Bachelor of Arts and Bachelor of Education

Chhindwara University, Chhindwara (M.P)

COURSE OF STUDIES

For

Four Year Integrated

B.Sc. B.Ed (Eight Semester) Course

EITHGTH SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc Part: Foundation Course Environmental Education	40	10	50	3
Elective I + Practicum	70+50	30	150	9
Elective II + Practicum	70+50	30	150	9
Elective III + Practicum	70+50	30	150	9
Total	400	100	500	
B.Ed Part Vision of Indian Education Issues and Concerns	40	10	50	3
School Management & Leadership	40	10	50	3
Total	**80**	**20**	**100**	
Grand Total	**480**	**120**	**600**	

- Elective 1 – Physics/Botany
- Elective 2 – Chemistry
- Elective 3 – Zoology/Mathematics

(All the elective will have one theory paper and external practical examination except Mathematics where there will be two theory papers and practicum which will be valued internally)

Semester Name	Paper	Marks	Paper Code	Name of Papers
VII	Paper Theory-XIII (Select any one Paper)	35	M-8.1(a) M-8.1(b) M-8.1(c) M-8.1(d) M-8.1 (e)	Elementry Number Theory Dynamics of Rigid Bodies Mathematical Statistics Topology, Tensor And Riemannian Geometry Numerical Analysis and C Language
	Paper Theory-XIV (Select any one Paper)	35	M-8.2 (a) M-8.2 (b) M-8.2 (c) M-8.2 (d) M-8.2 (e)	Hydrostatics Operation Research Discrete Mathematics Differential Geometry Probability Theory
	Internal Test	30		Related to above Papers
	Project, Practical/Dissertation	50		Project, Practical/Dissertation Mathematics

B.Sc. Component:

Foundation Course: Environmental Education

Paper II

Contact Periods/week: 03

Maximum Marks - 40

Min. Pass Marks – 13

Internal - 10

Distribution of Marks

All five units are compulsory. Two questions to be set from each unit, one to be attempted.

Objectives:

(i) To provide an understanding to the students about basic aspects of the environment and its concerns.

(ii) To generate awareness about the social issues of the environment.

(iii) To enable the students to analyse, evaluate and draw inferences about problems and concerns related to environment.

(iv) To create awareness about the legal framework for protection of environment and wild life.

Unit I

Ecosystems: Concept, structure and function of an ecosystem. Producers, consumers and decomposers. Ecological succession; Energy flow in the ecosystem; Food chains, food web and Ecological pyramids. Biogeochemical cycles: Oxygen, Carbon, Nitrogen and Phosphorus.

Unit II

Introduction, types, characteristic features, structure and function of the following Ecosystem: Forest, Grassland, Desert ecosystem. Aquatic ecosystems (Ponds, streams, lakes, rivers, ocean, estuaries)

Unit III

Biodiversity and its conservation: Introduction, definition, genetic, species, and Ecosystem diversity.Biogeographical classification of India; Value of biodiversity, consumption and productive use; Social, ethical and aesthetic values.

Unit IV

Biodiversity at global, national and local levels: India as a mega-diversity nation; Hot spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India; Conservation of biodiversity: In situ and ex situ conservation of biodiversity

Unit V

Environmental Pollution: Definition, cause, effects and control measures of - Air pollution, water pollution, marine pollution, noise pollution, thermal pollution and radioactive pollution Nuclear hazards. Solid waste management: cause, effects and control measures of urban and industrialwastes; Role of an individual in prevention of pollution; Pollution case studies;Disaster management :

Floods, earthquakes, cyclone and land slide. Human population and the environment Populationgrowth, population explosion, family welfare programme , variation among nations. Effects environment on human health.

FIELD WORK

1. Visit to local area to document environmental assets-rivers, forests, grasslands, hills, and mountains.
2. Visit to local polluted site – Urban, rural, Industrial and agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystem-pond, river hill slopes, etc. (Field work equal to 5 lecture hours)

Suggested Readings

1. Asthana D.K. and Asthana Meera. 2006 A Textbook of Environmental Studies S.Chand & Co. New Delhi.
2. Purohit, S.S. and Ranjan, R. 2005 Ecology, Environment and Pollution, Agrobios, Jodhpur.
3. Alma Peter 1993 Environmental Concern, Cambridge University Press.
4. Chadha S.K. 1992 Environmental Crisis in India. International Book Distributors Dehradun.
5. Saveland R.N. 1976. Handbook of Environmental Education. John Wiley & Sons. London.
6. Wright, Richard T and Nebel, Bernard J. 2002 Environmental Science: Towards Sustainable future, Prentice Hall, New Delhi.
7. Abbasi, S.A. 1998: Environmental Everyone Discovery Publishing House, New Delhi.
8. Saxena,A.B. and Anand, V.V. 008 : Essentials of Environmental Education, H.P Bhargava Book House, Agra.
9. Saxena A.B. 1969: Education for Environmental Concerns Radha Publications New Delhi.
10. Bharucha, E. 2005: Textbook of Environmental Studies. Universities Press. New Delhi
11. Sodhi G.S. 2005: Fundamental Concepts of Environmental Chemistry Narosa Publishing House, New Delhi.
12. Chapman, J.L. & Reiss, M.J. 2004. Ecology Principles and Applications. Cambridge University Press.

