## SARDAR PATEL UNIVERSITY VALLABH VIDYANAGAR



# SYLLABUS EFFECTIVE FROM: 2017-18 MSC (ENVIRONMENTAL SCIENCE AND TECHNOLOGY (EST)) SEMESTER - II

## PS02CEST21: REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM

Remote Sensing: Remote sensing: definition and scope; Electro-magnetic radiation: characteristics, interaction with matter and spectral regions. Active & Passive Sensors, Resolution: Spectral, Spatial, Radiometric & Temporal

Image Classification & RS Applications: Elements of Visual Interpretation, Supervised and Unsupervised classifications, Satellite Imageries and its application in Environmental Monitoring, Coastal zone planning, Flood & Drought mapping, Urban sprawl monitoring

Geographic Information System: GIS – definition, terminology, Map and GIS, Components of GIS, Data types: Point, Line, Polygon / Area, Surface, Non-spatial Attribute Data, Topology, Basic Spatial Analysis, Georeferencing: Datum projection & Coordinate System, GPS-GIS unification

Data Quality and Basic Spatial Analysis: Raster Models, Vector Models, Accuracy, Precision and Resolution, Consistency and Completeness, Error Sources, Queries, Measurement, Classification, Symbolization, Union, Intersection, Data Merging

- 1. Concepts and Techniques of Geographic Information Systems, C. P. Lo , A. K. W. Yeung, PHI
- 2. Fundamentals of Geographic Information System, Michael DeMers, Wiley
- 3. Fundamentals of Remote Sensing, George Joseph, University Press
- 4. Geographical Information Systems Principles, Techniques, Management & Applications, Paul A. Longley, Michael F. Goodchild, David J. Maguire, David w. Rhind by John Wiley & Sons Inc.
- 5. Global Navigation Satellite Systems, B. Bhatta, B S Publication
- 6. Global Positioning System: Signals, Measurements & Performance, Pratap Misra, Per Enge
- 7. GPS satellite Surveying, Alfred Leick, Wiley
- 8. Remote Sensing & Image Interpretation, Lillesand, Kiefer, Chipman, Wiley

# **PS02CEST22: METEOROLOGICAL AND ENVIRONNEMENTAL INSTRUMENTS**

Meteorological instruments- Meteorology as a discipline. Meteorology and Environment. Meteorological observatory and meteorological instruments: Cup anemometer, wet and dry bulb thermometer, minimum and maximum thermometer and hygrometers, rain gauge. sunshine recorder, aneroid barometer, Environmental monitoring and related Instruments-Sacchis disc, Soil samplers, Soil leachate collectors. Water and sediment samplers. Soil tensiometer. Soil gas samplers, high volume air sampler and other air samplers – stack monitoring, and its working ,applications

Analytical Instruments- U.V.-Visible and IR Spectrophotometer, Atomic Absorption spectrophotometer, Flame photometer, Bomb calorimeter, TOC analyzer, ICPAES, ICPMS, NMR., LCMS, Electrophoresis, Centrifuge

Chromatography- Paper, thin layer, HPLC, GCMS, GLC, Microscopy- Light microscope, Dark field, Bright field, Phase contrast, Electron microscope - SEM, TEM (Principle, ray diagram/figure, various important parts in brief and applications).

Biostatistics- Sampling, Data presentation, mean, median, mode, standard deviation, correlation, regression, ANOVA, t-test, Chi square, skewness, kurtosis, descriptive statistics, statistical sofwares & modeling (Aquatox, BD-Pro, PAST, Ky-Plot, Piper diagram, SPSS)

## **Suggested Books**

- 1. Arora & Malhan. 2000. Biostatistics. Scientific Publishing.
- 2. Negi, M.S. 2002. Fundamentals of Biostatistics. Enviro Publication.
- 3. Scoorg et al. 2000. Instrumental Analysis. Blackwell Publishing.
- 4. Turk, A, Turk, J. Wittes J.T. and Wottes, R.E. 1978. Environmental Science, W.B. Saunder Company, Philadelphia.
- 5. Watt, K.E.F. 1973. Principles of Environmental Sciences, McGraw Hill Book Company.
- 6. Willard, H.H. merit, L.L. and Dean, J.A. 1976. Instrumental methods of analysis, Van Nostrand Reinhold 5<sup>th</sup> ed.

