FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF ZOOLOGY

M.Sc Zoology- Syllabus Front Page

2020-2021

For those who joined in June 2019 onwards

PROGRAMME CODE: PSZO

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER - I						
19PG1Z1	Animal Diversity	6	4	40	60	100
19PG1Z2	Microbiology	6	4	40	60	100
19PG1Z3	Cell & Molecular biology	6	4	40	60	100
19PG1Z4	Lab in Animal Diversity& Microbiology	4	2	40	60	100
19PG1Z5	Lab in Cell & Molecular Biology	4	2	40	60	100
19PGZEDC1	Herbal Medicine	3	3	40	60	100
	Library	1	-	-	-	-
Total		**30**	**19**			
SEMESTER - II						
19PG2Z6	Genetics	6	4	40	60	100
19PG2Z7	Evolution	6	4	40	60	100
19PG2Z8	Biochemistry	6	4	40	60	100
19PG2Z9	Lab in Genetics & Evolution	4	2	40	60	100
19PG2Z10	Lab in Biochemistry	4	2	40	60	100
19PGZEDC2	Herbal Medicine	3	3	40	60	100
	Library	1		-	-	-
Total		**30**	**19**			
SEMESTER - III						
19PG3SIZ1	Internship/Summer Project*	-	3	50	50	100
19PG3Z11	Biophysics	6	5	40	60	100
19PG3Z12	Immunology	6	5	40	60	100
19PG3Z13	Biostatistics & Research Methodology	6	5	40	60	100
19PG3ZE1/ 19PG3ZE2	Fisheries & Aquaculture / Bioinformatics	4	4	40	60	100
19PG3Z14	Lab in Biophysics & Biostatistics	4	2	40	60	100
19PG3Z15	Lab in Immunology, Fisheries & Aquaculture	4	2	40	60	100

	and Bioinformatics					
Total		**30**	**26**			
SEMESTER - IV						
19PG4Z16	Environmental Biology	6	5	40	60	100
19PG4Z17	Biotechnology	6	5	40	60	100
19PG4Z18	Developmental Biology	6	5	40	60	100
19PG4ZE3/ 19PG4ZE4	Economic Zoology/ Ethology	4	4	40	60	100
19PG4Z19	Lab in Environmental Biology & Developmental Biology	4	2	40	60	100
19PG4Z20	Lab in Biotechnology, Economic Zoology& Ethology	4	2	40	60	100
19PG4Z21	Project*& Viva Voce		3	50	50	100
Total		**30**	**26**			
	Total	**120**	**90**			

OFF-CLASS PROGRAMME

ADD-ON COURSES

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
	SOFT SKILLS	40	4	I	40	60	100
	COMPUTER APPLICATIONS ● Computer Application for Biologists ● SPSS	40	4	II	40	60	100
	MOOC COURSES (Department Specific Courses) * Students can opt other than the listed	-	Minimum 2 Credits	-	-	-	

	course from UGC-SWAYAM /UGC /CEC						
	COMPREHENSIVE VIVA (Question bank to be prepared for all the papers by the respective course teachers)	-	2	IV	-	-	100
	READING CULTURE	15/ Semester	1	I-IV	-	-	-
	TOTAL		13 +				

EXTRA CREDIT COURSE

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
19PGSLZ1	**Vector Borne Diseases (Offered for II PG)**	-	-	III & IV	40	60	100

OLD

DEPARTMENT OF ZOOLOGY

Deletion

2016

I M.Sc., ZOOLOGY

II - SEMESTER

PG2Z7 - BIOSTATISTICS AND BIOINFORMATICS

(For those who join in 2016 onwards)

HRS/ WEEK: 6 **CREDITS-5**

OBJECTIVE:

To gain knowledge on various statistical tools available for biological samples and to understand the fundamentals of biological sequence analysis.

UNIT I INTRODUCTION TO BIOSTATISTICS (15 hours)

Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data. Measures of central tendency - Mean, Median, and Mode. Dispersion & variability – the range and the mean deviation, the variance, standard deviation, the coefficient of variance, standard error.

