



# **TRIPURA UNIVERSITY**

**(A Central University)  
Suryamaninagar-799022**

**Syllabus  
OF**

**Environmental Science  
(General)**

**Semester – I to V**

**2014**

**TRIPURA UNIVERSITY**  
(A Central University)  
B.Sc. Environmental Science Syllabus - 2014  
(Elective)  
**First Semester, Paper - 1**

**Unit – I (ES01): Introduction to Earth and Environment**

Origin of universe; evolution of earth, atmosphere, hydrosphere, Lithosphere, Pedogenesis and origin of life; Structure and components of earth, plate tectonics and continental drifts; Orogenesis; Upwelling (Oceanic zones, ocean currents), Environmental determinism.

**Unit –II (ES02): Ecology and Ecosystem dynamics**

Concept of Aut-ecology and Syn- ecology; Population Ecology, Community ecology; Law of minimum and limit of tolerance, Ecological niche and habitat concept, Ecological succession, Ecosystem Structure: Physico-chemical and Biological components of ecosystem; function of ecosystem: biogeochemical cycle and energy flow in ecosystem, different types of ecosystems (aquatic, forest, grassland, desert, Wetlands and Estuaries), Ecosystem Dynamics : Primary and Secondary succession, Climax community; Species interaction, Major Biomes of the World.

**Unit – III (ES03): Natural Resource and their Management**

Resource and reserves (Minerals, fossil fuel); Renewable and non renewable energy resources: Solar, Wind, Hydel, Geothermal, OTEC, Tidal energy, Nuclear energy, gas hydrates; Energy plantation and bio-fuel, Agro-ecosystem management, conservation and management of soil and water body: surface and subsurface water.

**Unit –IV (ES04): Environmental Education and Major Environmental Issues and Movements**

Objectives of EE, guided principles, Strategies for EE. Models for future EE systems. Climate change: adaptation, mitigation and vulnerability; Man induced Seismicity, Avalanches, Forest fire, La-Nina, El-Nino and Indian Agriculture, Big dam movement, Chipko movement, Silent valley movement: Montreal Protocol, Kyoto protocol, Carbon Trading.

**Suggested Readings:**

1. Ambast, R.S. 2000. A Textbook of Plant Ecology. Third Edition. Students, Friends and Co., Varanasi.
2. Anjaneyulu, Y. 2009. Introduction to Environmental Science, BSP Books Pvt. Ltd., Hyderabad.

3. Arora, M.P. 2001. Ecology. Himalaya Publishing House, New Delhi.
4. Bhattacharyya, N.N. 2008. Biogeography. Rajesh Publications, New Delhi.
5. Bloom, A.L. 2003. Geomorphology – A Systematic Analysis of Late Cenozoic Landforms. Third Edition, Pearson Education, Singapore.
6. Botkin, D.B. and Keller, E.A. 2011. Environmental Science: Earth as a Living Planet. John Wiley and Sons, New Delhi.
7. Chapin III, F.S., Matson, P.A. and Vitousek, P.M. 2012. Principles of Terrestrial Ecosystem Ecology. Springer, New Delhi.
8. Chapman, J.L. and Reiss, M.J. 2006. Ecology - Principles and Applications. Second Edition. Cambridge University Press, Cambridge.
9. Cunningham, W. P. and Saigo, B.W. 2007. Environmental Science – A Global Concern. Eighth Edition. WCB/McGraw Hill, New York.
10. Dakshini, K.M.M. and Foy, C.L. 2000. Principle and Practices in Plant Ecology. CRC, Boston.
11. Dash, M.C. and Dash, S.P. 2009. Fundamentals of Ecology. Tata McGraw Hill Publishing Company Ltd., New Delhi.
12. Dayal, P. 2001. A Textbook of Geomorphology. Shukla Book Depot, Patna.
13. Hyderabad.
14. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies. Pearson Education Publisher, Delhi.
15. Kormondy, E.J. 2000. Concepts of Ecology. Fourth Edition. Prentice Hall of India, New Delhi.
16. Kumar, H.D. 1995. General Ecology. Vikas Publishing House Pvt. Ltd., New Delhi.
17. Lal, D.S. 2003. Climatology. Sharda Pustak Bhawan, Allahabad.
18. Lal, D.S. 2009. Physical Geography. Sharda Pustak Bhawan, Allahabad.
19. McKinney, M.L., Schoch, R. and Yonavjak, R.M. 2007. Environmental Science Systems and Solutions. Jones & Bartlett Publishing Inc., Delhi.
20. Miller, G.T. and Spoolman, S. 2011. Essentials of Ecology. Brooks/Cole Learning, USA.
21. Misra, K.C. 1992. Manual of Plant Ecology. Oxford and IBH Publishing Co., New Delhi.
22. Molles Jr, M.C. 2010. Ecology- Concepts and Application. Fifth Edition. McGraw Hill, New Delhi.
23. Molles, M.C. 2012. Ecology: Concepts and Applications. McGraw-Hill Higher Education, UK.
24. Odum, E.P. 2005. Fundamentals of Ecology. Nataraj Publisher, Dehra Dun.
25. Odum, E.P. and Barret, G.W. 2005. Fundamentals of Ecology. Thomson Asia Pvt. Ltd., Singapore.
26. Purohit, S.S., Shammi, Q.J. and Agarwal, A.K. 2004. A Textbook of Environmental Science. Students Edition, Jodhpur.
27. Rana, S.V.S. 2005. Essentials of Ecology and Environmental Science. Prentice Hall of India, New Delhi.

