HCT-4.1: ENVIRONMENTAL BIOLOGY 48hrs

Unit 1: **02**

I**ntroduction**: Concept, Scope and awareness of environment.

Unit 2: **10**

Ecosystems and Productivity: Types and components, energy flow, food chain and food web; Ecological pyramids, ecological succession.

Productivity of an ecosystem: Primary and secondary, productivity of different ecosystems.

Unit 3: **08**

Natural resources: Concept and classification, Non renewable resources: Mineral, land and soil resources; Renewable resources: Water, forest, wildlife, Agriculture; live stock.

Energy resources: Sources and use, declining resource of crude oil, alternative fossil fuels, nuclear energy, solar and other renewable resources; Management strategies of resources

Unit 4: **08**

Environmental pollution: Important episodes of environmental pollution, Water pollution, eutrophication; Air pollution; Greenhouse effect, photochemical smog; Thermal pollution; Noise pollution; Radioactive pollution; Solid waste pollution control.

Unit 5: **06**

Climate Change: Global warming, Ozone layer depletion, Acid rain. Disaster Management: Floods, Earthquake, Tsunami, Cyclones and Land slides.

Unit 6: **06**

Human population and environment: Population growth, population explosion, Age structure, environment and human health; Human rights, value education, Role of information technology in environment and human health

Unit 7: **08**

Environment and social Issues: Resettlement of Rehabilitation of people; Waste land reclamation; Environmental ethics. Environmental Awareness: Environmental Education-role of educational institutions and other agencies; Environmental legislation and protection Acts.

References:

1. Mckinney, M. L. and Schoh, R. M. environmental Science: System and Solutions, Jones and Bartlett Publishers, 1998.
2. Chapman, J. L. and Reiss, M. J. Ecology: Principles and Applications. Cambridge University Press, 1999.
3. Eldon, D. Enger and Bradley, F. Smith. Environmental Sciences, 1995.
4. Willmer, P., Stone, G. Johnson, I. Environmental Physiology of Animals. Blackwell Science Ltd.
5. Arrora, R. K. Air Pollution, causes and effects, control. Mangaldeep Publications, Jaipur, 1999.
6. Chakraborti, N. K. Environmental Protection and Law. 1994
7. Chikara, M. G. Encyclopedia of Ecology. Environment and Pollution. Vol. I – XIII, 1997.

HCT-4.2: PROJECT WORK AND SUBMISSION OF DISSERTATION

OET-3.8: PARASITOLOGY 48hrs

Unit 1: **2**
Introduction: Origin and Evolution of Parasitism. Kinds of Hosts and Parasites

Unit 2: **10**
Pathogenic Microorganisms: Classification of Microorganisms and structural details; Food and Water borne diseases. Sexually transmitted bacterial diseases. Skin and Wound bacterial diseases.

Unit 3: **10**
Pathogenic Protozoan's: Amoebiasis, Giardiasis, Trypanosomiasis, Haemosporidians, Coccidiosis to Poultry; Myxosporians of fishes; Nosema and other pathogenic Protozoa of Insects.

Unit 4: **07**
Pathogenic Nemetodes; Etiology of diseases due to *Wuchereria sp, Trichinella spiralis and Hook worms*.

Unit 5: **07**
Pathogenic Trematodes: Etiology of diseases due to *Fasciola hepatica, Fasciolopsis buski and Systosoma sp*.

Unit 6: **07**
Pathogenic Cestodes: Etiology of diseases due to *Echinococcus, Hhymenolepis and Diphylobthrium*.

Unit 7: **05**
Host and parasitic interaction: physical, chemical and biological; Effect of parasitism on host and parasites.

References:

1. Hoare, C. A. *Hand Book of Medicinal Protozoology. London, Baltimore*, Tindall and Cox, 1950.
2. Levine, N. D. *Protozoan parasites of Domestic Animals and Man.* II Ed. Minncapolis: Burgess, 1978.
3. Noble, E.R. and Noble, G.A. *Parasitology: The Biology of Animal Parasites.* London Kimpton, 1961
4. Smith, K.G.V. *Insects and other Arthropods of Medical Importance*, London: British Museum of National History. 1973.
5. Soulsby, E.J.L *Biology of Parasites*. New York: Academic Press, 1966.
6. Smyth, J.D. Introduction to Animal Parasitology. London: Hodder and Stoughton. 1976.

