

Syllabus For
Bachelor of Science in Environmental Science (Honours)
Under Choice Based Credit System

Academic Session

w.e.f. 2020-2023



For

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

**Members of Board of Studies of CBCS under Graduate Syllabus as Per
Guidelines of Binod Bihari Mahto Koyalanchal University, Dhanbad**

| Sl. No. | Name | Signature |
|----------------|---|-------------------|
| 1. | Dr. Shailendra Kumar Sinha Associate Professor Head University Dept. of Zoology BBMKU, Dhanbad | – Chairman |
| 2. | Dr. Birendra Kumar, Associate Professor Dean Faculty of Science, BBMKU, Dhanbad | -Invited Member |
| 3. | Dr. Lal Bihari Singh DSW, BBMKU, Dhanbad. | - Invited Member |
| 4. | Dr Biswaroop Mukherjee, Professor, University Dept. Of Zoology, Ranchi. | - External Expert |
| 5. | Dr. J.N. Singh, Principal, R.S.P. College, Jharia. | - Member |
| 6. | Dr. Navita Gupta Associate Professor, University Dept. of Zoology, BBMKU, Dhanbad. | - Member |
| 7. | Dr. Rupam Mallik, Assistant Professor, University Dept. of Zoology, BBMKU, Dhanbad. | - Member |
| 8. | Dr, Sarita Murmu, Assistant Professor, University Dept. of Zoology, BBMKU, Dhanbad. | - Member |
| 9. | Dr. Ashok Kumar Mandal, Assistant Professor (Co-ordinator), Dept. Environmental Science, PKRM College, Dhanbad | - Member |

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Course Structure

For Practical Subjects

| Sl n o | Semeste r | Course Code | Name of Paper | Full Marks | End Semest er Marks | Mid Semeste r Marks |
|--------------|--------------|---|--|------------------------|------------------------------|---------------------------|
| 1 | I | ENV-H-C-101-T (04 CREDITS, 60 hr, Teaching) | Fundamentals of Ecology | 75 | 60 | 15 |
| | | ENV-H-C-102-T (04 CREDITS,60 hr, Teaching) | Environmental factors & Environmental Physics | 75 | 60 | 15 |
| | | ENV-H-C-101&102-P (04 CREDITS, 60*2 hr, Teaching) | Practical based on Course ENV-H-C- 101&102 | 50 | 40 | 10 |
| | | ENV-H-GE-101-T (04 CREDITS,60 hr, Teaching) ENV-H-GE-101-P 02 CREDITS, 30 hr, Teaching) Choice to choose from other disciplines (Annexure -2) | Chemistry | 75 Or 25 | 60 Or 20 | 15 Or 5 |
| | | ENV-H-AECC-101-T Language (English/Hindi/NH+M B) (02 Credits, 30 lectures) | | 50 | 40 | 10 |

| | | | | | | |
|---|-----|---|--|------------------------|------------------------|-----------------------|
| 2 | II | ENV-H-C-203-T (04 CREDITS, 60 hr, Teaching) | Productivity & Energy Flow | 75 | 60 | 15 |
| | | ENV-H-C-204-T (04 CREDITS,60 hr, Teaching) | Biogeochemical Cycles & Environmental Chemistry | 75 | 60 | 15 |
| | | ENV-H-C-203 &204-P (04 CREDITS, 60*2 hr, Teaching) | Practical based on courses ENV-H-C- 203&204 | 50 | 40 | 10 |
| | | ENV-H-GE-202-T (04 CREDITS,60 hr, Teaching) ENV-H-GE-202-P 02 CREDITS, 30 hr, Teaching) Choice to choose from other disciplines (Annexure -2) | Chemistry | 75 Or 25 | 60 Or 20 | 15 Or 5 |
| | | ENV-H-AECC-202-T (Environmental Studies) (02 Credits, 30 hr, Teaching) | | 50 | 40 | 10 |
| 3 | III | ENV-H-C-305-T (04 CREDITS, 60 hr, Teaching) | Biomes & Habitat | 75 | 60 | 15 |
| | | ENV-H-C-306-T (04 CREDITS,60 hr, Teaching) | Population & Community | 75 | 60 | 15 |
| | | ENV-H-C-307-T (04 CREDITS,60 hr, | Biological & Environmental | 75 | 60 | 15 |

| | | | | | | |
|---|----|--|---|--------------------|--------------------|-------------------|
| | | Teaching) | Instruments | | | |
| | | ENV-H-C-305-P,306-P &307-P (06 CREDITS, 60*3 hr, Teaching) | Practical based on courses ENV-H-C-305-P, 306-P, &307-P | 75 | 60 | 15 |
| | | ENV-H-GE-303-T (04 CREDITS,60 hr, Teaching) ENV-H-GE-303-P 02 CREDITS, 30 hr, Teaching) Choice to choose from other disciplines (Annexure -2) | Chemistry | 75 Or 25 | 60 Or 20 | 15 Or 5 |
| | | ENV-H-SEC-301-T (Annexure I) (02 Credits, 30 hr, Teaching) | | 50 | 40 | 10 |
| 4 | IV | ENV-H-C-408-T (04 CREDITS, 60 hr, Teaching) | Conservation of Biodiversity & Wildlife Management | 75 | 60 | 15 |
| | | ENV-H-C-409-T (04 CREDITS,60 hr, Teaching) | Freshwater, Marine & Soil Habitat | 75 | 60 | 15 |
| | | ENV-H-C-410-T (04 CREDITS,60 hr, Teaching) | Distribution of Rocks, GIS & Remote Sensing | 75 | 60 | 15 |
| | | ENV-H-C-408-P,409-P&410-P (06 CREDITS, 60*3 hr, Teaching) | Practical based on courseENV-H-C-408-P, 409-P&410-P | 75 | 60 | 15 |
| | | ENV-H-GE-404-T | | 75 | 60 | 15 |

| | | | | | | |
|---|---|---|--|--------------|--------------|-------------|
| | | (04 CREDITS,60 hr, Teaching) ENV-H-GE-404-P 02 CREDITS, 30 hr, Teaching) Choice to choose from other disciplines (Annexure -2) | | Or 25 | Or 20 | Or 5 |
| | | ENV-H-SEC-402-T (Annexure I) (02 Credits, 30 hr, Teaching) | | 50 | 40 | 10 |
| 5 | V | ENV-H-C-511-T (04 Credits,60 hr, Teaching) | Environmental Pollution | 75 | 60 | 15 |
| | | ENV-H-C-512-T (04 Credits,60 hr, Teaching) | Waste Management | 75 | 60 | 15 |
| | | ENV-H-C-511&512-P (04 Credits,60*2 hr, Teaching) | Practical based on ENV-H-C-511&512 | 50 | 40 | 10 |
| | | ENV-H-DSE-501A-T/ ENV-H-DSE-501B-T/ ENV-H-DSE-501C-T (04 credits, 60 hr Teaching) Choice to choose any one paper | 501A-Ecology Vs Economy 501B- Environmental Impact Assessment 501C-Atmosphere & atmospheric Science | 75 | 60 | 15 |
| | | ENV-H-DSE-502A-T/ ENV-H-DSE-502B-T/ ENV-H-DSE-502C-T (04 credits, 60 hr | 502A- Environmental Biotechnology 502B- | 75 | 60 | 15 |

