SEMESTER II

PCZOE20 - APPLIED ENTOMOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	II	PCZOE20	Applied Entomology	Theory	Core	5	4	100

Objective:

- This core paper has been designed to understand the biology of Insects, Insect pest management, Integrated Pest Management and biological control.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Identify the pest in different cash crops and the mode of infection.
CO2: Analyze the pest species of vegetables, fruits, stored grains and household pests.
CO3: Categorize the different insect pests and vectors of livestock.
CO4: Explain the classification of insecticides and the mode of action.
CO5: Apply appropriate method of insect pest management and integrated pest management.

CO/PO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	M	H	M	H

Unit 1: (15 Hours)

1.1: Causes for insects assuming pest status. (K1, K2, K3, K4, K5)
1.2: Forecasting Pest outbreak. (K1, K2, K3, K4, K5)
1.3: Biology, nature, extent of damage and control measures of insect pests of Sugarcane - *Chiloinfuscatellus, Tryporyzanivella, Chilosacchariphagus*. (K1, K2, K3, K4, K5)
1.4: Biology, nature, extent of damage and control measures of insect pests of Cotton – *Aphis gossypii, Dysdercuskoenigii, Thripstabaci.* (K1, K2, K3, K4, K5)
1.5: Biology, nature, extent of damage and control measures of insect pests of Groundnut – *Aphis craccivora, Aproraemamodicella, Helicoverpaarmigera.* (K1, K2, K3, K4, K5)
1.6: Coconut - *Rhyncophorusferrugineus, Oryctes rhinoceros, Nephantisseiropa.* (K1, K2, K3, K4, K5)

Unit 2: (15 Hours)

2.1: Biology, nature, extent of damage and control measures of insect pests of Vegetable - *Epilachnadodecastigma, Pierisbrassicae, Leucinodesorbonalis.* (K1, K2, K3, K4, K5)
2.2: Biology, nature, extent of damage and control measures of insect pests of Fruits - *Sternochetusmangifera, Cosmopolites sordidus, Papiliodemoleus.* (K1, K2, K3, K4, K5)
2.3: Biology, nature, extent of damage and control measures of insect pests of Stored product - Paddy - *Leptocorisavaricornis*, *Tryporyzaincertulus, Sitophilusoryzae*. (K1, K2, K3, K4, K5)
2.4: Biology, nature, extent of damage and control measures of insect pests of stored product Wheat - *Triticumvulgare, Mythimnaseparata, Spodopteramauritia.* (K1, K2, K3, K4, K5)
2.5: Biology, nature, extent of damage and control measures of insect pests of Household pest- *Ctenolepismasaccharina, Anthrenapimpinella, Trichophagaabruptella.* (K1, K2, K3, K4, K5)
2.6: Insect resistant crops. (K1, K2, K3, K4, K5, K6)

Unit 3: (15 Hours)

3.1: Insect pest of domestic animals - Cattle- Cattle fly. (K1, K2, K3, K4, K5)
3.2: Insect pest of domestic animals Ox - Warble fly. (K1, K2, K3, K4, K5)
3.3: Insect pest of domestic animals Fowl - Chicken flea, Shaft louse. (K1, K2, K3, K4, K5)
3.4: Insect pest of domestic animals Sheep and Goat - Head Maggot, Sheep Ked, Biting Louse. (K1, K2, K3, K4, K5)
3.5: Insect vectors of Animals – Mites, Ticks. (K1, K2, K3, K4, K5)
3.6: Organic methods of domestic pest management. (K1, K2, K3, K4, K5)

Unit 4: (15 Hours)