28. Reddy, A.M. 2005. Textbook of Environmental Science and Technology, BSP Books Pvt. Ltd., Hyderabad.
29. Santra, S.C. 2010. Environmental Science. Second Edition, New Central Book Agency (P) Ltd., Kolkata.
30. Sharma, P.D. 2004. Ecology and Environment. Seventh Edition. Rastogi Publication, Meerut.
31. Singh, S. 2002. Environmental Geography. Prayag Pustak Bhawan, Allahabad.
32. Trivedi, P.R. and Raj, G. 1992. Environmental Biology. Akashdeep Publishing House, New Delhi.
33. Verma, P.S. and Agarwal, V.K. 2005. Environmental Biology - Principles of Ecology. S. Chand and Co.Ltd., New Delhi.

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**Second Semester, Paper – 2A**

**Unit – I (ES05) Analytical Techniques and Environmental Statistics**

Principles and Applications: Titrimetry, Spectrophotometry, Flame Photometry, Electrophoresis, Atomic Absorption Spectrophotometry, Gas Chromatography, Microscopy: SEM, TEM and Image analysis; Sampling, Measures of Central tendency (mean, median, mode), SD, SE, Probability, Types of error, test of significance (Student t- test, F-test, Least Significant Difference); Correlation, regression

**Unit –II (ES06): Biodiversity Conservation**

Concept of Biodiversity, hierarchical levels (genetic diversity, species diversity, ecosystem diversity); Gradients of biodiversity (Latitudinal change); Biodiversity as a resource; Causes of biodiversity loss, Rare, Threatened and Endangered flora and fauna, Concept of Endemism and Invasive species, Global Biodiversity Hotspots, Strategies for Biodiversity Conservation Ex-situ, In-situ (Wild life sanctuaries, National Parks and Biosphere reserves, Gene and Seed bank), Biodiversity documentation, Convention on Biological Diversity.

**Suggested Readings:**

1. Adhikari, K. and Bhattacharjee, D. 2003. Statistics – Theory and Applications (including fundamentals of Computer). Bibhu Ranjan Paul, Silchar.