| | | | | | | |
|---|----|--|---|--|----|----|
| | | Teaching) Choice to choose any one paper | Environmental Statistics 502C- Environmental Pollution & Human Health | | | |
| | | ENV-H-DSE-501 A/B/C & 502 A/B/C-P (04 Credits, 60 hr Teaching) Practical will be based on 2 DSE theory papers opted by the student | Practical based on ENV-H-DSE- 501A/B/C&502A/B/ C | 50:25 marks from each DSE theory paper opted by the student | 40 | 10 |
| 6 | VI | ENV-H-C-613-T (04 Credits, 60 hr, Teaching) | Energy & Natural Resources | 75 | 60 | 15 |
| | | ENV-H-C-614-T (04 Credits, 60 hr Teaching) | Environmental laws & Policies | 75 | 60 | 15 |
| | | ENV-H-C-613 & 614-P (04 Credits, 60*2 hr Teaching) | Practical based on ENV-H-C- 613&614 | 50 | 40 | 10 |
| | | ENV-H-DSE-603A-T/ ENV-H-DSE-603B-T/ ENV-H-DSE-603C-T (04 credits, 60 Teaching) | 603A-Natural Catastrophes & Disaster management 603B-Organic Farming & Vermi Composting 603C- Forestry & | 75 | 60 | 15 |

| | | | | | | |
|--|--|--|---|---|----------|----------|
| | | | Habitat Management | | | |
| | | ENV-H-DSE-603 A/B/C-P (02 Credits) Practical will be based on 2 DSE theory papers opted by the student | ENV-H-DSE-603 A/B/C-P (02 Credits) | 25*2=50 25 marks from each DSE theory paper opted by the student | 40 | 10 |
| | | ENV-H-DSE-604A-T/ ENV-H-DSE-604B-T/ ENV-H-DSE-604C-T (04 credits, 60 hr Teaching) Choice to choose any one paper | 604A-Toxicology & Case Studies 604B- Green Technologies 604C- Global Climate Change | 75 | 60 | 15 |
| | | ENV-H-DSE-604 A/B/C-P (02 Credits) Practical will be based on 2 DSE theory papers opted by the student | Practical based on ENV-H-DSE-604A/B/C-P | 25*2=50 25 marks from each DSE theory paper opted by the | 40 20 | 10 05 |

| | | | | | | |
|--------------------|--|--------------------------------|--|-------------|-------------|------------|
| | | | | student | | |
| | | ENV-H-DSE-604 (06 credits) | *PROJECT TRAINING & DESSERTATION | 100 | | |
| | | | | | | |
| Total Marks | | | | 2400 | 1920 | 480 |

- **The student willing to under take project training and dissertation will have to opt only one DSE paper among 604-A/B/C**

SEMESTER I

| | | |
|----------------------|------------------------------------|---|
| ENV-H-C-101-T | FUNDAMENTALS OF ECOLOGY | (04 CREDITS, 60 hr.Teaching) |
|----------------------|------------------------------------|---|

- In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory
- Questions will be grouped into two - Group A and Group B.
- Group A will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-101-T : Fundamentals of environmental Science

Unit 1: The Biosphere

1.1 History & Scope of environmental science

1.2. Importance of environmental Science,

1.3. global concept of biosphere

1.4. Biomes

1.5. Ecosystem

1.5.1 Terrestrial

1.5.2 Aquatic

1.6. Subdivisions of the biosphere:

1.6.1 lithosphere

1.6.2. Atmosphere,

1.6.3. Hydrosphere.

1.7 Impact of Man on Biosphere:

1.7.1 Environmental Problems (Global Warming, ozone Depletion & Acid Rain) Environmental priority in India.

Unit II: System, concept & The Ecosystems

2.1. Concept pertaining to the ecosystem.

2.2. Ecosystem organization: structural and function Concepts of trophic levels, food chain, food webs. Comparison of ecosystem through Number, biomass and energy Pyramids, impact of man on ecosystem,

2.3.System Concept, System analyses, system measurements. Concept of ecosystem Dynamics: stability of ecosystems & Control Mechanisms: homeostasis, homeorhesis, microcosm & Mesocoms.

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.SinghandS.R.Gupta.2008.Ecology,Environment&Resource Conservation.
Anamaya Publications.

SEMESTER I

| | | |
|----------------------|--|--|
| ENV-H-C-102-T | Environmental Factors & Environmental Physics | (04 CREDITS, 60 hr, Teaching) |
|----------------------|--|--|

- In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory
 - Questions will be grouped into two - Group A and Group B.
 - Group A will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
 - Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options

ENV-H-C-102-T: Environmental Factors & Environmental Physics

Unit I: Environmental factors

1.1 Light.

1.1.2 Response to plant.

1.1.3. Response to animals.

1.2. Oxygen.

1.2.1 Response to plant.

12.2. Response to animals.

1.3 Carbon Dioxide.

1.4. Heat and Temperature.

1.4.1 Response to plant and animals.

Unit II: Environmental Physics

2.1. Basic Concepts of light and matter

2.2. Relation between energy, wavelength and frequency

2.3. Blackbody Radiation

2.4. Spectroscopic Concepts: Introduction to the concepts of absorption and transmission of light, Beer Lambert Law

2.5. Scattering of Light, Mie Scattering & Rayleigh Scattering

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.

SEMESTER I

| | | |
|------------------------------------|---|--|
| ENV-H-C-101 & 102-P | Practical based on 101-P & 102-P | (04 credits, 60 hr, Teaching) F.M-40 Ext. and 10 Int. |
|------------------------------------|---|--|

| Sl no | Practical | Marks Distribution |
|-------|--------------------------|--------------------|
| 1 | Ecological Instruments | 5x2=10 |
| 2 | Graphical representation | 10 |
| 3 | Mathematical analysis | 10 |
| 4 | Practical Record | 5 |
| 5 | Viva Voce | 5 |
| Total | | 40 |

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.

SEMESTER II

| | | |
|----------------------|---------------------------------------|--------------------------------------|
| ENV-H-C-203-T | PRODUCTIVITY & ENERGY FLOW | (04 CREDITS, 60 hr, Teaching) |
|----------------------|---------------------------------------|--------------------------------------|

- In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory
- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-203-T :Productivity& Energy Flow

Unit I: Productivity in Ecosystems

1.1. .Productivity in ecosystems, concepts of Gross production, Net Production, net ecosystem Production: Primary Production, Factor Effecting Primary production.