Elective I – PHYSICS

Paper VII: Atomic, Molecular and Nuclear Physics

Contact Periods/Week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (External)

Note – At least one question will be set from each unit. 20% of maximum marks will form simple numerical problems and another 20% would be for objective questions with a provision to provide reasoning. All questions will have 100 % internal choice

Objectives: After completion of this course the students will be able to

1. Understand the spectra of hydrogen and the fine structure of spectral lines.
2. Understand Raman Effect and its applications.
3. Understand various spectroscopic techniques.
4. Understand various efforts made by physicists to know about the constituents of the nucleus.
5. Understand nuclear forces and binding of nucleus.
6. Understand the use of nuclear accelerators and detectors.
7. Understand various types of elementary particles, forces of nature

Unit-1: Atomic Physics

Spectra of Hydrogen and alkali atoms, spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules.

Singlet and triplet fine structure in alkaline earth spectra, LS and JJ coupling, Fermi Golden rule.

Unit-2: Molecular Spectra

Discrete set of electronic energies of molecules, quantization of vibrational and rotational energies, determination of inter nuclear distance, pure rotational and rotational - vibrational spectra, dissociation limit for ground and other electronic states, transition rules for pure vibration and electronic vibration spectra.

Raman effect, stokes and anti-stokes lines, complementary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy, ideas about spectroscopic techniques.

Unit-3: Structure of Nucleus

Basic nuclear properties - size, binding energy, angular momentum parity, magnetic moment, semi empirical mass formula and application, magnetic moment and non central forces. Meson theory of nuclear forces, salient features of nuclear forces, liquid drop model & shell model of the nucleus - success and limitations.

Alpha decay, Geiger-Nuttal law, Fermi's theory of beta decay, violation of parity in beta decay and continuous and discrete spectra, gamma decay and internal conversion.

Unit-4: Nuclear Detectors and Accelerators

Interaction of charged particles and neutrons with matter, working of nuclear detectors, GM counter, proportional counter and scintillation counter, cloud chamber, spark chamber, emulsion detector. Survey of particle accelerators, cyclotron, synchrocyclotron, betatron, betatron.

Unit-5: Particle Physics and Nuclear Phenomena

Classification of elementary particles, anti particles and muons and their interactions conversion laws, quark structure of hadrons, field quanta of electro weak and other interactions, the W-Z particles,

conservation laws.

Q-value of nuclear reactions, nuclear fission and fusion, energy production in stars, nuclear reactors.

Suggested Readings

- Goyal, R.P, Unified Physics, Shivlal Agrawal and Co., Indore.
- Freedman and Young, University Physics, Addison-Wesley
- Sharma, R.C., Nuclear Physics, K. Nath and Co., Meerut.

Physics Practical List

1. To study the nuclear disintegration using GM counter
2. To determine the resistivity of given sample Ge/Si using four probe method

Projects: Innovative approach to experiments

Instructions for students

1. Choose an experiment you want to conduct in a project mode-get allotted.
2. Write its objectives to make it open ended.
3. Collect literature relevant to it.
4. Collect and sequence all materials for conducting it

5. Formulate hypothesis.
6. Envisage process to attack problems and verify hypothesis.
7. Conduct experiments.
8. Tabulate observation for each objective separately.
9. Plot graphs for finding any relationships.
10. Infer from graphs.
11. Discuss reliability of result.
12. Make error analysis.
13. Write questions that need to be answered on the project.
14. Whether the stated objectives have been realized or not. If not what were constraints (sources of error).
15. Number of consultation done with the teacher, experts and peer group about the project.
16. Write utility and scope of your investigation.
17. Provide references and acknowledgement.
18. Submit project by 15 march of each session.

Topics for suggestive projects (interdisciplinary projects are welcome)

1. communication electronics.
2. nano technology
3. superconductivity
4. projects based innovative experiments like half life simulations, galileo experiment, cart experiment, projectile motions, head on collision, rutherford scattering.
5. atmospheric physics
6. plasma physics
7. biophysics
8. design of power supply.