4.1: Classification of Insecticides - Chemical nature – Inorganic - Arsenic and Fluorine compounds. (K1, K2, K3, K4, K5)
4.2: Organic compounds- Animal origin – Nereistoxin. (K1, K2, K3, K4, K5)
4.3: Plant origin - Nicotinoids, Pyrethroides, Rotenoids. Hydrocarbons. (K1, K2, K3, K4, K5)
4.4: Synthetic organic compounds - DDT, BHC, Parathion. (K1, K2, K3, K4, K5)
4.5: Mode of action - Physical Poison, Protoplasmic Poison, Respiratory Poison. (K1, K2, K3, K4, K5)
4.6: Nerve Poison. Mode of Entry - Stomach Poisons, Contact Poison, Fumigants. (K1, K2, K3, K4, K5)

Unit 5: (15 Hours)

5.1: Biological control of plant pest. (K1, K2, K3, K4, K5)
5.2: Viral insecticides, Bacterial insecticides, Fungal insecticides. (K1, K2, K3, K4, K5)
5.3: Integrated Pest Management. (K1, K2, K3, K4, K5, K6)
5.4: Use of insect pathogens in control of pest. (K1, K2, K3, K4, K5)
5.5: Non-conventional pest control- Insect Attractants, Repellents, Antifeedants, Genetic radiations. (K1, K2, K3, K4, K5)
5.6: Plant protection appliances- Duster, Sprayers and Fumigators. (K1, K2, K3, K4, K5)

Books for study and Reference:

Textboks:

1. Vasantharaj V.B, Kumaraswami. T- 1998-Elements of Economic Entomology- Popular Book Depot.
2. NalinaSundari, Santhi R- 1962- Entomology- MJP Publishers.

Reference Books:

3. JawaidAhsan, Subhas Prasad Sinha 1981- A handbook on Economic Zoology- S. Chand and Company limited.
4. B.S Tomar 2004-Introduction to Economic Zoology-EMKAY Publications.
5. ChinmoyGoswami, B.D Panaik 2011- Handbook of Entomology- Wisdom press.
6. M. R Ghosh 1995-Concepts of Insect control- New Age International Publishers.
7. C.L Metcalf, W.P Flint 1962- Destructive and useful insects their habits and control 4ed- Tata McGraw Hill Publications.
8. United Stated Department of Agriculture Washington DC 1952- The Yearbook of Agriculture – Oxford and IBH Publishing Co.
9. David B.V, Muralirangan, M.C, MeeraMuralirangan 1992- Harmful and Beneficial Insects- Popular Book Depot.
10. Saxena A.B 1996 - Harmful Insects- Anmol Publications.

E-Resources:

http://www.entosocindia.org
https://www.entsoc.org
https://entomology.cals.cornell.edu

SEMESTER II

PCZOF20 - BIODIVERSITY AND WILDLIFE CONSERVATION

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	**II**	**PCZOF20**	**Biodiversity and wild life conservation**	**Theory**	**Core**	**6**	**4**	**100**

Objective:

- To understand the habitat and distribution of wild animals, causes for their endangerment and methods adopted for their conservation.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Discussthe Biodiversity India and ecosystems.
CO2: Explain the values of Biodiversity.
CO3: Discuss the Wildlife of India and threats to the wildlife.
CO4: Explain Wildlife protection and conservation.
CO5: Explain conservation methods.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	M	H	H	M	H
CO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	M	H	M	H

Unit 1:(18 Hours)

1.1: Biodiversity in India: Genetic, species and ecosystem diversity. (K1, K2, K3, K4, K5)
1.2: Biogeographic classification of India. National and local level. (K1, K2, K3, K4, K5)
1.3: India as a mega diversity nation. (K1, K2, K3, K4, K5, K6)
1.4: Ecology and Ecosystems - Structure and function of ecosystem. (K1, K2, K3, K4, K5)
1.5: Energy flow in the ecosystem. (K1, K2, K3, K4, K5, K6)
1.6: Types of Ecosystem: Forest, Aquatic (Lake and Ocean) and Urban. (K1, K2, K3, K4, K5)

Unit 2:(18 Hours)

