Prof. U. SHAMEEM Off.: 0891 – 2844761

Chairperson, BOS Res.: 0891 - 2525610

Department of Zoology

Andhra University Dt. 1stFebruary, 2021

VISAKHAPATNAM – 530 003

To

The Principal

College of Science and Technology

Andhra University

Visakhapatnam

Sir,

 Sub: Submission of Syllabus (3 units) and Model Question Papers for

M.Sc. Zoology and M.Sc. Fishery Science (1stSemester) courses –

reg.

 With reference to the subject mentioned above, I am herewith submitting one soft copy and one hard copy of the Syllabus (syllabus with three units) and a set of Model Question Papers for M.Sc. Zoology and M.Sc. Fishery Science (1stSemester) courses prepared as per the guide lines suggested.

 Thanking You

Yours Sincerely

 (U. Shameem)

 Chairperson, BOS

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – SYLLABUS (Trimmed – 3 Units)**

**SEMESTER – I - Paper Code Z/FS 101**

**BIOSYSTEMATICS, BIODIVERSITY AND TAXONOMY**

**UNIT – I**

* 1. Definition & basic concepts of biosystematics & taxonomy.
	2. History, Problems, aims and tasks in taxonomy. Importance and applications of biosystematics in biology
	3. Material basis of biosystematics – Taxonomic attributes.
	4. Theories of biological classification (Essentialism, Nominalism, Empirism, Cladism and evolutionary classification.

**UNIT – II**

* 1. **Trends in biosystematics**- Concepts of different conventional and newer aspects,Chemotaxonomy; Cytotaxonomy; Molecular taxonomy; Eco - taxonomy and Behavioraltaxonomy

2.2 Species Concept - Different species concepts - Typological, Nominalistic, Biological& evolutionary species concept, sub-species and other infra specific categories, Polytypicspecies.

2.3 Dimensions of speciation- types of lineage changes, production of additional lineage

2.4 Speciation –Allopatric, Sympatric &Parapatric speciation, and factors affecting speciation.

**UNIT – III**

* 1. **Sustainable utilization of Biodiversity** - Origin of biodiversity, Types of biodiversity & ecosystem, Threats to biodiversity.

 3.2 Equitable sharing & conservation of Biodiversity (in-situ & ex-situ & gene banks).

3.3 Genetic Variations&Non genetic Variations - Molecular perspectives on conservation ofBiodiversity, Hierarchy of categories.

 3.4Origin of reproductive Isolation (Prezygotic& Post zygotic mechanisms).

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – Model Question Paper**

**Semester – I - Paper Code Z/FS 101**

**BIOSYSTEMATICS, BIODIVERSITY AND TAXONOMY**

**3 hours 80 marks**

**Answer all questions. All questions carry equal marks**

 **5x16 = 80**

1. Write about basic concepts of biosystematics.

 OR

 2. Explain about theories of biological classification.

 3. What are the factors affecting speciation? Write about Sympatric &Parapatric

speciation

 OR

 4. Explain species concept write about sub-species and other infra specific categories,

Polytypic species.

 5. Write about Origin of biodiversity, Types of biodiversity and Threats of biodiversity.

 OR

 6. Explain the origin of reproductive Isolation (Prezygotic& Post zygotic mechanisms).

 7. Describe Genetic Variations & Non genetic Variations.

 OR

 8. Explain speciation- types of lineage changes, production of additional lineage.

 9. Answer **any 4** of the following:

 a. Taxonomy

 b. Cladism

 c. Lineage

 d. Cytotaxonomy

 e. Biodiversity

 f. Ecosystem

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – SYLLABUS (Trimmed – 3 Units)**

**SEMESTER – I - Paper Code Z / FS 102**

**BIOSTATISTICS AND BIOINFORMATICS**

**UNIT – I**

* 1. **Introduction to Biostatistics** – Definition, Terms, Applications and Role of biostatistics in modern research. Sampling – Characteristics, advantages and methods of sampling and sampling errors.
	2. **Presentation of the data** - Frequency distribution tables Preparation of ordered, discrete, continuous and Cumulative frequency distribution tables.
	3. **Diagrammatic presentation of data** - Data presentation by diagrams, graphs and curves, Skewness and Kurtosis.
	4. **Measures of central tendency** -Mean, Median and Mode

**UNIT – II:**

* 1. Measures of dispersion: Standard deviation, variance and coefficient of variance
	2. Probability and distributions- definition of probability, terminology and laws, Independent events. Addition and multiplication rules, conditional probability, examples – Bernoulli.
	3. Probability distributions: Binomial, Poisson and normal distributions.
	4. Proportion data- Examples of Proportion data- MPM- sterility testing of medicines- animal toxicity- infection and immunization studies e.g., LD50, ED50, PD50 statistical treatment to proportion data- Chi-square test- goodness of fit to normal distribution.
	5. Count data- Examples of count data (bacterial cell count, radioactivity count, colony and plaque count, etc.). Statistical treatment to count data- possion distribution- standard error- confidence limits of counts.