2. Alvi, Z. 2005. Statistical Geography – Methods of Application. Oxford University Press. New Delhi.
3. Asthana, B.N. 1996. Elements of Statistics (Part One). Tenth Edition. Chaitanya Publishing House. Allahabad.
4. Botkin, D.B. and Keller, E.A. 2011. Environmental Science: Earth as a Living Planet. John Wiley and Sons, New Delhi.
5. Cunningham, W.P. and Cunningham, M. 2011. Environmental Science: A Global Concern. McGrawHill, Boston.
6. Cunningham, W.P. and Saigo, W.B. 2005. Environmental Science. McGraw Hill, New York. Delhi.
7. Leon, A. and Leon, M. 2009. Fundamentals of Information Technology. Second Edition. Leon Press, Chennai.
8. Pal, S.K. 1999. Statistics for Geo-Scientists – Techniques and Applications. Concept, New Delhi.
9. Rajaraman, V. 1999. Fundamentals of Computers. Third Edition. Prentice-Hall of India Pvt. Ltd., New
10. Santra, S.C. 2005. Environmental Science. Second Edition. New Central Book Agency (P) Ltd., Kolkata.
11. Sharma, B.K. and Kaur, H. 1996. An Introduction to Environmental Pollution. GOEL Publishing House, Meerut.
12. Singhal, M. 2009. Elements of Statistics (Theory and Practice). Fourth Edition. Lakshmi Narain Agarwal, Educational Publishers, Agra.

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**Second Semester, Paper – 2B (Practical)**

1. Identification of rocks
2. Climatic maps – drawing of Hythergraph and Climograph
3. Identification of important minerals.
4. Study of meteorological parameters: light intensity, ambient temperature, wind velocity and relative humidity
5. Estimation of moisture, temperature and conductivity of soil
6. Determination of transparency, temperature and conductivity of water
7. Determination of requisite size and number of quadrates to be laid down for studying vegetation

8. Determination of Density, Abundance and Frequency of component species in a Grassland community
9. Measurement of primary productivity of a pond ecosystem
10. Estimation of population size from population chart by quadrat method
11. Computation of Mean, Median, Mode and Variance of the given environmental data set.
12. Working on Word Processing software
13. Preparation of Power point presentation for seminar

**Suggested readings:**

1. Misra, R. 1968. Ecology Workbook. Oxford & IBH Publications Co., New Delhi.
2. Michael, P. 1990. Ecological Methods for Field and Laboratory Investigation. Tata McGraw Hill, New Delhi.
3. Maiti, S.K. 2003. Hand Book of Methods in Environmental Studies. Vol. I & II. ABD Publishers, Jaipur.
4. Tripathi, B.D. and Govil, S.R. 2001. Water Pollution (An Experimental Approach). CBS Publishers and Distributors, New Delhi.
5. Sharma, P.D. 2003. Ecology and Environment. Rastogi Publications, Meerut.
6. Singh, R.L. 1997. Elements of Practical Geography. Kalyani Publishers, New Delhi.
7. Awasthi, D.D. 2000. A Handbook of Lichens. Bishen Singh Mahendra Pal Singh, Dehradun.

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**Third Semester, Paper – 3A**

**Unit – I (ES07): Environmental Chemistry**

Laws of thermodynamics, Chemical composition of Earth, Chemical composition of Air and Soil; Metals, Hydrocarbons. Biogeochemical cycles: Nitrogen, Phosphorus, Carbon, Sulphur; some important chemical processes (pyrolysis, fermentation, degradation pathways of organochemicals), Chemical nature of pesticides, surfactants, heavy metals, Photo Chemical Smog, Ozone Chemistry, Acid Rain, BOD and COD.

## Unit -II (ES08): Environmental Pollution and degradation

Definition, Type, source and consequence and remedial measures of Pollution (Air, Water, Soil, Noise, Radiation, Thermal); Sources and remedial measures for Marine and Coastal Pollution; Causes and consequences of Environmental degradation: deforestation, desertification and soil erosion.