Elective I – BOTANY

Paper VII: Ecology and Improvement of Plant Resources

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (External)

NOTE: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives :

- To enable the student teacher to understand the plants in relation to their environment.
- To provide an understanding for the improvement of plants by different methods.

Unit I: Plants and environment :

Atmosphere (gaseous composition), water (properties of water cycle), light (global radiation, photo synthetically active radiation), temperature, soil (development, soil profiles physicochemical properties) and biotic factors. Morphological anatomical and physiological responses of plants to water (hydrophytes and xerophytes), temperature (thermo periodicity) and vernalization), light (photoperiodism, heliophytes and sciophytes) and salinity.

Unit II:

Population ecology	:	Growth curves, ecotypes and ecads.
Community ecology	:	Community characteristics, frequency, density, cover, Raunkiar's life forms, biological spectrum; ecological succession.

Unit III: Ecosystems :

Structure, abiotic and biotic components; food chain, food web. Ecological pyramids, energy flow; biogeochemical cycles of carbon, nitrogen and phosphorus.

Unit IV

Biogeographically regions of India, vegetation types of India with special reference to Madhya Pradesh and Chhattisgarh, National Parks in M.P. and Chhattisgarh, endangered plant sp. in and their conservation.

Unit V : Improvement of Plants :

Plant breeding, nature scope and methods of plant breeding.

G. Gulati
Dean

Breeding for disease resistance.

Vegetative propagation methods, micro propagation, grafting and their economic aspects

PRACTICAL

Objective – To develop the skill of performing practical of ecology, collection of data, analysis of data and its interpretation

Practical:

1. Frequency, density and abundance of plant their in grassland ecosystem.
2. Frequency, density and abundance of plant in pond ecosystem.
3. Photo sociological study of vegetation of Shyamala Hills
4. Determine pH of water from various sources.
5. Determine the pH of Soil.
6. Estimation of biomass (Dry weight/fresh weight) of plant species.
7. BOD/DOD of plant system.
8. Emasculations of flower and Hybridization.
9. Grafting and Layering.

SCHEME OF EXAMINATION (Suggestive -Max. Marks: 25)

1. To conduct an Experiment 10
2. To analyse and interpret the given data 05
3. viva-voce 05
4. Practical Records 05

PROJECT (Internal)

Objective: To develop the skills of designing an experiment, collection of data, and its interpretation for making generalization/testing of hypothesis.

List of Suggestive Projects

1. Acquaintance with the local herbaceous flora and an ecological note about them
2. Preparation of inventory of tree species of RIE Campus.
3. Listing of soil types in relation to altitude from Shyamla Hills.
4. Enumeration of physical and chemical attributes of soil samples from Shyamla Hills and their relevance to the vegetation.
5. Listing of ephemerals from Van Vihar.
6. Phytosociological study of vegetation of Shyamla Hills in terms of density, frequency, abundance of important species.

7. Preparation of Raunkiar's frequency classes of an area

SCHEME OF EXAMINATION (Suggestive -Max. Marks: 30)

1. Project proposal and presentation	5
2. Project work in lab/field	5
3. Project report	10
4. Viva-voce on the project	10

Suggested Readings

- Kumar, H.D. Modern concepts of Ecology 1992. Vikas Publishing House, New Delhi
- Koromondy, E.J. 1996. Concepts of Ecology Prentice Hall of India Ltd., New Delhi
- Odum, E.P., 1983, Basic Ecology Saunders, Philadelphia
- Ganguly, A.K. and Kumar, N.C. Cytology, Genetics Plant Breeding and Organic Evolution Emkay Publications Delhi – 110051
- Singh B.D. 1997 Plant Breeding
- Gupta, S.K. 2000, Plant Breeding Agrobios Jodhpur
- Ambasht, R.S. 2001, A Text Book of Ecology Student's Friends & Co. New Delhi
- Shukla, S. and Chandel P.S. 2005, A Text Book of Plant Ecology. S. Chand & Co. New Delhi

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Elective II – CHEMISTRY

Paper VII

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (Theory)

NOTE: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives:

After completing this semester the students should be able to:

(i) Get a comparative idea of the concepts involved in classical mechanics and quantum mechanics.

(ii) Learn the origin of Schrödinger wave equation and its application in calculating the energy and wave functions of various atomic and molecular systems.

(iii) Appreciate to learn the quantum mechanical explanation of the concept of hybridization.

(iv) Assess the various interplay regions of electromagnetic radiations and their interaction with molecular rotational, vibrational and electronic energies.

(v) Get knowledge about NMR spectroscopy technique in elucidation of the structure of organic compounds and solve problems pertaining to elucidation of structures.

(vi) Utilize spectroscopic techniques in the elucidation of molecular structure.

(vii) Get acquaintance with the subject of photochemistry and make a comparative study about thermal and photochemical reactions.

