KOLHAN UNIVERSITY,
CHAIBASA

Proposed Syllabus for FYUGP, NEP-2020
B.Sc. (Hons.) Zoology
(Effective from Academic Year 2022-23 onwards)

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Semester III

Major Paper 4 (MJ 4) : Principles of Ecology

Theory (03 Credits): 45 hours

UNIT I: Introduction to Ecology **3 hrs**

History and Scope of ecology, Autecology and synecology, Laws of limiting factors, Study of physical factors: Temperature and Light.

UNIT II: Population **18 hrs**

Unitary and Modular populations; Unique and group attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion; Exponential and logistic growth, equation and patterns, *r* and *k* strategies, Population regulation; Density-dependent and independent factors; Population interactions; Gause's Principle with laboratory and field examples; Lotka-Volterra equation for competition and predation.

UNIT III: Community **8 hrs**

Community characteristics: species richness, dominance, diversity, abundance, Guilds, Ecotone and edge effect; Ecological succession with examples and types; Theories pertaining to climax community.

UNIT IV: Ecosystem **12 hrs**

Types of ecosystems with detailed study of any one: Forest Ecosystem, Pond or Lake ecosystem, Mangrove and Coral reef ecosystem. Vertical stratification in Forest and Aquatic ecosystem, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies, Nutrient and biogeochemical cycle with one example of Nitrogen cycle.

UNIT V: Applied Ecology **4 hrs**

Ecology in wildlife conservation and management, Biodiversity types, Importance & threats, Protected areas: National Parks, Bioreserves and Sanctuaries, Global climate change and its mitigation.

Recommended Readings:

- Odum, E.P. (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Smith, R. L. (2000). Ecology and field biology. Harper and Row publisher
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Ricklefs, R.E. (2000). Ecology. V Edition. Chiron Press.

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Major Paper 5 (MJ 5) : Cell Biology and Histology

Theory (03 Credits): (45 hours)

UNIT I: Overview of Cells **2 hrs**

Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions

UNIT II: Plasma Membrane **5 hrs**

Various models of plasma membrane structures, Transport across membranes: active and passive transport, facilitated transport; Cell-cell junctions, structures and functions: Tight junctions, adherens junctions, gap junctions

UNIT III: Endomembrane System **12 hrs**

Structure and Functions: Endoplasmic Reticulum, Signal hypothesis, Vesicular transport from ER to Golgi apparatus; Protein sorting and transport from Golgi apparatus; Golgi apparatus, Vesicular transport: Coated Vesicles; Lysosomes; Peroxisomes.

UNIT IV: Mitochondria **6 hrs**

Structure, Semi-autonomous nature, Endo-symbiotic hypothesis; Respiratory chain, Chemiosmotic hypothesis and ATP Synthase.

UNIT V: Cytoskeleton **4 hrs**

Structure and Functions: Microtubules, Microfilaments and Intermediate filaments.

UNIT VI: Nucleus, Cell Division and Cell Signalling **8 hrs**

Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Transport of molecules across nuclear membrane, Nucleolus, Mitosis, Meiosis, Cell cycle and its regulation, Basics of Cell Signalling, Apoptosis.

UNIT VII: Histology **8 hrs**

Introduction to tissues. Epithelial tissue: types, structure and characteristics. surface modifications. Basement membrane: structure and characteristics. Connective tissue cells. Blood: structure and functions. Structure and function of loose, dense and adipose tissue. Structure of Cartilage and bone. Muscular tissue: ultrastructure of smooth, skeletal and cardiac muscles. Structure and classification of neurons. Types of supporting (glial) cells and their function. Membranes of the brain and spinal cord.

Recommended Readings:

- Cooper, G.M., Hausman, R.E. (2009) The Cell: A Molecular Approach. V Edition, ASM Press and Sinauer Associates.

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- Becker, Kleinsmith, and Hardin (2009) The World of the Cell,VIII Edition, Benjamin Cummings Publishing, San Francisco.
- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments,VI Edition, John Wiley & Sons Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2009) The Cell and Molecular Biology, Lippincott Williams & Wilkins, Philadelphia.
- Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Robert Keith and Watson James. (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

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MJ 4+5 (Practical) (02Credits): (60 hours)

(Based on theory papers MJ4 and MJ5)

1. Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community.
2. Study of an aquatic ecosystem: phytoplankton and zooplankton, measurement of area, temperature, turbidity/penetration of light, determination of pH, and dissolved oxygen content (Winkler's method), chemical oxygen demand and free CO2, alkalinity.
3. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.
4. Study of various stages of meiosis.
5. Preparation of temporary stained mount to show the presence of Barr body in human female blood cells/ cheek cells.
6. Study of types of tissue through permanent slides: epithelial, connective, muscular, nervous.
7. Study of histology of tissues by preparing permanent stained slides through microtomy.
8. Report on a visit to National Park/Biodiversity Park/Wildlife sanctuary.
9. Group discussion or Seminar presentation from any topic from the paper.