1.2.Global primary productivity & its estimation,

1.3.Secondary Production, factors effecting secondary production, efficiency of production at various levels.

1.4.Succession & Changes in productivity.

Unit II: Energy Flow through Ecosystem

2.1.Concept of energy, energy reaching the earth, light as a energy Carrier, Energy transduction with respect to the laws of thermodynamics, concept of entropy, enthalpy, the ecosystem as a thermodynamics. Energy based for plants, photosynthesis,

2.2. Energy fixation and production, energy flow through the food chain, the Y – model.

2.3.Lindeman’s tropic dynamic aspect.

2.4. Energy flow models: basic or universal model, energy flow models of ecosystems (aquatic and terrestrial), comparison of energy flow.

SEMESTER II

| | | |
|----------------------|--|--------------------------------------|
| ENV-H-C-204-T | Biogeochemical cycles & Environmental Chemistry | (04 CREDITS, 60 hr, Teaching) |
|----------------------|--|--------------------------------------|

ENV-H-C-204-T :Biogeochemical Cycles & Environmental Chemistry.

- In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory
- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

Unit I: Biogeochemical Cycles

1.1.Hydrological Cycles

1.2.Carbon Cycles

1.3.Phosphorus Cycles

1.4.Nitrogen Cycles

1.5.Sulphur Cycles

1.6.Impact of man on biogeochemical Cycles

Unit II: Environmental Chemistry

2.1.Stoichiometry,Gibb's energy, Chemical potential, chemical equilibria,acid base reaction, solubility product, solubility of gases in water, the carbonate system unsaturated and saturated hydrocarbon. (5 lectures)

2.2.chemistry of water, concept of D.O, BOD, COD, Sedimatation, congulation, filtration, redox potential.

2.3. Principle of analytical method:titration, Gravimetry

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.

3.A.kDey environmental chemistry.

SEMESTER II

| | | |
|------------------------------------|---|--|
| ENV-H-C-203 & 204-P | Practical based on 203-P & 204-P | (04 credits, 60 hr. TEACHING) |
|------------------------------------|---|--|

| Sl no | Practical | Marks Distribution |
|-------|--------------------------------|--------------------|
| 1 | Water analysis | 10 |
| 2 | Soil Analysis | 10 |
| 3 | Identification of common biota | 5x2=10 |
| 4 | Practical Record | 5 |
| 5 | Viva Voce | 5 |
| Total | | 40 |

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.

SEMESTER III

| | | |
|----------------------|-----------------------------|--|
| ENV-H-C-305-T | Biomes & Habitat | (04 CREDITS, 60 hr. TEACHING) |
|----------------------|-----------------------------|--|

- In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory
- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-305-T : Biomes & Habita.

Unit I: Biomes

1.1.The Biome Concept

1.1.2.Principal biomes of the world

1.1.3.Temperate Biome

1.1.4.Tundra& Taiga Biomes

1.1.5.Grassland Biomes

1.1.6.Tropical Biomes

1.1.7.Aquatic Biomes

Unit II: Habitats

2.1. Concept of Habitat

2.1.1. Aquatic&Terrestrial Habitat

2.1.2.Cause of Destruction of Habitat

2.2.The Niche Concept

2.2.1The Niche Dimensions

2.3. Habitat Management

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 III

| | | |
|----------------------|-----------------------------------|----------------------------------|
| ENV-H-C-306-T | Population & Community | (04 CREDITS, 60 LECTURES) |
|----------------------|-----------------------------------|----------------------------------|

- In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory
- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-306-T :Population & Community

Unit I: Population:

1.Population

1.1. The population concept.

1.2. Age structure and significance.

1.3.Survivorship curves, demographic transition,

1.4. Population growth rate, pearls-verhulstequation.

1.5.Population regulation.

1.6Human population and environmental impact; Population and its impact on resources.

Unit IICommunity Concepts & Biomes

2.1.COMMUNITY

2.2.The community concept.

2.3. Development of the community through succession.

2.4 Community organization and stratification.

2.5.Concept of biogeography and continental drift.

Suggested Reading

• Hunter, Malcolm L., Jr., and Gibbs, James P. *Fundamentals of Conservation Biology*. 3rd ed. Wiley-Blackwell. 2006.

- Jeffries, M. *Biodiversity and Conservation*. 2nd ed. Routledge, UK. 1997.

Reports And Statistics on Dynamic Ground Water Resources of India, Govt. Of India, Ministry of Water Resources.

SEMESTER III

| | | |
|----------------------|---|--|
| ENV-H-C-307-T | Environmental & Biological Instruments | (04 CREDITS, 60hr.Teaching) |
|----------------------|---|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-307-T :Environmental& Biological Instruments

UNIT I

1.1. Concepts of Biological instruments.

1.2. Need of Biological instruments

1.3. Basic Biological instruments: pH, autoclave.

UNIT II

2.1. Centrifuge , types of centrifuge,

2.2. Chromatography, types of chromatography – techniques & principles.

2.3. Spectrophotometer, colorimeter.

Unit III

3.1 Air Sampling Instruments- High Volume Sampler, Respirable Dust Sampler, types & Uses

3.2 Water Sampling Instruments- Sampling Bottles, Tubes, Secchi disc, Desiccators, pH meter, Electrical conductivity meter, BOD incubator, Sedgwick Rafter, Pumps for groundwater sampling

3.3 Soil Sampling Instruments:- Soil Augers, Soil Probes, Soil Core Samplers, Simple Shovels and Scoops

3.4 Noise Sampling Instruments:- Sound Level meters, Noise level Meter

Suggested Readings Books:

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

SEMESTER III

| | | |
|------------------------------------|---|-------------------------------------|
| ENV-H-C-305,306 & 307-P | Practical based on 305-P,306-P & 307-P | (06 credits, 60hr. Teaching) |
|------------------------------------|---|-------------------------------------|

| Sl no | Practical | Marks Distribution |
|-------|-------------------------|--------------------|
| 1 | Instrumental Analysis | 5x2=10 |
| 2 | Identification Analysis | 15 |
| 3 | Quantitative Analysis | 15 |
| 4 | Microbial Analysis | 10 |
| 5 | Practical Record | 5 |
| 6 | Viva Voce | 5 |
| Total | | 60 |

ENV-H-C-305-P, 306-P& 307-P

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

SEMESTER IV

| | | |
|----------------------|--|--|
| ENV-H-C-408-T | Conservation of biodiversity & wild Life Management | (04 CREDITS, 60 hr, Teaching) |
|----------------------|--|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group A will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-408-T : Conservation od Biodiversity & Wildlife Management

Unit I: Conservation of Biodiversity

1.1. Biodiversity conservation:

1.1.1.Levels of Biodiversity, types and distribution of biodiversity,

1.1.2. Cause of biodiversity destruction, need for conservation of biodiversity,

1.1.3. Steps in the management & conservation of biodiversity principles and strategies; in-situ conservation, ex-situ conservation, inter-situ conservation,

1.1.4.Threats to biodiversity: Natural and anthropogenic, species extinctions, IUCN threat Categories, Red data book, Invasions: causes and impact.Protected Area Network.