OET-4.6: APPLIED ZOOLOGY 48 hrs

Unit 1: **02**
Introduction: Overview and scope of Applied Zoology, Economically important animals.

Unit 2: **10**
Sericulture: History of Sericulture. Types of Silk Moths, Rearing methods of Silkworms. Grainage activity, Silk production. Silk worm diseases.

Unit 3: **08**
Apiculture: Importance of Bee keeping. Different species of Honey bees and their distribution. Management of Bees, Product and byproduct of Apiculture and their uses.

Unit 4: **10**
Vermiculture: Importance of Vermiculture. Types of earthworms, Life cycle of earthworm, Use of Earthworms for bidegradation of organic waste materials, Techniques of Vermiculture, Harvesting of Vermicompost and Vermimass, Vermicompost as Soil Conditioner and Earthworms as source of Protein. Vermiwash.

Unit 5: **08**
Aquaculture: Fresh water, Brackish water and Marine fish culture in India, Prawn and Pearl culture, Preservation and Processing of fish; Fish byproducts.

Unit 6: **05**
Poultry Science: Introduction, Breeds of fowls, Poultry keeping, Nutritive value of egg and meat, Poultry diseases.

Unit 7: **05**
Dairy Technology: Introduction, Breeds of cattle, Breeding and Cattle improvement in India. Nutritive value of Milk and Milk by products.

References:

1. Srivasthava, K.P. *Text Book of Applied Entomology*, Vol. I and II Kalyani Publishers, 1996.
2. Mishra, R.C. *Perspectives in Indian Apiculture.* Allied Scientific Publishers, Bikaner, India, 1999.
3. Lee, K.E. *Earthworms*: *Their Ecology and Relationship with Soils and Land use* Academic Press. London, 1985.
4. Snathanam, R. Sukumaran, N. and Natarajan, P.: *A Manual of Freshwater Aquaculture*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1990.
5. Bell, F.W. and Canterbary, E.R. *Aquaculture for Developing Countries- A Feasibility Study*. Cambridge: Ballinger Publishing Co. 1976.

SCT-1.4a: BASIC AND APPLIED ENTOMOLOGY 48 hrs

Unit 1: **03**

Insect Taxonomy: Classification of insects up to orders with suitable examples; Morphology of integument, head, thorax and abdomen and appendages.

Unit 2: **10**

a. **Structure and function:** Digestive system, respiratory system, excretory system.
b. **Nervous system:** Sense organs, sound producing organs, photoreceptor and photogenic organs
c. **Endocrine system:** Hormones and their regulation
d. **Reproductive system:** Reproductive system, metamorphosis and diapauses in insects

Unit 3: **10**

Insect pests: a. Definition, categories, origin of pest, causes for outbreak, economic damage.

b. **Pest monitoring:** Pest surveillance, forecasting survey and sampling techniques, crop loss estimation.
c. **Insect pests of major crops:** Damage, life cycle, seasonal history, status and control of major pests of important crops such as Cereals: Rice, Sorghum, Maize, Wheat; Oil seeds: Sun flower, Saff flower & Groundnut; Vegetable crops: Brinjal, Ladies finger, Cabbage and Beans; Commercial crops: Sugarcane, cotton, Coconut and Coffee.

Unit 4: **10**

Integrated Pest Management: History, different phases of pest control, (Quarantine, Physical, Chemical, Biological control and, genetic and biotechnological methods) control. Pheromones- Types, chemical characteristics, biosynthesis and their use in pest management, Pheromone traps.

Unit 5: **05**

Medical Entomology:

Common insects attacking humans and domestic animals; their life history, mode of attack, type of injury or infection, treatment and control with reference to House fly, Blow flies, Blood sucking insects.

