

ZOOLOGY

- **M. Sc. in ZOOLOGY:**
- **FIRST SEMESTER (ODD SEMESTER)**

FACULTY OF LIFE SCIENCE

Eligibility Criteria (Qualifying Exams)	Admission Criteria	Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			EoSE Duration (Hrs.)	
						L	T	P	Thy	P
Chemistry, Botany, Zoology (CBZ-Group) & Chemistry, Geology, Zoology (CGZ-Group)	1) Merit List University Observance of Reservation Policy. 2) Entrance Test (written or/and oral) if decided by the 3)	ZOO 101	CCC	Systematics, Biodiversity and Evolution	5	4	2	0	3	0
		ZOO 111	CCC	Systematics, Biodiversity and Evolution –Laboratory work	2	00	00	3	0	3
		ZOO 102	CCC	Principles of Ecology	5	4	2	0	3	0
		ZOO 112	CCC	Principles of Ecology-Laboratory Work	2	00	00	3	0	3
		ZOO 103	CCC	Computational Biology, Biostatistics and Bioinformatics	5	4	2	0	3	0
		ZOO 113	CCC	Computational Biology, Biostatistics and Bioinformatics-- Laboratory Work	2	00	00	3	0	3
		ZOO S01	OSC	RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS	6	4	3	00	3	00
		ZOO A01	ECC/CB	CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM	6	4	3	00	3	00
		ZOO A02	ECC/CB	Entomology- Insect Diversity, Society and Evolution Theory						
		ZOO A03	ECC/CB	ENTOMOLOGY- Insect Physiology, Toxicology & Vector Biology						
		ZOO A04	ECC/CB	ENTOMOLOGY- Pest Ecology & Agricultural Entomology						
					TOTAL= 33					

M.Sc. (ZOOLOGY)		IST SEMESTER	
COURSE CODE: ZOO 101		COURSE TYPE: CCC	
COURSE TITLE: Systematics, Biodiversity and Evolution			
CREDIT:7		HOURS:135	
THEORY: 5	PRACTICAL:2	THEORY:90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL:33	
OBJECTIVE: This course is aimed towards generating fundamental knowledge , concepts related to Systematics, Biodiversity and Evolution.			
UNIT-1- 18 Hours	An overview of evolutionary biology, concept of organic evolution during pre- and post- Darwin era; evolution and molecular biology- a new synthesis; from molecules to life, life originated from RNA, introns as ancient component of genes.		
UNIT-2- 18Hours	The universal common ancestor and tree of life, three domain concept of living kingdom; molecular phylogeny– history, terms, definition and limitations, construction of phylogenetic trees using molecular data, construction of phylogenetic trees by using 16S rRNA gene sequences and concept of speciation in bacteria.		
UNIT-3- 18 Hours	Molecular divergence and molecular clocks and molecular drive; complication in inferring phylogenetic trees; origin and diversification of bacteria and archea; diversification of genomes; the nature of bacterial and archeal genomes; origin of genomes by horizontal gene transfer; role of plasmid, transposons, integrons and genomic islands in DNA transfer.		
UNIT-4- 18Hours	Origin and diversification of eukaryotes- origin of cells and first organisms; early fossilized cells; evolution of eukaryotic cell from prokaryotes- a case of symbiosis; evolution of eukaryotic genomes; gene duplication and divergence.		

UNIT-5- 15Hours	Mode of speciation- factors responsible for speciation; tempo of evolution; systematics- definition and role in biology, biological classification- theories and objectives, types of taxonomy, taxonomic diversity- definition and types, origination and extinction, rates of change in origination and extinction, causes of extinction, causes of differential rates of diversification, current status and future of biodiversity; human evolution- human evolutionary history; placing humans on tree of life; genomics and humanness; current issues in human evolution.
LABORATORY WORK (ZOO111)	1. Isolation of Genomic DNA from a bacterium and its quantification. 2. Designing primers for 16S rRNA gene sequence. 3. Amplification of 16S rRNA gene sequences by using genomic DNA as well as by colony boiling method. 4. Purification of 16S rRNA gene. 5. Sequence of 16S rRNA gene; editing the sequence, multiple alignments, construction of phylogenetic trees and interpretation of results. 6. Dot blot hybridization of different eubacterial species and interpretation of results.