**UNIT – III:**

3.1 **Tests of Significance** - Concepts of Null hypothesis and alternativehypothesis, degrees
of freedomLevel of significance, errors of inference.Students t-test, Chi-square test.

3.2 **Analysis of Variance –** One Way and Two-Way ANOVA - applications in biology

3.3. **Correlation -** Concepts and applications of correlation and regression, Bivariate data, Scatter plot,correlation coefficient (r), properties, interpretation of r.

3.4. **Linear regression -** Fitting of lines of regression, regression coefficient, coefficient ofDeterminationstandard curves and interpolations of unknown y-values thereon.

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – Model Question Paper**

**Semester – I - Paper Code Z/FS 102**

**BIOSTATISTICS AND BIOINFORMATICS**

**3 hours 80 marks**

**Answer all questions. All questions carry equal marks**

 **5x16 = 80**

1. Define sampling and write about various sampling techniques used for data collection.

 OR

2. What are measures of central tendency? Explain analysis of median for different type of

data’s with suitable examples.

3. What is Probability? Explain binomial distribution with a suitable example.

 OR

4. Explain analysis of standard deviation for various types of data’s and calculate SD for

 the following data.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| X | 6 | 7 | 9 | 12 | 10 | 8 | 11 |
| Y | 3 | 6 | 13 | 4 | 8 | 9 | 5 |

5. What are tests of Significance? Explainchi-square test with a suitable example.

 OR

 6. Write about analysis of variance and its applications in the field of biology.

 7. Give an account on various types of frequency distribution tables.

 OR

 8. What is linear regression analysis – Explain?

 9. Answer any **FOUR** of the following

 a). Sampling errors

 b). Skewness

 c). Coefficient of variance

 d). Null hypothesis

 e). LC**50** dose

 f). Addition and Multiplication rules

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – SYLLABUS (Trimmed)**

**SEMESTER – I - Paper Code Z / FS 103**

**TOOLS AND TECHNIQUES FOR BIOLOGY**

**UNIT – IInstrumentation in Biology**

* 1. **Assays-**Chemical and Biological assay, Centrifugation, Working Principle andapplications of Centrifugation; differential and density gradient centrifugation,Ultrafiltration.
	2. **Electrophoresis –** Electrophoresis, Agarose Gel electrophoresis, 2- D Electrophoresis working
	Principle, structural components and applications of electrophoresis. Analysis of RNA, DNA
	and proteins by one and two-dimensional gel electrophoresis, Isoelectric focusing gels.
	3. **Chromatography-**Working Principle and applications of chromatography, Chromatography Planar chromatography (paper & TLC), Gas Chromatography(GC-MS), High Performance Liquid Chromatography (HPLC), and LC-MS
	4. **Spectrophotometer -** UV-visible, fluorescence, circular dichroism, absorption spectrophotometry principles and applications, NMR and ESR spectroscopy, Molecular structure determination using X-ray diffraction and NMR. Molecularanalysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.

**UNIT – IIMicroscopy and Histological Techniques in Biology**

2.1. **Microscopy -**Visualization of cells and subcellular components by light microscopy,resolving powers of different microscopes, microscopy of living cells, principle, andapplications of different types of microscopes - Light, Phase Contrast, Fluorescencemicroscopy, Electron microscopy: SEM and TEM and Atomic force microscopy(AFM). Image processing methods in microscopy.

2.2. **Microtomy-** Working principle and different types of Microtomes.Knives and Blades,Tissue embedding (paraffin wax), Section cutting, Floatation (water bath), slidemounting, drying (oven or hot plate) and section adhesives.Applications of microtomyin biological studies.

2.3. **Cryotechniques-** History and applications of Cryotechniques for light and electronmicroscopy.Different fixation and staining techniques for EM, freeze-etch and freezefracture methods for EM.

**UNIT – IIIMicrobiological and Cell Culture Techniques**

3.1 Media preparation & Sterilization, Inoculation and growth monitoring. BiochemicalMutants and their use, Microbial assays.

3.2 **Cell Culture System -** History and scope of animal cell and tissue culture, Advantagesand disadvantages of tissue culture, Substrates and Culture media, Treatment of substrate surfaces, Feederlayers, gas phase for tissue culture, Culture media for cellsand tissues, Culture procedures.

