# SOLAPUR UNIVERSITY, SOLAPUR

## REVISED SYLLABUS - M.Sc. I ENVIRONMENTAL SCIENCE

## To be implemented from year 2011-2012

## M.Sc. SEMESTER - I and II

**SCHOOL OF EARTH SCIENCES,**

**SOLAPUR UNIVERSITY, SOLAPUR.**

**SYLLABUS OT THE M. Sc . ENVIRONMENTAL SCIENCE**

**STRUCTURE OF THE COURSE**

**SCHOOL OF EARTH SCIENCES, DEPARTMENT OF ENVIRONMENTAL SCIENCE**

**SOLAPUR UNIVERSITY, SOLAPUR.**

SYLLABUS OT THE M. Sc ENVIRONMENTAL SCIENCE

**STRUCTURE OF THE COURSE**

**SEMESTER I**

| COURSE CODE | SUBJECT | Hourse/ Weaks | EXTERNAL MARKS | INTERNAL MARKS |
|---|---|---|---|---|
| EST 101 | GEOMORPHOLOGY | 4 | 70 | 30 |
| EST 102 | PHYSICAL ENVIRONMENT AND ECOLOGY | 4 | 70 | 30 |
| EST 103 | ENVIRONMENTAL CHEMISTRY | 4 | 70 | 30 |
| EST 104 | COMPUTER APPLICATION IN EARTH SCIENCE | 4 | 70 | 30 |
| ESP 105 | PRACTICAL RELATED TO EST 101 & EST 102 | 6 | 70 | 30 |
| ESP 106 | PRACTICAL RELATED TO EST 103 & EST 104 | 6 | 70 | 30 |

**SEMESTER II**

| | | | | |
|---|---|---|---|---|
| EST 201 | ANALYTICAL TECHNIQUES IN ENVIRONMENTAL SCIENCE | 4 | 70 | 30 |
| EST 202 | AIR POLLUTION | 4 | 70 | 30 |
| EST 203 | WATER AND SOIL POLLUTION | 4 | 70 | 30 |
| EST 204 | INTRODUCTIONS TO REMOTE SENSING (RS), GEOGRAPHICAL INFORMATION SYSTEM (GIS) AND GPS. | 4 | 70 | 30 |
| ESP 205 | PRACTICAL RELATED TO EST 201 & EST 202 | 6 | 70 | 30 |
| ESP 206 | PRACTICAL RELATED TO EST 203 & EST 204 | 6 | 70 | 30 |

**SEMESTER III**

| | | | | |
|---|---|---|---|---|
| EST 301 | ENVIRONMENTAL TOXICOLOGY | 4 | 70 | 30 |
| EST 302 | SOLID WASTE & ENVIRONMENTAL PROBLEMS ASSOCIATED WITH MAJOR PROJECTS | 4 | 70 | 30 |
| EST 303 | NOISE POLLUTION, INDUSTRIAL AND OCCUPATIONAL HEALTH | 4 | 70 | 30 |
| EST 304 | WASTEWATER AND GROUND WATER POLLUTION | 4 | 70 | 30 |
| ESP 305 | PRACTICAL RELATED TO EST 301 & EST 302 | 6 | 70 | 30 |
| ESP 306 | PRACTICAL RELATED TO EST 303 & EST 304 | 6 | 70 | 30 |

**SEMESTER IV**

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|---|---|---|---|---|
| EST 401 | DISASTER MANAGEMENT & ENVIRONMENTAL TECHNOLOGY | 4 | 70 | 30 |
| EST 402 | ENVIRONMENTAL POLICY, ACT AND PLANNING | 4 | 70 | 30 |
| EST 403 | WATERSHED MANAGEMENT | 4 | 70 | 30 |
| EST 404 | DISSERTATION | 4 | 70 | 30 |
| ESP 405 | PRACTICAL RELATED TO EST 401 & EST 402 | 6 | 70 | 30 |
| ESP 406 | PRACTICAL RELATED TO EST 403 & EST 404 | 6 | 70 | 30 |

**TOTAL DURATION OF THE COURSE: 2 YEARS**

**Each Semester will have 1 credits (25 Marks) for- Field training for long tour / In-plant Training,/ Industrial visits or Nature visits /Field work, data acquisition related to dissertations**

# M.Sc. Environmental Sciences

## Part – I Semester- I

**EST101: GEOMORPHOLOGY (70 MARKS)**

UNIT 1: Fundamental concept in Geomorphology, nature of Geomorphology. Mechanical and Chemical Weathering. Weathering and Soil Formation.

