

ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

CUDDALORE-1



DEPARTMENT OF ZOOLOGY

SYLLABUS 2019-2020

DEPARTMENT OF ZOOLOGY**ALLIED ZOOLOGY
&
ENVIRONMENTAL STUDIES (SKILL- BASED)****COURSE PATTERN**

SEMESTER	PART	CODE	COURSE TITLE	HOURS	CREDITS
III	III	19AZMB31	Classical Genetics & Biostatistics / Laboratory animal care (II Year MicroBiology)	5	4
III	III	19AZMP31	Practical- Classical Genetics & Biostatistics / Laboratory animal care (II Year MicroBiology)	3	2
IV	III	19AZMB42	Applied Entomology/Solid waste Management (II Year MicroBiology)	5	4
IV	III	19AZMP42	Practical - Applied Entomology/Solid waste Management (II Year MicroBiology)	3	2
IV	III	AZBC401T	Advanced Zoology-Theory (II Year Bio –Chemistry)	5	4
IV	III	AZBP401	Advanced Zoology-Practical (II Year Bio –Chemistry)	3	2
III & IV	IV	EVS301S & EVS401S	Environmental Science (All UG B.Sc/B.A/B.COM/B.C.A)	3	3

II B.Sc (MB)	CLASSICAL GENETICS & BIO-STATISTICS	19AZMB31
SEMESTER - III		HRS/WK – 5
ALLIED		CREDIT – 4

(For II Year B.Sc., Micro-Biology)

Objective:

- To provide basic knowledge in the field of genetics and applications of biostatistics for data analysis.

Course Outcome

On completion of the course students will be able

CO1: To understand the history of genetics and Mendel's laws**CO2:** To understand recombination in Eukaryotes**CO3:** To describe molecular, human and and cytogenetics**CO4:** To obtain knowledge on introduction, scope, importance and functions of biostatistics**CO5:** To analyze correlation, regression and test of significance

SEMESTER III	COURSE CODE: 19AZMB31					COURSE TITLE: CLASSICAL GENETICS & BIO-STATISTICS										HOURS: 5	CRE DITS :4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	3	5	4	5	4	2	2	4	4	3	5	2	5	3.9	
CO2	5	5	4	5	4	4	4	2	3	4	4	3	5	2	5	4.0	
CO3	5	5	4	5	4	4	4	2	4	4	4	3	5	2	5	4.0	
CO4	5	5	4	5	4	4	4	2	2	4	4	4	5	2	5	4.0	
CO5	5	5	4	5	4	4	4	2	1	4	4	4	5	2	5	3.9	
Mean Overall Score																4.0	

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

Unit – I : Genetics and Mendel's laws :

History of genetics – Mendel's experiments: monohybrid, dihybrid Cross - hybrid vigour – pleiotropism - epistasis - lethal genes – atavism –polygenic inheritance Multiple Alleles and linkage - ABO Blood Group inheritance - Rh factor – linkage and linkage group.

Unit – II : Recombination in Eukaryotes :

Crossing over –Mechanism- factors controlling crossing over – mitotic and meiotic crossing over – somatic and germinal crossing over – significance of crossing over - construction of chromosome maps –chromosomes – size, shape, structure, types and physiology of chromosomes.

Unit – III: Molecular, Human and cytogenetics:

DNA as the genetic material – structure of DNA, euploidy - aneuploidy – chromosomal aberrations - Pedigree analysis – eugenics and euphenics – inbreeding, outbreeding and hybrid vigour - population genetics.

BIO-STATISTICS**Unit – IV:**

Introduction – Scope – Definition –Data collection – Methods of data collection – Classification of Data – Tabulation of Data – Diagrammatic, Graphical presentation of Data – Histogram – Frequency polygon – Oogive curves. Measures of central tendency - Arithmetic mean – Median – Mode – standard deviation– mean deviation – skewness – kurtosis.

Unit –V:

Correlation – simple correlation – Rank correlation – Regression – Probability – Addition theorem – Multiplication theorem – Test of significance – Hypothesis testing – Null hypothesis – Large sample test – small sample test (Students 't' test) – chi-square test – standard error – ANOVA (Analysis of variance) – one way ANOVA.

Text Books:

1. Verma, P.S and Agarwal, V.K 2005 ' Cell Biology, Genetics, Molecular Biology, Evolution & Ecology', S. Chand and Co., New Delhi.
2. Biostatistics P. Ramakrishnan Saras Publications 1996 A.R.P. Camp Road, Kottar, Nagarkoil, Kanyakumari District.
3. Elements of Biostatistics by Gurumani Nithi Publishers.