SUGGESTED READINGS	1. <i>Evolution</i>, Barton, N. H., Briggs, D. E.G., Eisen, J. A., Goldstein, A. E., Patel, N. H., Cold Spring Harbor Laboratory Press, New York, USA 2. <i>Evolution</i>, Hall, B. K. and Hallgrimsson, B., Jones and Bartlett Publisher, Sudbury, USA 3. <i>Evolution</i>, Futuyma, D. J., Sinauer Associates, Inc., Sunderland, USA 4. <i>What Evolution Is</i>, Mayr, E., (2001), Basic Books, New York, USA
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M.Sc (ZOOLOGY)			IST SEMESTER	
COURSE CODE: ZOO 102			COURSE TYPE: CCC	
COURSE TITLE: Principles of Ecology				
CREDIT:7			HOURS:135	
THEORY: 5		PRACTICAL:2	THEORY:90	PRACTICAL:45
MARKS				
THEORY: 100(30+70)			PRACTICAL:33	
OBJECTIVE: The purpose of the course is to make the students to understand various ecological principles and factors that determine the size and number of population that can co-exist within a specific area. This knowledge is crucial for better development and management of natural resources and global environment.				
UNIT-1- 18Hours	Introduction to ecology, evolutionary ecology, environmental concepts – laws and limiting factors, ecological models. Characteristics of population, population size and exponential growth, limits of population growth, population dynamics, life history pattern, fertility rate and age structure. Competition and coexistence, intra-specific and inter-specific interactions, scramble and contest competition model, mutualism and commensalism, prey-predator interactions.			
UNIT-2- -18Hours	Nature of ecosystem, production, food webs, energy flow through ecosystem, biogeochemical cycles, resilience of ecosystem, ecosystem management. The biosphere, biomes and impact of climate on biomes.			
UNIT-3- 18Hours	Environmental Stresses and their management, global climatic pattern, global warming, atmospheric ozone, acid and nitrogen deposition, coping with climatic variations. Major classes of contaminants. Uptake			

UNIT-4- 18Hours	Biotransformation, detoxification, elimination and accumulation of toxicants. Factors influencing bioaccumulation from food and trophic transfer. Pesticides and other chemical in agriculture , industry and hygiene and their disposal. Impact of chemicals on biodiversity of microbes, animals and plants. Bioindicator and biomarkers of environmental health. Biodegradation and bioremediation of chemicals.
UNIT-5 18Hours	Biodiversity – assessment, conservation and management, biodiversity act and related international conventions. Sustainable development, natural resource management in changing environment. Molecular ecology, genetic analysis of single and multiple population, phylogeography, molecular approach to behavioural ecology, conservation genetics.
LABORATORY WORK (ZOO112)	Habitat studies: 1. Physical and chemical characteristics of soil. 2. Assessing influence of light, temperature and moisture on plant germination and growth/animal behavior and growth. 3. Assessing influence of soil nutrient status on plant germination and growth. Community/ecosystem studies: 1. Assessment of density, frequency and abundance of plants/animal in a community using various techniques i.e. transect, quadrat etc. 2. Comparison of stands/communities and ordination. 3. Profile diagrams. 4. Biomass and reproductive allocation under various environments. 5. Nutrient uptake and budget for various communities/Food chain assessment. 6. Decomposition of various organic matters and nutrient release mechanisms/role of arthropods and other micro-, and macrofauna in decomposition. 7. Understanding ecosystem succession by studying various stages of vegetation/community assemblages development. 8. Molecular techniques in laboratory. 9. Insect diversity in soil. Landscape studies: 1. Principles of GIS, GPS and RS technology. 2. Interpretation (visual and automated) of remote sensing information for landscape differentiation.