Unit 6: **10**

Culture of commercial Insects:

a. Honey bee: Species, role in pollination, bee keeping and management, bee products.
b. Silk worm: species, silkworm rearing and management, pests of silkworm
c. Lac Insect: Host plants, Lac cultivation, commercial importance.

References:

1. Awasti V.B. 2009 Introduction to general entomology 3rd Ed. Scientific publication (India), Jodhpur
2. Awasti V.B.2007, Agricultural Insect Pests and their control. Scientific publishers (India) Jodhpur
3. Trigunayat M.M. 2009, A Mannual of practical entomology, scientific publishers, Jodhpur, India.
4. Dhaliwal G.S. Ramsingh and B.S. Chillar 2006, Essentials of Agricultural entomology. Kalyani Publishers, New Delhi.
5. L . K Jha. Applied Agricultural Entomology. New central book agency. Culcutta
6. Rajendra singh. 2007. Elements of Entomology. Published by Rakesh kumar. Rastogi and Rastogi Publications. Gangotri, Shivaji Road. Meerut.

SCT-1.4 b: BIODIVERSITY 48 hrs

Unit 1: **03**

Introduction: Concepts, Definition, Values of diversity, Consumptive use and productive use, Social and Aesthetic values.

Unit 2: **09**

Genetic diversity: Genetic diversity, Species diversity, Ecosystem diversity, Biodiversity at global, National and local levels.

Hot spots of Biodiversity: Biodiversity hot spots in India**,** India as a mega diversity country, Endemic species.

Unit 3: **06**

Concept of biodiversity: Types of biodiversity and biodiversity profile of India. Ramsar wetlands. General theories of biodiversity: biotic and abiotic theories.

Unit 4: **12**

a. Threats to Biodiversity: Deforestation, Habitat destruction, Hunting, and over exploitation, introduction of exotic species, Impact of Pollution on biodiversity.

b. Wild life status; Endangered, vulnerable, Rare and threatened species

c. Conservation of biodiversity: Objectives, In-situ and Ex-situ conservation, People movement, Role of Educational Institutes and NGO's Biodiversity awareness, programme, Future strategies for biodiversity conservation in India.

Unit 5: **12**

a. Biodiversity Legislation: Legal aspects with respect to India, Biodiversity Act, 2002; CBD**;** CITES, IPR.

b. Biodiversity and Biotechnology: Assessment of biodiversity and bioresources, biodiversity conservation, utilization of biodiversity, GMO's and their impact on biodiversity.

Unit 6: **06**

Biodiversity and Management:

a. Organizations associated with biodiversity Management, IUCN,UNEP, UNESCO, WWF, FAD, WCWC, BMC, KBB and BHS; their role and contributions
b. Bioprospecting, Biopiracy, Biosafety, Bioremediation.

References:

1. Dasmann. F Raymond. Wildlife Biology. Wiley Eastern Ltd. India. 1982.
2. Encyclopedia of Nature and Science. Vols 1-18. Bay Books Pvt.Ltd. Sydney, 1974.
3. Burnie. D. (Ed). Animal: the Definitive Visual Guide to the Worlds Wildlife. D.K.Publications, 2001.
4. Singh, M.P. 2009. Biodiversity. APH Publishing Corporation, New Delhi.
5. Saharia, V.B. 1982. Wildlife in India. Natraj Publishers, Dehara Dun.
6. Kotwal, P.C. and Banerjee, S. 2004. Biodiversity Conservation in managed forests and protected areas. Agrobios (India) Publishers, Jodhpur.
7. NBA. 2004. The Biological Diversity Act (2002) and Biological Diversity Rules (2004). NBA, Chennai, India.
8. Kumar, U. and Asija, M. 2005. Biodiversity: Principles and Conservation. 2nd Edn. Agrobios (India) Publishers, Jodhpur.
9. B. B. Hosetti 2005. Glimpses of biodiversity, Daya Publishers. Delhi-11
10. B.B.Hosetti and M.Venkateshwarlu 2004. Trends in wildlife biodiversity, conservation and management. Vol. I and II Daya Publishers, Delhi-11.
11. B.B. Hosetti 2008. Concepts in wildlife management, III edition, Daya Publishers, Delhi.