2.1: Value of biodiversity: Consumptive use, Productive use, Social, Ethical and Aesthetic. (K1, K2, K3, K4, K5)
2.2: Hotspots of biodiversity. (K1, K2, K3, K4, K5, K6)

2.3: Endemic and Invasive species. (K1, K2, K3, K4, K5)
2.4: Threats to biodiversity: Habitat loss. (K1, K2, K3, K4, K5, K6)
2.5: Climate change; Poaching. (K1, K2, K3, K4, K5)
2.6: Man and wildlife conflicts. (K1, K2, K3, K4, K5)

Unit 3:(18 Hours)

3.1: Wildlife of India. (K1, K2, K3, K4, K5)
3.2: Values of wildlife - Positive and Negative. (K1, K2, K3, K4, K5)
3.3: Morphological and Physiological adaptations of Endangered and threatened species. (K1, K2, K3, K4, K5)
3.4: Population dynamics: Exponential and Logistic. (K1, K2, K3, K4, K5)
3.5: Local and Regional Extinction. (K1, K2, K3, K4, K5)
3.6: Red Data Book. (K1, K2, K3, K4, K5)

Unit 4:(18 Hours)

4.1: Wildlife protection Act. (K1, K2, K3, K4, K5)
4.2: In-situ and ex-situ conservation. (K1, K2, K3, K4, K5, K6)
4.3: IUCN Red List – CITES. (K1, K2, K3, K4, K5)
4.4: National Parks and Sanctuaries. (K1, K2, K3, K4, K5)
4.5: Biospheres reserves. (K1, K2, K3, K4, K5)
4.6: Project Tiger - Project Gir Lion and Crocodile breeding project. (K1, K2, K3, K4, K5)

Unit 5: (18 Hours)

5.1: Germplasm conservation and Cryogenic preservation. (K1, K2, K3, K4, K5)
5.2: Assisted reproduction. (K1, K2, K3, K4, K5)
5.3: Captive breeding - Non-invasive and Minimal invasive method. (K1, K2, K3, K4, K5)
5.4: Scat analysis and Radio telemetry. (K1, K2, K3, K4, K5, K6)
5.5: Habitat suitability. (K1, K2, K3, K4, K5)
5.6: Remote sensing and GIS. (K1, K2, K3, K4, K5, K6)

Books for Study and Reference:

Textbooks:

1. H.R Singh, Neeraj Kumar - Ecology and Environmental science- Vishal Publishing Co., 2006
2. Rayappa A. Kasi - Earth- Designed for Biodiversity- LTD Media Publications, 2010

Reference Books:

3. K.C Agarwal - Biodiversity- Agarobios India, 2000
4. Desh Deepak Verma, SujataArora, R K Rai - Perspectives of Biodiversity-Ministry of Environment and Forest, 2006
5. Lee Hannah - Climate change Biology- Elsevier, 2011
6. P.C Das - Environmental Biology- AITBS Publishers India, 2011
7. V.K Agarwal, Usha Gupta - Ecology and Ethology- S. Chand and Company Ltd, 2002

E-Resources:

http://www.enviroindia.net
http://aelsindia.com
http://environment-ecology.com

SEMESTER III

PCZOI20 - ENVIRONMENTAL BIOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	III	PCZOI20	Environmental Biology	Theory	Core	7	4	100

Objectives:

- Understand the Changes in environment and its impact.
- Understand the contaminants, their effects and disposal.
- Importance of recycling technologies in Environmental Conservation.
- Understand the issues related to pollution and laws enforced.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Describe ecological succession and Environmental stresses and their management.

CO2: Explain the major classes of contaminants and their impact on environment.

CO3: Explain green energy and the types of recycling technologies for solid and liquid wastes and their role in environmental conservation.

CO4: Discuss environmental indicators and their role in environmental balances and bioremediation.

CO5: Explain the importance of global ecology towards sustainable civilization.