SUGGESTED READINGS	1. <i>Field Sampling: Principles and Practices in Environmental Analysis</i>, Conklin, A.R. Jr., (2004), CRC Press. 2. <i>Principles and Standards for Measuring Primary Production</i>, Fahey, T.J. and Knapp, A.K., (2007), Oxford University Press, UK 3. <i>Ecological Modeling</i>, Grant, W.E. and Swannack, T.M., (2008), Blackwell. 4. <i>Fundamental Processes in Ecology: An Earth system Approach</i>, Wilkinson, D.M., (2007), Oxford University Press, UK. 5. <i>Animal Ecology</i>, Ranga M.M., Agrobios, Jodhpur, India
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M.Sc (ZOOLOGY)		IST SEMESTER	
COURSE CODE: ZOO103		COURSE TYPE: CCC	
COURSE TITLE: Computational Biology, Biostatistics and Bioinformatics			
CREDIT:7		HOURS:135	
THEORY: 5	PRACTICAL:2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 34	
OBJECTIVE: The Purpose of this course is to make the students to understand computational biology- Bioinformatics & Biostatistics			
UNIT-1- 20 Hours	Basic components of computers– hardware (CPU, input, output, storage devices), Software (operating systems), Application software; Introduction to MSEXCEL- use of worksheet to enter data, edit data, copy data, move data; Use of in- built statistical functions for computations of mean, S. D., correlation, regression coefficients etc., Use of bar diagram, histogram, scatter plots, etc., Graphical tools in EXCEL for presentation of data; Introduction to MS- WORD word processor- editing, copying, moving, formatting, table insertion, drawing flow charts etc; Introduction to Power Point, image and data handling.		
UNIT-2- 15 Hours	Biostatistics- population, sample, variable, parameter, primary and secondary data, screening and representation of data, frequency distribution, tabulation, bar diagram, histograms, pie diagram, mean, median, mode, quartiles and percentiles, variance, standard deviation, coefficient of variation; Probability and distributions- definition of probability (frequency approach), independent events. Addition and multiplication rules,		

UNIT-3- 15 Hours	Conditional probability, examples- bernoulli, binomial, poisson and normal distributions; bivariate data- scatter plot, correlation coefficient (r), properties (without proof), interpretation of r, linear regression: Fitting of lines of regression, regression coefficient, coefficient of determination; hypothesis, critical region, and error probabilities, tests for proportion, equality of proportions, equality of means of normal populations when variances known and when variances are unknown: chi-square test for independence, P- value of the statistic, confidence limits, introduction to one way and two- way analysis of variance.
UNIT-4 -20 Hours	The era of computerized biology information, review of relevant definitions in molecular biology, overview of challenges of molecular biology computing, proteins, secondary structure and folding, RNA secondary structures, introduction to phylogenetic analysis; introduction to bioinformatics; introduction to genomics and proteomics databases- nucleic acid sequence database: Genbank, UCSC, ENSEMBL, EMBL, DDBJ, protein sequence databases: Swiss- prot, PDB, BLAST, PSI- BLAST (steps involved in use and interpretation of results) and HMMER, BLAST vs FASTA, file formats- FASTA, GCG and ClustalW.
UNIT-5- 20- Hours	Databank search- data mining, data management and interpretation, multiple sequence alignment, genes, primer designing; Protein modeling, protein structure analysis, docking, ligplot interactions, phylogenetic analysis with the program PHYLIP, DISTANCES, GROWTREE etc.; introduction to computational genomics and proteomics- basics of designing a microarray, image analysis and normalization, annotations, protein prediction tools- protein secondary structure, molecular modeling, identification and characterization of protein mass fingerprint, world- wide biological databases, Introduction to programming languages such as “C”.

LABORATORY WORK (ZOO 113)	1. Use of excel sheet for data processing. 2. Use of search engines like Scopus, Science direct for reference material collection and management. 3. Nucleic acid and protein sequence databases. 4. Data mining for sequence analysis. 5. Web– based tools for sequence searches and homology screening. 6. Primer designing for gene amplification and gene cloning. 7. Annotations: ORF finder, Use of ARTEMIS or any other suitable software. 8. Construction of phylogenetic trees for DNA and proteins. 9. Introduction to microarray technology. 10. Identification of peptide finger print by nano LC- MS/MS and database search using MASCOT and OMSSA.
SUGGESTED READINGS	1. <i>Principles of Biostatistics</i>, Pagano M., Gauvreau, K, (2000), Duxbury Press, USA 2. <i>Bioinformatics for Dummies</i>, Claverie J. M., Notredame C., (2nd Ed., 2007), Wiley Publishing, Inc., New York, USA 3. <i>Bioinformatics: Sequence and Genome Analysis</i>, Mount, D. W. (2nd Ed., 2001), Cold Spring Harbor Laboratory Press, New York, USA. 4. <i>Animal Ecology</i>, Ranga M.M., Agrobios, Jodhpur, India