(viii) Appreciate to learn different photo-physical processes responsible for some interesting phenomenon like fluorescence and phosphorescence.

Instructional Strategy:

In dealing with quantum mechanics, the teachers should impress upon the students the role of mathematical modelling in transaction of concepts in physical sciences. The MO theory may be transacted with the help of computer technology. Alongwith theoretical classroom discussions, to effectively teach the spectroscopy ideas a visit to a nearby instrumental laboratory may be fruitful. The technique of open-ended learning may be encouraged in giving treatment to the subject of photochemistry. Students may be encouraged to take some project work on the study of properties associated with the substances as they effect molecular mass calculation and elucidation of structures. The idea of individual learning may be encouraged for some concepts of electrochemistry.

UNIT – I

Elementary Quantum Mechanics: Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect. De Broglie Hypothesis, the Heisenberg's uncertainty principle. Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.

Molecular orbital theory, basic ideas-criteria for forming M.O. from A.O., construction of M.O.'s by LCAO-H2 + Ion, calculation of energy levels from wave functions, physical [illegible] of bonding and antibonding wave functions, concept of □, □*, □, □* orbitals and their

characteristics. Hybrid orbitals –sp, sp2, sp3-, calculation of coefficients of A.O.'s used in these hybrid orbitals.

Introduction to valence bond model of H2, comparison of M.O. and V.B. models.

UNIT – II

Spectroscopy: Introduction: electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum: Diatomic molecules, Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

Vibrational Spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, Idea of vibrational frequencies of different functions groups Finger print region, IR spectra of simple organic compounds.

Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle.

Qualitative description of □,□ and □M.O., their energy levels and the respective transitions. Application of UV- Visible absorption spectroscopy in structural determination-absorption law(Beer –Lambert law),molar absorptivity,types of electronic transition,effect of conjugation,chromophores&auxochromes,bathochromic,hypsochromic,hyperchromic&hypochromic shifts.UV –spectra of ene and enones.woodwardfischerx rule.

UNIT – III

Spectroscopy: Nuclear magnetic resonance (NMR) spectroscopy.

Proton magnetic resonance (1H NMR) Spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1, 2- tribromoethane, ethyl acetate, toluene and acetophenone

Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

UNIT – IV

Photo Chemistry: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Draper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions energy transfer processes (simple examples).

UNIT – V

Heterocyclic Compounds: Introduction: Molecular orbital picture and aromatic character of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophillic substitution.Mechanism of nucleophilic substitution reaction in pyridine derivatives.Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles.Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraupsynthesis and Bischler-Napieralski synthesis.Mechanism of electrophilic substitution substitution reactions of indole, quinoline and isoquinoline.

Organic Synthesis via Enolates: acidity of D-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate, the Claisen Alkylation of 1, 3-dithianes Alkylation and acylation of enamines

Suggested Readings:

1. Chandra ,A.K., Quantum Chemistry TMH Publication
2. . Levine, I.N., Quantum Chemistry, Prentice Hall of India Pvt. Ltd.
3. Banwell, C.N., Spectroscopy , TMH Publication
4. Sharma ,Y.R., Elementary Organic Spectroscopy , S. Chand & Company
5. Glasstone, S. Theoretical Chemistry, East-West Publication
6. Puri, Sharma &Pathania, Physical Chemistry, SohanLalNagin Chand & Company
7. Atkins, P.W., & Paula, J.D., Physical Chemistry , Oxford Press
8. Vemulapalli , G.K., Physical Chemistry , Prentice Hall of India Pvt. Ltd.
9. RohtagiMukherjee ,K.K., Photochemistry , Wiley Eastern Ltd.
10. Barrow ,G.M., Physical Chemistry ,McGraw Hill Kogakusha Ltd. Tokyo 4th Edition 1979

Elective III – ZOOLOGY

Paper VII: - ECOLOGY, ETHOLOGY AND APPLIED ZOOLOGY

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (Theory)

NOTE: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives: To develop skill of analysis of behavioural patterns of animals and their place in the ecosystem and to utilize the various biotic components in a practical manner for economic purposes.

Unit-1

1. Concept and ideas of ecology; scope ecology, autecology, synecology, habitat and ecological niche, habitat ecology – aquatic and terrestrial.
2. Concept of ecosystem, different types of ecosystem, structure and function of ecosystem, some major ecosystems, energy flow in an ecosystem
3. Food chains, food webs and ecological pyramids
4. Population Ecology – Definition and characters of population, population density, natality, mortality, age distribution, biotic potential of population, population dispersal
5. Biogeochemical cycles: patterns and basic types of biogeochemical cycles, cycling pattern in ecosystem like carbon, phosphorus, nitrogen cycle.