### Suggested Readings:

1. Sharma, B.K. and Kaur, H. 2004. Environmental Chemistry. Krishna Prakashan Mandir, Merrut.
2. Abbasi, S.A. and Ramasami, E. 1999. Biotechnological Methods of Pollution Control. University Press, Hyderabad.
3. Arya, S.P. 1999. Air Pollution Meteorology and Dispersion. Oxford University Press, London.
4. Asthana, D K. and Asthana, M. 2005. Environment -Problems and Solutions. Second Edition. S. Chand and Co. Ltd., New Delhi.
5. Bahl, A and Bahl, B.S. 2005. A textbook of Organic Chemistry. Seventeenth Edition. S.Chand & Company, New Delhi.
6. Bell, J.N.B. 2002. Air Pollution and Plant Life. Second Edition. John Wiley and Sons, New Delhi.
7. Bhagi, A.K. and Chatwal, G.R. 2003. Environmental Chemistry. Himalaya Publishing House, New Delhi.
8. Butter, G.C. (ed). 1978. Principles of Ecotoxicology. Scope 12. John Wiley & Sons, New York.
9. Casarett, A.P. 1968. Radiation Biology. Prentice-Hall Inc., New Jersey.
10. Cheremisinoff, N.P. 1996. Biotechnology for Waste and Wastewater Treatment. William Andrew Publishing, New York.
11. Dara, S.S. 2010. A Textbook of Environmental Chemistry and Pollution Control. Fifth Edition. S. Chand & Co. Ltd., New Delhi.
12. De, A.K. 2004. Environmental Chemistry. New Age International Pvt. Ltd., New Delhi.
13. Fellenberg, G. 2003. Chemistry of Pollution. John Wiley and Sons, New Delhi.
14. Finlayson-Pitts, B.J. and Finlayson Jr., J.N. 1986. Atmospheric Chemistry: Fundamentals and Experimental Techniques. John Wiley and Sons, New Delhi.
15. G.W. and Duffy, S.J. 2000. Environmental Chemistry – A global perspective. Oxford University Press, New Delhi.
16. Gupta, P.K. 2010. Modern Toxicology Vol. I-III. Metropolitan Book Co. Pvt. Ltd., Delhi.
17. Hayes, W.A. 2001. Principles and Methods of Toxicology. CRC Press, New York.
18. Khitoliya, R.K. 2004. Environmental Pollution Management and Control for Sustainable Development. S. Chand & Co. Ltd., New Delhi.

19. Klaassen, C.D and Watkins, J.B. 2003. Essentials of Toxicology. McGraw-Hill Professional, New Delhi.
20. Pelczar, Jr. M.J, Chan. E.C.S. and Krieg. N.R. 2009. Microbiology. Fifth edition. Tata McGraw-Hill, New Delhi.
21. Pery, G. 1980. Introduction to Environmental Toxicology. Elsevier. Amsterdam.
22. Rao, M.N. and Sultana, R. 2011. Solid and Hazardous Waste Management. BPS Books Pvt. Ltd, Hyderabad.
23. Reddy, P.J. 2011. Pollution and Global Warming. BSP Books Pvt. Ltd, Hyderabad.
24. Sharma. B.K. 2005. Water Pollution. GOEL Publishing House. Meerut.
25. Spiro, T.G. and Stigliani, W.M. 2003. Chemistry of the Environment. Second Edition. Prentice-Hall of India Pvt. Ltd., New Delhi.
26. Tirvedi, R.K. and Geol, P.K. 2010. An Introduction to Air Pollution. Second Edition., DVS Publication, New Delhi
27. Uma Devi, P., Nagarathnam, A. and Satish Rao, B.S. 2000. Introduction to Radiation Biology. B.I. Churchill Livingstone Pvt. Ltd., New Delhi.
28. Walker, C.H. , Sibly R.M., Hopkin S.P., and Peakall D.B. 2012. Principles of Ecotoxicology. Fourth Edition. CRC Press, New York.
29. Wright, D.A. and Welbourn, P. 2002. Environmental Toxicology. Cambridge University Press, London.