UNIT II DISTRIBUTION AND TESTING OF HYPOTHESIS (15 hours)

The normal distribution- skewness & kurtosis, proportions of a normal curve – Z scores - Testing of hypothesis - Importance & types – Chi – square test – comparison of means of two large samples, means of two small samples, paired & unpaired t tests.

UNIT III CORRELATION & REGRESSION (15 hours)

Pearson's Correlation coefficient, simple linear regression, testing the significance of regression. The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA, One way and two way ANOVA.

UNIT IV SEQUENCING METHODS & BIOLOGICAL DATABASES (15 hours)

Sanger's, Chemical, and Automated methods - Hierarchical sequencing and shot gun sequencing - Contigs assembly – Human Genome Project, Bioinformatics: Definition – scope - Nucleic acid databases: GenBank, EMBL, DDBJ - Protein Databases: UNIPROT, TrEMBL. Secondary Databases: PROSITE, PRINTS – PDB.

UNIT V SEQUENCE ANALYSIS AND STRUCTURE PREDICTION (15 hours)

Scoring matrices: PAM, BLOSUM – Sequence similarity tools: working principle and types of BLAST & FastA – Multiple Sequence alignment: Principle and applications - ClustalW – Phylogenetic analysis – Molecular modeling – Drug designing.

REFERENCES:

1. Khan I.A and Khanum A., (2004) Fundamentals & Biostatistics, 2nd ed., Ukaaz Publications, Hyderabad.

2. Banerjee P.K., (2006) Introduction to Biostatistics, 3rd ed., S.Chand Publication, New Delhi.

3. Arora P.N., and Malhan P.K., (2012) Biostatistics, Himalaya Publishing House, New Delhi.

4. Misra B.N and Misra M.K., (1983) Introduction to Practical Biostatistics, Naya Prokash, Calcutta.

5. Baxevanis D and Francis B.F., (2004) Bioinformatics – A Practical Guide to the Analysis of Genes and Proteins, 3rd ed., John Wiley & Sons Inc.

6. Attwood T.K and Parrysmith D.J., (2005) Introduction to Bioinformatics, Pearson Education.

7. Gurumani, N., 2010. An Introduction to Biostatistics, MJP Publishers, Chennai.

8. Prasad, S., 2012. Elements of Biostatistics, Rastogi publications, Meerut.

9. Campbell M.A and Heyer L.J., (2004) Discovering Genomics, Proteomics and Bioinformatics, Pearson Education.

10. Gibson G and Muse S.V., (2002) A Primer of Genomic Science, Sinauer Associates Inc. Pub., Sunderland.

11. Jones N.C and Pevzner P.A., (2005) An Introduction to Bioinformatics Algorithms, Ane Books, New Delhi.

12. Lesk M., (2004) Introduction to Bioinformatics, Oxford University Press.

13. Bergeron B.M.D., (2003) Bioinformatics Computing – The Complete Practical Guide to Bioinformatics for Life Scientists, Pearson Education (Singapore) Pvt. Ltd., Delhi.

14. Rastogi P.S.C., Namita M and Rastogi P., (2004) Bioinformatics Concepts, Skills and Applications, CBS Publishers, New Delhi.

NEW

2020

II M.Sc., ZOOLOGY

SEMESTER –III

60%

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG3ZE2	Bioinformatics	Elective Core	4 Hrs.	4

COURSE DESCRIPTION

The course provides an outline on various DNA sequencing methods, and principle and methods of sequence analysis with various bioinformatics tools and macromolecular structure prediction.

COURSE OBJECTIVES

To understand the fundamentals of biological sequence analysis and principle of substitution matrices, phylogenetic tree construction and protein structure prediction.

UNIT –I DNA SEQUENCING AND BASICS OF INTERNET (12 HRS.)

15%

Sanger's, Chemical, and Automated methods - Hierarchical sequencing and shot gun sequencing - Human Genome Project. Networking in computers: Intranet and internet - TCP/IP, file transfer protocols, web browsers, internet addresses, domain names, basic concepts of HTML, HTTP, web search engines.