M.Sc (ZOOLOGY)		1ST SEMESTER	
COURSE CODE:ZOOS 01		COURSE TYPE: OSC	
COURSE TITLE:RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS			
CREDIT: 06		HOURS : 90	
THEORY: 06		THEORY: 90	
MARKS : 100			
THEORY: 70		CCA : 30	
OBJECTIVE: - Understands the concept and place of research in concerned subject - Gets acquainted with various resources for research - Becomes familiar with various tools of research - Gets conversant with sampling techniques, methods of research and techniques of analysis of data - Achieves skills in various research writings - Gets acquainted with computer Fundamentals and Office Software Package .			
UNIT - 1 15 Hrs	CONCEPT OF RESEARCH : Meaning and characteristics of research , Steps in research process , Types of research - i) Basic, applied and action research ii) Quantitative and qualitative research , Areas of research in concern discipline SELECTION OF PROBLEM FOR RESEARCH : Sources of the selection of the problem , Criteria of the selection of the problem ,Drafting a research proposal , Meaning and types of variables ,Meaning and types of hypotheses.		
UNIT - 2 15 Hrs	TOOLS OF RESEARCH : Meaning and general information about construction procedure of (i) Questionnaire, (ii) Interview, (iii) Psychological test, (iv) observation (v) Rating scale (vi) Attitude scale and (vii) check list , Advantages and disadvantages of above tools SAMPLING : Meaning of population and sample , Importance and characteristics of sample , Sampling techniques - i) Probability sampling : random sampling, stratified random sampling, systematic sampling, cluster sampling ii) Non-probability sampling: incidental sampling, purposive sampling, quota sampling		
UNIT - 3 15 H rs	METHODS OF RESEARCH Meaning and conducting procedure of following methods of research : Historical method , Survey method , Case study , Causal comparative method , Developmental methods , Experimental methods		

UNIT - 4 15 Hrs	TREATMENT OF DATA : Level of measurements of data , Steps in treatment of data: editing, coding, classification, tabulation, analysis and interpretation of results WRITING RESEARCH REPORT : Sections of report : Preliminary section , Content section : various chapters , Supplementary section : appendices, references, abstract , Format and style
UNIT - 5 15 Hrs	Computer Fundamentals Computer System : Features, Basic Applications of Computer, Generations of computers. Parts of Computer System : Block Diagram of Computer System ; Central Processing Unit (CPU) ; Concepts and types of Hardware and Software, Input Devices - Mouse, Keyboard, Scanner, Bar Code Reader, track ball ; Output Devices - Monitor, Printer, Plotter, Speaker ; Computer Memory - primary and secondary memory, magnetic and optical storage devices. Operating Systems - MS Windows : Basics of Windows OS ; Components of Windows - icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders ; Control panel : display properties, adding and removing software and hardware, setting date and time, screensaver and appearance ; Windows Accessories : Calculator, Notepad, WordPad, Paint Brush, Command Prompt, Windows Explorer.
UNIT - 6 15 Hrs	Office Software Package Word Processing - MS Word : Creating, Saving, Opening, Editing, Formatting, Page Setup and printing Documents ; Using tables, pictures, and charts in Documents ; Using Mail Merge sending a document to a group of people and creating form, letters and label. Spreadsheet - MS Excel : Opening a Blank or New Workbook, entering data/Function/ Formula into worksheet cell, Saving, Editing, Formatting, Page Setup and printing Workbooks. Presentation Software - MS Power Point : Creating and enhancing a presentation, modifying a presentation, working with visual elements, adding Animations & Transitions and delivering a presentation.

