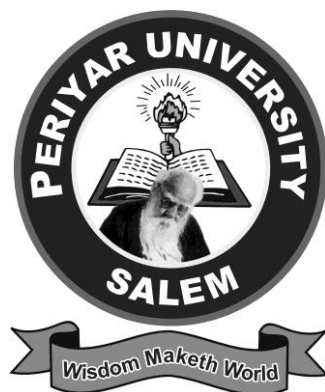# PERIYAR UNIVERSITY
SALEM – 636 011.

PERIYAR INSTITUTE OF DISTANCE EDUCATION

[PRIDE]

B.Sc., ENVIRONMENTAL SCIENCE

SYLLABUS & REGULATIONS

NON - SEMESTER

[Candidates admitted from 2007-2008 onwards]

B.Sc., ENVIRONMENTAL SCIENCE

REGULATIONS

1. Condition for Admission

A candidate who has passed Higher Secondary examination in any one of the **biological science (Academic/Vocational/Vocational stream)** under higher secondary board of examination, Tamil Nadu or as per norms set by the Government of Tamil Nadu or an examination accepted as Equivalent thereto by the Syndicate subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the B.Sc., Environmental Science degree examination of this University after a course of the study of three academic years.

2. Duration of the Course

The course for the degree of Bachelor of Environmental Sciences shall consist of three academic years.

3. Course of Study

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

IYear

Part I	-	Language
Part II	-	English
Main Paper I	-	Fundamentals of Environmental Science
Allied Paper I	-	Environmental Chemistry
Main Practical I		
Allied Practical I		

II – Year		
Part I	-	Language
Part II	-	English
Main Paper 2	-	Environmental Pollution
Allied Paper 2	-	Biostatics and Computer in Environmental Science

Main Practical II

Allied Practical II

III – Year		
Main Paper 3	-	Natural Resources
Main Paper 4	-	Environmental Toxicology
Main Paper 5	-	Environmental Education
Main Paper 6	-	Remote Sensing and GIS

Main Practical III

Main Practical IV

4. Examinations

The theory examination shall be three hours duration to each paper at the end of the each year. The candidates failing in any subject (s) will be permitted to appear for each failed subject(s) in the subsequent examinations. The practical examinations for UG course should be conducted at the end of the year.

5. Scheme of Examinations

S. No	Paper	Title of the Paper	Exam Duration	Max. Marks
		I Year		
1	Part I	Language 1	3 hrs	100
2	Part II	English 1	3 hrs	100
3	Main Paper I	Fundamentals of Environmental Sciences	3 hrs	100
4	Allied Paper I	Environmental Chemistry	3 hrs	100
		Main Practical I	3 hrs	100
		Allied Practical I	3 hrs	100
		II Year		
5	Part I	Language 2	3 hrs	100
6	Part II	English 2	3 hrs	100
7	Main Paper 2	Environment Pollution	3 hrs	100
8	Allied Paper 2	Biostatistics and Computer in Environmental Science	3 hrs	100
		Main Practical II	3 hrs	100
		Allied Practical II	3 hrs	

III Year					
9	Main Paper 3	Natural Resource		3 hrs	100
	Main Paper 4	Environmental Toxicology		3 hrs	100
	Main Paper 5	Environmental Education		3 hrs	100
	Main Paper 6	Remote Sensing and GIS		3 hrs	100
		Main Practical – III		3 hrs	100
		Main Practical – IV		3 hrs	100
				Total	1800

6. Question paper model for theory and practical

Major Theory Paper

Time 3 Hours   Max. Marks : 100

Part – A   **10 x 2 = 20**

Answer all questions

(Two questions from each unit)

Part – B   **5 x 4 = 20**

Answer all questions

(One question from each units with internal choice)

Part – C	**5 x12 = 60**
	(One question from each unit with internal choice)

QUESTION PAPER PATTER

(Allied Theory Paper)

Time 3 Hours	Max. Marks : 100
Part – A	**10 x 2 = 20**
	Answer all questions
	(Two questions from each units)
Part – B	**5 x 4 = 20**
	Answer all questions
	(One question from each units with internal choice)
Part – C	**5 x12 = 60**
	(One question from each unit with internal choice)

QUESTION MODEL FOR MAIN PRACTICAL

Time 3 Hours	Max. Marks : 100
• 3 Major questions, each carry 20 marks	(3 x 20 = 60)
• Spotters	(4 x 05 = 20)

• Record	(20 Marks)
QUESTION MODEL FOR ALLIED PRACTICAL – I & II	
Time 3 Hours	Max. Marks : 100
• 2 Major questions, each carry 40 marks	(2 x 40 = 80)
• Spotters	(20 Marks)

7. Passing Maximum

The candidate shall be declared to have passed the examination if the candidate secures not less than 40 marks in the University examination in each theory paper.