Reference books:

1. Veer Bala Rastogi. 1992 .A textbook of Genetics, 9th edition, Keda Nath Ram Nath, New Delhi.
2. Karvita B. Aluwalia , 1991. 'Genetics' Wiley Eastern Ltd, New Delhi .
3. Sarin, C.1990. ' Genetics' Tata Mcgraw – Hill Publishing Co ., Ltd., New Delhi.
4. Burns. G.W .and Boltsmo, P.J. 1989. The Science of Genetics' Macmillan publishing Co ., New York.

II B.Sc (MB)	CLASSICAL GENETICS & BIO-STATISTICS PRACTICALS	19AZMP31
SEMESTER – III		HRS/WK – 3
ALLIED PRACTICALS		CREDIT – 2

Genetics

1. Squash preparation of Salivary glands of chironomous larva (Giant chromosome).
2. Male & Female identification of Drosophila.
3. Observation of common Mutants of Drosophila.
4. Human Blood Grouping
5. Human pedigree construction for a family data

Biostatistics

- Mean, Median, Mode and Standard deviation.
- Correlation and Regression Analysis.

II B.Sc (MB)	SOLID WASTE MANAGEMENT	AZMB402
SEMESTER – IV		HRS/WK – 8
ALLIED		CREDIT – 6

(For II Year B.Sc., Micro-Biology)

Objective:

- To provide basic knowledge solid waste management and their handling rules as well as vermicomposting technology

Course Outcome

On completion of the course students will be able

CO1: To describe the types, sources and generation of solid waste and their handling rules**CO2:** To identify the types of industrial waste and their treatment and disposal methods**CO3:** To describe biomedical waste and hazardous waste and their handling rules**CO4:** To understand various species of earthworm, vermiculture and vermicomposting**CO5:** To gain information regarding composting technology and economics of vermicomposting

SEMESTER IV	COURSE CODE: AZMB402					COURSE TITLE: SOLID WASTE MANAGEMENT										HOURS: 8	CREDITS: 6
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	3	4	1	1	3	3	2	5	5	5	3.7	
CO2	5	5	5	5	4	3	4	1	1	3	3	2	5	5	5	3.7	
CO3	5	5	5	4	4	3	4	1	1	3	3	2	5	5	5	3.7	
CO4	5	5	4	4	4	3	4	1	1	4	5	2	5	5	5	3.8	
CO5	5	5	4	4	4	3	4	1	1	4	5	2	5	5	5	3.8	
Mean Overall Score																3.7	

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

Unit I : Introduction (20 Hrs)

Waste – classification, quantification, solid waste management and disposal, source and generation of solid wastes – characterization, composition and classification, physico-chemical properties - Municipal solid wastes: Collection, storage and transportation – disposal methods – sanitary land fills, shredding and pulverizing, baling, incineration, composting, vermicomposting, recycling – energy recovery from wastes – municipal wastes management and handling rules (1999)

Unit II: Industrial wastes: (20 Hrs)

Industrial solid wastes and description – health hazards – collection and storage – treatment and disposal - liquid wastes – primary, secondary and tertiary treatments – water pollution and their effects on animals and plants – water quality standards – gaseous pollution – types and sources – air pollution control.

Unit III: Bio-medical wastes: (20 Hrs)

Generation – legal aspects and environmental concern – Bio-medical waste management and handling rules, 1998 – storage, handling and transportation of bio-medical wastes – disposal technologies - Hazardous wastes: Definition – characteristics – sources and transportation – radioactive wastes – half life, mode of decay, effect on plants, animals and man – treatment methods; physical, chemical and biological methods – site remediation – waste minimization – hazardous waste rules, 1989.

Unit IV : Earthworms: (20 Hrs)

Characteristics, types – Indian species – suitable species for vermicomposting – digestion, decomposition and humification – role of microorganisms - Earthworm culture: Steps involved in the culture of indigenous and exotic species of earthworms – physical, chemical and biological requirements – protection of worms from predators – enemies of earthworms - Organic wastes: Definition – types and sources of various organic wastes – utilization of organic wastes in vermiculture and vermicomposting.