Unit-2

1. Community Ecology- Concept of biotic community, community structure, analytical and synthetic characters of community
2. Ecological Succession: Causes, basic types, general process
3. Biodiversity Conservation: Definition, types, value and importance
4. Hotspots of biodiversity, Megabiodiversity nations, conservation of biodiversity (Ex situ and In situ conservation strategies)
5. Forest Resource: types and importance of forest: Forest resources of India Deforestation effects of Deforestation, Management and conservation of forest

Unit-3

1. Environmental pollution- concept of pollution and contaminant: Primary and secondary pollutants, Air pollution- Definition, sources and effects. Soil pollution- Definition, sources and effects.
2. Water Pollution- Definition, sources and effects. Noice Pollution- sources and effects Pesticides- Definition, Categories, general effects, Heavy metals- Definition, examples, general effects.
3. Basic idea about acid rain, green house gases and their effects, ozone hole, eutrophication, bioaccumulation, biomagnifications
4. Toxicology- Basic concepts, Types of Toxicants, Toxicity testing, LC 50, LD 50, acute and chronic toxicity.
5. Pesticide and their toxicological effects, dose-response relationship categories of toxic effects.

Unit-4

1. Animal behavior: Introduction to Ethology.
2. Patterns of behavior (taxes, reflexes, instinct and motivation)
3. Biorhythms; learning and memory
4. Migration of fishes and birds, social behaviour in animals.
5. Courtship and reproductive Behaviour.

Unit-5

1. Aquaculture and pisciculture
2. Sericulture.
3. Apiculture.
4. Lac-culture.
5. Control of insect pests (Biological and Chemical)

PRACTICAL

Objective – To make students develop skills of maintenance of components of ecosystem in an artificial condition and to take initiatives to analyse the environment and organism to understanding the practical aspects of life.

Mandatory Class Work Experiments:

1. Study of museum specimen of fresh water edible fishes, honey bee and prawn
2. Study of pH of water and soil.

3. Maintenance of aquarium.
4. Study of plankton-Euglena, Paramecium, Cyclops, Mysis, Daphnia and other Planktons in water.
5. Analysis of DO, COD, BOD in water samples.
6. Analyses of chloride, lead, carbonate, zinc ions etc. in water samples.
7. Study of biodiversity through quadrate method.
8. Calculation of Shannon-Weiner index.
9. Toxicity testing through LD50 and LC50 method.
10. Experimentation on learned behaviors of animals

(eg: light sensitivity in earthworms, olfactory senses in Drosophila sp.)

Individual Project Submission:

Aim: to develop the skill of data collection, hypothesis and generalization and analysis interpretation of data (related to syllabus of all semesters).

SCHEME OF EXAMINATION (Suggestive)

1. Experiment 1 (Ecology)	09
2. Experiment 2 (animal behaviour/Toxicity testing)	06
3. Spotting	05
4. Study of planktons	02
5. Practical Records	03
6. Project submission and viva-voce 25	

Total = 50 Marks

Suggestive books -:

1. Fundamental of Ecology-E.P.Odum,W B.Saunders Com., 3 rd Edition
2. Environmental Biology, Biswarup Mukherjee, Tata McGrew-Hill Publishing Com. Ltd.
3. A Textbook of Environment, K.M Agarwal, P.K Sikdar & S.C.Deb. MacMillan India Ltd.
4. Concepts of Ecology, Edward J Kormondy Prentice- Hall of India Pvt.Ltd., New Delhi
5. Introduction to Environmental science, Y Anjaneyulu, B.S Publishing Com. Ltd
6. Principles of Animal Taxonomy, G.G simpson, Columbia University press
7. Environmental Science- A Global concern, William P Cunningham, Barbara Woodworth saiga, WCB McGrew-Hill
8. Principles of Systematic Zoology, Mayur.McGrew-Hill Publishing Com. Ltd.

9. Environmental Science. Richard T Wright. Pearson, Prentice Hall
10. Environmental Science; Earth as a Living Planet. Daniel B Botkin & Edward A Keller. John Wiley & sons,Inc.
11. Elements of Ecology, Clerke. John, Wiley & sons
12. Environmental Studies, A.K. De. Age International Pvt.,Ltd
13. Environmental Chemistry, New A.K De. New Age International Pvt.,Ltd
14. Aquaculture
15. A Manual of fresh water aquaculture
16. Aquaculture
17. Tropical Fish Farming
18. Fishes of India
19. Introduction of Fishes
20. Applied Entomology
21. Pest Control and its ecology
22. Laboratory Techniques in Modern Biology

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 35+35=70
Min. Pass Marks – 23
Internal – 30
Practicum – 50 (Internal)

(One each to opt. out of M-8.1 and M-8.2)

M — 8.1 (a) ELEMENTARY NUMBER THEORY

NOTE : Two questions will be set from each unit with Internal choice.