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	H	H	H	H	M	H
CLO2	H	H	H	H	M	H
CLO3	H	H	H	H	M	H
CLO4	H	H	H	H	M	H
CLO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	H	H	M	H	M	H
CLO2	H	H	M	H	M	H
CLO3	H	H	M	H	M	H
CLO4	H	H	M	H	M	H
CLO5	H	H	M	H	M	H

Unit 1:(21 Hours)

1.1: Ecological succession – Process and Patterns of Succession. (K1, K2, K3, K4, K5)

1.2: Human influence on Succession. (K1, K2, K3, K4, K5, K6)

1.3: Homeostasis. (K1, K2, K3, K4, K5, K6)

1.4: Radioactive compounds and their impact on the environment. (K1, K2, K3, K4, K5)

1.5: Environmental Stresses and their management - global climatic pattern. (K1, K2, K3, K4, K5, K6)

1.6: Atmospheric ozone, Ozone depletion, coping with climatic variations. (K1, K2, K3, K4, K5, K6)

Unit 2:(21 Hours)

2.1: Major classes of contaminants. (K1, K2, K3, K4, K5)

2.2: Uptake, biotransformation, detoxification, elimination and accumulation of toxicants. (K1, K2, K3, K4, K5)
2.3: Factors influencing bioaccumulation from food and tropic transfer. (K1, K2, K3, K4, K5)
2.4: Important heavy metals and their role in environment. (K1, K2, K3, K4, K5)
2.5: Agrochemical use and misuse, alternatives. Pesticides and other chemicals in agriculture, industry and hygiene and their disposal.(K1, K2, K3, K4, K5)
2.6: Impact of chemicals on biodiversity of microbes, animals and plants. Biodegradation of chemicals.(K1, K2, K3, K4, K5)

Unit 3: **(21 Hours)**

3.1: Green energy – Bio fuels. (K1, K2, K3, K4, K5)
3.2: Recycling and reuse technologies for solid wastes and their role in environmental conservation. (K1, K2, K3, K4, K5)
3.3: Recycling and reuse technologies for liquid wastes and their role in environmental conservation. (K1, K2, K3, K4, K5)
3.4: Remote sensing – basic concepts. (K1, K2, K3, K4, K5)
3.5: Applications of remote sensing techniques in environmental conservation. (K1, K2, K3, K4, K5, K6)

Unit 4:(21 Hours)

4.1: Environmental indicators and their role in environmental balance. (K1, K2, K3, K4, K5)
4.2: Bioremediation - Definition - Need and Scope of Bioremediation. (K1, K2, K3, K4, K5, K6)
4.3: Environmental application of Bioremediation. (K1, K2, K3, K4, K5)
4.4: Phytoremediation. (K1, K2, K3, K4, K5)
4.5: Biomagnifications. (K1, K2, K3, K4, K5)
4.6: Bioavailability. (K1, K2, K3, K4, K5)

Unit 5:(21 Hours)

5.1: Global ecology towards sustainable civilization: Ecological. (K1, K2, K3, K4, K5)
5.2: Societal gaps. (K1, K2, K3, K4, K5)
5.3: Global sustainability, Long term transitions. (K1, K2, K3, K4, K5)
5.4: Human designed and Management systems. (K1, K2, K3, K4, K5)
5.5: Environmental laws and Acts pertaining to environmental protection and management. (K1, K2, K3, K4, K5)
5.6: Environmental monitoring and environmental assessment. (K1, K2, K3, K4, K5)

Books for Study and Reference:

Text books:

1. Odum E.P., 1983, Basic Ecology, Saunders, New York.
2. ShardhaSinha, ManishaShukla and RanjanaShukla. 2013, A Text book of Environmental Studies, A.I.T.B.S. Publishers, India.

Reference Books:

3. Rao C.S., 1992, Environmental Pollution Control Engineering, Wiley Eastern Ltd.
4. Peter Gomes Dayal, 2010-11, Environmental Toxicology, Dominant Publishers.
5. Trivedi P.R., Gurdeep Raj, 1992, Environmental Biology, Akashdeep Publishing House.