SCT-1.4 c: VECTORS AND COMMUNICABLE DISEASES. 48 hrs.

Unit 1: Introduction to vector borne diseases and vectors- World scenario; Indian scenario. Historical perspective- Epidemics, discoveries; Scientists and major events involved in the discovery of vectors and pathogens of communicable diseases 08

Unit 2: Epidemiology, biology of vectors and pathogens, transmission cycles and symptoms- of malaria, filariasis, yellow fever, leishmaniasis and anthrax. 08

Unit 3: Epidemiology, biology of vectors and pathogens, transmission cycles and symptoms- of dengue, chikungunya, Japanese encephalitis, schistosomiasis and plague. 08

Unit 4: Distribution, epidemiology and control of Yellow fever, African sleeping sickness, oncocerciasis and chagas disease. 08

Unit 5: Mechanical vectors- House flies, cockroaches and bedbugs- Transmission of dysentery, diarrhea, typhoid, cholera, epidemic conjuctivity and skin infections. 08

Unit 6: Control of vector borne diseases; Vector control- Chemical, Biological, Genetic and Environmental. Insecticide resistance in vectors. Drug resistance in pathogens. Importance of education, awareness and Community participation. 08

References:

1. Clements, A. N., 1992. The biology of Mosquitoes, Vol-I, Chapman and Hall, London.
2. Clements, A. N., 1999. The biology of Mosquitoes, Vol-II, Chapman and Hall, London.
3. Fenemore, P. G. and Alka Prakash., 1992. Applied Entomology, Wiiey Eastern Ltd., New Delhi.
4. Gullan, P. J. and Cranston. 1994. The Insects: An outline of Entomology, Chapman and Hall, London.
5. Kenneth, G. V. Smith, 1973. Insects and other arthropods of medical importance. Trustees of British Museum, London.
6. Manson- Bahr, P. E. C. and Bell, D. R., (Ed) 1987. Manson's tropical diseases. English Language Book Society, Barillien Tindall.
7. Metcalf, R. L. and W. B. Flint. 1962. Destructive and useful insects, their habits and control. McGraw Hill Publ. Co., N. Y.
8. Rao, T. R., 1984. The Anophelines of India. Publ. by Malaria Research Centre, Delhi.
9. Service, M. W., 1976. Mosquito ecology. Applied Science Publication Ltd., London.
10. Srivastava, K. P., 1988. A Textbook of Applied Entomology, Publ. Kalyani Publishers, New Delhi.
11. WHO (Geneva), 1989. Geographical distribution of arthropod borne diseases and their principal vectors. WHO. Geneva.

OET-1.8. Offered by the Department of Women's Studies.

SCT-2.4a: ECONOMIC ZOOLOGY 48 hrs

Unit 1: **02**
Introduction: Overview and scope of Applied Zoology, Economically important animals.

Unit 2: **08**
Sericulture: Brief History and Development of Sericulture. Types of Silk Moths, Rearing methods of Silkworms. Grainage activity, Silk production. Silkworm diseases.

Unit 3: **08**
Apiculture: Importance, History and Development of Bee keeping. Different species of honey bees and their distribution. Management of beekeeping, Product and byproduct of Apiculture and their uses.

Unit 4: **08**
Vermiculture: Importance of Vermiculture. Types of earthworms, Life cycle of earthworm, Use of Earthworms for biodegradation of organic waste materials, Techniques of Vermiculture, Harvesting of Vermicompost and Vermimass, Vermicompost as Soil Conditioner and Earthworms as source of Protein. Vermi-wash.

Unit 5: **09**
Aquaculture: Freshwater, brackish water and Marine fish culture in India, Prawn and Pearl culture, Preservation and processing of fish; Fish byproducts.

