

**ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
CUDDALORE-1**



**DEPARTMENT OF ZOOLOGY  
SYLLABUS 2016-2017**

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

<b>SEMESTER</b>	<b>PART</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>HOURS</b>	<b>CREDITS</b>
III	III	AZMB301	Solid waste Management (II Year Micro – Biology)	8	6
IV	III	AZMB402	Classical Genetics & Biostatistics (II Year Micro – Biology)	8	6
IV	III	AZBC401S	Advanced Zoology (II Year Bio – Chemistry)	5	4
IV	III	AZBCP401S	<b>Practical</b> - Advanced Zoology (II Year Bio – Chemistry)	3	2
III & IV	IV	EVS301S & EVS401S	Environmental Science	3	2

<b>II B.Sc (MB)</b>	<b>SOLID WASTE MANAGEMENT</b>	<b>AZMB301</b>
<b>SEMESTER – IV</b>		<b>HRS/WK - 8</b>
<b>ALLIED</b>		<b>CREDIT - 6</b>

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

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

**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 – radio active 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.

<b>II B.Sc (MB)</b>	<b>CLASSICAL GENETICS &amp; BIO-STATISTICS</b>	<b>AZMB402</b>
<b>SEMESTER - III</b>		<b>HRS/WK - 8</b>
<b>ALLIED</b>		<b>CREDIT – 6</b>

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

**Objective:**

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

**Unit – I : Genetics and Mendel’s laws :**

History of genetics – Mendel’s experiments: monohybrid, dihybrid and polyhybrid cross - Mendel’s laws of inheritance - hybrid vigour – gene expressivity - pleiotropism – incomplete dominance – complementary genes - epistasis - supplementary genes – duplicate genes – lethal genes – atavism – multiple genes – polygenic inheritance – continuous and discontinuous characters. Multiple Alleles and linkage - Characters and theories of multiple alleles – sub alleles and iso alleles - ABO Blood Group inheritance - Rh factor – linkage and linkage group – history - linked genes – complete and incomplete linkage – significance of linkage.

**Unit – II : Recombination in Eukaryotes :**

Mechanism – stage specificity - cytological evidence – frequency of crossing over – factors controlling crossing over – mitotic and meiotic crossing over – somatic and germinal crossing over – significance of crossing over - construction of chromosome maps – history of chromosomes – size, shape, structure, types and physiology of chromosomes- gene concept - gene function.

**Unit – III: Molecular, Human and cytogenetics**

DNA as the genetic material – nucleic acids – structure of DNA , gene – enzyme relationship - euploidy - aneuploidy – chromosomal aberrations - Pedigree analysis – human chromosomes – eugenics and euphenics – inbreeding, outbreeding and hybrid vigour - population genetics.

**BIO-STATISTICS**

**Unit – IV:**

Introduction – Scope – Definition – Importance – Functions – Data – Data collection – Methods of data collection – Classification of Data – Tabulation of Data – Diagramatic, Graphical presentation of Data – Histogram – Frequency polygon – Oogive curves. Measures of central tendency \_ Arithmetic mean – Median – Mode - Measures of dispersion – range – quartile deviation – standard deviation and coefficient of variation – mean deviation – skewness – kurtosis.

**Unit –V:**

Correlation – simple correlation – Rank correlation – Regression – Probability – Addition theorem – Multiplication theorem – Permutation and combinations - Test of significance – Hypothesis testing – Null hypothesis – alternative 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.

<b>II B.Sc (BC)</b>	<b>ADVANCED ZOOLOGY</b> <b>For the students admitted in the year 2011</b>	<b>AZBC401S</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 5</b>
<b>ALLIED</b>		<b>CREDIT – 4</b>

**Objective:**

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

**Unit: 1**

**INVERTEBRATES AND CHORDATES**- Structural and functional details of phylum- Protozoa: *Plasmodium vivox*, *Taenia solium*, Earthworm- Digestive system, Prochordata – amphioxus- Morphological details of chordates- Pisces-shark, Amphibia -Frog, Reptiles- Calotes, Aves- pigeon, Mammalia- Rat.