Pattern of Examination: **50 Marks**

1. Spotting (5 spotting × 3 marks = 15 Marks)
   a. Any one phytoplankton/ zooplankton
   b. Permanent slide of any one mitosis or meiosis stage
   c. Permanent slide of any two types of mammalian tissues
   d. Histology equipment- Microtome
2. Determination of population density and calculation of diversity index or Determination of pH and dissolved oxygen content in given water sample. (10 Marks)
3. Preparation of temporary stained squash of onion root tip or Barr body in human female blood cells/ cheek cells (10 Marks)
4. Visit Report (5 Marks)
5. Practical record (5 Marks)
6. Viva-voce (5 Marks)

Bhattacharjee 04.05.2024

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Nitish 04/05/2024

MN- 1B: Apiculture

Credits: **Theory:03**
Practical: 01
Total: 04

Theory (03 Credits): **45 hours**

UNIT I: Biology of Bees **10 hrs**

History, Classification and biology of Honey Bees, different species of honey bees- *Apis dorsata*, *Apis cerana indica*, *Apis florea*, *Apis mellifera*, *Melipona* sp. Social Organization of bee colony, behavioural patterns (Bee dance, swarming).

UNIT II: Rearing of Bees **15 hrs**

Artificial bee rearing (Apiary), Beehives- Newton and Langstroth; Bee Pasturage; Selection of bee species for Apiculture- *Apis cerana indica*, *Apis mellifera*; Bee keeping equipment, Methods of extraction of Honey (Indigenous and Modern) and processing; Apiary management- Honey flow period and Lean period.

UNIT III: Diseases and Enemies **6 hrs**

Bee diseases, control and preventive measures; Enemies of bees and their control.

UNIT IV: Bee Economy **7 hrs**

Products of Apiculture Industry (Honey, Bees Wax, Propolis, Royal jelly, Pollen etc.) and their uses; Modern methods in employing artificial beehives for cross pollination in horticultural gardens.

UNIT V: Entrepreneurship in Apiculture **7 hrs**

Bee Keeping Industries- Recent efforts, Employment opportunities, Economics in small scale and large-scale beekeeping, Scope for women entrepreneurs in beekeeping sector.

Recommended Readings:

- Singh S. (1962) Beekeeping in India, Indian Council of Agricultural Research, New Delhi.
- Mishra, R. C. (1995) Honeybees and their Management in India. Indian Council of Agricultural Research, New Delhi.
- Prost, P. J. (1962) Apiculture. Oxford and IBH, New Delhi.
- Rahman, A. (2017) Beekeeping in India. Indian Council of Agricultural Research, New Delhi.
- Gupta, J. K. (2016) Apiculture, Indian Council of Agricultural Research, New Delhi.

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Practical (01 Credit): **30 hours**

1. Study of the life cycle of honey bee from specimen/ photographs - Egg, larva, pupa, adult (queen, drone, worker).
2. Study of natural bee hive and identification of queen cells, drone cells and brood.
3. Study of morphological structures of honey bee through permanent slides/photographs: mouth parts, antenna, wings, legs (antenna cleaner, mid leg, pollen basket), sting apparatus.
4. Study of artificial hive (Langstroth/Newton), its various parts and beekeeping equipment.
5. Visit to an apiary/honey processing unit/Institute and submission of a report.
    a. Study of bee pasturage
    b. Visit to fields/gardens/orchards for studying the bee activity (role in pollination and nectar collection).
    c. Making of herbarium of nectar and pollen yielding flowering plants
6. Submission of a few products obtained from apiculture industry.
7. Group discussion or Seminar presentation from any topic from the paper.

Pattern of Examination: **(25 Marks)**

1. Life cycle of honey bee (3 Marks)
2. Spotting (4 spotting × 3 marks = 12 Marks)
    a. Mouth part/ antenna/ wing/ leg
    b. Sting apparatus
    c. Any type of artificial hive/ bee product
    d. Any beekeeping equipment
3. Visit Report (4 Marks)
4. Practical record (3 Marks)
5. Viva-voce (3 Marks)

Thakkho 04.05.2024 Prabhat 04/05/2024 04/05/2024 Nitish 04/05/2024

Examination Framework for B.Sc. (Hons.) Zoology

Zoology Paper Type	Credits	Full Marks	Pass Marks	Semester Internal Examination	End Semester Examination
Major (Theory)	3	75	30	15	60
Major (Practical)	1	25	10	--	25
Minor (Theory)	3	75	30	15	60
Minor (Practical)	1	25	10	--	25

SEMESTER INTERNAL EXAMINATION (SIE):

- For Semester Internal Examination (SIE 15 marks),15 Marks in Theory Examination will include 10 Marks questions from Written Examination/Assignment/Project/Tutorial wherever applicable whereas 5 marks will be awarded on the attendance/overall class performance in the semester. Range for conversion of attendance into marks is as follows: Attendance upto 45%, 1 mark; 45%<Attd.<55%, 2 marks; 55%<Attd.<65%, 3 marks; 65%<Attd. <75%, 4 marks; 75%<Attd, 5 marks.

- For Semester Internal Examination (SIE 10 marks, 1Hr Exam), there will be two group of questions. Question No.1 will be very short answer type in Group A consisting of five questions of 1 mark each. Group B will contain descriptive type two questions of five marks each, out of which any one to answer.

END SEMESTER UNIVERSITY EXAMINATION (ESE):

- For End Semester Examination (ESE 60 marks, 3Hrs Exam), there will be two group of questions. Group A is compulsory which will contain three questions. Question No.1 will be very short answer type consisting of five questions of I mark each. Question No. 2 & 3 will be short answer type of 5 marks. Group B will contain descriptive type five questions of fifteen marks each, out of which any three are to answer.