Unit V: Composting technology: (20 Hrs)

Definition – types of vermicomposting – requirements – advantages – precautionary measures - nutrients enhancement of vermicompost – effect of vermicomposting in the soil fertility - Economics of vermicomposting: Small scale and large scale applications of vermicomposting – loan facilities – marketing strategies.

Field Work: (20 Hrs)

Methods of vermicomposting – preparation of vermi bed – monitoring – bio-manure production – application of compost for culture operations – minor project reports.

Text Books:

Study materials given

Reference Books:

1. K.C.Agarwal, 2001. Environmental pollution: Causes, Effects and Control, Nidhi Publisher (India), Bikaner.
2. Verma, P.S., and VK. Agarwal. 2003. Environmental Biology, S. Chand and Company. Ram Nagar, New Delhi.

3. Pradyot Patnik, 1977. Hand book of Environmental Analysis. Chemical Pollutants in Air, Water, Soil and Solid wastes, Lewis Publishers, CRC Press. U.S.A.
4. S.A. Abbasi, 1998. Water Quality, Sampling and Analysis. Discovery Publishing House, New Delhi.
5. P.K. Gupta, 2000. Methods in Environmental Analysis. Water Soil and Air, Agrobios (India) Jodhpur.
6. Bhatnager and R.K. Patra (1996); Earthworm, Vermiculture and Vermicompositing, Kalyani Publishers, New Delhi.
7. C.A. Edwards and B.J. Bohlen (1996); Biology and Ecology of Earthworms, Chapman and Hall, London.
8. S. Ismail (1997); Vermicology, Orient Long man Limited, Chennai.
9. K.E. Lee (1985) 'Earthworms; Their Ecology and Relationship with Soils and Land Use', Academic Press, Sydney.
10. J.E. Satchell (Ed) (1983) - Earthworm Ecology: From Darwin to vermi culture. Chapman and Hall, "London.

II B.Sc (Microbiology)	ALLIED APPLIED ENTOMOLOGY	19AZMB42
SEMESTER – IV		HRS/WK – 5
ALLIED		CREDIT – 4

Objective:

- To provide extensive knowledge in the field of applied entomology.
- The familiarity between insect and environment was highlighted to various field like agricultural entomology, medical entomology and industrial entomology

Course Outcome

On completion of the course students will be able

CO1: To obtain knowledge on basic introduction of entomology

CO2: To recognize beneficial and harmful insects in the agricultural entomology

CO3: To describe vector borne diseases, control measures and awareness in medical entomology

CO4: To identify productive insects in industrial entomology

CO5: To understand pest control methods and application

SEMESTER IV	COURSE CODE: 19AZMB42					COURSE TITLE: ALLIED APPLIED ENTOMOLOGY										HOURS: 5	CREDITS 4
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	5	5	5	3	2	4	4	2	5	1	5	4.1	
CO2	5	5	5	5	5	4	5	5	2	4	4	2	5	2	5	4.2	
CO3	5	5	5	5	5	4	5	5	2	4	4	2	5	3	5	4.3	
CO4	5	5	5	5	5	4	5	5	3	4	4	2	5	3	5	4.3	
CO5	5	5	5	5	5	4	5	4	2	4	4	2	5	3	5	4.2	
Mean Overall Score																4.2	

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT – I**Introduction to Entomology**

Definition – classification upto orders - scope- Agricultural entomology, Forest entomology, Veterinary entomology, Medical entomology, Forensic entomology, Industrial entomology.

UNIT – II**Agricultural entomology**

Pest identification marks, nature, symptoms of damage. Any three pests - rice, cholam, pulses, sugar cane, cotton, coconut, ground nut, gingelly, brinjal, cardamom, tea, coffee, mango, citrus.

Pollinators, Destroyers of insect pests, Serve as food, Destroyers of weeds, Improve soil fertility.

UNIT – III**Medical entomology**

Life cycles of arthropod vectors - ticks, mites and fleas. Vector borne diseases: malaria, filariasis, dengue. Vector control- Chemical, Biological, Genetic and Environmental. Insecticide resistance in vectors. Drug resistance in pathogens. Importance of education, awareness and Community participation.

UNIT – IV**Industrial Entomology**

Productive Insects (a) Honey bee: Apiculture and its scope; life history, Bee products- Honey and Bee wax, and Uses, Bee diseases. (b) Silk moth: Different types of silkworms, life cycle; Sericulture, uses of silk, silk worm diseases. (c) Lac insect: Different strains of Lac insects, uses of lac.