**Unit: 2**

**PHYSIOLOGY**-Digestion and absorption of carbohydrates proteins and lipids. **Respiration** –exchange and transport of Gases (CO<sub>2</sub> & O<sub>2</sub>) Bohr's effect. **Circulation**:- Structure and functions of human heart, **Excretion** – Structure and functions of kidney. **Nerve Physiology**: Structure of Neuron, Conduction of Nerve impulse. **Muscle Physiology**: Types of Muscle, Theories of Muscle contraction. **Endocrinology**: Structure, secretions and functions of Pituitary, Thyroid, adrenal, islets of langerhans, Gonads –Pheromones.

**Unit: 3**

**MOLECULAR BIOLOGY 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 & Blastulataion 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. Fossil and Fossilization, Dating of Fossils, Geological timescale.

**Books for reference:****BIODIVERSITY OF 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 AND ENDOCRINOLOGY:**

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

**MOLECULAR BIOLOGY AND HUMAN GENETICS:**

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

**DEVELOPMENTAL BIOLOGY**

8. Verma.S and Agarwal V.K(2000) Chordate Embryology S.Chand & Co. New Delhi.
9. Balinsky.B.I (1981) An Introduction to Embryology S.Chand & Co. New Delhi.
10. Saunders.J.W (1982) Developmental Biology – Pattern and Principles, Macmillan New York.

**ECOLOGY AND EVOLUTION**

11. Text book of Ecology & Animal Distribution by P.S.Verma V.K.Agarwal S.Chand & Co. New Delhi.
12. Odum E.P.Basic Ecology (1983) Saunders College Publishing’s New York.
13. Arumugam.N (2002) Organic Evaluation, Saras Publication., Nagercoil.



<b>II B.Sc (BC)</b>	<b>ADVANCED ZOOLOGY- PRACTICAL</b>	<b>AZBCP401S</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 3</b>
<b>ALLIED</b>		<b>CREDIT -2</b>

### MAJOR PRACTICALS

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

### MINOR PRACTICALS

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

### SPOTTERS

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

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

(For All UG II Year Students Any One Semester)

**Objective:**

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

**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](mailto: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. 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

<b>II B.Sc (MB)</b>	<b>GENETICS</b>	<b>AZBC402</b>
<b>SEMESTER - III</b>		<b>HRS/WK - 6</b>
<b>ALLIED</b>		<b>CREDIT - 5</b>

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

- To provide basic knowledge in the field of genetics, mutation, human genetics and population genetics.

**Unit-I: Genetics and Mendel's laws**

Basics of Mendelian inheritance – Interaction of genes – complementary factors, supplementary factors, inhibitory and lethal factors – atavism. Blood groups and their inheritance. Chromosomes - the vehicle of inheritance – Chemical basis of inheritance. Molecular basis of genetic material - genetic code – gene function – operon concept. Inborn errors of metabolism.

**Unit-II: Gene Mutations**

Linkage and Crossing over – Chromosome maps – Chromosomal mutation and gene or point mutation – mutagens. Chromosomal aberrations – numerical and structural – examples from humans.

**Unit-III: Sex Inheritance**

Sex determination - sex linked inheritance – extra chromosomal inheritance – kappa particles in paramecium, milk factor in mice.

**Unit-IV: Human Genetics**

Pedigree analysis – Human karyotype – sex determination, barr body and drumstick chromosome – anomalies in sex chromosomes and autosomes – Congenital malformation – Genetic disorders in man – Eugenics and Euphenics – Euthenics – Bioethics.

**Unit-V: Population Genetics**

Population – Gene pool – Gene frequency and genotypic frequency – Genetic equilibrium and Hardy Weinberg Law – Factors affecting gene frequency – Evolutionary forces of factors. Applied Genetics: Animal breeding – heterosis, inbreeding, out breeding. Out crossing and hybrid vigour.