- Agrawal, Y. P. (1988). **Better sampling : Concepts, Techniques and Evaluation**. New Delhi : sterling Publishers Private Ltd. Best, J. W. (1993). **Research in Education** (6th ed.) New Delhi : Prentice-Hall of India Pvt. Ltd.
- Broota, K. D. (1992) **Experimental design in Behavioral Research** (2nd ed.) New Delhi : Wiley Eastern Limited.
- Dasgupta, A. K. (1968). **Methodology of Economic Research**. Bombay: Asia Publishing House. Edwards, A. L. (1957). **Techniques of Attitude Scale construction**. New York : Appleton-Contury
- Gall, M. D., Gall, J. P. and Borg, W. R. (2007). **Educational Research : An introduction** (8th ed.) Coston : Allyn and Bacon.
- Garrett, H. E. & Woodworth, R. S. (1969). **Statistics in Psychology and Education**. Bombay : Vakils, Fecffer & Simons Pvt. Ltd.
- Goode, W. J. & Hatt, Paul K. (1952). **Methods in Social Research**. New York : McGraw-Hill.
- Gopal, M. H. (1964). **An Introduction to research Procedure in Social Sciences**. Bombay : Asia Publishing House.
- Hillway, T. (1964) **Introduction to Research** (2nd ed.) Noston : Houghton Miffin.
- Hyman, H. H., et al. (1975). **Interviewing in Social Research**. Chicago : University of Chicago Press.
- Kerlinger, F. N. (1983) **Foundation of Behavioural Research**. (2nd Indian Reprint) New York : Holt, Rinehart and Winston.
- Kothari, C. R. (2007) **Research Methodology: Methods & Techniques** (3rd ed.) New Delhi : Wishwa Prakashan. Fundamentals Of Computers, Dr. P. Mohan, Himalaya Publishing House.
- Microsoft First Look Office 2010, K. Murray, Microsoft Press.
- Fundamental Of Research Methodology And Statistics, Y.K. Singh, New Age International (P) Limited, Publishers. Practical Research Methods, Dr Catherine Dawson,
- The Essence Of Research Methodology, Jan Jonker & Bartjan Pennink, Springer.

M.Sc (ZOOLOGY)		1ST SEMESTER	
COURSE CODE:ZOOA 01		COURSE TYPE: ECC	
COURSE TITLE: CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM			
CREDIT: 06		HOURS : 90	
THEORY: 06		THEORY: 90	
MARKS : 100			
THEORY: 70		CCA : 30	
OBJECTIVE:			
- Understands the concept of Constitutionalism - Gets acquainted with various Indian Political System - Becomes familiar with various Union Executive - Gets conversant with Legislatures, Legislative Bills - Achieves skills in various writings			
UNIT - 1 12 Hrs	Unit- I: Meaning: Constitution, Constitutional government & constitutionalism; Difference between Constitution & Constitutionalism; Constitutionalism: Basis, Elements, Features & future. Forms of Government: Democracy & Dictatorship, Unitary & Federal, Parliamentary & Presidential form. Ideals of the Indian Constitution incorporated in the Preamble. Special Features of the Indian Constitution.		
UNIT - 2 24 Hrs	Unit-II: Concept of State and Citizenship, Judicial Review and Fundamental Rights, Directive Principles of the State Policy, Fundamental Duties, Procedure to Amend the Indian Constitution, Judiciary: Supreme Court and High Court, Judicial Activism and Public Interest Litigation and Provisions relating to Emergency.		
UNIT - 3 10 H rs	Unit-III: Union Executive- President, Prime Minister, Council of Ministers. State Executive- Governor, Chief Minister and Council of Ministers. Local Bodies & Panchayati Raj		
UNIT - 4 24 Hrs	Unit-IV: Parliament of India, State Legislatures, Legislative Bills: Ordinary, Money and Financial, Union State Relations, Principles of the ‘Separation of Power and the ‘Principles of Check & Balance’. Political Parties and Pressure Groups. Challenges before Indian Democracy: Terrorism, Regionalism, Communalism, <u>Linguistics</u> and National Integration.		
UNIT - 5 20 Hrs	Unit-V: Controller & Accountant General of India, Solicitor General, Advocate General, Election Commission, Union and State(s) Public Service Commission, Finance Commission.		

SUGGESTED READINGS

HOBBS, Thomas, The Leviathan, Chapters XIII & XVII [entry]
LOCKE, John, The Second Treatise of Civil Government, Chapter IX [entry]
ROUSSEAU, Jean-Jacques, The Social Contract or Principles of Political Right
MONTESQUIEU, The spirit of the laws,
RAZ, Joseph, “The rule of law and its virtue”, in The authority of law, Oxford University Press, 1979
Dicey on British constitution
P. Ishwara Bhat Inter-relationship between Fundamental Rights
M P Jain Indian Constitutional Law
H M Seervai Constitutional Law of India
V N Shukla Constitution of India
D DBasu Shorter Constitution of India
B Sivarao Constitutional Assembly Debates
J. V R Krishna Iyer Fundamental Rights and Directive Principles
Paras Diwan Human Rights and the Law
P K Tripathi Some Insight into Fundamental Rights
S P Sathe Fundamental Rights and Amendment to the Constitution
P B Gajendragadkar Law, Liberty and Social Justice
David Karrys Politics of Law