For the Practical paper, a minimum of 40 marks out of 100 marks in the University examination and the record notebook taken together is required to pass the examination. There is no passing minimum for the record notebook. However submission of a record notebook is a must.

8. Classification or successful Candidates

Candidates who secure not less than 60% of the aggregate marks in the whole examination and have passed in single attempt shall be declared to have passed the examination in First Class.

All other successful candidates shall be declared to have passed in the Second Class.

Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed of the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period of three academic years from the year of admission to the course only are eligible for University Ranking.

9. Maximum duration for the completion of the UG programme

The maximum duration for completion of the UG programme shall not exceed six years.

10. Commencement of the Regulation

These regulations shall take effect from the academic year 2009 -2010, i.e., for students who are to be admitted to the first year of the course during the academic year 2009 —2010 and thereafter.

MAIN PAPER 1- FUNDAMENTALS OF ENVIRONMENTAL SCIENCES

(End of the First Year)

UNIT - I Ecology and Environment: Scope - Environmental Science as interdisciplinary Subject - Earth, Man and Environment Relationship - Importance of biological cycles in the environment.

UNIT - II Earth -its interior and surface -The Universe -Big Bang theory -Meteors -The Origin, shape and size of the earth -The solar system -Planets -Eclipse -Solar, Lunar - Rotation and Revolution of the earth -Seasons -Latitute and Longitute -Layers of the earth -Sial, Sirna, Nife - History of the Earth's surface -Precambrian, Paleozoic, Mesozoic, Neozoic and Quaternary era.

UNIT - III Habitat and ecological niche -Pond, grass -land, forest, mangrove ecosystem - concept of energy, food chain, food web and ecological pyramids, Ecological succession.

UNIT - IV Animal Association -Interspecific interactions and Intraspecific interactions - Symbiosis, Mutualism, Antagonism, Commensalisms, Predation and Parasitic relationship.

UNIT -V Diversity of plant species -Trees, shrubs, herbs, grasses -halophytes, hydrophytes, mesophytes and xerophytes, Conservation of Biodiversity, Value of biodiversity, Threats Biodiversity – global, National and local levels.

REFERENCES

1. Odum E.P., Fundamentals of Ecology, WB Saunders Co., London (1971).

2. Sharma P.D., Ecology and Environment, Rastogi Publications, Meerut (1994)

3. Daniel D Chiras, Environmental Science, The Benjamin/Cummings Publishing Co. Inc (1994).

4. Singh H.R., Introduction to Animal and Environmental Biology, Vishal Publications (1989).

5. Robert H Giler, Wildlife Management, W.H. Freeman and Company, San Francisco (1978).

6. Keller, E. A. (2005) Introduction to Environmental Geology. Prentice Hall Pub., NY.

ALLIED PAPER 1- ENVIRONMENTAL CHEMISTRY

(End of the First Year)

UNIT -I Water Chemistry: Physico - Chemical parameters of water -Hydrogen bonding - covalent - ionic bonding - Normality, molarity and molality of solutions – Henry's law - Solubility of gases in H20 (carbonate system). Primary standards - secondary standards.

UNIT -II Air Chemistry: Meteorological chemistry - humidity, wind speed, wind direction, temperature wind roses and plume behavior Photochemical and Thermo - chemical reactions. Laws of Thermodynamics.

UNIT -III Classification of Elements: General characteristics - Mass number - Atomic number -Oxidation -reduction. Calculation of oxidation number

UNIT -IV Laws of Photochemistry - Beer-Lambert's law - Electromagnetic radiation UV and visible radiation - 1R radiation, Mass spectroscopy.

UNIT -V Instrumentation: Atomic Absorption Spectroscopy - Flame Photometry - Conductivity meter - Volumetric titrations (Acid-base, redox, precipitation and Complexometric).