Self-study - concepts of HTML, HTTP, web search engines

UNIT –II BIOLOGICAL DATABASES (12 HRS.)

Classification of Biological Databases, Nucleic acid sequence databases: GenBank, EMBL, DDBJ - Protein sequence databases: UNIPROT, Secondary Databases: PROSITE, PRINTS - Genome Databases, Gene

10%

Expression database: GEO, Chemical Structure database: PubChem, and Pathway database: KEGG.

Self-study – DDBJ, PRINTS

UNIT –III PAIRWISE ALIGNMENT (12 HRS.)

Pair-wise alignment: Types - Global and local alignment; gapped and ungapped alignment – DOTPLOT, Dynamic programming: Needleman-Wunsch algorithm - Substitution matrices: PAM, BLOSUM - Word methods– Sequence similarity tools: working principle and types of BLAST. **5%**

Self-study – DOTPLOT

UNIT –IV MULTIPLE SEQUENCE ALIGNMENT (12 HRS.)

Multiple Sequence alignment: Progressive method and iterative method - applications - ClustalO– Phylogenetic analysis: Orthologs, paralogs, xenologs - Typical structure of phylogenetic tree - types: rooted and unrooted tree, phylogram and cladogram, Phylogenetic algorithm: Phenetic method (UPGMA) – Cladistic method (Maximum parsimony). **10%**

Self-study – ClustalO, Cladistic method

UNIT –V STRUCTURE PREDICTION & DRUG DESIGNING (12 HRS.)

Classification of proteins (Review) – Structure databases – Structural classification databases: SCOP, CATH - Secondary structure prediction – Chou-Fasman method, GOR method, Nearest neighbourhood method – Three dimentional structure prediction: homology modeling, threading, *ab initio* – Structure based drug design (SBDD). **20%**

Self-study – Structural classification databases

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (12 HRS.)

REFERENCES:

1. Baxevanis D and Francis B.F., (2004). *Bioinformatics – A Practical Guide to the Analysis of Genes and Proteins*, 3rd ed., John Wiley & Sons Inc.

2. Attwood T.K and Parrysmith D.J., (2005). *Introduction to Bioinformatics*, Pearson Education.
3. Campbell M.A and Heyer L.J., (2004). *Discovering Genomics, Proteomics and Bioinformatics*, Pearson Education.
4. Gibson G and Muse S.V., (2002). *A Primer of Genomic Science*, Sinauer Associates Inc. Pub., Sunderland.
5. Jones N.C and Pevzner P.A., (2005). *An Introduction to Bioinformatics Algorithms*, Ane Books, New Delhi.
6. Lesk M., (2004). *Introduction to Bioinformatics*, Oxford University Press.
7. Bergeron B.M.D., (2003). *Bioinformatics Computing – The Complete Practical Guide to Bioinformatics for Life Scientists*, Pearson Education (Singapore) Pvt. Ltd., Delhi.
8. Rastogi P.S.C., Namita M and Rastogi P., (2004). *Bioinformatics Concepts, Skills and Applications*, CBS Publishers, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER):

1. www.ncbi.nlm.nih.gov
2. www.uniprot.org
3. www.rcsb.org
4. https://prosite.expasy.org
5. www.ncbi.nlm.nih.gov/blast/

COURSE DESIGNER:

Dr. J. Asnet Mary

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HOD'S Signature & Name

OLD

2018

Deletion

I M.Sc. ZOOLOGY

II - SEMESTER

PG2Z8 - ECOLOGY & EVOLUTION

(For those who join in 2016 onwards)

HRS/ WEEK: 6 **CREDITS:5**

OBJECTIVE:

To understand the principles of ecology and animal interactions in an ecosystem that paves origin and evolution of life.