6. Sharma B.K., 2001, An Introduction to Environmental Pollution, Goel Publishing House, Meerut.
7. Sharma P.D., 1995, Ecology and Environment, Rastogi Publications.
8. Chapman J.L. and Resiss M.J., 1992, Ecology Principles and applications, Cambridge University Press.
9. Biswarup Mukherjee, 1997, Environmental Biology, Tata McGraw-Hill Publishing Company Ltd. New Delhi.
10. Lee Hannah 2011, Climate Change Biology, Elsevier.
11. Conklin, A.R. Jr., 2004, Principles and Practices in Environmental Analysis, CRC Press.
12. Grant, W.E. and Swannack, T.M., 2013, Ecological Modeling, Blackwell.
13. Meenambal T., Uma R.N., and Murali K.,2005, Principles of Environmental Science and Engineering, S. Chand and Company Ltd.

E-resources:

https://www.sebiology.org
http://www.enviroindia.net
http://aelsindia.com
http://environment-ecology.com

SEMESTER III

PCZOJ20 -LIMNOLOGY AND TOXICOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	III	PCZOJ20	Limnology and Toxicology	Theory	Core	6	4	100

Objectives:

- To understand the different fresh water habitat, their fauna and Physio-chemical properties.
- An introduction to basic toxicology to understand dosage, route of exposure and its effects on fauna

Course Outcomes:

On completion of the course the student will be able to…

CO1: Attains basic concept about fresh water habitats and its types.

CO2: Describe the Physio-Chemical Characteristics and its importance in freshwater ecosystems.

CO3: Summarize about the organisms and adaptation in the freshwater ecosystem.

CO4: Explain the basic knowledge about toxicology its principle, agents and estimation methods.

CO5: Describe the impact of toxicant in the aquatic ecosystem.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	L
CO2	H	H	H	H	M	M
CO3	H	H	H	H	M	M
CO4	H	H	H	H	M	M
CO5	H	H	H	H	M	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	L	H
CO2	H	H	M	H	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

Unit 1: LIMNOLOGY(18 Hours)

1.1: Limnology – Definition, historical development. (K1, K2, K3, K4, K5)

1.2: Scope of Limnology. (K1, K2, K3, K4, K5)

1.3: Types of freshwater habitats and their ecosystem. (K1, K2, K3, K4, K5, K6)

1.4: Lentic- Ponds. (K1, K2, K3, K4, K5)

1.5: Lakes. (K1, K2, K3, K4, K5)

1.6: Lotic- Streams, Rivers. (K1, K2, K3, K4, K5)

Unit 2:(18 Hours)

2.1: Physio – Chemical Characteristics- Light. (K1, K2, K3, K4, K5)

2.2: Temperature and Radiation.(K1, K2, K3, K4, K5)
2.3: Stratification and Heat Budget. (K1, K2, K3, K4, K5)
2.4: Dissolved Solids – Carbonate, Bicarbonates, Phosphate and Nitrate. (K1, K2, K3, K4, K5)
2.5: Turbidity. (K1, K2, K3, K4, K5)
2.6: Dissolved gases - Oxygen, Carbon dioxide, pH. (K1, K2, K3, K4, K5)

Unit 3:(18 Hours)
3.1: General study of freshwater organisms. Plankton – Phytoplankton - Diatoms, Dinoflagellates, Blue- green algae. (K1, K2, K3, K4, K5, K6)
3.2: Zooplankton – Larval forms of Arthropods. (K1, K2, K3, K4, K5, K6)
3.3: Benthos- general adaptations. (K1, K2, K3, K4, K5)
3.4: Littoral zone- general adaptations. (K1, K2, K3, K4, K5)
3.5: Limnetic zone- general adaptations. (K1, K2, K3, K4, K5)
3.6: Profundal zone - general adaptations. (K1, K2, K3, K4, K5)