UNIT 2: Concept of Erosion, Cycle of Erosion, Rejuvenation and Polycyclic relief's.

UNIT 3: Drainage System and Patterns.

UNIT 4: Erosional & Depositional Landforms of Fluvial, Karst, Glacial, Aeolian and marine environment.

UNIT 5: Coastal Geomorphology, Classification of coast, Sea level waves and currents, Beach process and Shoreline changes.

UNIT 6: Tectonics of the Oceans: Tectonics and Coastal Classification, the origin of ocean water and its implication. Lineament Analysis, Neotectonism, Plate Tectonic theory.

**Internal Evaluations:**

**Seminar + Term Paper + Test (30 MARKS)**

**ESP 101: Practicals of Geomorphology (35 MARKS)**

1. Drainage basin and morphometry.
2. Basin demarcation
3. Ordering of streams – Strahler's and Horton methods
4. Relief and slope analysis – profiles and maps.
5. Identification of landforms on toposheets (aerial photographs and satellite imageries)
6. Soils: textural characteristics, study of representative soil profiles.

**Internal Evaluations:**

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books :-**


1. Savinder sing, Physical Geography, Prayag Pustak Bhawan, 20-A university road, Allahabad-211002
2. Husain M ,Systematic Agricultural Geography, Rawet Publication ,jaipur,Dehli
3. Hoover E,M. Location Economic Activity ,New York ,McGraw Hill 1948
4. Rafillah,S.M. A New Approach to functional Classification of Town ,Geographer New Dehli
5. Climatology, A.K. Barua
6. K.siddhartha,S.mukherjee, Cities urbanization and urban system, kisalaya publication pvt. Ltd,Dehli
7. Fundamental of Geomorphology, R.J. Rice
8. Geomorphology, R.J. Chorley, S.A.Schumm, D.E. Sugden
9. Principle of geomorphology, W.D. Thornbury
10. Geomorphology, Majid Husain
11. Indian Geomorphology, H.S.Sharma

**EST 102: PHYSICAL ENVIRONMENT AND ECOLOGY (70) MARKS)**

UNIT 1: Concept of Environment, Evolution of Environment.

UNIT 2: Lithosphere: Rock cycle, types of rocks and composition, minerals and its properties, Brief introduction to Rock Forming Mineral Groups. Internal Structure of the Earth. Hydrosphere: Hydrological Cycle, stages, Evolution and Composition. Atmosphere: Structure, Composition, Evolution and Classification.

UNIT 3: Biogeochemical cycles, Global Environmental Issues: Green House Effect, Sea Level rise, global warming, ozone depletion, acid rain.

UNIT 4: Concepts in Ecology, Environmental factors (Biotic and Abiotic) Ecological adaptations, Auto ecology of species, Population Ecology, habitat ecology.

UNIT 5: Concepts and Principles of Ecosystem, Development and Evolution of ecosystem, Fresh water, Marine and Terrestrial Ecosystems. Ecological Pyramid, Ecological Organisms and Biotic Community.

UINT 6: Bio-diversity concept, Wildlife management and conservation. Protected Areas Network in India: Goals of management, Strategies for planning. Factors influencing wildlife management such as habitats, population, behavior, food-habits, health, etc., tools for data collection and analysis. Human land-use and wildlife management units, important projects for the conservation of wildlife in India, Role of local communities in wildlife management.