M.Sc (ZOOLOGY)		IST SEMESTER	
COURSE CODE: ZOO A02		COURSE TYPE: ECC/CB	
COURSE TITLE: Entomology- Insect Diversity, Society and Evolution Theory			
CREDIT:6		HOURS:90	
THEORY: 6	PRACTICAL:0	THEORY: 90	PRACTICAL: 0
MARKS			
THEORY: 100(30+70)		PRACTICAL:0	
OBJECTIVE: This course is aimed towards generating fundamental knowledge of insects diversity society and evolution theory.			
UNIT-1- 18-Hours	Morphology: external features and their articulation. Comparative study of head-antennae, mouth parts; thorax – legs, wings; abdominal appendages, genitalia		
UNIT-2- 18 Hours	Taxonomy- historical development of classification of insect, basis of insect classification; classification of insects up to sub orders and up to super families in economical important groups; fossil history, origin and evolution of insects		
UNIT-3- 18 Hours	Insect Society: group of social insects and their social life; evolution of sociality; social organization and social behaviour in honey bee, ants, termites and wasps		
UNIT-4- 18-Hours	Insect Plant Interaction - Theory of co-evolution, role of allelochemicals in host plant mediation, tritrophic interaction, host-plant selection by phytophagous insects, establishment of insect population on a plant surface.		
UNIT-5- 18 Hours	Forensic Entomology: Introduction, forensically important insects, collection of data from cadaver site, interpretation of data for predicting time and cause of death.		

SUGGESTED READINGS	1. <i>A general text book of entomology</i>, Imms , A. D., Chapman & Hall, UK 2. <i>Introduction to the study of insects</i>, Borror, D. J., Triplehorn, C. A., and Johnson, N. F.,M Saunders College Publication, USA 3. <i>Principles of Insect Morphology</i>, Snodgrass, R. E., Cornell Univ. Press, USA 4. <i>The Insect Societies</i>, Wilson, E. O., Harward Univ. Press, UK 5. <i>Host Selection by Phytophagous insects</i>, Bernays, E. A., and Chapman, R. F., Chapman and Hall, New York, USA 6. <i>Insect Plant Biology</i>, Schoonhoven, L. M., van Loop, J. A., & Dicke. M. Pub. Oxford Univ. Press. USA
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M.Sc (ZOOLOGY)		IST SEMESTER	
COURSE CODE: ZOO A03		COURSE TYPE: ECC/CB	
COURSE TITLE: EMTOMOLOGY- Insect Physiology, Toxicology & Vector Biology			
CREDIT:6		HOURS:90	
THEORY: 6	PRACTICAL:0	THEORY:90	PRACTICAL: 0
MARKS			
THEORY: 100 (30+70)		PRACTICAL-0	
OBJECTIVE: This course is aimed towards generating fundamental knowledge concepts related to insect physiology toxicology and vector biology			
UNIT-1- 20-Hours	Structure and physiology of integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive, and nervous system. Sensory receptors. Growth, metamorphosis and diapause in insect.		
UNIT-2- 20-Hours	Definition of pesticides, brief history, pesticides registration, pesticide industries and markets. Dose-response relationship; mode of action of insecticide, carcinogenic, mutagenic and teratogenic effects, and evaluation of toxicity		
UNIT-3- 15- Hours	Group characteristics of insecticide, structure and function of organochlorine, organophosphorus, carbamate, pyrethrod, other plant origin as well as bio-insecticides, neonicotinoids and nitrogenous insecticides, fumigants, IGRs. Metabolism or degradation of pesticides - phase I and phase II reactions. Insecticide resistance and health hazards.		
UNIT-4- 15 Hours	Introduction to vector biology, economic importance and control of fleas, lice, bugs, mosquitoes, flies and parasitoids.		
UNIT-5- 20 Hours	Vector-parasite interaction; host-pathogen interaction, Insect transmitting bacteria and viruses of medical, veterinary and agricultural importance; control of insect vector.		