Unit 4:TOXICOLOGY (18 Hours)
4.1: Toxicology - Basic concepts. (K1, K2, K3, K4, K5)
4.2: Toxicokinetics –Principles- ADME (Absorption, Distribution, Metabolism and Excretion). (K1, K2, K3, K4, K5, K6)
4.3: Various types of toxicological agents. (K1, K2, K3, K4, K5)
4.4: Toxicity testing principles, hazards, risks and their control methods. (K1, K2, K3, K4, K5)
4.5: Heavy metal toxicity – Estimation of mercury by DithizoneColorimertic method, Estimation of fluoride by DiphenylCarbozide Colorimetric method. (K1, K2, K3, K4, K5)
4.6:Estimation of Chromium by DiphenylCarbozide Colorimetric method. (K1, K2, K3, K4, K5)

Unit 5:(18 Hours)
5.1: Aquatic environment – Toxicants and toxicity. (K1, K2, K3, K4, K5)
5.2: Factors that affect the environmental concentrations of the toxicants. (K1, K2, K3, K4, K5, K6)
5.3: Factors that influence toxicity. (K1, K2, K3, K4, K5)
5.4: Effect on aquatic Fauna. (K1, K2, K3, K4, K5)
5.5: Toxicity test: Acute toxicity test - chronic toxicity test - LC 50 – LD 50. (K1, K2, K3, K4, K5)
5.6: Factors that modify toxicity. (K1, K2, K3, K4, K5)

Books for Study and Reference:

Textbooks:

1. V.K.Agarwal, Usha Gupta 2002 - Ecology and Ethology- S. Chand and Company Ltd.
2. S.N Prasad 1991- An Introduction to Toxicology- S. Chand and Company Ltd.

Reference Books:

3. H.R Singh, Neeraj Kumar 2006 - Ecology and Environmental Science - Vishal Publishing Co.
4. G T Tonapi 1950 - Fresh Water animal of India an ecological approach - Oxford and IBH Publishing Co.
5. Alexander J Horne, Charles R. Goldman 1994- Limnology- McGraw- Hill International editions.

6. Modern concepts of ecology H.D. Kumar 1995 - Vikas Publishing House Pvt. Ltd., New Delhi.
7. Ecology of Freshwater, Alison Leadlay Brown 1971, Heinemann Educational Books Ltd., London.
8. Introduction to Ecology, Papul A. Colinvaux, 1978 John Wiley and Sons, Inc., New York.
9. Fish and Fisheries of India V.G. Jhingram, 1980 Hindustan Publishing Co., New Delhi.
10. Peter Gomes Dayal 2011- Environmental Toxicology- Dominant Publishers and Distributors.
11. Krishna Pillai N. 1986- Introduction to Planktonology 1 ed - Himalaya Publishing House.
12. Manivasakam. N. Physico chemical examination of water, sewage and industrial effluents. PragatiPrakashan, Meerut.

E-Resources:

https://limnology.org
https://www.aslo.org
http://www.geocities.ws/limsocindia/limlinks.htm
https://www.toxicology.org
https://www.setac.org
http://www.indiansocietyoftoxicology.org

SEMESTER IV

PIZOG20 - INDEPENDENT ELECTIVE IVA- BIOSYSTEMATICS

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	IV	PIZOG20	Biosystematics	Theory	Independent Elective	-	2	100

Objectives:

- To understand biological characteristics.
- To learn diversity and evolutionary relationship among the organisms.
- To apply phylogeny classification at species level and infra species level.

Course Outcomes:

On completion of the course the student will be able to…

CO1: Explain the concept, importance and attributes of biosystematics.
CO2: Discuss the biological characteristics.
CO3: Compute the evolutionary relationship among the organisms.
CO4: Familiarize different taxonomic procedures, taxonomic keys and zoological nomenclature.
CO5: Apply phylogeny classification at species level and infra species level.