## Internal Evaluations:

## Seminar + Term Paper + Test (30 MARKS)

**ESP 102: Practicals of Physical Environment & Ecology (35 MARKS)**

1. Megascopic properties of Minerals.

2. Classification and identification of minerals (Museum specimens).
3. Preparation of a climatic maps and diagrams.
4. Identification of Rocks and specimens.

5. Estimation of Biomass production of grassland

6. Frequency and relative frequency distribution

7. Study of Density & Relative density of Grass land species.

8. Productivity estimation. (Primary, NPP & GPP)

## Internal Evaluations:

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books :**

1) Fundamentals of Ecology:- E.P. Odum, Revised Edition 1995-96 Edition 2003.

2) The Biological diversity Act 2002 and Biological diversity rules 2004 :- National Biodiversity Authority INDIA. 475, 9th South cross street, Kalpalocwar Nagar, Neelangarai Chennai – 600041.

3) Biodiversity and Environment:- S.K. Agarwal, S. Tiwari and P.s. Dubey, 1996.

4) Concept of Ecology :- E.J. Koromondy, 1996, Concept of modern Biology Series, Prentice Hall.

5) Biodiversity Measurement and Estimation :- D.L. Hawks worth Director international Mycological Institute Surrey, UK, Published:- Chapman & Hall, Condou New York, Tokyo, Madras.

6) Ecology and Environment :- P.D. Sharma, 1994.

7) Biodiversity Conservation:- Global agreements and nationational concems. RAMSAR sites CBD, Ouarantine, Regulation, National terety pdicy Biodiversity Act wild life Act.

8) Environmental Science :- Daniel Botkin and Edward Kelter, John Wiley and Sons, NewYork.

9) Environmental Science :- Eldon d. Enger and Bradley F. Smith, WCB Publishers; Boston.

10) Ecology 2000 :- Sir Edmand Hillary.

11) Manual for field scology :- R. Mishra.

12) Modern Concepts of Ecology :- H.D. Kumar.

13) Fundamentals of Ecology:- Dash M.C. Tata McGraw Hill. Pub. Co-Ltd. New Delhi.

14) Ecology and Environment :- P.W. Sharma Rastogi Publications, Meerut.

15) Principals of Environmental Biology :- P.K.G. Nair, Himalaya Pub. House, Delhi.

16) Environmental Science :- Enger, Smith, Smith W.M.C, Brown. Company Publication

**EST103: ENVIRONMENTAL CHEMISTRY (70 MARKS)**

UNIT 1: Concept and Scope of Environmental Chemistry. Environmental Segments Chemistry of Environmental segments.

UNIT 2: Fundaments of Environmental chemistry – Stiochiometry, Gibbs' Energy, Chemical potential, chemical equilibria, acid – base reaction, solubility products, solubility of gases in water, carbonate system, unsaturated and saturated hydrocarbons, radionuclides.

UNIT 3: Chemistry of Various Organic and Inorganic Compounds. Carcinogenic compounds and their effects. Surfactants: Cationic, anionic and nonionic detergents, modified detergents. Synthetic Polymers: Microbial decomposition, polymer decay, ecological and consideration, Photosensitize additives. Lead and its compounds : Physical and chemical properties, behavior, human exposure, absorption, influence.

UNIT 4: Pesticides: Classification, degradation, analysis, pollution due to pesticides and DDT problems. Chemistry of Corrosive and metallic compounds.

UINT 5 : Classification of Industrial Pollutants, Chemical characteristics of waste water, heavy metals, soaps & detergents, asbestos & food additives, chemistry of pollutants from pulp & paper mill, sugar & starch industries, textile, cement & pharmaceutical industries. Destruction of hazardous substances – Acid halides – and anhydrides, alkali metals, cyanides and cyanogens bromides, chromium, halogenated compounds.

UNIT 6: Toxic chemicals in the environment: Atmospheric toxicants; Toxic heavy metals; Solvents and other organic chemicals; Petroleum and other related compounds; Carcinogens; Assessment of toxicity; Assessment of environmental risks; Chemistry of toxic chemical and hazardous substances in the environment.