Objectives : To develop the understanding of Elementary Number Theory

Unit — I Division algorithm. Congruences and modular arithmetic.G.C.D.

Unit — II The Diophantine equation ax+by = c Chinese remainder theorem. Euler phi function. Primes and factorization. Fermat's and Wilson's theorem

Unit — III The order of integer modulo n. Primitive-roots for primes Composite number having primitive roots Quadratic law of reciprocity, and its application.

Unit — IV Arithmetical functions. Mobius inversion formula. Numbers of special form- perfect numbers, Mersenne primes, Fermat numbers.

Unit — V The Diphantine equations x2 + y2 = z2, x4 + y4 = z2. Farey sequences.

Content as in

David M. Burton : Elementary Number theory Wm C.Brown Publishers

M — 8.1(b) DYNAMICS OF RIGID BODIES

NOTE : Two questions will be set from each unit with Internal choice.

Unit — I Moments and products of inertia. The momental Ellipsoid. Equimomental Systems. Principal axes.

Unit — II D' Alembert's principle. The general equations of motion of a rigid body. Motion of the center of inertia and motion relative to the center of inertia.

Unit — III Motion about a fixed axis. The compound pendulum. Center of percussion.

Unit — IV Motion of a rigid body in two dimensions under finite and impulsive forces.

Unit — V Conservation of Momentum and Energy. Lagrange's equations. Initial Motion.

Content as in : S.L. Loney: An Elementary Treatise on the Dynamics of a particle and rigid Bodies Cambridge Univ. Press

M — 8.11 MATHEMATICAL STATISTICS

NOTE : Two questions will be set from each unit with Internal choice

Unit — I Probability: Independent and dependent events, conditional probability. Addition and multiplication theorems, Bayes theorem, Random variables – Discrete and continuous variates and their distributions.

Unit — II Binomial, Poison, rectangular, exponential and normal distributions, their derivations, properties and uses.

Unit — III Methods of least squares, curve fitting, co-relation and regression (two variates only)

Unit — IV Partial and multiple co-relation, regression (upto three variates only).

Unit — V Sampling, Null and Alternate hypotheses, errors of first and second kind, level of significance, critical region, one-tailed and two - tailed tests. Test of significance based on Chi-square (goodness of fit and test of independence)

't' and 'F' (to test equality of several means) statistics

Content as in

S.C. Gupta, V.K. Kapoor "Fundamentals of Mathematical statistics"

M — 8.1(d) TOPOLOGY, TENSOR AND RIEMANNIAN GEOMETRY

NOTE : Two questions will be set from each unit with Internal choice

Unit -1 Topology: Topological spaces, Comparison of topologies, close set, Neighborhood, Basis for a topology, limit points, Adherent points and derived set, interior, exterior and frontier of a set.

Unit- 2 Continuity in topological space, compact space, Heine-Borel theorem, connected space.

Unit- 3 TENSOR ALGEBRA- Space of N-dimension, Subspace, Curve, Summation convention, Kronecker delta, Transformation of coordinates, Summation of convention, Indicial (or range) convention, Dummy suffix, Contravariant and covariant vectors (Tensor of first order), Tensor of second order (or rank two), Tensor of higher rank (or higher order), Invariant of Scalar, Addition ad subtraction of tensors, Multiplication of Tensor, Contraction, Inner Product, Symmetric Tensor, Skew-symmetric Tensor, Quotient law, Conjugate (or Reciprocal) symmetric tensor, Relative tensor, Tensor field, Christoffel's Index

Unit- 4 Riemannian Geometry: Riemannian metric, Magnitude of a Vectors, Length of a Curve, Unit Tangent Vector, Associated Vectors, Angle between two vectors, Conjugate or Reciprocal Symmetric Tensor, Law of Covariant differentiation of Tensor, Divergence of a Tensor, Curl of a Tensor, Ricci's Theorem, Curvature Tensor or Riemannian Christoffel Tensor, Ricci Identity, Bianchi's Identity, Ricci's Tensor, Riemannian christoffel's Tensor of first kind or Associative Curvature tensor or Covariant Curvature tensor,

Unit- 5 Riemannian manifold or Riemannian space, Curvature of a curve, Derived vector, Geodesics and related theorems, Geodesic mapping, Gradient, Weyl's Curvature tensor or Projective Curvature Tensor, Geodesic Coordinate, Riemannian Coordinates, Riemannian curvature, Einsteen space, Flate space, Schur's theorem, Weyl's Tensor, Fundamental theorem of Riemannian geometry.