UNIT – V

Pest control methods and application: cultural, mechanical, biological and chemical methods – classification of pesticides. First Aid & precautions in handling pesticides – pesticide spraying appliances. Residual effects of pesticides on non target organisms. Pesticide industry - production and marketing –Integrated pest management, its importance & applications.

Reference Books:

1. Vasantharaj David and T. Kumaraswami 1988. Elements of Economic Entomology Popular Book Depot, Chennai.
2. Nayar, K.K., Ananthakrishnan, T.N. and B.V. David 1992 General and Applied Entomology Tata McGraw, New Delhi.
3. P.G. Fenemore and Alka Prakash 1997 Allied Entomology, Wiley Eastern Ltd., New York.
4. Wigglesworth J.B., 1994. Insect Physiology, Chapman and Hall, London.
5. Temphare D.B., 1984 A. Text Book of Insects Morphology, Physiology and Endocrinology. S. Chand and Co., New Delhi.
6. A.Upadhyaya, K.Upathyaya and N.Nath, 2003 Biophysical chemistry, Principles and Techniques, 3rd Ed, Himamalaya publishing house.
7. H.B.Bull, F.H.Davis, 1971. An introduction to physical Biochemistry 2nd Ed, Philadelphia
8. Gurumani.N 2006. Research methodology for biological sciences MJP publ. Chennai.

II B.Sc (MB)	ALLIED APPLIED ENTOMOLOGY-PRACTICAL	19AZMP42
SEMESTER – IV		HRS/WK – 3
ALLIED		CREDIT -

Major Practical

1. Methods of insect collection and preservation - Submission of insect box, Field visit.
2. Identification of at least 10 insects belonging to different orders.
3. Mounting of salivary gland of cockroach, mouth parts of cockroach, housefly, and mosquito.
4. Mounting of different types of antennae and legs of insects, wings and their venation.
5. Demonstration of digestive, reproductive (male and female) and nervous system of insects (Cockroach or Odontopus).

Spotters

1. Histological slides –T.S of testis, L.S. of ovary and types, T.S. of carpus cardiacum and T.S. of carpus allatum.
2. Life history of silkworm (egg, larva, cocoon and adult).
3. Identification of honey bee sting Identification of honey bees, drone, workers and queen.

II B.Sc (BC)	ADVANCED ZOOLOGY For the students admitted in the year 2019	AZBC401T
SEMESTER – IV		HRS/WK – 5
ALLIED		CREDIT – 3

Objective:

- To understand the basic concepts of animal kingdom, Invertebrates, Chordates, cytological techniques, human genetics, developmental biology, ecology and evolution.

Course Outcome

On completion of the course students will be able

CO1: To describe structure and functions of some invertebrate species

CO2: To describe structure and functions of some chordate species

CO3: To analyze cytological techniques and human genetics

CO4: To understand developmental biology

CO5: To understand the basic concepts of ecology and evolution

SEMESTER IV	COURSE CODE: AZBC401T					COURSE TITLE: ADVANCED ZOOLOGY										HOU RS: 5	CRE DITS :3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	5	4	5	5	5	5	5	5	2	5	3	5	4.5	
CO2	5	5	4	5	4	5	5	5	5	5	5	2	5	3	5	4.5	
CO3	5	5	4	5	4	5	5	5	5	5	5	5	5	3	5	4.7	
CO4	5	5	4	5	4	5	5	5	5	5	5	3	5	3	5	4.6	
CO5	5	5	4	5	4	5	5	5	4	5	5	3	5	3	5	4.5	
Mean Overall Score																4.6	

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

Unit: 1

INVERTEBRATES - Structural and functional details of phylum-Protozoa-*Plasmodium vivax*, Helminthes-*Taenia solium*, Annelida-Earthworm- Digestive system,

Unit: 2

CHORDATES- Prochordata – amphioxus- Morphological details of chordates- Pisces-shark, Amphibia -Frog, Reptiles- Calotes, Aves- pigeon, Mammalia- Rat.

Unit: 3

CYTOLOGICAL TECHNIQUES AND HUMAN GENETICS – Histological techniques – Fixation- selective fixatives- Embedding- Sectioning and Staining Principles. Mendels experiments, Fine structure of Gene, Mutation, Linkage and crossing over, Eugenics, Human chromosome, Chromosome number, Idiogram. Population genetics- Hardy Weinberg principle and its application in human population. Genetic engineering and its applications in human being. Pedigree chart and its uses.