Unit 6: **04**
Poultry Science: Introduction, Breeds of fowls, Poultry rearing (Broiler and layer farming), Nutritive value of egg and meat, Poultry diseases.

Unit 7: **05**
Dairy Technology: Introduction, Breeds of cattle, Breeding and Cattle improvement in India. Nutritive value of Milk and Milk by products.

Unit 8: **04**
Lac culture: Lac insect, strains of Lac insects, host plants Cultivation, lac culture, composition of Lac, processing of Lac and its uses.

References:

1. Srivasthava, K.P. *Text Book of Applied Entomology*, Vol. I and II Kalyani Publishers, 1996.
2. Mishra, R.C. *Perspectives in Indian Apiculture.* Allied Scientific Publishers, Bikaner, India, 1999.
3. Lee, K.E. *Earthworms*: *Their Ecology and Relationship with Soils and Land use* Academic Press. London, 1985.
4. Snathanam, R. Sukumaran, N. and Natarajan, P.: *A Manual of Freshwater Aquaculture*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1990.
5. Bell, F.W. and Canterbary, E.R. *Aquaculture for Developing Countries- A Feasibility Study*. Cambridge: Ballinger Publishing Co. 1976.

SCT-2.4b: WILDLIFE AND CONSERVATION 48 hrs

Unit 1: **12**

Introduction, History and Scope:

Importance and values of wildlife. Wildlife categories: Endangered, Threatened, Vulnerable, rare; data Deficient categories, Red Data Book. Causes of wildlife depletion: Degradation and destruction of natural habitats, exploitation for commercial purposes, deforestation, agricultural expansion and grazing, urbanization and industrialization, Forest fires.

Unit 2: **10**

Wildlife Conservation: Conservation strategies, Role of NGO's in Conservation, Global and Indian bodies concerned with wildlife conservation, Wildlife conservation projects in India – Project Tiger, Gir Lion sanctuary project, elephant, Musk deer and Crocodile breeding and management project.

Unit 3: **10**

In situ and ex situ conservation: Biodiversity and Biodiversity hotspots, Bioreserves, National Parks and Wildlife sanctuaries– their characteristics. Ex situ Conservation: Zoos and their significance – Captive breeding of animals– Zoos, Cryo – preservation, Modern methods of ex situ conservation, Artificial insemination for conservation: Germplasm stations; pollen banks; sperm bank.

Unit 4: **10**

Wild Life census and Management: General methods; Census Methods for vertebrate species (Mammals and Birds)

Wild life management: Range lands: status, types and management. Case studies (Gudavi and Mandagadde bird sanctuary, Bhadra wildlife sanctuary). Wildlife-Human conflicts.

Unit 5: **06**

Wild life protection Acts: Wild life protection Act 1972 and its amendments; Wildlife schedules.

References:

1. Ali, S. and Ripley S.D. 1969. Handbook of Birds of India and Pakistan, Oxford University.
2. Chatrath, K.J.S. 1992. Wetlands of India, Ashish Publishing House,New Delhi.
3. Heywood, V.H. (Eds) 1995. Golbal Biodiversity, Published for UN Environmental Programme, Cambridge University Press.
4. Hosetti, B.B. 2006. Concepts in Wildlife Management, Daya Publishing House, Delhi. III edition
5. Hosetti, B.B. and Venkateshwarlu M. 2001. Trends in Wild life, Biodiversity, Conservation, and Management, Daya publishing House, Delhi-35, India. Vol. I and II
6. Hosetti, B.B. 2002. Glimpses of Biodiversity, Daya Publishing House, Delhi-35, India.
7. Stiling, P, 2002. Concepts in Ecology: Theories and Applications IV Ed. Prentice Hall of India Pvt. Ltd., New Delhi-110 001.
8. Khanna, D.R. and P.R.Yadav, 2005. Biology of Birds, Discovery Publishing House, New Delhi 110 002.
9. Sharma, B.B. 1994. High altitude Wildlife of India, IBH Publ. House New Delhi.Ganguly, G. Sinclair and R.E. Anthony, 1994. Wildlife Ecology and Management, Blackwell Scientific Publ. Bostan.
10. Negi, S.S. 2002. Hand book of National Parks, Wildlife Sanctuaries and Biosphere reserves in India. Indus Publ., New Delhi.