# PS02CEST23: OCCUPATIONAL AND ENVIRONMENTAL TOXICOLOGY

Introduction to Occupational pollutants: Classification of Hazardous Substances, types of effects and entry, preventive measures, industrial cancer causing agents and substances and process causing occupational diseases. Toxicology- Acute and chronic toxicity, LC  $_{50}$ ,LD $_{50}$  Dose and Response, ADME.

Basic structure: Human tissue, skin, blood, kidney, lungs, heart ,liver - , dermal, Nephro , cardiac, pulmonary toxicity and hepatic toxicity.

Basic structure of Nervous system, ear and eye and their toxicity due to environmental pollutants: Neuron toxicity and ophthalmic toxicity. Respiration (ATP synthesis, biological oxidation) Glycolysis, Kreb's Cycle ,Electron transport Chain, photosynthesis- Structure of Chlorophylls , photosystems, pigment systems, light reaction, C3,C4 Plants, CAM metabolism, environmental factors governing these process.

Mode of action of herbicide- absorption, translocation, biochemical fate, metabolic response, morphological variations of herbs in general. Herbicide toxicology- classification and mode of action of urea, phenoxy, triazine substituted herbicides. Heavy metal toxicity- Mode of action of Lead, Mercury, Chromium and Cadmium and their impact on plants and animals including human organs . Teratogenicity and carcinogenicity, Persistent Organic Pollutants (POPs): Chemistry, distribution, long range transformation at Global level

## **Suggested Books**

- 1. Ashton and Crafts. Mode of Herbicides. Tata McGraw Hill Publishers
- 2. David, A.W. & Pamela, W. 2002. Environmental Toxicology. CUP.
- 3. Donald, G. Crossby. 1998. Environmental Toxicology & Chemistry. OUP.
- 4. Floyd M. Ashton and Alden S. Craft: 1981. Mode of Action of Herbicide Physiology. A Wiley Inter Science Publications
- 5. Landis, W.G. and Ming-Hoyo. 1998. Introduction to Environmental Toxicology. Lewis Press, London.
- 6. M. O. Amdur, John Doull and Curtis B. Klaassen, Casarett and Doull's Toxicology: The basic science of poisons.(4<sup>th</sup> edition). Pergamon press.
- 7. Mary O Amdur, John Doull and Curtis D Klaasen 1991Toxicology The Basic science of Poisons Pergamon Press.
- 8. Nene YL and Thapliyal P N Fungicides in Plant Disease Control.
- 9. NIIR. 1998. Pesticides, Insecticides and Fungicides.
- 10. Pandey & Shukla. 2001. Environmental Toxicology. Dominant Press.
- 11. Tortora and Grabowski. 2003 Principles of Anatomy and Physiology, John Wiley and Sons co.
- 12. Trivedi, R.K. 2000. Introduction to Toxicology.
- 13. Wayne G Landis and Ming-Ho YU Introduction to Environmental Toxicology. 2000 Lewis Publishers.

# PS02EEST21: INDUSTRIAL HYGIENE AND OCCUPATIONAL HEALTH

Industrial hygiene: definition of hygiene, industrial hygiene practices, role of industrial hygienist and scope, difference between industrial hygiene and occupational health, Environment benefits of industrial hygiene workplace environment. Introduction to Occupational hazards: definition and classification, adverse health effects and controls, Chemical, physical and biological hazards. Definition of various T.L.V.s.

Occupational Health Hazards in specific industries like Power plants, Textile mills, Cement industries, chemical and pharmaceutical , Petrochemical industries, coal mines etc. Occupational Carcinogens & Occupational Cancer. First aid and Antidotes for certain commonly used chemicals.

Recognition and evaluation of occupational health hazards, exposure assessment (Qualitative and quantitative), types of monitoring-air, workplace area, personal exposure. Physiology of work, assessment of workload, assessment of work capacity, nutrition, diets, physical fitness and their relationship, Ergonomics-principles, major heads, muscular physiology, work station design.

Occupational health services- occupational health centre, qualification and practices. Factory medical officer, staff and equipment, ambulance van, Control of occupational diseaseshierarchy of controls, engineering controls (local exhaust ventilation, general ventilation), substitution, elimination, administration, personal protective equipments. OSHA standards. Accident statistics, Medical emergency plan.