1.1.5. Biodiversity Hot spots: concepts, distribution and importance.

Use of biodiversity: Source of food, medicine, raw material, aesthetic and cultural.

Biodiversity prospecting.

1.2. Role of IT in conservation of floras &faunas

Unit II: Wild life Management

2.1. Wildlife management, national parks, biosphere reserves, sanctuaries .

2.2. Concept of various conservation project implemented in India:

2.2.1Project Tiger,

2.2.2Project Rhino

2.2.3 Project Crocodile,

2.2.4. Project Elephant;

2.3. IUCN Categories of threatened species

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

| | | |
|----------------------|--|--|
| ENV-H-C-409-T | Freshwater, Marine & Soil Habitat | (04 CREDITS, 60 hr. Teaching) |
|----------------------|--|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group A will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each (1x6=6) and part B will comprise short answer, three mark each (3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-409-T :Freshwater, Marine & Soil Habitat

Unit I: Freshwater and Marine Habitat

1.1. Fresh habitat: lotics and lentic habitats,

1.2. Physical, chemical, and biological characteristics.

1.3. Marine Habitat: Zonation, types of shores, deep sea adaptations.

Unit II: Estuaries & Soil Habitat

2.1 Estuaries: Characteristics, adaptation on organisms living in estuaries, important estuaries in India.

2.2 Soil: formation, profile, zonation, classification and types of soil soils found in India; physical, chemical and biological characteristics,

2.3. C/N Ratio, Soil Indicators, Factors effecting Soil Quality – Harvesting, Fertilizers

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

| | | |
|----------------------|--|--------------------------------------|
| ENV-H-C-410-T | Distribution of Rocks, Remote Sensing & GIS | (04 CREDITS, 60 hr, Teaching) |
|----------------------|--|--------------------------------------|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group A will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.

ENV-H-C-410-T :Distribution of Rocks, Remote Sensing & GIS

Unit I: Rocks

1.1Structure of earth, Composition of Earth.

1.2. Rocks: Definition, Formation, Types of rocks, Distribution on India.

Unit II: GIS & Remote Sensing

2.1.Remote Sensing, Physical Basis for remote sensing, Remote sensing process, Platform& Sensors for remote sensing, remote sensing satellite, Ground station, system for data collection, passive system & Active system,

2.2. Microwave remote sensing.

2.3. Applications of remote sensing.

2.4Geographic Information System: basic concepts, GIS tools & Components, data for GIS Procedure perspective for GIS,

2.5 Integration 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. Cambridge University Press Threats to biodiversity: Natural and anthropogenic, species extinctions, IUCN threat categories, Red data book, Invasions: causes and impact. Biodiversity conservation, principles and strategies; *in-situ* and *ex-situ* conservation, Protected Area Network. Biodiversity Hot spots: concepts, distribution and importance. Use of biodiversity: Source of food, medicine, raw material, aesthetic and cultural. Biodiversity prospecting.

SEMESTER IV

| | | |
|------------------------------------|---|-------------------------------------|
| ENV-H-C-408,409 & 410-P | Practical based on 408-P,409-P & 410-P | (06 credits, 60 hr,Teaching) |
|------------------------------------|---|-------------------------------------|

| Sl no | Practical | Marks Obtained |
|--------------|------------------------------------|-----------------------|
| 1 | Water analysis | 15 |
| 2 | Soil forming rocks analysis | 15 |
| 3 | Microbiological analysis | 10 |
| 3 | Project of nearest habitat visited | 10 |
| 4 | Practical record | 5 |
| 5 | Viva voce | 5 |
| Total | | 60 |

ENV-H-C-408-P, 409-P& 410-P - Practical based on 408-P,409-P& 410-P

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- voice and Practical Record.

SEMESTER V

| | | |
|----------------------|--------------------------------|--|
| ENV-H-C-511-T | Environmental Pollution | (04 CREDITS, 60 hr, Teaching) |
|----------------------|--------------------------------|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- The question no. 9 will be of short notes type each carrying six marks (6x2=12) in which only two should be answered out of four options.
-

ENV-H-C-511-T : Environmental Pollution

Unit I : Water Pollution & Air Pollution

1.1. Concept of pollution: types of pollutants,

1.1.2. Entry into the environment and biological systems,

1.1.3. Bioaccumulation, biomagnifications, stress and strain.

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

1.3. Air pollution: definition, ambient standards , treatment , Acid rain, photochemical smog, Green houses green house effect, ozone depletion, automobile pollution,& its control measures, oxides of SO_x , NO_x , hydrocarbons & Fluorocarbons, CO_x SPM,

Unit 2: Soil, Sound & Radiation pollution:

2.1. Soil pollution: definition, sources, types, effects and control. Factors effecting Soil Quality- Harvesting, Fertilizers and Insecticides & Pesticides.

2.2. Sound pollution- Basic concepts. Noise –Sources effect & Control measures, types of Diseases Due to Noise Pollution

2.3. Radiation pollution – Basic Concepts. Types of Radioactive pollutants, Hazards & Its control Measures, Case study of Nagasaki & Hiroshima

2.4. Standards of Air, Water, Soil & Noise Quality

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 V

| | | |
|----------------------|-----------------------------------|--|
| ENV-H-C-512-T | Waste & its Management | (04 CREDITS, 60 hr. Teaching) |
|----------------------|-----------------------------------|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-C-512-T : Waste & Its Management

Unit I: Waste Concepts

1.1. Basic Concepts of waste- types, sources, and separation of wastes; solid waste, liquid waste, Hazardous waste,

1.2. Characterization of municipal solid waste, Biomedical waste, effect of Solid waste on environment, human health, aquatic bodies, Mines wastes.

Unit II: Waste Management

2.1. Different techniques on collection, storage, transportation, and disposal of solid waste;

2.3. Wastewater treatment,

2.3.1Industrial effluent, and their effects on environment, municipal effluents and its treatment

2.4. Concept of 3R's- Recycle, Reuse, Reduce

2.5. Biological Processing- Composting, Aerobic & Anaerobic Digestion.

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 Management*, 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

| | | |
|------------------------------------|---|--|
| ENV-H-C-511 & 512-P | Practical based on 511-P & 512-P | (04 credits, 60 hr. Teaching) |
|------------------------------------|---|--|

| Sl no | Practical | Marks Distribution |
|--------------|---------------------------|---------------------------|
| 1 | Capillary rise experiment | 10 |
| 2 | Ion exchange analysis | 10 |
| 3 | Soil Temperature analysis | 10 |
| 4 | Practical Record | 5 |
| 5 | Viva Voce | 5 |
| Total | | 40 |

ENV-H-C-511-P& 512-P

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

SEMESTER V

| | | |
|------------------------------|---------------------------|---|
| ENV-H-DSE- 501A-T | ECOLOGY Vs ECONOMY | (04 CREDITS, 60hr. Teaching) |
|------------------------------|---------------------------|---|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-501A-T: ECOLOGY Vs ECONOMY

Unit I: Environmental Economics

1.1. Basic Concepts of environmental economics

1.1.1 Characteristics of environmental goods, environmental economics Vs Traditional economics, and brief introduction to major components of economy: consumer, firm, their interactions in market, producer and consumer surplus, law and demand supply

1.2. Cost Benefit Analysis, Social Effectiveness analysis

1.3 Morals & Ethics of Environmental Protection,

1.4 Natural Resources Economics- Economics of Non-renewable & renewable Resources, economics of fuels & Minerals, Taxation, economics of Water Use

Unit II: Sustainable Development

2.1.Concepts of Sustainable development- Resource management, water Use strategies, Land use planning, Forest Management, Energy consumption from non renewable resources, Alternate option of Energy & Challenges.