SCT-2.4.c: ORNITHOLOGY 48 hrs

Unit – 1: Habitat ecology of birds : Habitat ecology of Indian birds; Coastal birds, Inland water birds, Birds of high altitude and deserts. Distribution of birds in India. Morphometric measurement used in food habit studies.

06

Unit-2: Feeding ecology of Birds; Insectivores, Frugivores, Nectarivores, Graminivores, Carnivores and Scavengers.

06

Unit-3: Territoriality; Functions and types of territoriality, sizes and shapes of territory, Defense and site fidelity. **05**

Unit-4: Songs and calls; Functions of voice, birds vocabularies, nature of song, non vocal songs.

05

Unit-5: Nesting; Functions, choice of nest sites, colonial nesting, forms of nests, nest materials and nest building and multiple nests. **05**

Unit-6: Reproduction; Breeding seasons, Factors influencing breeding seasons, seasonal reproductive cycles, photo periodism, courtship and display, sexual selection, pair bond, sexual dimorphism, mating systems, polyandry, polygyny, promiscuity, co-operative breeding, brood parasites. Egg laying- Timing of egg laying, clutch size, incubation patterns, hatching. Parental care- Feeding, nest sanitation.

08

Unit-7: Feathers and Moulting – Types, Functions, growth, Moulting. **04**

Unit- 8: Birds Migration; Economic values of birds, endangered and threatened birds. **05**

Unit-8: Field identification tools and techniques, Importance of birds, Modern methods for birds research.

04

References:

1. Ali, S and S.D. Ripley. 1969. The Handbook of Birds of India and Pakistan. Oxford University Press – New Delhi
2. Ali, Salim,1997. The Book of Indian Birds, Oxford University Press, Mumbai.
3. Arora B. M. , 2002. Editor, Indian Wildlife Yearbook, AIZ & WV, Bareilly and Central Zoo Authority, New Delhi.
4. Arora, B.M. 2007. Rehabilitation in free living wild animals . AIZ & WV, Bareilly and Central Zoo Authority, New Delhi.
5. Singh, S.K. 2005. Text Book of Wildlife Management. IBDC, Lucknow.
6. Welty, J. 1982. The Life of Birds. Saunders College Publishing, New York 7. William Sutherland, 1984. Ecological census techniques, Cambridge

OET-2.9. Offered by the Department of Women's Studies

SCT-3.3a: ANIMAL BEHAVIOUR 48 hrs

Unit 1: **05**

Animal Behavior: Introduction, definition and history (Lorenz, Tinbergen, von Frisch); Questions about animal behavior

Unit 2: **08**

Development of Behavior: Behavior and genes; Innate behavior; Parent-offspring,
Interaction; Imprinting- Filial Imprinting and Sexual imprinting; Instinct- Interaction between instinct and learning; Biological clock; Cultural transmission as a form of behavior and development

Unit 3: **10**

Learning: Definition and forms**:** Habituation; Associative learning/ conditioning
(Classical conditioning- Pavlov; Operant conditioning, instrumental learning, Skinner), Spatial learning; Insight learning; Social learning; Cognitive maps; Observational learning/imitation; Insight learning; Social learning; Memory – increased synapses, increased neurons; Memory and cognition

Unit 4: **09**

Communication: Sign and normal stimuli; Channels of communication; Pheromones and acoustic signals; Evolution of display and mimicry, aposematic coloration, deception and honesty; communication in social groups, alarm calls, alarm pheromones, trail pheromones; Dance language in honey bee; Primate language

Unit 5: **08**

Evolution of Social system:
Society, benefits and costs of sociality; Social interactions of groups- Altruism – concept of inclusive fitness, (Kin selection, parental care); Reciprocal Altruism, selfish, spite, conflict and infanticide; Insect eusociality: a case of altruism and cooperation (honey bee); Vertebrate societies; Human sociobiology; Biological and cultural evolution

Unit 6: **04**

Decision making in animals: Mechanism of decision making, motivational state; competition, inhibition/ disinhibition, decision making on time scale

Unit 7: **04**

Migration in Insects, fishes and birds.