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**Third Semester, Paper – 3B (Practical)**

1. Determination of SPM in atmosphere (roadside and classroom).
2. Determination of total suspended solids (TSS) and total dissolved solids (TDS) in water samples.
3. Determination of alkalinity, chloride, calcium and magnesium content of water samples.
4. Study of the soil profile.
5. Estimation of soil organic carbon content in grassland and forest.
6. Determination of pH of grassland and forest soil.
7. Comparative study of different types of lichen population (crustose, fructose and foliose) in disturbed and undisturbed forest ecosystem.
8. Monitoring of noise level in public area (campus and roadside).
9. Inventorization of important local NTFPs.
10. Study of Mycorrhizal association.



### Suggested Readings:

1. Gurumani, N. 2006. Research Methodology for Biological Sciences. MJP Publishers, Chennai.
2. Tripathi, B.D. and Govil, S.R. 2001. Water Pollution (An Experimental Approach). CBS Publishers and Distributors, New Delhi.
3. Kaur, K. 2007. Handbook of Water and Wastewater Analysis. Atlantic Publishers and Distributors (P) Ltd., New Delhi.
4. Maiti, S.K. 2003. Hand Book of Methods in Environmental Studies. Vol. I and II. ABD Publishers, Jaipur.
5. Sharma, P.D. 2003. Ecology and Environment. Rastogi Publications, Meerut.

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**Fourth Semester, Paper – 4A**

#### **Unit – I (ES09): Ecotoxicology and Environmental health**

Pesticides – types and mode of action; Bio-entry, Bioaccumulation, Bio-transformation and Biomagnifications ; Persistent Organic Pollutants (Organochlorine), Concept of LD50 and LC 50, Concept of xenobiotics, indices of toxicology, mutagens, carcinogens and teratogens and mutagens – their effects on human system, Concept of environmental health, water borne, Air borne and Vector born diseases. Causes and remedial measures of Malaria, Arsenikosis, and Amoebiosis. Toxins of biological origin; Occupational health. Epidemiological Issues - Goiter, Fluorosis.

#### **Unit – II (ES10) Remote sensing and GIS**

Definition, principle and kind of remote sensing, types of images and data, aerial photographs, resolution, pixel, electromagnetic spectrum, Global positioning system, data interpretation, mapping, False colour composing, Normalized Differential Vegetation Index, Reflectance pattern of different surfaces, application of remote sensing and GIS in environmental management.

### Suggested Readings:

1. Bahl, A and Bahl, B.S. 2005. A textbook of Organic Chemistry. Seventeenth Edition. S.Chand & Company, New Delhi.
2. Barrett, E.C. and Curtis, L.F. 1999. Introduction to Environmental Remote Sensing. Routledge, Taylor and Francis. New York.
3. Bhagi, A.K. and Chatwal, G.R. 2003. Environmental Chemistry. Himalaya Publishing House, New Delhi.
4. Bhatta, B. 2011. Remote Sensing and GIS. Oxford University Press, New York.
5. Butter, G.C. (ed). 1978. Principles of Ecotoxicology. Scope 12. John Wiley & Sons, New York.
6. Dara, S.S. 2010. A Textbook of Environmental Chemistry and Pollution Control. Fifth Edition. S. Chand & Co. Ltd., New Delhi.
7. De, A.K. 2004. Environmental Chemistry. New Age International Pvt. Ltd., New Delhi.
8. Gupta, P.K. 2010. Modern Toxicology Vol. I-III. Metropolitan Book Co. Pvt. Ltd., Delhi.
9. Hayes, W.A. 2001. Principles and Methods of Toxicology. CRC Press, New York.
10. Klaassen, C.D and Watkins, J.B. 2003. Essentials of Toxicology. McGraw-Hill Professional, New Delhi.
11. Lillesand, T.M. and Kiefer, R.W. 2004. Remote Sensing and Image Interpretation. Fifth Edition. John Wiley, Cambridge.
12. Masters, G.M. and Wendell, E. 2008. Introduction to Environmental Engineering and Science. Third Edition. Prentice-Hall India Pvt. Ltd., New Delhi.
13. Pelczar, Jr. M.J, Chan, E.C.S. and Krieg, N.R. 2009. Microbiology. Fifth edition. Tata McGraw-Hill, New Delhi.
14. Pery, G. 1980. Introduction to Environmental Toxicology. Elsevier, Amsterdam.
15. Sharma, B.K. and Kaur, H. 2004. Environmental Chemistry. Krishna Prakashan Mandir, Merrut.
16. Siddiqui, M.A. 2005. Introduction to Geographical Information System. Sharda Pustak Bhawan, Allahabad.
17. Spiro, T.G. and Stigliani, W.M. 2003. Chemistry of the Environment. Second Edition. Prentice-Hall of India Pvt. Ltd., New Delhi.
18. vanLoon, G.W. and Duffy, S.J. 2000. Environmental Chemistry - A global perspective. Oxford University Press, New Delhi.
19. Walker, C.H. , Sibly R.M., Hopkin S.P., and Peakall D.B. 2012. Principles of Ecotoxicology. Fourth Edition. CRC Press, New York.
20. Wing, M.G. and Bettinger, P. 2008. Geographic Information Systems: Applications in Natural Resource Management. Oxford University Press, New York.
21. Wright, D.A. and Welbourn, P. 2002. Environmental Toxicology. Cambridge University Press, London.