2.2. Carrying Capacity - Definition & Scope of Development Planning, Societal Approach, Economic approach, integrated resources management strategies.

2.3Environmental Education,- Needs and different approaches In India,

2.3. Institutes & Research Centres in INDIA.

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 V

| | | |
|-------------------------|--|--------------------------------------|
| ENV-H-DSE-501B-T | ENVIRONMENTAL IMPACT ASSESSMENT | (04 CREDITS, 60 hr, Teaching) |
|-------------------------|--|--------------------------------------|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-501B -T: ENVIRONMENTAL IMPACT ASSESSMENT

Unit I: Environmental Impact Assessment

1.1. EIA- definitions, Introduction, Concepts,

1.2. Scope and methodologies of EIA.

1.3. Role of Projects Proponents, developers & Consultants.

1.4. Terms of Reference, Impact Identification and Prediction, EIS and EMP.

Unit II: EIA Regulations

2.1. EIA Regulations, Social Impacts, Cost Benefit Analysis,

2.2. Life cycle Assessment.

2.3. Environmental Planning & Environmental Audit.

2.4. ISO Guidelines.

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.

SEMESTER V

| | | |
|-------------------------|---|--------------------------------------|
| ENV-H-DSE-501C-T | Atmosphere & Atmospheric stability | (04 CREDITS, 60 hr, Teaching) |
|-------------------------|---|--------------------------------------|

ENV-H-DSE-501C-T: Atmosphere & Atmospheric Stability

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.
-

Unit I: The Atmosphere

- 1.1. Structure of atmosphere& Composition
- 1.2. Significance of atmosphere in making Biosphere
- 1.3. Energy Balance & energy transfers
- 1.4. Green house effect

Unit II: Atmospheric Stability

- 2.1. Atmospheric Lapse Rate, ALR, DLAR.
- 2.2. Inversions, Mixing Heights, Plume Behaviour.
- 2.3. Gaussian Plume Behaviour, Wind rose Diagram.

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 V

| | | |
|------------------------------|---|---|
| ENV-H-DSE- 502A-T | Environmental Biotechnology & Eco -restoration | (04 CREDITS, 60hr. Teaching) |
|------------------------------|---|---|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

| | | |
|------------------------------|--|---|
| ENV-H-DSE- 502A-T | Environmental Biotechnology &Eco- restoration | (04 CREDITS, 60hr. Teaching) |
|------------------------------|--|---|

ENV-H-DSE-502A-T: Environmental Biotechnology &Eco-restoration

Unit I: Bioremediation

1.1. Basic Concepts of Pollutants, Bioremediation- Concepts, Need & Scope, Concepts of Bioreactors,

1.2. Environmental Application of Bioremediation, Case Study in Mines and oil spills areas

Unit II: Cleaning Up of Environments by using plants

2.1. Phytoremediation – Basic Concepts, Biological Cleaning up of the environment with plants.

2.2. Medicinal Plants - their role. Project medicinal Plants.

2.3. Aforestation, forestry & their types- commercial forestry, production forestry, social forestry, Agro forestry.

Suggested Readings

- Evano, G.H. and Furlong, J.C. *Environmental Biotechnology – Theory and Application*. John Wiley and Sons, USA. 2004.
 - Jjemba, P.K. *Environmental Microbiology – Theory and Application*. Science Pub. Inc., USA. 2004.
 - Olguin, C. J., Sanchez, G., Hernandez. E. *Environmental Biotechnology and Cleaner Bioprocesses*. Taylor & Francis.2000.
 - Pepper, I.L. and Gerba, C.P. *Environmental Microbiology - Laboratory Manual*. Elsevier, USA. 2005.
 - Ratledge, C. and Kristiansen, B. *Basic Biotechnology*. 2nd ed. Cambridge University Press, Cambridge, UK. 2002.
- Rittman, B. and McCarty, P. L. *Environmental Biotechnology: Principles and Applications*. 2nd edition. Tata McGraw-Hill, USA. 2000.
- Rittmann, B.E. and McCarty, P.L. *Environmental Biotechnology – Theory and Application*. McGraw Hill, USA. 2001.
- Silver C. S. and DeFries, R. S. *One Earth one Future: - Our Changing Global Environment*. East-West Press Edition, 1991.
- Singh, J.S., Singh, S.P. and Gupta, S.R. *Ecology, Environment and Resource Conservation*. Anamaya Publishers, New Delhi, India. 2006.
- Speth, J. C. *Global Environmental Challenges – Transitions to a Sustainable World*. Orient Longman Pvt. Ltd., New Delhi. 2004.
- UNEP. *Global Environmental Outlook 3: Past, Present and Future*. Earthscan Publications. 2002

SEMESTER V

| | | |
|------------------------------|---------------------------------|--|
| ENV-H-DSE- 502B-T | Environmental Statistics | (04 CREDITS, 60 hr, Teaching) |
|------------------------------|---------------------------------|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-502B-T: Environmental Statistics

Unit I: Data Sampling & Structure

1.1 Data types and sampling.

1.1.1. Data collection & organization.

1.2. Central tendencies- Mean, Median and Mode.

1.2. Measures of Dispersion – standard Deviation, Standard Error, Variance, Correlation & Regression.

Unit II: Test of Significance

2.1. Test of significance (T- Test).

2.2. Chi Square test

2.3. ANNOVA, System Modelling- Analytical Models, Stochastic Models

Suggested Readings:

- Biostatistics by S. Chand
- Biostatistics by Tata Mcgrawhill Publication.

SEMESTER V

| | | |
|------------------------------|---|--|
| ENV-H-DSE- 502C-T | Environmental Pollution & Human Health | (04 CREDITS, 60 hr, Teaching) |
|------------------------------|---|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1. Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks. two should be answered out of four options.

