Subject Code : RCCN3G9

CORE COURSE IX : ENVIRONMENTAL BIOLOGY AND EVOLUTION
A. Environmental Biology

UNIT 1

Survey of natural resources – Renewable (food, water and forest) and non-renewable (land, energy and mineral) resources. Conservation of natural area and biota-soil conservation – Conservation of biosphere reserve – environmental quality standards.
Biodiversity – Definition, importance in biology, basic concepts, types, values, threats to biodiversity, biodiversity conservation- methods of conservation-biodiversity and sustainable development and biodiversity indices.

Unit II

Pollution – sources, effects, and control of air, water, organic pollutants, BOD, COD, pesticides, heavy metals, thermal, radiation, oil, land and noise pollution – indicator organisms – bioaccumulation – biomagnification and biomonitoring of pollutants.

Environmental impact assessment (EIA) – definition, steps in EIA, method of EIA, problems involved in EIA, reporting (EIS).

Unit III

Trends in human population – urbanization

Remote sensing – aerial photography – satellite images – thermal, infra – red, radar images, ecological applications – resources exploration, understanding environmental factors, predicting natural hazards, ecosystem management.

B. Evolution

Unit IV

Present status of the concept of natural selection – genetical theory of natural selection – evidences for the role of natural selection – mathematical and experimental analysis of selection.

Neo – Lamarckism – present concept of recapitulation – genetic and non-genetic variations – origin and evolutionary significance.

Polymorphism and selection – definitions, transient polymorphism, balanced polymorphism, genetic polymorphism, enzyme polymorphism and selection advantages.

Unit V

Polyploidy and evolution – genetic assimilation – genetic speciation – species concept – isolating mechanisms – evolutionary trends – canalization of selection – orthoselection.

Molecular evolution – gene evolution, evolution of gene families, molecular drive, assessment of molecular variation, punctuated equilibria and neutrality theory.

Molecular phylogenies and evolution – immunologic techniques, amino acid sequences, DNA sequences, nucleic acid phylogenies based on DNA-DNA hybridization and restriction enzymes, combined nucleic acid – amino acid phylogenies – rate of molecular change, molecular clock, regulatory genes and evolution.

Evolution of population – from races to species, adaptation pattern, behavioural adaptations and strategies, sexual competition and selection, isolating mechanisms, mode of speciation, evolutionary rate and punctuated equilibria.

Recommended Text Books :

Environmental Biology :

ODUM, E.P. (1996) Fundamentals of Ecology (III Edn), Nataraj Publishers, Dehradun.
SHARMA, B.K. and KAUR, H. (1997) Environmental Chemistry, Goel Publishing House, Meerut.
TACCONI, L. (2000) Biodiversity and Ecological Economics : Participation, Values and Resource Management. Earthscan Publications Ltd., London.
CASTRI, F.D. and YOUNES, T. (1996). Biodiversity : Science and Development. CAB Int., Wallingford, U.K.

Evolution

STRICKBERGER, M.W. (1996). Evolution. Jones and Barlett publishers Inc., London.
DOBZHANSKY, T., AYALA, F.J., STEBBINS, G.L. and VALENTINE, J.W. (1975). Evolution. Surjeet Publications.

Reference Books :

Environmental Biology

CHAPMAN, J.L., and REISS, M.J. (1997). Ecology – Principles and Applications, CAMBRIDGE University Press, U.K.
CLARK, G.L. (1963). Elements of Ecology, John Wiley and Sons, Inc., New York.

GHOSH, G.K. (1992). Environmental Pollution, Ashish Publishing house, New Delhi.
SHARMA, B.K. and KAUR, H. (1997). An Introduction to Environmental pollution, Goel Publishing House Meerut.
SIMMONS, I.G. (1981). The Ecology of Natural Resources (II Edn), Edward Arnold Publishers Ltd., Bedford Square, London.
KAPOOR, V.c. (1995). Theory and Practice of Animal Taxonomy (III Edn) Oxford and IBH Publishing Co., New Delhi
Global Biodiversity strategy (1992). Report by World Resources Institute (WRI). The Work Conservation Union, and United Nations Environment Programme (UNEP).
SINHA, R.K. (1996) Biodiversity (Global Concerns), Commonwealth Publishers, New Delhi.
SOLBRIG, O.T., VAN EMDEN, H.M., and VAN OORDT, P.G.W.J. (1995). Biodiversity and Global change. CAB International, Wallingford, U.K.
STEAMS, S.C and HEKSTRA, R.F. (2000) Evolution – An Introduction, OUP, London.
MUNN, R.E. (1975) Environment Impact Assessment, Principles and Procedures, John Wiley and Sons, Toronto.
AHMAD, Y.J and SAMMY, G.K. (1985). Guidelines to Environmental Impact Assessment in Developing Countries. Hodder and Stoughton, London.

Evolution

DODSON, E.O. and DODSON, P. (1976). Evolution : Process and Product (II Edn), Van Nostrand Company, New York.
DOWDESWELL, W.H. (1963). The Mechanism of Evolution, Arnold-Heinmann India, Delhi.
JOHA, A.P. (1992). Gene and evolution, The Macmillan Co., New Delhi.
MERREL, D.P. (1962). Evolution and Genetics : The Modern theory of Evolution. Holt, Rinehart and Winston Inc., New York.