Unit: 4

DEVELOPMENTAL BIOLOGY- Gametogenesis in mammals – Spermatogenesis, Oogenesis, Fertilization. Types of Eggs, Pattern of cleavage & Blastulation in chick, Gastrulation. Human Reproduction- puberty, Menstrual cycle, Menopause, Pregnancy and related problems-parturition and lactation- Human cloning- Ethics.

Unit: 5

ECOLOGY AND EVOLUTION- Principles and Applications of Environmental biology. ecological succession, ecological niche, Animal relationships, Interspecific- Antagonism, symbiosis, Parasitism, Mutualism, commensalisms. Lamarckism, Darwinism, mimicry, Fossil and Fossilization.

Books for reference:**INVERTEBRATES AND CHORDATES:**

1. Ekambaranatha Ayyar & T.N.Ananthkrishnan (1992) Manual of Zoology Vol – I, part I & II S.Viswanathan Pvt. Ltd. Chennai.
2. Jordan.E.L & P.S.Verma (2000) ‘Chordate Zoology’ S.Chand & Co New Delhi.

ANIMAL PHYSIOLOGY:

1. Parameswaran.R.S.Viswanathan – Animal Physiology Printers & Publishers Pvt. Ltd.
2. Verma.P.S and Agarwal.V.K. Animal Physiology S.Chand & Co NewDelhi.

CYTOLOGICAL TECHNIQUES AND HUMAN GENETICS:

1. Verma.P.S and Agarwal.V.K (2004) Genetics, S.Chand & Co., New Delhi
2. Dalela.R.C and Verma.S.R (1970) A Textbook of Genetics, Jaiprakash Nath and Company., Meerut.
3. Max Levitan Tex Book of Human Genetics - Oxford University Press.

DEVELOPMENTAL BIOLOGY

1. Verma.S and Agarwal V.K(2000) Chordate Embryology S.Chand & Co. New Delhi.
2. Balinsky.B.I (1981) An Introduction to Embryology S.Chand & Co. New Delhi.

3. Saunders.J.W (1982) Developmental Biology – Pattern and Principles, Macmillan New York.

ECOLOGY AND EVOLUTION

1. Text book of Ecology & Animal Distribution by P.S.Verma V.K.Agarwal S.Chand & Co. New Delhi.
2. Odum E.P.Basic Ecology (1983) Saunders College Publishing's New York.
3. Arumugam.N (2002) Organic Evolution, Saras Publication., Nagercoil.

II B.Sc (BC)	ADVANCED ZOOLOGY- PRACTICAL	AZBP401
SEMESTER – IV		HRS/WK – 3
ALLIED		CREDIT -2

MAJOR PRACTICALS

1. Dissection of digestive system and body setae in earthworm.
2. Prawn- Appendages
3. Estimation of Unit metabolism of fish.

MINOR PRACTICALS

1. Squash preparation of onion root tip for mitosis.
2. Human pedigree construction for a family data.
3. Mouth parts- Honey bee and Mosquito.

SPOTTERS

T.S. of Chick embryo- 24hrs, 48hrs, 72hrs and 96hrs, *Taenia solium*, Placoid scale, T.S. of Pituitary gland, Adrenal gland, Thyroid gland, Testis and Ovary.

II YEAR	ENVIRONMENTAL SCIENCE	EVS301S/ EVS401S
SEMESTER – III		HRS/WK - 3
AEC		CREDIT - 2

(For All UG II Year Students Any One Semester)

Objective:

- The need for sustainable development is a key to the future of mankind.

Course Outcome:

On completion of the course students will be able

CO1: To understand the natural environment and its relationships with human activities.

CO2: To demonstrate an awareness and knowledge of the intrinsic values of ecological system.

CO3: To characterize and analyze human impacts on biodiversity and its conservation.

CO4: To demonstrate an ability to integrate the many disciplines and fields that intersect with environmental concerns

CO5: To integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at local and global levels.