## Internal Evaluations:

## Seminar + Term Paper + Test (30 MARKS)

**ESP 103: Practical Environmental Chemistry (35 MARKS)**

1. Selection of sampling sites and collection of methods of samples.
2. Determination of pH, Electrical conductivity, turbidity, odour and colour.
3. Determination of TS, TDS and TSS.
4. Determination of Acidity and Alkalinity.
5. Determination of Chlorides
6. Determination of Hardness
7. Determination of Dissolved oxygen.
8. Study of phytoplankton's and zooplanktons

## Internal Evaluations:

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books:**

1) Environmental Chemistry :- A.K. De, Wiley eastern Ltd, 1987.

2) Environmental Chemistry:- R.C. Rasswell, Edward Armold press 1980.

3) Fundamentals of Environmental Chemistry:- Stanley E. Manahan.

4) Demalogy:- Wetzel

5) Photo chemistry & spectroscology:- J.P. Simmons Wiley 1971.

6) Fundamentals of Photo chemistry:- K.K. Rohatgi-Mukherjee.

7) Environmental Chemistry:- B.K. Sharma.

8) Elements of Environmental Chemistry.:- H.V. Jadhav, Himalya Publication House

9) Environmental Chemistry:- B.K. Sharma and H.kaur, Krishan Prakashan Meia (p) Ltd.

10) Environmental Pollution analysis:- S.M. Khopkar, New Age, International.

11) Environmental Chemistry :- A.K. De. Wiley Interscience.

12) Environmental Chemical Analysis:- Lain L. Marr, Mallelm S. Cresser, international text book company, USA.

13) Dimndogy : Wetgel

14) Environmental Geology :- K.S. Valdiya Indian. Context Tata Mcgraw Hill Pub. Co, New Delhi, 1987.

15) Environmental Geology :- Barbara, Wim, Brain, J.S. Stephen, C.P. John Wiley & Sens. Inc.

16) Environmental Geology :- Cundgran, Lawrence Prentice Hall.

17) I-Geology in Env. Planning :- Howard, A.D., and Remson, McGraw. Hill, New York 1978.

18) Env. Geology :- Kellev.

19) Natural hazards :- Alexander.

**EST104: COMPUTER APPLICATION IN EARTH SCIENCE (70 MARKS)**

UNIT 1: History of computer, Basics of computers- An introduction to computers, development of computers, Hardware and Software. Fundamentals of computers – Operating systems, Input to the computers, Storage devices, central processing unit, Computer output, Compact Disk Cartridges, Floppies, pen drives, etc.

UNIT 2: Personal Computers- Data communication and networks – Application software, word processing, spread sheets, Data management and graphics. Data Base Management System, Multimedia. General Idea about the networking, LAN, WAN, databases, etc

UNIT 3: Use of information technology in environmental studies, Definition, scope of information technology, history and present status of information technology, application of IT in environmental protection. Environmental sciences and the Internet.

UNIT 4: Computer applications, technology and futuristic for environmental sciences. Use of standard software's for representing various data in graphs, diagrams, charts etc.

UNIT 5: Website Design, Introduction to Bio informatics – scope, tools and applications. Application of Computer in Earth Sciences - Geoinformatics, Geology, Geography, hydrology, Environment or in thematic map preparation and modeling.

## Internal Evaluations:

## Seminar + Term Paper + Test (30 MARKS)

**ESP 104: Practicals of Computer Application in Earth Sciences (35 MARKS)**

1. Presentation of data by graphic methods: histogram, frequency curve, cumulative frequency curve on simple arithmetic and log probability scales.
2. MS –Word - Report, typing, files.
3. MS-Access - Database management system
4. MS-excel - Line, Bar, Pie, Scatter.