References:

1. Aubrey, Manning and Marian, S. Dawkins. *An Introduction to Animal Behavior*. Cambridge University, Press, 1995.
2. McFarland, D. *The Oxford Companion to Animal Behavior*
3. McFarland, D. *Animal Behavior Psychology, Ethology and Evolution.* Pitman Publications. 1985,
4. Slater, P. J.B. Essentials of Animal Behavior, Cambridge University press, 1999,
5. Krebs, J.R. and Davies, N.B. An Introduction to Behavioural Ecology-III (ed). Blackwell Science Ltd., 1993.

SCT-3.3b: MICROBIOLOGY 48 hrs

Unit 1: **08**

Introduction: History of Microbiology, biodiversity, distribution, general classification and distinguishing features of various groups of microorganisms.

Unit 2: **10**

Isolation and culture of microorganisms: Principle and technique of isolation; microbial nutrition (types of microbial culture and microbial media), microbial growth, enumeration of microbes and microbial biomass

Unit 3: 1**0**

Sterilization techniques: Physical methods (Dry and wet), Radiation (ionizing and non ionizing), Filtration (porcelain, sintered glass and membrane filters), Chemical methods (Asepsis, disinfection); phenol alcohols: halogens and phenol coefficient).

Unit 4: **05**

Viruses: Structure and classification, replication, bacteriophages, life cycle of phage typing, Viroids and prions.

Unit 5: **05**

Mycoplasma: Chlamydiae, Rickettsia, their Properties, classification and their role in animal and human diseases.

Unit 6: **04**

Yeast: Structure, classification, culture and economic importance.

Unit 7: **06**

Industrial microbiology: Importance of bacteria and Yeasts; production of alcohol, microbial pesticides, microbial antibiotics and microbial enzymes

References:

1. Alexander N. Glazer, Hiroshi Nikaido 1998. Microbial biotechnology. Fundamentals of Applied biotechnology, W.H. Freeman and Company, NY.
2. Edward. 1996, Fundamentals of microbiology, 4th edition. The Benjamin/Cumming Publication Corp.
3. Lancing M. Prescott, John P. Harley and Donald A. Klein. 2002. Microbiology. 5th edition. McGraw Hill publication. New Delhi.

SCT- 4.3a: EVOLUTIONARY BIOLOGY 48hrs

Unit 1: **02**

I**ntroduction**: An overview of evolutionary biology.

Unit 2: **10**

Theories of evolution: Lamarckism; Natural Selection (Darwinism), contribution of Charles Darwin, Alfred Russel Wallace and Thomas Malthus; Postulates of Natural Selection and evidences; Darwin's finches, Experimental evidences of Natural selection.

Unit 3: **12**

Neo-Darwinism: Hardy-Weinberg Law; Genes and genotype frequencies, Concept of Mendelian Population and gene pool; Factors operating against Hardy-Weinberg Law; Types of mutation; Different types of selection; Random Genetic drift (Bottle neck effect, Founder's effect); Migration;

Molecular polymorphism: Nucleic acids and proteins; Molecular clock; Neutral theory of evolution and evolution random walk; Forces in evolution- stochastic Vs deterministic

Unit 4: **05**

Speciation: Types of species; concept of species; isolating mechanism; prezygotic and post zygotic; Phyletic gradualism and punctuated equilibrium; micro and macroevolution

Unit 5: **08**

The Evolution of Life histories: Basic questions in life history evolution; Life history trade-offs: Optimality arguments, age and size at maturation; clutch size and reproductive investment, empirical evidences of life-history trade-offs; Life span and aging; evolutionary theories for aging

Unit 6: **06**

Impact of Darwin's thoughts in understanding human health and diseases:

Proximate versus ultimate causes of diseases; Design defects; Defense Mechanisms; Allergy; Evolution of antibiotic / Pesticide resistance; Spread of quirk genes; Evolution of behaviors such as anxiety, fear and depression

Unit 7: **05**

Evolution of Horse, Monkey and Man.