SEMESTER III	COURSE CODE: EVS301S/ EVS401S					COURSE TITLE: ENVIRONMENTAL SCIENCE										HOURS: 3	CREDITS :2
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	3	4	4	5	5	5	2	3	5	1	5	5	5	4.1	
CO2	5	5	3	4	4	5	5	5	2	3	5	1	5	5	4	4.1	
CO3	5	5	3	4	4	5	5	5	2	4	5	1	5	5	3	4.1	
CO4	5	5	3	4	4	4	5	4	2	4	5	1	5	5	3	4.0	
CO5	5	5	3	4	4	4	5	4	2	4	5	1	5	5	5	4.1	
Mean Overall Score															4.1		

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

Unit I : Environmental studies and Natural resources (20 Hrs)

Definition, scope and importance of environmental studies – forest resources: deforestation, mining, dams – water resources: over – utilization, floods, drought – mineral resources: exploitation, extraction and usage – food resources: food problems, overgrazing, pesticide problems, water logging, salinity – energy resources: energy needs, renewable and non renewable energy – land resources: land degradation, landslides, soil erosion and desertification – conserving natural resources.

Unit II: Ecosystems : (20 Hrs)

Concept, structure and function of an ecosystem – producers, consumers and decomposers – energy flow – ecological succession – food chains, food webs and ecological pyramids – types, characteristics, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem –

Unit III: Biodiversity: (20 Hrs)

Definition of biodiversity – genetic, species and ecosystem diversity – value of biodiversity – India as a mega diversity nation – hot spots – threats to biodiversity – endangered and endemic species of India – In-situ and Ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution: (20 Hrs)

Cause, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards – solid waste management: causes, effects, control measures and disposal of wastes – disaster management: floods, earthquakes, cyclone, land slides and tsunami.

Unit V: Social Issues, Human population and the Environment: (20 Hrs)

Water conservation, rain water harvesting, watershed management – environmental ethics: issues and possible solution – climate change, global warming, acid rain, ozone depletion, nuclear accidents and holocaust – wasteland reclamation – Environment protection Act – Wildlife protection Act – Forest Conservation Act – public awareness – Population explosion – Environment and human health – Role of Information Technology in Environment and human health.

Field work: (20 Hrs)

1. Visit to a local area to document environmental assets – river / forest / grassland/mangrove.
2. Visit to a local polluted site – urban / rural / industrial / agricultural.
3. Study of common plants, insects, birds.
4. Study of simple ecosystems – pond, river, forest, etc.,
5. Practical work

Reference Books:

1. Joseph C.Daniel,2004. Principles of Environmental Science. Brightson's Publications,Chennai.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email:mapin@icenet.net

4. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
5. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.
6. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,
7. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
8. 8. Trivedi R.K., Hand book of Environmental Laws, Rules Guidelines, Compliances and Standards. Vol I and II, Enviro Media9.Wanger K.D., 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA

Rw;Wr; NHy; fy;tp**Unit-myF/ 1Rw;Wr; NHapay; kw;Wk; ,aw;if ts';fs;**

Rw;Wr;NHy; ,aypd; ,yf;fzk;. neh;fk;. Kf;fpaj;Jtk;? fhLk; mjd; ts';fSk;. fhLfs; mHpg;g[. Ru';fk;. ePh; njf;f miz?ePh; Mjhu';fs; : gad;ghLfs;. bts;sk;. twl;rp/ fdpk ts';fs;? Ruz;ly;. msthf vLj;jy; (k) gad;ghL: czt[ts';fs;? czt[k; mjd; epiw FiwfSk;. mjp jPtpu nka;r;ry;. g{r;rpbfhy;yp (k) caph;bfhy;ypapd; Fiwfs;. ePh; nj';Fjy;. eg;g[j;jd;ik/ rf;jp ts';fs; ? rf;jpapd; njitfs;. g[Jg;gpf;f Toa (k) g[Jg;gpf;f ,ayhj rf;jpfs; epy ts';fs; ? wpytsf;Fiwt[. epyr;rhpt[. kz;rhpt[kw;Wk; ghlytdkhFjy;. ,aw;if ts';fspd; ghJfhg;g[ed;ikfSk;/

Unit-myF II) NHy;epiy kz;ly';fs;

nfh;ghL. mikg;g[kw;Wk; bray;ghL: cw;gj;jpahsh;fs;. Efh;nthh;fs;. kw;Wk; rpijg;gth;fs; ? NH;epiy kz;ly;jpd; Mw;wy; xl;lk; NHpay; tHpKiw tsh;r;rp. czt[r;r';fpyp. czt[tis. NH;epiy kz;ly';fs; tiffs;. jd;ikfs;. mikg;g[kw;Wk; bray;gh:L? fhL;L NH;epiy kz;lyk;. g[y;btsp NH;epiy kz;lyk;. ghlytdk; kw;Wk; ePh;r;NH;epiy kz;lyk;/