## Internal Evaluations:

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

## Reference Books:-


- Principles of GIS for Land Resources Assessment by P.A. Burrough, Oxford : Science publications, 1986.
- Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc, New York, 2002.
- GIS – A computing Perspective by Micheal F. Worboys, Taylor & Francis, 1995
- Introduction to computer and operating system – sharada sahasrabudhe ,pune
- Elmasri R. and Navathe S.B., "**Fundamentals of Database** Systems", Benjamin/Cummings Publishing Co. Inc.(Addison-Wesley world student series), 2002
- Trembley J.P. and Sirenson P.G., "An Introduction to Data Structures with Applications", Tata McGraw-Hill.
- Date C.J., "An Introduction to Database Systems", Vol-I, Addison-Wesley.
- A.Silberschatz, H.F.Korth and S.Sudarshan, "Database System Concepts", McGraw-Hill International Editions, Computer Science Series.


*** 1 credits (25 Marks) for-**

**Field training for long tour / In- plant Training,/ Industrial visits or Nature vists Field work related to dissertations.**

# M.Sc Environmental Sciences

## Part – I Semester – II

**EST 201: ANALYTICAL TECHNIQUES IN ENVIRONMENTAL SCIENCE**

**(70 MARKS)**

UNIT 1: Sampling :- Sample preparation, methods of sample pre - treatment, standard calibration, sample classification by size and analyses level, limits of trace analysis, preservation, storage and processing of air, liquid ( Water) and Solid (Soil) samples, Separation and sampling techniques- precipitation, fractional crystallization, fractional distillation, solvent extraction etc.

UNIT 2: Introduction to separation techniques, Lamberts and Beers law, neutron activation analysis, Atomic Absorption Spectroscopy (AAS), Flame photometry, inductively couple plasma emission spectroscopy. X-ray Fluorescence, Non-dispersive IR Spectroscopy (NDIR), UV- Visible spectrophotometer, High performance liquid chromatography (HPLC), colorimeter, potentiometer, Gas chromatography, NMR and MASS spectroscopy.

UNIT 3: Sampling methods, Data collection and recording. Data structure in Environmental statistics, Statistical Methods: Measures of central tendency, Measures of dispersion, Kurtosis, Skewness, regression, Hypothesis testing, Pearson and other correlation coefficients, probability Distribution.

UNIT 4: Experimental designs. Statistical tests and Models for Pollution monitoring and abatement (air, water, soil, waste), Air Quality Index. Difference among means: F-test: 1 way ANOVA; F-test: 2 ways ANOVA.

**Internal Evaluations:**

**Seminar + Term Paper + Test (30 MARKS)**

**ESP 201: Practicals of Analytical Techniques in Environmental Sciences (35 MARKS)**

1. Analysis of water, soil, plant through Spectrophotometer, AAS, Colorimeter, and flame photometer.
2. Find the outcomes from the given samples (water, air, soil and plant) through statistical methods –
    1. Measures of central tendency
    2. Dispersion
    3. Probability and various test and models.

**Internal Evaluations:**

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books :**

1. Environmental Chemistry : B. K. Sharma and H. Kaur.
2. Elements of Environmental Chemistry : H. V. Jadhav
3. Environmental Chemistry : S. K. Banerji
4. Environmental Chemistry : J. W. Moore and E. A. Moore
5. Destruction of hazards Chemicals in the Laboratory : G. Lunn and E. B. Sansone
6. A text book of Environmental Chemistry and Pollution Control : S. S. Dara
7. Instrumental Methods of Analysis : G. W. Ewing
8. Instrumental Methods of Analysis : Chatwal and Anand

**EST 202: AIR POLLUTION (70 MARKS)**

UNIT 1: Meteorology- atmospheric structure, stability, variation of wind, temperature & water vapor, turbulence, plume size, plume diffusion & trappings, topographic effects, estimation of atmospheric dispersion & diffusion.

UNIT 2: Global climatic effects- Urban climatic changes, inversion phenomena, greenhouse effects, fog, smog, acid rains, national and international level discussions on the climate change, carbon credit system, clean development mechanism.

UNIT 3: Air Pollutants, types of air pollutants, effects of air pollutants on man, plants, animals and structures. Environmental indices, air quality standards, biological indicators of air pollution.

UNIT 4: Air pollution control methods, Air monitoring survey network- sitting criteria, principles & techniques for ambient & stack monitoring and sampling.