REFERENCE

1. Puri, B.R., L.R. Sharma and M.5.Pathania. (2004) Physical Chemistry. Vishal Pub. and co., Jalandar.

2. De, A.K (2003) Environmental Sciences. Wiley Eastern ltd., New Delhi. Williards,

3. Sharma, B.K. (1990) Instrumental Methods of Chemical Analysis. Goel Pub. House. Meerut.

4. Bhatia, S.C. (2002) Environmental Chemistry. CBS Publishers and Distributors. New Delhi.

5. Chatwal, A. (1999) Instrumental Methods of Chemical Analysis. Himalaya Pub House.Mumbai

MAIN PRACTICAL - I

FUNDAMENTALS OF ENVIRONMENTAL SCIENCES

(End of the First Year)

Max. Marks: 100   **Exam. Duration: 3hrs**

1. Identification of type of rock - Igneous, sedimentary and discuss their properties.

2. Identification of Soil texture - clay, sand, loamy.

3. Identification of Soil types - red soil, black soil.

4. Diagrammatic representation of solar, lunar eclipses, day and night.

5. 5. Identification of coal fields - Economic aspects, availability of coal or Usage of topographic maps - to study about land forms

6. Demonstration of Microscope.

7. Identification and salient features of animals available [Prepared slides or Museum specimens)

8. Identification of Mendelian population - dominant - recessive by PT.C. test.

9. Submission of Economically important insects available [chart] in your habitat.

10. Qualitative and quantitative analysis of zooplankton.

ALLIED PRACTICAL-I

ENVIRONMENTAL CHEMISTRY

(End of the First Year)

Max. Marks: 100 Exam. 						Duration: 3hrs

1. Calculation of Oxidation number of Cr in $K_2Cr_2O_7$, Mn in $KMnO_4$

2. Standardization of pH with buffer solutions (4, 7 and 9)

3. Measurement of pH of acidic and basic solution using pH meter

4. Conductometric titration Strong acid vs. Strong base. Calculation of end point using $V_1N_1=V_2N_2$

5. Conductometric titration-Strong acid vs. Strong base. Calculation of end point using graph.

MAIN PAPER 2- ENVIRONMENTAL POLLUTION

(End of the Second Year)

UNIT -I Water Pollution - Introduction - Sources and types of water pollutants Physical, Chemical and Biological. Ground water - Surface water - lake water - seawater. Effects of water pollution.

Water Quality standards (drinking and industrial) - water treatment - physical, chemical and biological. Water Pollution (Prevention and Control) Act, 1974.

UNIT - II Air pollution - Introduction - structure and composition of atmosphere - classification and effects of air pollutants - vehicular pollution - acid rain green house effect – global warming - inversion - ozone depletion

Prevention and control of air pollution: particulate control - settling chamber, scrubbers, bag filter, cyclones, electrostatic precipitators. Gaseous emission control methods, Air Pollution'(Prevention and Control) Act, 1981.

UNIT - III Soil pollution: sources, effects and control of soil pollution. Solid waste Municipal solid waste, Hazardous waste, plastic waste and biomedical waste collection and transport Disposal methods - Landfill, incineration, pyrolysis - composting and anaerobic digestion - recycling and reuse.

UNIT -IV Noise Pollution: Sources - Noise indices - Classification of Noise loads - Effect of noise on biota and human health - Control and prevention methods.

UNIT – V Hazardous solid waste. Industrial disaster and Pollution – Case studies. Bhopal tragedy, Chernobyl accident, Love canal tragedy. Thermal Pollution, nuclear hazards. Marine Pollution – Pollution Control Board.

REFERENCE

1. Rao, M. N and H.V.N. Rao (1993) Air Pollution, Tata McGraw -Hill Publishing Company Limited. New Delhi.

2. Kudesia, V.P and Ritu Kudesia (1992) Water Pollution, Pragati Prakashan Publication, Meerut.

3. Sawyer, C. N., P.L McCarty and G.F. Perkin (1994) Chemistry for Environmental Engineers, "Edition. McGraw-Hill.

4. Sharma, B.K and H.Kaur (1994) Soil and Noise Pollution. God Publishing House, Meerut.

5. Kurnarasawmy, K., A. Alagappa Moses and M. Vasanthy (2004) Environmental Studies (A Text Book for All Under Graduate Students) Bharathidasan University Publications.

ALLIED PAPER 2- BIOSTATISTICS AND COMPUTER IN ENVIRONMENTAL SCIENCES

(End of the Second Year)

UNIT - I Data - Methods of Collection. Tabulation - types of tables. Diagrammatic and graphical repreSentat1o

UNIT - II Measures of central tendency - Calculation of Mean, Median and Mode, Moments Skewness and Kurtosis.

UNIT - III Measures of dispersion - range and deviations, Mean deviation, Standard deviation and standard error. Students – t – test, ANOVA, Correlations – Regression.

UNIT-IV Introduction and basic concepts of computer, Parts of computer, types of Computer Number system. Computer organization, software, computer virus, C Language and its applications.

UNIT - V Basic principles of a digital computer (Elementary knowledge - input central processing unit - output - peripherals). Compression of hardware and software. Computer operating systems - WINDOWS - MS Word, Excel - Internet, World Wide Web, Search Engines, e-mail.