UNIT I ECOSYSTEM - STRUCTURE AND FUNCTION (15 Hours)

Physical Environment- biotic and abiotic interactions.Ecosystem: aquatic, terrestrial, forest, desert – Biomes- energy flow in the ecosystem. Primary productivity, Biomass and productivity measurement -Food chain, food web, and tropic levels - Ecological efficiencies, Ecological pyramids, Biogeochemical cycles- patterns and types (C, N, P - cycles).

UNIT II POPULATION AND COMMUNITY ECOLOGY (15 Hours)

Population: Structure and characteristics of population - Concept of metapopulation - Levin's model of metapopulation - Comparison of Metapopulation and Logistic population model - Metapopulation structure. Concept of community - Definition, nature and flux of energy through communities - Influence of competition, predation and disturbances- Community succession - Homeostasis. Species diversity in community - Alpha diversity, Beta diversity, Gamma diversity (Types)

UNIT III ECOLOGICAL RESOURCES (15 Hours)

Natural Resources: Soil-soil formation, physical and chemical properties of soil. Significance of soil fertility. Mineral resources - Forest resources- Aquatic resources. Energy Resources –renewable and non-renewable (solar, fossil fuels, hydro, tidal, wind, geothermal and nuclear). Green technology and sustainable development. Ecosystem monitoring- GIS, Physics of remote sensing, role of remote sensing in ecology, GPS and its application.

UNIT IV ORIGIN AND EVOLUTION OF LIFE (15 Hours)

Origin of basic biological molecules, Theories of the origin of life – Spontaneous generation, Biochemical evolution: Oparin - Haldane, Urey- Miller Experiment. Theories of evolution– Lamarkism, Darwinism, Mutation theory of De Vries -

Evolution of Prokaryotes - origin of eukaryotic cells - evolution of unicellular eukaryotes - Origin of photosynthesis and aerobic metabolism - Geological time scale.

UNIT V SPECIATION AND HUMAN EVOLUTION (15 Hours)

Speciation: geographic, allopatric, sympatric, peripatric, parapatric – Isolating mechanisms - structural and functional analogy - Comparative anatomical, Physiological and Biochemical evidences. Molecular evolution: evolution of haemoglobin and Cytochrome c - Hardy-Weinberg equilibrium - Evolution of human – paleontological, cultural and social evolution

REFERENCES:

1. Hall B.K, and Hallgrimsson B., (2015) Strickberger's Evolution, 5th ed., Jones and Bartlett Student Ed.,

2. Rastogi V.B., (2015) Evolutionary Biology 13th ed., Kedar Nath Ram Nath publications, Meerut.

3. Moody P.A., (1992) Introduction to Evolution 3rd ed., Kalyani publishers, New Delhi.

4. Renganathan T.K., (1980) Evolution, 3rd revised ed., Sri Raman Press, Tuticorin.

5. Odum P.G, Gray W and Barrett., (2009) Fundamentals of Ecology, 5th ed., CENGAGE learning. India.

6. Chapman J.L, and Reiss M.J., (1995) Ecology principles and applications, Cambridge University Press.

7. Kusky T., (2014) Encyclopaedia of the hazardous earth - Volumes 1-8 (Asteroid and meterotites, climate change, earthquakes, floods, landslides, the coast, tsunamis, and volcanoes). Viva Books, Indian Ed. New Delhi.

NEW

50%

2019

II M.Sc.,Zoology

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG4Z16	Environmental Biology	PG Core	6	6

COURSE DESCRIPTION

To understand the basic concepts of Ecology.

COURSE OBJECTIVES

To understand the key aspects of ecology, impact of pollution and biodiversity conservation for sustainable development

UNIT –I ECOSYSTEM AND HABITAT (18 HRS.)

Structure – Components of ecosystems - Food chain, Food web - Ecological pyramids-Trophic levels–energy flow - productivity – Biomagnification- Classification of ecosystems- Introduction, structure and function of terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine) - Energy flow and mineral cycling (CNP)- Concept of habitat and niche ecosystem - Ecological indicators- Biomes - Tundra, Forest, Desert and mountain biomes – Biogeography: biogeographical zones of India.