UNIT 5: Environmental impact assessment studies on air pollution in sitting industries. Air pollution episodes and disasters.

## Internal Evaluations:

## Seminar + Term Paper + Test (30 MARKS)

**ESP 202: Practicals of Air Pollution (35 MARKS)**

1. Study of Air micro flora.
2. Identification of morphological characteristics of aero-microorganisms.
3. Collection and analysis of metrological data – Temperature, wind, solar radiation, rain fall, pressure and humidity.
4. Analysis of air samples from different locations.
5. Estimation of RSPM, SPM, Sox, NOx etc.
6. Estimation of dust falls by slide and beaker method.

## Internal Evaluations:

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books:**

1. The Atmosphere : An Introduction to Meteorology : Frederic K. Lutgen, E.J.Tarbuck
2. Introduction to Weather and Climate : Trewartha
3. Introduction to Climatology for Tropics : Ayoade J. O.
4. General Climatology : Critichfield H. J.
5. Climatology : Fundamentals and Applications : Mater J. R.
6. Climatology, Selected applications : Oiver J. E.
7. Environmental Chemistry : B. K. Sharma and H. Kaur.

**EST 203: Water & Soil Pollution (70 MARKS)**

UNIT 1: Hydrosphere hydrological cycle, atmospheric water interaction between atmosphere & hydrosphere. Sources of water, utility of waters and water budget.

UNIT 2: Properties and structure of water and ice, Characteristics of water and Potability. Sources and types of water pollution, pollutants. Eutrophication and its effects.

UNIT 3: Effects of pollution on water quality, aquatic fauna & flora, human. Process of Bioaccumulation, Biomagnification and toxicity levels. Water quality standards. Case studies on water pollution.

UNIT 4: Soil chemistry, importance of soil, composition, formation of soil and Factors affecting on soil quality. Soil nutrients- micro and macronutrients. Soil erosion and soil salinity.

UNIT 5: Concept of Soil pollution, Sources, types of pollutants and pollution. Effects of soil pollutants and effect of modern agro technology on quality of soil. Control of soil pollution. Physical, chemical and biological methods of soil reclamation. Case studies of soil pollution.

## Internal Evaluations:

## Seminar + Term Paper + Test (30 MARKS)

**ESP 203: Practicals on water and soil pollution (35 MARKS)**

9. Determination of COD and BOD.
10. Estimation of Free Caron dioxide (CO2)
11. Estimation of Residual Chlorine.
12. Estimation of chloride from water samples
13. Estimation of TKN
14. Estimation of oil and grease
15. Estimation of heavy metals from water samples.
16. Estimation of WHC.
17. Soil texture and soil profile.
18. Study of physico-chemical parameters of soil.
19. Estimation of soil nutrients (NPK)
11. Estimation of organic mater.

## Internal Evaluations:

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books:**

1. Environmental Chemistry : B. K. Sharma and H. Kaur.
2. Elements of Environmental Chemistry : H. V. Jadhav
3. Environmental Chemistry : S. K. Banerji
4. Environmental Chemistry : J. W. Moore and E. A. Moore
5. Destruction of hazards Chemicals in the Laboratory : G. Lunn and E. B. Sansone
6. A text book of Environmental Chemistry and Pollution Control : S. S. Dara

**EST 204: INTRODUCTIONS TO REMOTE SENSING (RS), GEOGRAPHICAL INFORMATION SYSTEM (GIS) AND GPS. (70 MARKS)**

UNIT 1: Introduction, History, development, of Remote sensing in World and India, stages of remote sensing, EMR & EMR spectrum, EMR Quantities, Energy sources and radiation principles, Theories of EMR, Concept of Energy interactions in the atmosphere, energy Black body, atmospheric windows and types of remote sensing interactions with the earth surface features, Spectral reflectance of vegetation, Soil and water.