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**Fourth Semester, Paper – 4B (Practical)**

1. Determination of *Coliform* count in natural waters.
2. Study of root nodules of a nitrogen fixing plant.
3. Estimation of nitrate and phosphate content in natural waters.
4. Demonstration on the use of GPS.
5. Preparation of area map by using GPS.
6. Demonstration on the use of ARC-GIS software.
7. Determination of Height and Distance of an object from ground with Clinometer.
8. Visit to a place/ area/ locality promoting biodiversity conservation and preparation of field report using GIS.
9. Demonstration and editing of Scientific photography and videography
10. Visit to a health institution and preparation of health report.

**Suggested Readings:**

1. Gurumani, N. 2006. Research Methodology for Biological Sciences. MJP Publishers, Chennai.
2. Chadda, A. 1989. Agricultural Statistics in India. Suman Book House, New Delhi.
3. Tripathi, B.D. and Govil, S.R. 2001. Water Pollution (An Experimental Approach). CBS Publishers and Distributors, New Delhi.
4. Kaur, K. 2007. Handbook of Water and Wastewater Analysis. Atlantic Publishers and Distributors (P) Ltd., New Delhi.
5. Maiti, S.K. 2003. Hand Book of Methods in Environmental Studies. Vol. I and II. ABD Publishers, Jaipur.
6. Sharma, P.D. 2003. Ecology and Environment. Rastogi Publications, Meerut.
7. Awasthi, D.D. 2000. A Handbook of Lichens. Bishen Singh Mahendra Pal Singh, Dehradun.

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**Fifth Semester, Paper – 5A**

**Unit –I (ES11): Disaster management and Traditional knowledge system**

Nature and types of Disaster, Earthquake, Tsunami: Disaster management plans, Roles and regulatory functions of NIDM and NDMA in disaster management. Intellectual Property Rights, Traditional Agro-forestry system, Traditional Water Harvesting system and Traditional health care system: Ethno-biology Wild Edibles.

**Unit – II (ES12): Environmental Biotechnology and Management**

Management of Municipal Solid Waste, Biomedical waste, Hazardous waste and Electronic waste, Integrated pest management; Biopesticides, Bio-fertilizer, Vermicomposting and its importance. Environmental monitoring; environmental audit and reporting; major environmental acts: Air, Water, Wildlife and Biodiversity; Concept of Sustainable Development; Joint Forest Management; Environmental Impact Assessment (EIA); Environmental management Plan.