3.3 **Cell culture techniques -** Primary culture and large scale cell cultures, Tissue and Organ Culture: Primary explantation techniques, Tissue culture (slide, flask and test tube cultures), Organ culture, whole embryo culture, and tissue engineering (artificial skin and artificial cartilage).

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – Model Question Paper**

**Semester – I - Paper Code Z/FS 103**

**TOOLS AND TECHNIQUES FOR BIOLOGY**

**3 hours 80 marks**

**Answer all questions. All questions carry equal marks**

 **5x16 = 80**

1. Write about Chemical and Biological assays.

 OR

2. Principle, structural components and applications of electrophoresis.

3. Describe Transmission and Scanning Electron microscopy.

 OR

4. Explain briefly about applications of Cryotechniques for light and electron

microscopy.

 5. Write about history and scope of animal cell and tissue culture.

 OR

 6. Write about different Tissue culture techniques.

 7. Write an essay about Molecular structure determination using X-ray diffraction.

 OR

 8. Explain different fixation and staining techniques for EM.

 9. Answer **any 4** of the following:

 a. Gradient centrifugation

 b. Biological assay

 c. Microtomes

 d. Fluorescence microscopy

 e. Culture media

 f. Biochemical Mutants

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – SYLLABUS (Trimmed)**

**SEMESTER – I - Paper Code Z / FS 104**

**MOLECULAR CELL BIOLOGY**

**UNIT – I**

1.1 **Membrane structure and function -** Structure of model membrane, lipid bilayer andmembrane protein diffusion, osmosis, ion channels.

1.2 **Transport across cell membranes -** Active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport.

1.3 Cotransport by symporters and antiporters, Membrane potential

1.4 Cellular transepithelial transport and electrical properties.

**UNIT – II**

2.1 Cellular shape, motility and energetics; Cytoskeletal elements in cell shape and motility; their structure and dynamics (Microtubules, Cilia and Flagella).

2.2 Role of Microtubules in cell locomotion and mitosis, Cell movements – Intracellular transport,
role of kinesin anddynein.

2.3 **Cell signaling –** Types and stages of cell signaling. Cell-Cell interactions: Cellular gap junctions and adhesions; structure and functional significance of plasmodesmata; Mechanisms of cellular recognition and communication.

2.4 Extracellular matrix, Signal transduction, Intracellular receptor and cell surface receptors; Signaling via G-protein linked receptors (PKA, PKC, CaM kinase); Overview of various cell signaling pathways with examples such as EGFR, Notch, Wingless, JAK - STAT etc.; Enzyme linked receptor signaling pathways; Network and cross-talk between different signal mechanisms; regulation of signaling pathways, Programmed cell death.

**UNIT – III**

3.1 **Cell division and Cell Cycle -**Overview of mitosis and meiosis; chromosome labeling and cell cycle analysis; cell cycle and control mechanisms; types and regulation of cyclins, sister chromatid cohesion remodeling; differential regulation of cohesion complex during mitosis and meiosis; mitotic spindle and arrangement of chromosomes on equator; regulation of exit from metaphase, chromosome movement at anaphase.

3.2 Genetic control of meiosis with examples from yeast.

3.3 **Steps in cell cycle** - Role of Cyclins’ and Cyclin Dependent Kinases (CDKs) in the regulation and control of cell cycle.

3.4 **Cell cycle checkpoints –** Different types of check points, Checkpoint genes and significance of checkpoints in cell cycle.

**ANDHRA UNIVERSITY**

**DEPARTMENT OF ZOOLOGY**

**M. Sc. Zoology/M.Sc. Fishery Science – Model Question Paper**

**Semester – I - Paper Code Z/FS 104**

**MOLECULAR CELL BIOLOGY**

**3 hours 80 marks**

**Answer all questions. All questions carry equal marks**

 **5x16 = 80**

1. Write an account on the structure and function of the model membranes.

 OR

2. Explain various steps involved in Transport across cell membranes.

3. What is the role of microtubules in cell locomotion and mitosis.

 OR

4. Write about the Mechanisms of cellular recognition and communication.

5. Explain cell cycle and control mechanisms.

 OR

6. Write about the Genetic control of meiosis with examples from yeast.

7. Explain Signal transduction mechanism and its various pathways.

 OR

8. Write about Different types of check points, Checkpoint genes and add a note on the

significance of checkpoints in cell cycle.

9. Answer any **FOUR** of the following

 a). Symporters and Antiporters

 b). Plasmodesmata

 c). G-protein linked receptors.

 d). Programmed cell death.

 e). Chromosome movement at anaphase

 f). Cyclin Dependent Kinases