UNIT 2: Aerial photography- Types, Geometry, Scale, Height and Process of Aerial Photograph, basic requirement of Aerial Photograph, planning & execution of photographic flight, aerial cameras, relief displacement, stereo vision, stereo model & stereoscope, parallax & parallax measurement. Platform: Ground based, air-borne, space-borne, Orbit: Geostationary satellite and polar orbiting satellite, Sensor: Types of sensor and cameras, processes of sensor & its characteristics, Whiskbroom and Pushbroom cameras.

UNIT 3: Techniques of interpretation - Aerial photo interpretation, satellite image interpretation, Recognition elements: Tone, Color, Texture, Pattern, Shape, Size and associated features

UNIT 4: Introduction to GIS, Definition, historical evolution, components, objectives, basic concept, need, scope, overview of GIS application areas. Data Structure, Types and Models - Raster and vector data structure, fundamental of data storage: block code, run length code, chain code, quad tree, advanced data model: Grid model, TIN model, Network model, Relational model, Vector data type: point, line, polygon, Digital Elevation Model (DEM), Need, methods, data sources and products of DEM, Digital Terrain Modeling (DTM) – Input verification, storage and methods of data analysis for spatial modeling – Methods of GIS and spatial interpolation.

UNIT 5: Global Positioning System (GPS): Main segments, nature and sources of errors in GPS signals, differential GPS.

## Internal Evaluations:

## Seminar + Term Paper + Test (30 MARKS)

**ESP 204: Practicals on Introductions to Remote Sensing, GIS and GPS (35 MARKS)**

1. Determination of photo scale and height determination from aerial photograph.
2. Use of Lens stereoscope and Mirror stereoscope, Determination of vertical exaggeration, Use of Parallax Bar for height calculation from aerial photographs, Calculation of scale of the photographs.
3. Interpretation of aerial photograph and satellite imagery PAN, LISS, WiFS, OCM, ETM, TM, MSS.
4. Application of various imageries.
5. Introduction to AutoCAD, Scale, rubber sheeting, Drawing tool ,Modify tool, Building topology, measuring distance and area, linking attribute data with geographical feature, Data Conversion – Vector to Raster, Raster to Vector, query, analysis, Export and Import data in Auto-CAD.
6. Arc – GIS - ArcMAP, ArcCatlog,, ArcToolbox, Rectify, Resampling, Coordinate systems & map projections, Linking feature & attributes, Geodatabase, metadata, Querying maps, Working with table , join and relates, Reports, Graph, Geoprocessing and Network Analysis
7. GPS handling ,path tracing, location set

## Internal Evaluations:

(Viva-voice + Journal + Data Evaluation) **(15 MARKS)**

**Reference Books :**


1. Fundamentals of Remote Sensing: George Joseph
2. Remote Sensing and Image Interpretation: Lillesand & Keifer.
3. Manual of Remote Sensing: ASP Falls Church Virginia USA.
4. Physical aspects of Remote Sensing: PJ Curran.
5. Remote Sensing Principles and Interpretation: F.F. Sabins.
6. Introduction to Remote Sensing: J.B. Campbell.
7. Remote sensing Models and methods for image processing by Robert A. Schowengerdt, second edition, 1997, Academic Press
8. Concepts and Techniques of Geographic Information Systems CP Lo Albert K W Yeung, 2005 Prantice Hall of India.
9. Principles of GIS for Land Resources Assessment by P.A. Burrough, Oxford : Science publications, 1986.
10. Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc, New York, 2002.
11. GIS – A computing Perspective by Micheal F. Worboys, Taylor & Francis, 1995.
12. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc., New York, 1994.
13. Geographical Information Systems – Principles and Applications, Volume I edited by David J. Maguire, Micheal F Goodchild and David W Rhind, John Wiley Sons. Inc., New York 1991.
14. Geographical Information Systems – Principles and Applications, Volume II edited by David J. Maguire, Micheal F Goodchild and David W Rhind, John Wiley Sons. Inc., New York 1991.


*** <u>1 credits (25 Marks) for</u>-**

**Field training for long tour / In- plant Training,/ Industrial visits or Nature vists Field work related to dissertations.**