ENV-H-DSE-502C-T: Environmental Pollution & Human Health

Unit I: Air and Soil Pollution on Human Health

1.1. Ambient Air Quality Monitoring & Standards (National Ambient Air Quality Standards of India).

1.2. Air Quality Index.

1.3. Indoor air pollutants & their effects on human health.

1.4. Control measures

1.5. Effect of Soil Pollution on human health

1.6. Effect of Radioactive Pollutants on human health

Unit II: Water & Noise Pollution on Human Health

1.1. Standrads of IS: BIS on drinking water quality, Industrial quality, and Municipal waste water.

1.2. Eutrophication & effect of BOD, COD, DO on human health.

1.3. Effect of heavy metals on human health.

1.4. Effects of noise on human health.

1.5. NAAQs standards of Noise Pollution.

1.6. Effect of Biomedical pollutants (Carcinogenic) - somatic & Genetic effects, Control Measures.

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 V

| | | |
|--|---|---|
| ENV-H-DSE-501A/B/C & 502A/B/C-P | Practical based on DSE 501-P&502-P | (04 credits, 60hr. Teaching) F.M: 50(40 EXT. +10 INT.) |
|--|---|---|

ENV-H-DSE-501A/B/C & 502A/B/C-P - Practical based on DSE 501A/B/C & DSE502A/B/C

1. ENV-H_DSE501A-P- Practical based on ENV-H-DSE-501A (Ecology Vs Economy and Sustainable Development)

| SI no | Practical | Marks Distribution |
|-------|---|--------------------|
| 1 | Report presentation | 5 |
| 2 | Power point presentation+ Report presentation , Mathematical Analysis | 10 |
| 3 | Practical Record ,Viva voce | 5 |
| | | |
| | | |
| Total | | 20 |

1. Prepare a report on estimation of minerals from various sources.
2. Prepare a power point presentation / Report on visit to forest ecosystem using curated database.
3. Prepare a report on estimation of Non Renewable fuels and renewable fuels used in India by Various sources
4. Estimation of plant population by T-test and Z-test method.

5. Prepare a report on case studies of interlinking of Rivers & its applications.

6. Practical Record.

7..Viva Voice.

2. .ENV-H_DSE501B-P- Practical based on ENV-H-DSE-501B (Environmental Impact Assessment)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation ,Report presentation | 10 |
| 2 | Project work | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Prepare a report on case studies on impact assessment : River valley mining projects.

2. Prepare a power point presentation / Report on general principles of environmental audit.

3. Prepare a report on case studies on effective utilization of environmental laws in oil refineries, petro chemical Industries.

4. Draw digital mapping of green belt zones in India.

5. Prepare a report on various mega building projects and its impact assessment.

6. Practical Record.

7.Viva Voice

3. ENV-H_DSE501C-P- Practical based on ENV-H-DSE-501C (Atmosphere and Atmospheric Stability)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation +Report presentation | 10 |
| 2 | Mathematical Analysis /practical analysis | 5 |
| 3 | Practical Record, and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Draw a wind rose diagram from given atmospheric circulation data.
2. Visit a nearby Industry and learn about various plumes behaviour at differ day times. Prepare a report on the different plume behaviour.
- 3 .Draw a temperature Inversion graph /diagram of your local area by using various sources/ given data.
4. Draw a meteorology graph/weather pattern of your area by using various sources.
5. Determine the AQI index of your nearby areas.
6. Practical Record.
- 7.Viva Voice.

4. ENV-H_DSE502A-P- Practical based on ENV-H-DSE-502A (Environmental Biotechnology &Ecorestoration)

| Sl no | Practical | Marks Distribution |
|--------------|--|---------------------------|
| 1 | Growth pattern & Characteristics of microbes | 10 |
| 2 | Isolation of microbes /effect of antimicrobial chemicals, Graphical representation | 5 |
| 3 | Practical Record and Viva voce | 5. |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Isolation and enumeration of microbes from environmental samples.
2. Estimate or obtain the cultural Characteristics of isolated microbes.
3. Evaluation of antimicrobial chemical agents.
4. Study the graphical representation of effect of environmental parameters e.g temperature, pH, Salinity on microbes.
5. Determination of Bi-phasic growth curve.
6. Practical Record.
7. Viva Voice

5. ENV-H_DSE502B-P- Practical based on ENV-H-DSE-502B (Environmental Statistics)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Calculation of Mean, Median, Mode | 5 |
| 2 | Standard Deviation ,Drawing of graphs from given data | 10 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Study of entry of data on Microsoft Excel Sheet.
2. Calculation of mean, median and mode from Microsoft Excel sheet.
3. Draw the different types of graphs, bar columns and pie charts by using given data in Microsoft Excel sheet.
4. Calculations of Standard Deviation by given data in Microsoft Excel Sheet.
5. Study and use of various computer applications/modes used in environmental practical.
6. Practical Record.
- 7.Viva Voice

6. ENV-H_DSE502C-P- Practical based on ENV-H-DSE-502C (Environmental Pollution & Human Health)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation +Report presentation | 10 |
| 2 | Drinking water Analysis | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Prepare a report on Population modelling using Leslie's model.
2. Prepare a powerpoint presentation / Report on environmental issues & Human health
3. Prepare a report on awareness studies of different global pollutants- ozone depletion, corona Virus etc.
4. Prepare a power point presentation / report on basic hygiene and safety standards.
5. Drinking water/potable water Quality Assessments.
6. Practical Record.
- 7..Viva Voice

SEMESTER VI

| | | |
|---------------|----------------------------|----------------------------------|
| ENV-H-C-613-T | Energy & Natural Resources | (04 CREDITS, 60 hr, Teaching) |
|---------------|----------------------------|----------------------------------|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-C-613-T: Energy & natural Resources

Unit I Energy Resources

1.1. Concept of conventional and non Conventional energy resources India's present generation of energy from various sources and future planning.

1.2. Thermal, hydroelectric and nuclear power generation.

Unit II: Non Conventional or renewable energy Resources

2.1. Wind power

2.2. Water power.

2.3. Solar power.

2.4. Biomass power.

2.5. Geothermal energy, OTEC, Hydrogen power.

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 VI

| | | |
|----------------------|--|--|
| ENV-H-C-614-T | Environmental Laws & Policies | (04 CREDITS, 60 hr, teaching) |
|----------------------|--|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.
-

ENV-H-C-614-T : Environmental Laws & Policies

Unit I: Environmental Laws

.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 Act, 1988.

1.4. The Environmental Protection Act, 1986.

1.5. Wildlife Protection Act, 1972.

1.6. Hazardous waste management and handling Rules1989.

1.7. Biomedical Waste management and handling Rules1998.

Unit II: Environmental Policies

2.1. Stockholm Conference, 1972.

2.2 National environmental Policy, 2006.

2.3. Establishment of National Green Tribunal.

2.4. Work of pollution Control Boards.

2.5. Earth Summits.

2.6. Montreal Protocol, Kyoto Protocol.

2.7. Vienna Convention.

2.8.Case Studies of- Sardar Sarovar Dam Projects, Tehri projects, Narmada Bachao Andolan, National Heritage Sites of India, Chipko Movement, Silent Valley Project.

