 3.1.2- Non-renewable resources-Coal, Petroleum & minerals.
- 3.2-Conservation of Resources.
- 3.3-Sustainable development.

Unit- IV: Environmental pollution.

- 4.1- Air pollution- concept & their cause.
- 4.2-Water pollution- concept & their cause.
- 4.3- Soil pollution- concept & their cause.
- 4.4- Noise pollution- concept & their cause.

Unit-V: Environmental Education & Awareness.

- 5.1- Need for environmental education.
- 5.2-Definition of environmental education with respect to multidisciplinary subject.
- 5.3- Environmental awareness programmes.
 - Governmental initiatives.
 - Non- governmental initiatives.
- 5.4- Environmental issues in India.
- 5.5- Major environmental projects & movements in India
 - Sardar Sarovar Dam
 - Chipko Andolan.
 - Tehri Dam

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