REFERENCE

1. Palanisamy, M (1989) A Text Book of Statistics, Paramount Publication, Palani

2. Vittal, R.R (1986) Business Mathematics and Statistics, Murugan Publications

3. Gupta, S.P. (1996) Statistical Methods, Sulthan Chand and Sons Publications, New Delhi

4. Byron S Gottfried (1996) Programming with C, Hill Publishing Co, New Delhi

5. Sanjay Saxena (2003) A First Course in Computers, Vikas Publishing House Pvt. Ltd, New Delhi

MAIN PRACTICAL 2

ENVIRONMENTAL POLUTION

(End of the Second Year)

Max. Marks: 100   **Exam. Duration: 3hrs**

1. Estimation of Physico -chemical parameters in water.

    Temperature, Turbidity, p1-I, Total solids, Chlorides, Dissolved oxygen, Total hardness, Acidity and Alkalinity, Phosphate, sulphate and nitrate.

2. Estimation of carbon, nitrogen, phosphorus and potassium in soil.

3. Air sampling (High Volume Air Sampler) -Demonstration.

ALLIED PRACTICAL -2

BIOSTATISTICS AND COMPUTER IN ENVIRONMENTAL SCIENCES

(End of the Second Year)

Max. Marks: 100   **Exam. Duration: 3hrs**

1. Calculation of mean, meridian and mode

2. Graphical representation of data

3. MS-Word File: Creation, editing and retrieving.

4. MS-Power Point: Presentation Project preparation.

5. MS-Excel: Spreadsheet preparation.

6. E-mail and Internet.

MAIN PAPER 3- NATURAL RESOURCES

(End of the Third Year)

UNIT-I-Introduction to Natural Resources - Classification of natural resources - List of natural resources - Values of natural resources - Demands on Natural Resources - Population, lifestyle and natural resources - Impact of poor natural resource management.

UNIT-II - Land resources - Land: Definition - Land use pattern in India. Wetlands: Definition - Formation - Classification - Wetlands in India. Waste Land: Types. Desertification: Definition – Causes and impacts.

UNIT-III - Water resources - Hydrological cycle - Surface water - Ground water. Water resources in India: Lakes and Reservoirs. Dams: Uses and impacts on environment. Marine resources: Biotic and abiotic resources.

UNIT-IV - Forest and Mineral Resources: Forest produce - Food - Fodder - Fuelwood Fiber - Timber - Market use. Minerals; Metal and Non- metal resources.

UNIT-V - Energy Resources: ,Renewable and non-renewable - Fossil fuel - Oil and Natural gas - Coal formation - Hydroelectric power - Solar energy - Wind energy - Nuclear energy - geothermal energy - tidal energy - Hydrogen energy - Biogas.

REFERENCE

1. Bali, S (2000) Land Resource Management in India. Souvenir of International Conference on Land Resource Management for food, employment and environmental security, 9 - 13 November, 2000. Organized by Soil Conservation Society of India. Pp. 29 - 48.

2. Department of Land Resources (2000) Ministry of Rural Development, Government of India, New Delhi.

MAIN PAPER 4- ENVIRONMENTAL TOXICOLOGY

(End of the Third Year)

UNIT-I - Principles of toxicology - introduction - classification of toxic agents - toxic responses - mechanisms of toxicity - interaction of the toxicant with target molecules.

UNIT-II - Factors influencing toxicity - abiotic and biotic factors - interaction of chemicals - bioaccumulation and biomagnification - Toxicants in environmental samples

UNIT-III - Risk assessment - introduction - definition, hazards identification, risk characterization - exposure assessment. Effect of Pollution on human, animals and plants.

UNIT-IV - Production of mycotoxins in general - fungal toxins - bacterial toxins - exo and endo toxins - viral toxins, algal toxins - teratogen - carcinogen and mutagens - causes mode and evaluation.

UNIT-V - Sources, transport, mobility, deposition and effects of pesticides (DDT and BHC), heavy metals (Cr and Pb), nitrate and fluoride - impact on man, animals and plants. Fertilizers toxicity on land, water and its effect.

REFERENCE

1. Casseret, L. J and Doull, J(1982) Toxicology. The basic science of Poisons. Macmillan Publishers, New York.

2. Stake, M. Y. Mido, M.s. Sethi, S.A. Iqbal, H. Yasuhisa, S. Taguchi (1997) environmental Toxicology, Discovery Publishing House, New Delhi3. Dc, A. K. (1986) Environmental Chemistry, Willey Eastern Limited, New Delhi.