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

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|------------------------------------|---|---|
| ENV-H-C-613 & 614-P | Practical based on 613-P & 614-P | (04 credits, 60hr. TEACHING) |
|------------------------------------|---|---|

ENV-H-C-513 & 514-P - Practical based on C13 & C14

| Sl no | Practical | Marks Distribution |
|-------|------------------------|--------------------|
| 1 | Air pollutant analysis | 10 |
| 2 | Microbial analysis | 15 |
| 3 | Microbial analysis | 5 |
| 4 | Practical record | 5 |
| 5 | Viva voce | 5 |
| Total | | 40 |

1. Calibration of High Volume Sampler
2. Estimation of SPM, PM 2.5, PM10, SO_x, NO_x, CO_x
3. Microbial analysis- Standard plate count method, counting of bacteria.
4. Introduction to Most Probable Number Method for identification of E.Coli Bacteria.
5. Practical Record.
6. Viva Voce.

SEMESTER VI

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|------------------------------|---|--|
| ENV-H-DSE- 603A-T | Natural Catastrophes & disaster Management | (04 CREDITS, 60 hr, Teaching) |
|------------------------------|---|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-603A-T: Natural Catastrophes & Disaster Management

Unit I: Natural Catastrophes

1.1 Definition and types of natural Catastrophes such as earthquakes, floods, cyclones, and storms, landslides, drought & famines, tsunamis, and diseases epidemics etc. with examples.

1.2. Epidemic & pandemic Diseases- E- Bole Virus, SARS, Small Pox, COVID-19, Cholera, diarrhoea, Dengue etc.

Unit II: Disaster management

2.1. Pre disaster & Post Disaster Management; Risk Assessment; Role of administrator, Scientists, Planners, Volunteers, and community in disaster mitigation; Public awareness, drills and training, Forecasting.

2.2. Warning systems including tsunami warning system; 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 VI

| | | |
|-------------------------|--|--------------------------------------|
| ENV-H-DSE-603B-T | Organic Farming & Vermicomposting | (04 CREDITS, 60 hr, Teaching) |
|-------------------------|--|--------------------------------------|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-603B-T: Organic farming & Vermicomposting

Unit I: Organic farming

1.1Economic Zoology- Need SilviCulture- Scope & Need

1.2. Methods of Propagation- Grafting, Nursery Planning, Site Factors, water Budgeting, Special approaches

1.3. Mangroves & Cold Desert- Habitat Characterization & Management of Species

Unit II: Composting &Vermicomposting

2.1. Composting – A better approach & Need.

2.2. Types of Composting- aerobic & anaerobic Composting.

2.3.Digestion & Composting.

2.4. Vermicomposting- Types, Methods, & Significance.

Suggested Readings

- Evano, G.H. and Furlong, J.C. *Environmental Biotechnology – Theory and Application*. John Wiley and Sons, USA. 2004.
- Jjemba, P.K. *Environmental Microbiology – Theory and Application*. Science Pub. Inc., USA. 2004.
- Olguin, C. J., Sanchez, G., Hernandez. E. *Environmental Biotechnology and Cleaner Bioprocesses*. Taylor & Francis.2000.

- Pepper, I.L. and Gerba, C.P. *Environmental Microbiology - Laboratory Manual*. Elsevier, USA. 2005.
 - Ratledge, C. and Kristiansen, B. *Basic Biotechnology*. 2nd ed. Cambridge University Press, Cambridge, UK. 2002.
- Rittman, B. and McCarty, P. L. *Environmental Biotechnology: Principles and Applications*. 2nd edition. Tata McGraw-Hill, USA. 2000.
- Rittmann, B.E. and McCarty, P.L. *Environmental Biotechnology – Theory and Application*. McGraw Hill, USA. 2001.

SEMESTER VI

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|-------------------------|--|--------------------------------------|
| ENV-H-DSE-603C-T | Forestry & Habitat Management | (04 CREDITS, 60 hr, Teaching) |
|-------------------------|--|--------------------------------------|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-603C-T : Forestry Habitat Management

Unit I: Forestry

1.1.Need, definition, and Scope

1.1.1.Types of Forestry

1.2.Afforestation& Eco restoration

1.2.1Agroforestry

1.2.2.Social Forestry

1.2.3.Joint Forest Management .

Unit II: Habitat management

2.1.Forest Soils - Characterization & Properties

2.2.Soil Conservation – Step farming, Crop rotation, Strip Cropping etc.

2.3.Water Conservation- Reservoir, Watershed, Water Recharge

2.4.Neutrientavabilibity of Soil

2.5.River Channel Stabilization

2.6.Avalanche& landfall Control

Suggested Readings

- Evano, G.H. and Furlong, J.C. *Environmental Biotechnology – Theory and Application*. John Wiley and Sons, USA. 2004.

- Jjemba, P.K. *Environmental Microbiology – Theory and Application*. Science Pub. Inc., USA. 2004.
 - Olguin, C. J., Sanchez, G., Hernandez. E. *Environmental Biotechnology and Cleaner Bioprocesses*. Taylor & Francis.2000.
 - Pepper, I.L. and Gerba, C.P. *Environmental Microbiology - Laboratory Manual*. Elsevier, USA. 2005.
 - Ratledge, C. and Kristiansen, B. *Basic Biotechnology*. 2nd ed. Cambridge University Press, Cambridge, UK. 2002.
- Rittman, B. and McCarty, P. L. *Environmental Biotechnology: Principles and Applications*. 2nd edition. Tata McGraw-Hill, USA. 2000.
- Rittmann, B.E. and McCarty, P.L. *Environmental Biotechnology – Theory and Application*. McGraw Hill, USA. 2001.

SEMESTER VI

| | | |
|-------------------------|--------------------------------------|--------------------------------------|
| ENV-H-DSE-604A-T | Toxicology & Case Studies | (04 CREDITS, 60 hr, Teaching) |
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In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.

ENV-H-DSE-604A-T : Toxicology & Case Studies

Unit I : TOXICOLOGY

1.1 Definition, Branches. Dose- Response relationship graded ,quantal.

1.2. Different types of toxicants and their effects.

1.3. Types of effects: physiological, behavioural, teratogenic, mutagenic, carcinogenic, effect at cellular level.

1.4. Probit scale.

Unit II: Case Studies

2.1. Diseases due to air borne microbes

2.2. Diseases due to water parameters like- Fluorosis,

2.3. Diseases due to water Pollution- Dysentery, Cholera, Typhoid etc.

2.4. Diseases due to Heavy metals- Minamata diseases, Blue baby syndromes, Itai-itai, etc

2.5. Diseases due to biomagnifications & Bioaccumulation of Elements.

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.