**Suggested Readings:**

1. Abbasi, S.A. and Ramasami, E. 1999. Biotechnological Methods of Pollution Control. University Press, Hyderabad.
2. Chiras, D.D. and Reganold, J.P. 2009. Natural Resource Conservation: Management for a Sustainable Future. Addison Wesley, Boston.
3. Flintan, F. and Tedla, S. 2010. Natural Resource Management: The impact of gender and Social Issues. IDRC, New Delhi.
4. Gupta, H.C.L., Siddiqui, A.U. and Parihar, A. 2010. Biopest Management (Entomopathogenic Nematodes, Microbes & Bioagents). Agrotech Publishing Academy, Udaipur.
5. Gupta, P.K. 2007. Elements of Biotechnology. Rastogi Publications, Meerut.
6. Jain, S.K. (ed) 1981. Glimpses of Indian Ethnobotany. Oxford and IBH, New Delhi.
7. Jain, S.K. 2004. Manual of Ethnobotany. Scientific Publishers, Jodhpur.
8. Jemba, P.K. 2004. Environmental Microbiology. Science Publishers, New Hampshire.
9. Khan, I.A. 2000. Environmental Law. Central Law Agency, Allahabad.
10. Murugesan, A.G. and Rajakumari, C. 2006. Environmental Science and Biotechnology. MJP Publishers, Chennai.
11. Negi, S.S. 2000. Forest Law (with explanations). Oscar Publications, Delhi.

12. Pandey, H.N. 2010. Sacred Forests – Their Ecology and Diversity. Regency Publications, Delhi.
13. Priyasankar Choudhuri (2006), Kenchor Jeeban Baichitra O Kencho Prejukti. Jyan Bichitra Prakashani, Agartala.
14. Raina, M., Pepper, I. and Gerba, C. 2006. Environmental Microbiology. Academic Press, New York.
15. Sands, P. 2003. Principles of International Environment Laws. Cambridge University Press, London.
16. Scrogg, A. 2005. Environmental Biotechnology. Second edition, Oxford University Press, New York.
17. Somani, L.L., Shilpkar, P. And Shilpkar, D. 2011. Biofertilizers – Commercial Production Technology & Quality Control. Agrotech Publishing Academy, Udaipur.
18. Srivastava, M.L. 2003. Basic Environmental Microbiology. Manohar Books, New Delhi.
19. Thapar, S.D. 1975. India's Forest Resources. Macmillan India, New Delhi.
20. Tiwari, B.K., Barik, S.K. and Tripathi, R.S. 1999. Sacred forests of Meghalaya: biological and cultural diversity. Regional Centre: NAEB, North-Eastern Hill University, Shillong.
21. Trivedi, P.C. 2010. Bioremediation of wastes and Environmental Laws. Aavishkar Publishers, Distributors, Jaipur.
22. Trivedi, R.K. 2004. Handbook of Environmental Laws, Acts, Guidelines, Compliance and Standards (Vol. I and II). B.S. Publications, Hyderabad.
23. Zafar, R. 2002. Medicinal plants of India. CBS Publishers & Distributors, New Delhi.

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**Fifth Semester, Paper – 5B (Practical)**

1. Preparation of Pre disaster, disaster and post disaster plans for earth quake disaster.
2. Measurement of girth, height and volume of tree bole.
3. Determination of similarity and dissimilarity by Morisita Index and Bray Curtis methods.
4. Determination of Simpson Diversity Index ( $\lambda$ ) in a forest community.
5. Study of important ethno-medicinal plants with the help of herbarium.
6. Determination of texture of given soil sample.
7. Identification of plants of a grassland and forest community.
8. Preparation of vermicompost.
9. Preparation of environmental models on Global warming, Climate change, Water harvesting technique etc.

10. Study of edible insects and molasses of different tribes of Tripura.

Suggested Readings:

1. Charles, P. and Vincent, J.R. 2005. Natural Resource Accounting and Economic Development: Theory and Practice. Edward Elgar Publishing Ltd., Cheltenham.
2. Haab, T. and McConnell, K.E. 2003. Valuing Environmental and Natural Resources. Edward Elgar Publishing Ltd., Cheltenham.
3. Ghosh, S.K. and Singh, R. 2003. Social Forestry and Forest Management. Global Vision Publication, Delhi.
4. Khanna, L.S. 1985. Forest Mensuration. International Book Distributors, Dehradun.
5. Principles and methods of Geographic Information Systems and Science, Paul A. Longley, Prentice-Hall.