3. Timbrel (1989) Elements Toxicology, British Council Library.

4. Trivedy, R. K (1994) Encyclopaedia of Environmental Pollution and Control, Enviromedia Publications, Karad.

MAIN PAPER – 5: ENVIRONMENTAL EDUCATION

(End of the Third Year)

UNIT-I EIA – Introduction – Concept of EIA – Scope and object of EIA, EMP and EIS Historical Prospective – Organization responsible for EIA – Baseline and inventory Environmental Studies – Site selection and area classification. Siting and setting criteria for EIA projects.

UNIT-II Environmental Indicators – Macro and Micro climates – abiotic and biotic factors – Social and Economics aspects – Environmental quality – Air, Water, Soil, Flora and Fauna – Field survey and data collection – environmental auditing.

UNIT-III Various steps of EIA – Content of EIA – Analytical and integratie approach Assessment methodology – Adhoc, Overlay, Network, Matrix and checklist. Environmental Values and Technique – Cost benefit analysis – Case studies, Hydroelectric projects, Mining, Power plant Roads and airports.

UNIT-IV Environmental Impact Assessment Notification (1994): Procedure for Environmental Clearance, List of the projects requiring Environmental Clearance, Composition of Expert Committee for impact Assessment, Public hearing Committee, Procedure for public bearing – Project clearance.

UNIT-V Coastal Regulation Notification 1991: Prohibitory activities, Permissible activities, Coastal area classification, List of products permitted for storage port areas, composition of coastal zone committee.

REFERENCE:

1. Rau, J.G. and Wooten, D.C. (1980) Environmental Impact Analysis Hand Book, Mc G raw Hill, USA.

2. Canter, L.W. (1977) Environmental Impact Assessment, McGraw-Hili, New York.

3. Erickson, P.A. (1997) Environmental impact Assessment – Principles an Applications McGraw – Hili, New York.

4. Munn, R.E. (1982) Environmental Impact Assessment. McGraw – Hili, New York.

MAIN PAPER -6 - REMOTE SENSING AND GIS

(End of the Third Year)

UNIT-I Remote sensing - An introduction, Fundamental Principle of Remote sensing, Stages in remote sensing process - Types of remote sensing - The Electromagnetic radiation: Wave model, Particle theory - Electromagnetic spectrum - Energy interaction with the atmosphere: Scattering, adsorption, refraction - interactions of energy with earth surface: Reflection, Emission Types of aerial photo.

UNIT-II Satellite and Sensors - platforms, Satellite orbits (Geostationary Satellite, Sun-synchronous satellite), Resolution: Spatial, Spectral, Radiometric and Temporal. Multispectral scanning: Across track scanning and Along track scanning. Satellites in orbit: LANDSAT Series, SPOT Satellite and IRS Satellites. Data reception transmission and processing,

UNIT-III Thermal Infrared (Characteristics, TIR Band Properties, TIR Image Interpretation, Intro to Microwave (Importance and applications), Digital Image Processing (Over view of computer based image processing).

UNIT-IV GIS - Components of GIS - Hardware, software and organizational Context Dta - spatial and non-spatial - maps-types of maps- projection - types of projection - data input - digitizer - scanner - editing - raster and vector data structure - analysis using raster and vector data - retrieval, reclassification overlaying, buffering - data output. Levels / Scales of measurement

UNIT-V Remote sensing and GIS application: Agriculture, urban, Forestry, Natural resources – wafer (wetland, marine and coastal, forest and mineral resources) wasteland mapping, geology – disaster management.

REFERENCE

1. Anand,pjj and V. Rajesh Kumar (2002] Principles of Remote sensing and GIS -, Sri Venkateswara Publishers, Kumbakonam

2. Anji Reddy, M (2003] Textbook of Remote sensing and GIS (IT edition] BS Publications, Hyderabad.

3. Panda. B. C (2005] Remote Sensing Principles and Application. Viva Books Private Limited, New Delhi.

MAIN PRACTICAL -3

NATURAL RESOURCES AND ENVIRONMENTAL TOXICOLOGY

(End of the Third Year)

Max. Marks: 100   **Exam. Duration: 3hrs**

1. Vegetation analysis: Frequency, Abundance and Density, Cover and Basal area, Important and Value Index.

2. Vegetation sampling: Transects, Plotless methods.

3. Diversity measures: Shannon Wiener, Simpson and Brilloin's Index.

4. Diversity measures of Birds fauna in different habitat conditions.

5. Estimation of LC_{50} and LD_{50} for a given heavy metal using a suitable organism

6. Bioassay - Effect of metals (Cr. and Pb) on seed germination (root length, shoot length and total chlorophyll).

7. Effect of metals (Cr. and Pb) on algae.