PSO/CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

CO/PLO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

Unit 1:

1.1: Introduction & basic concept of biosystematics & taxonomy. (K1, K2, K3, K4, K5)
1.2: Rise of Taxonomy - Problems, aims and tasks in taxonomy. (K1, K2, K3, K4, K5)
1.3: Taxonomy as a profession. (K1, K2, K3, K4, K5)
1.4: Importance & application of biosystematics in biology. (K1, K2, K3, K4, K5)
1.5: Chemotaxonomy – Cytotaxonomy. (K1, K2, K3, K4, K5)
1.6: Attributes of Taxonomy. (K1, K2, K3, K4, K5)

Unit 2:

2.1: Types of biological classification (Essentialism, Nominalism, Empirism, Cladism and evolutionary classification). (K1, K2, K3, K4, K5)
2.2: Newer Trends in Taxonomy: Morphological approach, Immature stages and embryological approach. (K1, K2, K3, K4, K5)

2.3: Ecological Approach, Behavioural Approach. (K1, K2, K3, K4, K5)
2.4: Cytological and Biochemical Approaches. (K1, K2, K3, K4, K5)

2.5: Numerical taxonomy. (K1, K2, K3, K4, K5)
2.6: Differential Systematics. (K1, K2, K3, K4, K5)

Unit 3:

3.1: Zoological Classification Kinds of classification, phyletic lineages. (K1, K2, K3, K4, K5)
3.2: Components of classification - Hierarchy of categories. (K1, K2, K3, K4, K5)
3.3: Species concepts, Typological species concept, Nominalistic species concept. (K1, K2, K3, K4, K5)
3.4: Biological species concept, Evolutionary species concept, Recognition species concept. (K1, K2, K3, K4, K5)
3.5: Kinds of species : Polytypic & monotypic species, subspecies, infraspecific groups. (K1, K2, K3, K4, K5)
3.6: Super species, other kind of species. (K1, K2, K3, K4, K5)

Unit 4:

4.1: Taxonomic procedures, Taxonomic collection. (K1, K2, K3, K4, K5)
4.2: Curetting of animals & Process of Identification. (K1, K2, K3, K4, K5)
4.3: Preservation of specimens. (K1, K2, K3, K4, K5)
4.4: Taxonomic Keys - Types, merits & demerits. (K1, K2, K3, K4, K5)
4.5: International code of Zoological Nomenclature (ICZN). (K1, K2, K3, K4, K5)
4.6: Interpretation of rules of nomenclature. (K1, K2, K3, K4, K5)

Unit 5:

5.1: Taxonomic Records. (K1, K2, K3, K4, K5)
5.2: Publications Taxonomic keys. (K1, K2, K3, K4, K5)
5.3: Taxonomic characters description. (K1, K2, K3, K4, K5)
5.4: Taxonomic paper. (K1, K2, K3, K4, K5)
5.5: Zoological Records. (K1, K2, K3, K4, K5)
5.6: Directories, Abstracts, Review.(K1, K2, K3, K4, K5)

Books for Study and Reference:

Textbooks:

1. Kapoor V.C. 2010. Theory and practice of animal taxonomy, Oxford and IBH, New Delhi.
2. Ashok Verma, 2015. Principles of Animal Taxonomy, Narosa Publishing house, New Delhi.

Reference Books:

3. George Gaylord Simpson, 1990. Principles of animal taxonomy, Columbia University Press, New York.
4. Quicke, D. L. J, 2008. Principles and Techniques of contemporary Taxonomy, Blackie Academic Professional, 310pp.
5. Quentin. T. Wheeler,2008m The New Taxonomy, The Systematics Association Special Volume Series, 76. (ed.) CPR Press.
6. Theodore Horace Savory, 1970. Animal Taxonomy, University of Michigan.
7. Dr.R.C.Tripathi, Biosystematics &Taxonomymm, University Book House, Jaipur.
8. G.G. Simpson, Principle of Animal Taxonomy**:** Oxford & IBH Publishing Co.

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