## **Suggested Books**

1. Barbara A. Plog and Patricia J. Quimlan Fundamentals of Industrial hygiene:.(NSC Press)

- 2. Browning, E. 1963. Toxicology of Industrial Organic Solvents, Chemical Publishing, N.Y.
- 3. K.U. Mistry Fundamentals of Industrial safety and Health: Dr. Siddharth Prakashan, Ahmedabad)
- 4. Kohn & Bisesi. 2005. Environmental Health and Safety. CRC Press.
- 5. Patty, F.A. Industrial Hygiene and Toxicology, Vol.I and II. Inter science, N.Y.
- 6. Raval, H.R. Industrial Safety and its Applications.

# PS02EEST22: ENVIRONMENTAL ECONOMICS

Concept of economy and environment, Basic principles of environmental economics, International trade and environment, externalities and market failure. World environmental history and economic development, valuation of natural resources, sustainable agriculture and development, cost benefit analysis, current moral and philosophical problems of traditional and technological societies, investment projects and natural resources.

Natural resource accounting and valuation: techniques (travel cost method, contingent method, hedonic price methods etc.),case studies. Integrated economic modeling at scales from local to regional to global, alternative principles for valuing natural wealth.

Valuation of eco-system services, economic theories of renewable and non-renewable resources, resource curse hypothesis, environmental policy analysis: criteria for policy, policies in industrialized countries, institution and incentives. economic and ecological consequences of genetically engineered organism and gene pool inventory and management, environmental indicators and their use in resource management, intellectual property rights.

Voluntary mechanisms, eco-labeling, product certification, economics of climate change, cost benefit analysis of environmental projects. Integrating natural resources and environmental services into national income and wealth accounts, methods of implementing efficient environmental policies, case studies of economic and ecological conflict,

# **Suggested Books**

- 1. D Chapman, 2000. Environmental Economics Theory, Application, and Policy. 1st edition only. Reading: Mass: Addison Wesley
- 2. G.Carlson., D Zilberman and J Miranowski. 1993. Agricultural and Environmental Resource Economics. 1st edition only. Oxford: Oxford University Press.
- 3. J Asafu-Adjaye. 2000. Environmental Economics for Non-Economists. Singapore: World Scientific.
- 4. J Bowers. 1997. Sustainability and Environmental Economics: an Alternative Text. 1st edition only. NJ: Prentice Hall.
- 5. S Callan and J Thomas. 2000. Environmental Economics and Management: Theory, Policy and Applications. 2nd edition. Fort Worth: Dryden Press.

## PS02CEST24: Practicals based on PS02CEST21and PS02CEST22

Determination of wind velocity by anemometer, atmospheric pressure by aneroid barometer, temperature by minimum and maximum thermometer, relative humidity by wet and dry thermometer, sunshine hour by sunshine recorder, Separation of amino acids by using paper chromatography, Aerial photograph and remote sensing data interpretation. Principle,

working method of HVAS, Stack monitoring kit. Estimation of PM, CO<sub>2</sub>, NO<sub>2</sub>, SO<sub>2</sub> and NH<sub>3</sub> in atmosphere by high volume air sampler, Preparation of Windrose,

Instruments- Principle, working methods, PH meter, Flame photometer, spectrophotometer, colony counter, centrifuge. Visit to Meteorological department, AAU and SICART laboratories.

Statistics: graphical representation of data (bar, column, compound, pie, scatter), frequency distribution (histogram, frequency polygon, ogive), central tendency, mean, median, mode, t-test, ANOVA, Chi square test, correlation, Regression. Environmental softwares,

# PS02CEST25: Practical based on PS02CEST23 and PS02EEST21

Extraction and estimation of pigments, carbohydrates, proteins, amino-acids, phenol, protease, amylase in treated and untreated samples, Separation of pigments by paper chromatography, LC 50 determination by *Eichhornia crassipes*, quantification of heavy metals by spectrophotometer method/ ICPA- Iron, Chromium, Boron, Aluminum and Copper, Determination of heavy metal/industrial toxicity by germination and seedling growth tests.

PS02CEST26: Viva Voce