10%

Self-Study - Structure – Components of ecosystems - Food chain, Food web - Ecological pyramids

UNIT –II POPULATION AND COMMUNITY ECOLOGY (18 HRS.)

Concept of population - Biotic potential and Natality, Mortality, Survivorship curves, life table, Age structure, carrying capacity, Environmental resistance -Population growth forms - Life history strategies (r and K selection) –Population fluctuatuions- Population interactions- Competition, Predation, Parasitism, Mutualism -Concept of Community - Structure, Composition and Stratification- Community Function- Ecological succession – Primary and Secondary succession-

Climax community - Hydrarch ,Xerarch - Ecotone and Edge effect – Ecological equivalents - Ecotypes and Ecophenes

Self-Study - Population interactions- Competition, Predation, Parasitism, Mutualism

UNIT –III NATURAL RESOURCES (18 HRS.)

Renewable & Non–renewable resources: Renewable resources–Forest Resources: Types of forests-Biomass, Biogas, Solar energy, Wind Energy, Tidal Energy, Geothermal Energy - Non Renewable resources–Fossil fuel (Coal, Petrol & Natural Gas) Nuclear Fuels

Self study - Forest Resources : Types of forests

UNIT –IV ENVIRONMENTAL POLLUTION (18 HRS.)

Impact of pollutants on general fauna, flora and ecosystems - Environmental pollution: Causes, effects and control measures of air, water, soil, noise and nuclear pollution- Greenhouse gases, Ozone layer and depletion –Waste water management – Primary secondary Global Climatic change - *El nino*and *La nina*Phenomenon- Green peace movement- Chipko movement- Nuclear disarmament - Role of Government agencies - Central and state Pollution Control Boards- - Environmental protection act, 1986 - Paris Summit- Kyoto protocol.

20%

Self-Study - Environmental pollution: Causes, effects and control measures of air, water, soil, noise and nuclear pollution

UNIT –V BIODIVERSITY CONSERVATION (18 HRS.)

Concepts of Biodiversity - Need for conservation-Conservation Stratagies- *In situ* conservation - Protected areas, National parks, Sanctuaries, Biosphere reserves, Sacred groves – *Ex situ* Conservation - Seed Banks, Gene banks- Sthalvirukshas - Animal Translocation- Human animal conflicts and management - Biodiversity database - Endangered animals, endemism and Red data Book- Environmental protection act (1986)- Forest conservation Act (1980)- Biodiversity Act, 2002- Remote sensing and GIS: Methods and Applications in environmental management

20%

Self-study - Concepts of Biodiversity- Need for conservation

REFERENCES:

1. Odum, E.P. and Barrett, G.W. (2005) *Fundamental of Ecology. 5th* Ed., Cengage Learning India. New Delhi.

2. Primark R.B., (2000) *A Primer of Conservation Biology. 2nd Ed.*, SinauerAssociates..
3. Kormondy, E.J. (1996) *Concepts of Ecology. 4th Ed.*, PHI Cengage Learning India, New Delhi).
4. Peter J.R., Stephan, L.W., PauleH., Ceche S. & Bevlerly, M. (2008) *Ecology*. Cengage learning India,New Delhi.
5. Wright, R.T.(2008) *Environmental Science*, 10th Ed., Pearson Education, New Delhi.
6. Smith T.M. & Smith R.L. (2008) *Elements of Ecology*. 6th Ed., Pearson Education, New Delhi.
7. Turk A. & Turk J. (1993) *Environmental Science*. 4th Ed., Saunders.
8. Odum, E.P. & Barrett, G.W. (2005) *Fundamentals of Ecology*. 5th Ed., Cengage Learning India. New Delhi).

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)::

1. https://openoregon.pressbooks.pub/envirobiology/
2. https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_(Morrow)/02%3A_Introduction_to_Ecology
3. https://cnx.org/contents/AK5sUWpu@1.1:GNNbYBSX@1/Global-Processes
4. https://bio.libretexts.org/Bookshelves/Ecology/Book%3A_Environmental_Biology_(Fisher)

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