Content as in :

G.F. Simons	-	Topology and Modern analysis
J.N.Sharma	-	Topology
James R. Munkres	-	Topology —A First Course

M — 8.1(e) NUMERICAL ANALYSIS AND 'C' LANGUAGE

NOTE : Two questions will be set from each unit with Internal choice

Unit — I Programme's model of a computer, Algorithms, Flow Chart, Data Types. Arithmetic and Input/output instruction, overview of C++ programming style Constant, variables, and data type, operations and expressions, Managing Input and Output operations. Decision making and Branching. Decision making and Looping, Arrays, Handling of Character and strings, File formatting.

Unit — II Interpolation: Lagrange and Hermite. Interpolation. Divided Differences. Difference Schemes, Interpolation Formulae using Differences. Solution of Non-linear Equations- Bisection, Secant, Regula Falsi, Newton's Method. Roots of Polynomials.

Unit — III Numerical Quadrature: Newton – Cote's Formula, Gauss Quadrature Formula ,Chebyshev's Polynomials.

Unit — IV System of Linear Equations: Direct Methods for solving system of Linear Equations – Gauss Elimination, LU Decomposition, cholesky Decomposition Iterative Methods Jacobi, Gauss- seidel, Relaxation Methods.

Unit — V Ordinary Differential Equations - Euler Method, Single step Methods, Runge Kutta's Method, Multistep Methods, Milne simpson's Method, Methods based on Numerical Integration, Methods Based on Numerical Differentiation Eigenvalue Problems.

Content us in :

S.S. Sastry: Introductory Methods of Numerical Analysis

M — 8.2 (a) HYDROSTATICS

NOTE : Two questions will be set from each unit with Internal choice

Unit — I Pressure equation, Condition of equilibrium, Lines of Force, Homogeneous and heterogeneous fluids, Elastic fluids.

Unit — II Surface of Equal pressure, Fluid at rest under action of gravity, Rotating fluids.

Unit — III Fluid pressure on plane surfaces, Centre of pressure, Resultant pressure curved surfaces.

Unit — IV Equilibrium of floating bodies, Curves of buoyancy, Surface of buoyancy, Stability of equilibrium of floating bodies, Meta center, Workdone in producing a displacement, Vessel containing liquid.

Unit — V Gas laws. Mixtures of gases. Internal energy. Adiabatic expansion. Work done in compressing a gas. Isothermal Atmosphere. Convective equilibrium

Content as in : W.H.Besant and A.S. Ramsey : A treatise on Hydromechanics Part I ELBS.

M — 8.2 (b) OPERATION RESEARCH

NOTE: Two questions will be set from each unit with internal choice

Unit — I Introduction to Operations Research. The linear programming problem. Problem formulation. Linear programming in matrix notation. Graphical solution of linear programming problems.

Unit — II Some basic properties of convex sets, convex functions and concave functions. Theory and application of Simplex method of solution of a linear programming problem.

Unit — III The transportation and Assignment problems.

Unit — IV Charne's M-Technique. The two phase method .Principle of duality in linear programming problem. Fundamental duality theorem. Simple problems.

Unit — V Game theory –2 persons zero sum games

Content as in : Operations Research — Man Mohan Singh

Operations Research — S.D. Sharma

M — 8.2 I DISCRETE MATHEMATICS

NOTE: Two questions will be set from each unit with Internal choice

Unit — I Sets and Propositions — Cardinality. Mathematical Induction. Principle of inclusion and exclusion. Computability and Formal Languages – Ordered sets. Languages, Phrase Structure Grammars. Types of Grammars and Languages.

Unit — II Relations and Functions – Binary Relations. Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle.

Unit — III Graphs – Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Travelling Salesman Problem.

Unit — IV Planar Graphs. Trees.

Unit — V Analysis of Algorithms – Time complexity of Problems. Discrete Numeric Functions and Generating Functions. Recurrence Relations and Recursive Algorithms – Linear recurrence Relations with constant coefficients.

Homogenous solutions. Particular solutions Total solution. Solution by the method of Generating Functions.

Content as in :

1. C.L. Liu
   - Elements of Discrete Mathematics
   - Discrete Mathematics and its applications.

M — 8.2 (d) DIFFERENTIAL GEOMETRY

NOTE : Two questions will be set from each unit with internal choice

Unit — I Local theory of curves. Space curves. Examples. Planar curves. helices. Serret Frenet appuratus. Existence of space curves. Involutes and evolutes of curves

Unit - II Global curve theory – Rotation index, convex curves. Isoperimetric, inequality. Four vertex theorem.

Unit — III Local theory of surfaces – Parametric patches on surface. First fundamental form and are length. Normal curvature, Geodesic curvature and Gauss formula shape operator LP of a surface at a point. Vector field along a curve, second and third fundamental forms of a surface, Weiengarten map.