**Text Books:**

Verma, P.S and Agarwal, V.K 2005 'Cell Biology, Genetics, Molecular Biology, Evolution & Ecology', S. Chand and Co., New Delhi

**Reference books:**

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

<b>II B.Sc (MB)</b>	<b>GENETICS- PRACTICAL</b>	<b>AZBCP402</b>
<b>SEMESTER - III</b>		<b>HRS/WK - 3</b>

**MAJOR PRACTICALS**

1. Experiments on Mendelian inheritance
2. Gene frequency calculations.
3. Statistical analysis of genetic data using Chi-square test.
4. Human pedigree construction for a family data.

**MINOR PRACTICALS**

1. Tracing of genes in family pedigree studies
2. Collection and identification of human finger prints
3. Study of hereditary disorders with the aid of chromosome karyotyping
4. Identification of sex and mutant characters in *Drosophila*

<b>II B.Sc (MB)</b>	<b>ENDOCRINOLOGY</b>	<b>AZMB402</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 6</b>
<b>ALLIED</b>		<b>CREDIT – 5</b>

**Objective:**

- To make the students to learn the objectives and scope of comparative endocrinology, anatomy, morphology and histology of endocrine tissues of vertebrates, crustacean and insect endocrine organs and their functions.

**Unit–I: Pituitary Gland**

General characteristics of hormones-Pituitary gland-structural organization-Pituitary hormones functions - hypothalamic control.

**Unit–II: Thyroid Gland**

Thyroid gland-structural organisation- metabolic effects of thyroid hormone- effects of thyroid on reproduction – Parathyroid – structure – function of parathyroid hormone.

**Unit–III: Pancreas and Adrenal Glands**

Structure of pancreas- function of Insulin and glucagon- Adrenals – structural organization, functions of cortical and medullary hormones.

**Unit–IV: Vertebrate Reproductive Endocrinology**

Structure of mammalian testis and ovary-male and female sex accessory organs- hormones of testis and ovary – estrus and menstrual cycle –hormones of pregnancy – parturition – hormonal control of lactation.

**Unit–V: Insect and Crustacean Endocrinology**

The concepts of neurosecretion – Endocrine system in crustacea – endocrine control of moulting and metamorphosis – Neuroendocrine system in insects- endocrine control of moulting and metamorphosis.

**Text Books**

1. Turner C.D, 1966, General Endocrinology. 4th Ed, W.B.Saunders Co., London.
2. Bentley P.J., 1985. Comparative Vertebrate Endocrinology. S.Chand and Co.,
3. Barrington E.J.W., 1968. An Introduction to General and Comparative endocrinology. Academic press, London.

**Reference Books**

1. Harris.G.W. and B.T.Donovan (Ed) 1968. The Pituitary Gland. Vol.3
2. Williams.R.M, 1974, Text Book of Endocrinology 5th Ed.
3. BentleyP.J. 1982. Comparative Vertebrate Endocrinology Cambridge University Press.
4. Michael .P. 1968. Endocrinology and Human Behaviour. Oxford University Press, New York.

<b>II B.Sc (MB)</b>	<b>ENDOCRINOLOGY-PRACTICAL</b>	<b>AZBCP401S</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 3</b>
<b>ALLIED</b>		<b>CREDIT -</b>

**MAJOR PRACTICAL**

1. Demonstration of Male and Female reproductive systems in cockroach
2. Demonstration of nervous system of Prawn

**MINOR PRACTICAL**

1. Prawn - Appendages
2. Mouth Parts - Honey Bee and Mosquito

**SPOTTERS**

1. Histology of ovary, accessory glands, corpus allatum and brain in insects
2. Histological study of pituitary, adrenal, testis, ovary, corpus luteum, pancreas and thyroid gland
3. Demonstration of Ovariectomy in cockroach.
4. Vaginal smear showing various stages of estrus cycles.