Reference:

1. Futuyama, D.J. Evolutionary Biology- III Ed. Sinauer Associates Inc. Massachusetts, 1998.
2. Gerhart, J and Kirchner, M. Cell, Embryos & Evolution. Blackwell Science Publishers, 1997.
3. Keynes, R. Charles Darwin's Zoology Notes & Specimen List from H.M.S Beagle. Cambridge University Press, 2000.
4. Price, P.W. Biological Evolution. Saunders College Publishing, 1995.
5. Smith, J.M. Evolutionary Genetics. Oxford University Press, 19

SCT- 4.3.c: ANIMAL BIOTECHNOLOGY 48 hrs

Unit 1: **02**

Introduction: Concept and Scope of Biotechnology, Current Status and Future

Unit 2: **06**

Animal Cell and Tissue Culture: Definition, Principles of cell and tissue culture; cell lines. Requirement: Equipments, Culture media, Application of cell culture.

Stem Cell Technology: Definition, types and properties of stem cells, Differentiation of stem cells, Advantages and Disadvantages of Stem cell technology.

Unit 3: **06**

Gene Cloning and Gene Transfer Techniques: Somatic cell nuclear transfer; Recombinant DNA Technology- Molecular tools, Cloning vectors: Gene transfer methods- Microinjection, Electroporation, Polycations, Lipofection, Retroviral infection.

Unit 4: **06**

Invitro-fertilization, Embryo transfer and cloning in Mammals: Procedure and limitations of IVF, Embryo Transfer Technique, Cloning of different Mammals.

Unit 5: **06**

Trangenic animals and Gene Therapy: Production of transgenic animals, Gene targeting, Knock-out and Knock-in Technology. Transgenic animals- Ethical concerns and Patenting.

Gene therapy: Somatic versus- germ line therapy, Gene therapy in animals.

Unit 6: **08**

Application of Animal Biotechnology: Production of regulatory proteins (TRF, GRF, Somatostatin, Somatomedin), epidermal growth factors, Anti-coagulants.

Recombinant vaccines: Production of vaccines: DNA vaccines, Monoclonal antibodies, Hybridoma Technology, DNA probes, Biochips, DNA finger printing.

Unit 7: **04**

Histological and histochemical techniques: Fixation, embedding, sectioning (microtomy), staining, dehydration, cleaning agents, infiltration, mounting and mountants, Cytological/ histological methods- Enzyme histochemistry, immunohistochemistry

Unit 8: **04**

Separation techniques: Chromatography and Gel filtration. Electrophoresis and electro-focusing. Cell fractionation, gradient centrifugation and sub-cellular fractions.

Unit 9: **06**

Principles and applications of biochemical methods: RIA, ELISA, DNA sequencing, PCR, GLC, HPLC, Preparation of physiological solutions: Media and Buffers.

Nanotechnology and its Application in Biology

References:

1. Chirikjian, J.C. *Biotechnology: Theory and Techniques* Vol. I-II. Jones and Bartlett, 1995
2. Glick, B.R. and Pasternak, J.J. *Molecular Biotechnology: Principles and Applications of Recombinant DNA* II (Ed) A.S.M. Press, 1998.
3. Primrose, S.B. *Molecula rBiotechnology*- II (Ed). Panima Publishing Corporation, New Delhi/ Bangalore, 2001.
4. Celis, J.E. (Ed) *Cell Biology: A Laboratory Handbook*- Vol. I and II. Academic Press, 1998.
5. Young, S. S. Computerized data acquisition & Analysis for life Sciences: A Hands-on guide. Cambridge University Press, 2001.
6. Robert Brown. Introduction to instrumental analysis. McGraw RHill International Editions.
7. Wilson, K & Goulding, K.H. A Biologists Guide to Principles and Techniques of Practical Biochemistry. ELBS Ed.