SEMESTER VI

| | | |
|-------------------------|-------------------------|-------------------------------------|
| ENV-H-DSE-604B-T | Green Technology | (04 CREDITS, 60 hr.Teaching) |
|-------------------------|-------------------------|-------------------------------------|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.
-

ENV-H-DSE-604B-T : Green Technology

Unit I : Green Technology

1.1.Green Technology- Introduction

1.2.Green energy, Green Economy, Green Chemistry, Biodegradable Wastes

1.3.Energy Conservation and Sustainable Development

1.4.Public Transport instead of Private Transport

Unit II: Green Requirements

2.1.3Rs techniques.

2.2. Carbon Credits & Carbon Trading

2.3.Ecomark objects / practices

2.4. Green Planning- Use of Renewable resources

2.5. Land Use planning

2.6. Coastal zone Regulation

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
- andBarlett Publications.

SEMESTER VI

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|------------------------------|------------------------------|--|
| ENV-H-DSE- 604C-T | Global Climate Change | (04 CREDITS, 60 hr. Teaching) |
|------------------------------|------------------------------|--|

In all nine questions are to be set of equal values and five questions are to be answered of which question no. 1 will be compulsory

- Questions will be grouped into two - Group A and Group B.
- Group a will comprise question no. 1, which will consist of two parts A & B. Part A will be MCQ type, covering entire syllabus and carry one mark each(1x6=6) and part B will comprise short answer, three mark each(3x2=6). There will be no option in the Q. No. 1.
- Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from this group, each carrying 12 marks.
- two should be answered out of four options.
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ENV-H-DSE-604C-T : Global Climate Change

Unit I : Global Warming

1.1. Global Warming- Introduction

1.2. Earth's Climate Through ages

1.3. Trends of global warming and global Cooling

1.4. Drives of Global Warming & Potential of GHGs

1.5. Atmospheric Windows

1.6. Ozone layer depletion & ozone Shield

1.7. Ozone Depleting Substances

Unit II: Impacts on Environment

2.1. Climate Change, Sea Level, Rise, Weather, Patterns Agricultural, productivity Biological responses

2.2. Ozone layer depletion over Antarctica

2.3 .Effects of Ozone Depletion on Health

2.4. Mitigation & International Efforts

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.

OR

SEMESTER VI

| | | |
|--------------------------------|--|---------------------|
| ENV-H-DSE- DSE604-T | Project Dissertation & Presentation | (06 CREDITS) |
|--------------------------------|--|---------------------|

| Sl no | Practical | Marks Distribution |
|--------------|-------------------------|--------------------|
| 1. | Powerpoint Presentation | |
| 2. | Project Report | |
| Total | | 100 |

Project development in coordination with environmental institution, agricultural institution, nearby industries, central industries and other NGO organizations. Students will be required to provide an explicit presentation of their work which will be certified by concerned institution from which the training has been taken.

SEMESTER VI

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| ENV-H-DSE-603A/B/C & 604A/B/C | Practical based on ENV-H-603A/B/C& 604A/B/C-P | (02 credits) 30hr Teaching) 50(Ext.:40 and Int:10) |
|--|--|---|

1. ENV-H_DSE603A-P- Practical based on ENV-H-DSE-603A (Natural Catastrophes & Disaster Management)

| SI no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation+ Report presentation | 10 |
| 2 | Map Analysis /Project work | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

- 1.Preparation of digital environmental zonation map for landslides in India.
- 2.Preparation for hazard zonation digital map for earthquakes.
- 3.Prepare a report on case studies of natural hazards in India e.g Tsunami, Himalayan Tsunami, Nepal-Bihar earthquakes, tropical cyclones.
4. Prepare a report on case studies of recent man made hazards in India e.g Bhopal gas Tragedy, Vishakhapatnam Gas Tragedy, fire in oil Refineries.
5. Prepare a report on various hazard Prediction models & preparatory plans.
- 6.Practical Record.
- 7..Viva Voice

2. ENV-H_DSE603B-P- Practical based on ENV-H-DSE-603B (Organic Farming & Vermicomposting)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Report presentation | 10 |
| 2 | Practical analysis of microbes & wastes | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Study on the preparation of anaerobic digestion process.
2. Study on the preparation of aerobic digestion process.
3. Study and prepare the process of composting for vegetable wastes, and paper wastes.
4. Analysis of the growth pattern of microbes and the temperature variation in compost files.
5. Prepare a report on the study of food web in compost / vermicomposting files.
6. Practical Record.
7. Viva Voice

3. ENV-H_DSE603C-P- Practical based on ENV-H-DSE-603C (Forestry & Habitat Management)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation+ Report presentation | 10 |
| 2 | Graph representation/ Project work | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Studies on the types of forest distribution in India. Draw a digital map.
2. Studies on the agroforestry practices in India and Jharkhand. Draw a digital map.
3. Prepare a report on the cause of habitat destruction of ecologically sensitive sites- mangroves, tropical rain forests, coral reefs.
4. Prepare a report on the effect of climate change & the desertification process in India.
5. Prepare a report by graphical representation on different habitat management techniques practices in India.
6. Practical Record.
7. Viva Voice

4. ENV-H_DSE604A-P- Practical based on ENV-H-DSE-604A (Toxicology & Case Studies)

| Sl no | Practical | Marks Distribution |
|--------------|--------------------------------|---------------------------|
| 1 | Report presentation | 10 |
| 2 | Estimation analysis | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Estimation of metals in soil samples.
2. Estimation of heavy metals from water samples.
3. Prepare a report on effects of pesticides on environment.
4. Study on the modelling of pollutant dispersion in environment.
5. Prepare a report on toxico genomic and pharma genomic evaluation of pollutants.
6. Practical Record.
7. Viva Voice

5. ENV-H_DSE604B-P- Practical based on ENV-H-DSE-604B (Green Technologies)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation+ Report presentation | 10 |
| 2 | Project work | 5 |
| 3 | Practical record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Study on the production process of Biodiesel.
2. Study on the production process of Ethanol.
3. Study on solar photo voltaic fencing and solar lighting systems.
4. Study on solar cookers and water pumping systems.
5. Prepare a representation of a on solar pond.
6. Practical Record.
7. Viva Voice

6. ENV-H_DSE604C-P- Practical based on ENV-H-DSE-604C-P (Global Climate Change)

| Sl no | Practical | Marks Distribution |
|--------------|---|---------------------------|
| 1 | Power point presentation+ Report presentation | 10 |

| | | |
|-------|--------------------------------|----|
| 2 | Map Analysis /Project work | 5 |
| 3 | Practical Record and Viva voce | 5 |
| 4 | | |
| 5 | | |
| Total | | 20 |

1. Prepare a report on effects of climate change: Green House gases emissions, global warming and sea level Rise.

2. Prepare a report on effects of climate change on: crop productivity, human diseases.

3. Prepare a power point presentation on Clean Development Mechanisms.

4. Prepare a report on comparative evaluation of data from IPCC.

5. Prepare a graphical representation of successful green energy initiatives in India.

6. Practical Record.

7. Viva Voice