Unit-myF III) caphpag; gy;tifik

tiuaw. tiffs;. caphpag; gy;tifikapd; gad;fs;. ,e;jpah Xh; caphpakpif gy;tifik kz;lyk;. caphpa kpif gy;tifik ,l';fs;. caphpay; gy;tifik;F mr;RWj;jy;. caphpa gy;tifikapd; ghJfhg;g[/

Unit-myF IV) Rw;Wr;NHy; khRghL

fhw;WkhRghL. ePh; khRghL. kz; khRghL/ fly; khRghL/ ,iur;ry; khRghL/. mdy; khRghL/ kw;Wk; fjphpaf;f khRghL/. jplfHpt[nkshd;ik. fhuzpfs;. tpist[fs;. jLf;Fk;Kiw kw;Wk; ghJfhg;ghd mg;g[wg;gLj;Jk; Kiw nghplh; nkyhz;ik. bts;sk;. epyLf;fk;. g[ay;. epyr;rhpt[kw;W MHPg;nguiyfs;/

Unit-myF V).rK:f rpf;fy;fSk; kf;fs; bgUf;fKk; Rw;WNHYk;

ePh;ts ghJfhg;g[. kiHePh; nrfhpg;g[. ePh;ts nkyhz;ik ? Rw;Wr;NHy; tiuKiw rpf;fy;fSk; mjd; ePh;f;Fk; fhuzpfSk;. thdpiy khw;w';fs;. cyfbtg;gkakhjy;. mkpykiH. Xnrhd; rpijt[. fjphpaf;f tpgj;Jfs; kw;Wk; nghplh;fs; ePh;gphpif KfL rPuikg;g[. Rw;Wr;NHy; ghJfhg;g[rl;lk;. td caphpdg; ghJfhg;g[rl;lk;. tdg;ghJfhg;g[rl;lk;. Rw;Wr;NHy; tpHpg;g[zh;t[. kf;fs; bjhifg; bgUf;fk;. Rw;Wr;NHy; (k) kdpj eyd;. kdpj eydpYk;. Rw;Wr; NHypYk; jfty; bjhHpy; El;gjj;jpd; g';F/

QUESTION PAPER PATTERN**THEORY EXAMINATION****Continuous Internal Assessment (CIA) 25marks**

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks
Total	25 marks

Semester Examination (75 marks)**Time: 3Hrs****Max. Marks: 75**

A Question paper consists of three parts

Part-A

10 very short answer question without choice. Each question is to be answered in about 50 words. Each answer is to be valued out of 2 marks.

Part-B

5 questions are to be answered out of 8 given. Each question is to be answered in about 300 words. Each answer is to be valued out of 5 marks.

Part-C

Essay questions containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

Part-A

Very Short Answers (50 words) 10 questions each 2 marks. (10x2=20 Marks)

Part-B

Short Answers (300 words) 5 questions each 5 marks. (5x5=25 Marks)

Part-C

Essay questions (1200 words) 2 questions each 15 marks. (2x15=30 Marks)

TOTAL**75 Marks**

PRACTICAL EXAMINATION**Continuous Internal Assessment (CIA) (40 marks)**

Based on the periodical evaluation of Record, Observation record and Experiments assessed by the staff incharge.

External Examination (60 marks)**Time: 3 Hrs**

Practical	- 50marks
Record	- 10marks
Total	- 60marks

QUESTION PAPER PATTERN
(For Environmental Science)
THEORY EXAMINATION

Continuous Internal Assessment (CIA) 25 marks

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks
Total	25 marks

Semester Examination (75 marks)

Time: 3Hrs

Max. Marks: 75

A Question paper consists of three parts

Part-A

20 choose the answer question. Each answer is to be valued out of 1 marks.

Part-B

5 questions are to be answered out of 8 given. Each question is to be answered in about 300 words. Each answer is to be valued out of 5 marks.

Part-C

Essay questions containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

Part-A

Choose the answer 20 questions each 1 mark. (20x1=20 Marks)

Part-B

Short Answers (300 words) 5 question each 5 marks. (5x5=25 Marks)

Part-C

Essay questions (1200 words) 2 questions each 15 marks. (2x15=30 Marks)

Field work

TOTAL

75 Marks