SUGGESTED READINGS	1. <i>The Insects: Structure and function</i>, Chapman, R. F., Cambridge University Press, UK 2. <i>Physiological system in Insects</i>, Klowden, M. J., Academic Press, USA 3. <i>The Insects, An outline of Entomology</i>, Gullan, P. J. , and Cranston, P. S., Wiley Blackwell, UK 4. <i>Insect Physiology and Biochemistry</i>, Nation, J. L., CRC Press, USA 5. <i>Toxicology and Risk Assessment: A Comprehensive Introduction</i>, Greim H., and Snyder, R. (ed), John Wiley and Sons, UK 6. <i>The Complete Book of pesticide management</i>, Whitford, F., Wiley Interscience, John Wiley and Sons, UK 7. <i>Safer Insecticides</i>, Hodgson, E., and Kuhr, R. J., (ed), Marcel Dekker Inc., New York, USA 8. <i>Pesticide Application Methods</i>, Matthews, G, A., Blackwell Science, London, UK 9. <i>Pesticide Biochemistry and Physiology</i>, Wilkinson, C. F., Plenum Press, New York, UK 10. <i>Metabolic pathways of agrochemicals Part II</i>, Roberts, T. R., and Hutson, D. H. The Royal Society of Chemistry, UK 11. <i>Medical and Veterinary Entomology</i> Mullen, G. , Durden, L., Academic Press, USA 12. <i>Medical and Veterinary Entomology</i>, Kettle, D. S., Cabi Press, USA 13. <i>Medical Entomology for students, Service</i>, M. Cambridge University Press, UK
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M.Sc (ZOOLOGY)		IST SEMESTER	
COURSE CODE: ZOO A04		COURSE TYPE: ECC/CB	
COURSE TITLE: ENTOMOLOGY- Pest Ecology & Agricultural Entomology			
CREDIT:6		HOURS:90	
THEORY: 6	PRACTICAL:0	THEORY: 90	PRACTICAL: 0
MARKS			
THEORY: 100 (30+70)		PRACTICAL:0	
OBJECTIVE: This course is aimed towards generating fundamental knowledge concepts related to pest ecology and agricultural entomology			
UNIT-1- 25-Hours	Pest - definition and its ecology, pest status, features responsible for evolutionary success of insect species, factors responsible for achieving the status of pest, Economic injury level, economic threshold, action threshold, pest spectrum, pest complex, carrying capacity, secondary pest out break, pest surveillance and sampling.		
UNIT-2- 15-Hours	Population dynamics of pests - agro-ecosystem, phases of population fluctuation, models of population growth, factors for population fluctuation, population size and regulatory mechanisms.		
UNIT-3- 20-Hours	Identification, seasonal history, biology, nature of damage and control measures of pests, of cereals, pulse crops, cotton, vegetables (summer vegetable and winter vegetable), oil seeds, fruit crops, sugarcane and stored grains. Locust- different species and phases, phase transition, periodicity, migration, biology and control measures		
UNIT-4- 15 Hours	Integrated Pest Management: history, different phases of pest control, Quarantine, Physical, Cultural, Chemical, Biological control and, genetic and biotechnological methods of control. Pheromones- production, and their use in pest surveillance and management		

UNIT-5- 15 Hours	Plant resistance to insects: types of resistance, mechanism of resistance-antibiosis, antixenosis, tolerance, factors mediating resistance, JH Mimics & MH-agonist. Transgenic plants: history, <i>Bacillus thuriengensis</i> and its mode of action on insect, different sub species of <i>Bt</i> , development of <i>Bt</i> plant by recombinant DNA technology, resistance management of <i>Bt</i> crop, prospective and controversies of <i>Bt</i> crop.
SUGGESTED READINGS	1. <i>Ecology of insects</i>, Speight, M. R., Hunter, M. D., & Watt, A. D., Wiley-Blackwell, UK 2. <i>Insect Plant Biology</i>, Schoonhoven, L. M., van Loon, J.A., & Dicke, M., Publisher Oxford University Press, USA 3. <i>Interrelationship between insects and Plants</i>, Jolivet, P., CRC Press, USA 4. <i>Chemical Ecology of Insects</i>, Carde, R. T., and Bell, W. J., Chapman & Hall, New York, USA 5. <i>Entomology & Pest Management</i>, Pedigo, L. P., Prentice Hall, New Jersey, USA 6. <i>Concepts of IPM</i>, Norris, Caswell-Chen and Kogan, Prentice-Hall, USA 7. <i>Agricultural insects pests of the tropics and their control</i>, Hill, D. S., Cambridge University Press, UK