<b>II B.Sc (MB)</b>	<b>ENTOMOLOGY</b>	<b>AZMB402</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 6</b>
<b>ALLIED</b>		<b>CREDIT – 5</b>

**Objective:**

- To provide extensive knowledge in the field of Entomology.
- The familiarity between insect and environment was highlighted to the entomological research in many directions which have immense value in the control measures various disease causing insects.

**Unit–I: Insect Morphology**

Insect taxonomy upto orders – Salient features with suitable examples of the insect orders – Thysanura, Odonata, Isoptera, Orthoptera, Hemiptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera - Insects collection – Preservation – Identification – insect head – types of antennae – mouth parts and wing venation.

**Unit–II: Insect Physiology**

Structure and physiology of integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive and nervous system.

**Unit–III: Agricultural Entomology**

Insect – pests outbreak – assessment of insect population – Identification, seasonal history, biology, nature of damage and control measures of major pests of paddy, sugarcane, vegetables (Brinjal).

**Unit–IV: Principles and methods of Pest Management**

Principles of Insect control – Prophylactic measures – cultural, mechanical, physical methods– Genetic control and quarantine. Biological control : parasites, Predators and Microbial agents. Chemical methods: Pesticides- general classification – classification based on mode of action, mode of entry and Biopesticides: Integrated Pest Management (IPM) – definition, Integration of methods – potential components – need for IPM and uses.

**Unit–V: Beneficial insects and Vector insects**

Sericulture: biology of silk worm, silk gland, cultivation of mulberry plants, rearing silkworm and uses of silk – Apiculture: types of bees, bee colony, life history, Beekeeping accessories and byproducts of bees and its uses. Useful insects – Biology and control measures of important insect vectors – mosquitoes and houseflies.

**Text Books**

1. Temphare D.B. 1984. A Text Book of Insect Morphology, Physiology and Endocrinology. S.Chand and Co., New Delhi.
2. Chapman R.F. 1982. The Insect Structure and Functions. English Language Book society, Hooper Strongron.



**Reference Books**

1. Vasantharaj David.B. and V.V. Ramamurthy (2011). Elements of Economic Entomology, Namrutha publications, Chennai 600 116.
2. Temphare, D.B. (2009). Modern Entomology, Himalaya publishing Mumbai.
3. Ambrose, Dunston P,. (2004). The Insects: Structure, function and Biodiversity. Kalyani publishers, Ludhiana – New Delhi – Chennai.
4. Chapman, R.F. (2002) The Insect structure and functions. English Languages Book Society, Hooder Strongton.
5. Mike, W., Service (1999). Medical Entomology for Student, Cambridge Press.
6. Nayer, K.K., Ananthkrishnan T.N. and David B.V. General and Applied Entomology. Mc.Grow Hill Publications, New Delhi.
7. Rathanswamy, G. K. (1986). AHandbook of Medical Entomology and Elementary Parasitology. S. Viswanathasn Printers & Publishers Pvt. Ltd.
8. Srivastava, K.P. (1993). A Text Book of Applied Entomology. Vol I & II Kalyani Publishers, New Delhi.
9. P.G. Fenemore, Allaprakash, (1992). Applied Entomology : Wiley Eastern Ltd., Delhi.
10. Ullal., S.R. and M.N. Narasimhanna (1987). Hand book of practical sericulture, Central silk board (Ministry of textiles – Government of India), United Mansion, 39, Mahatma Gandhi road, Bangalore.

<b>II B.Sc (MB)</b>	<b>ENTOMOLOGY-PRACTICAL</b>	<b>AZBCP401S</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 3</b>
<b>ALLIED</b>		<b>CREDIT -</b>

**Major Practical**

1. Methods of harmful insect collection, preservation and submission of insect box.
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 and Odontopus).

**Spotters**

1. Histological slides – T.S. of foregut, midgut and hindgut, 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. Collection and Identification of medically important arthropods (Moquitoes, house flies, lice and mites).

**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
<b>Total</b>	<b>25 marks</b>

**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
<b>Total</b>	<b>- 60marks</b>

**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
<b>Total</b>	<b>25 marks</b>

**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**