Unit — IV Principal curvatures, Gaussian Curvature. Mean and normal curvatures, Gauss theorem, Isometry groups and the fundamental existence theorems for surfaces.

Unit — V Global theory of surfaces –Geodesic coordinate patches. Gauss Bonnet formulae, Euler characteristic of a surface, Index of a vector field, spaces of constant curvature.

Content as in

T.J. Willmore . An introduction to Differential and Riemann Geometry.

M — 8.2 (e) PROBABILITY THEORY

NOTE : Two questions will be set from each unit with internal choice

Unit — I Notation of probability, Random experiment, Sample space, axiom of probability, elementary properties of probability, equally likely outcomes. conditional probability, Bayes theorem. Independence, Geometric Probability

Unit — II Random variables. Concept. Cumulative distribution function, discrete and continuous random variables, expectations, mean, variance, moment generating function.

Unit — III Discrete random variable, Bernoulli random variable, binomial random variable, geometric random variable, Poisson random variable.

Unit — IV Continuous random variable. Uniform random variable. Exponential random variable, Gamma random variable, normal random variable

Unit — V Bivariate random variable. Joint distribution, joint and conditional distribution, the correlation coefficient.

Content as in

1. R.V. Hogg and A.T. Craig : Introduction to Mathematical Statistics
2. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics.

M — 8.3 Project, Practical / Dissertation in Mathematics

List of Activities:

- Project, Practical / Dissertation related to Mathematics
- Mathematics seminar.

Education Component:

Vision of Indian Education: Issues & Concerns

Contact Periods/week: 03

Maximum Marks – 50

Min. Pass Mar[illegible] – 1[illegible]

Internal – 10

Objectives:

After the completion of the course Pupil-teachers will:

- Appreciate Constitutional ideals and values and reflect critically on the [illegible] education in realizing those ideals
- Identify and Internalize Values of New Social order envisioned and enshrined in Indian Constitution
- Understand the diverse and complex nature of Indian Society
- Appreciate that the Indian nation is in the process of making
- Reflect on inherent contradictions present in India
- Develop critical faculty in realizing and interpreting the nature of Indian Schooling
- Develop perspective on issues and concerns of Indian schooling
- Become sensitive towards child rights and classroom practices

Unit-I: Understanding India : Indian Constitution: Concern for New Social Order

- Constitution and Preamble: National Ideals

- Equality,
- Liberty,
- Secularism, and
- Social Justice.

- Constitutional provisions on education that reflect these ideals: Implicit conc[illegible] issues
- India as a Society: Socio-economic, cultural, linguistic and regional framework
- India as an evolving Nation state: Vision, Nature and Salient Features
    - Democratic polity,
    - Federal structure.
- Implications to Educational arrangements and responsibility
- India as Developing Economy: Salient features and contradictions
    - Development and Displacement,
    - Development and environmental degradation,
    - Growing incomes and widening inequalities.
- Facets/sectors of Indian economy: Agriculture, Industrial and Service
- India as Knowledge economy
- Implications to education

Unit-II: Education as Fundamental Right: Practices of Indian Schooling

- Child Rights: International Covenants and Indian Constitutional Provisions
- Rights of Girl Child
- Education as a Fundamental Right of Children
- Universalisation of School Education
- Equalization of Educational Opportunities
- Problematization of Indian schooling in understanding the apparent contradictions/ Paradoxes of universality and equality.
    - Private-public schools
    - Urban –rural schools
    - Centre-state schools
    - Many other forms of in-equalities in Indian Schooling
- Schooling and Access: Physical, Epistemological, and Cultural Access
- Issue of enrollment, retention and success: Sociological analysis

Unit III Secondary Education: Status, Issues and Concerns

- Concept of Secondary Education
- Secondary School: its linkages with primary and higher secondary stages of education
- Aims of Secondary Education with special reference to Secondary Education Commission 1954
- Universalization of Secondary Education, status and issues
    - Quantitative Expansion
    - Qualitative Consolidation
    - Equity Perspective—A Sociological Understanding
    - Skill development and Vocationalization
    - Privatization

Unit IV: Guidance and Counseling

- Guidance –concept, need and principles
- Counseling concept, need and principles
- Guidance-Types- Educational, Vocational, and personal
- Educational guidance-nature, scope and approaches
- Vocational guidance-nature, scope and approaches
- Personal guidance-nature, scope and approaches
- Role of teacher in Guidance and Counseling

Transactional Modes:

The transactional/construction modes of the course work may consist of:

- Lecture-cum discussions.
- Extended reading of certain required portions from Indian constitution and UN conventions on Human Right and Child Rights.
- Observational studies.
- Analysis of education data.

(Practicum on Forms of inequalities and their reflection in Education- A critical study)

(To situate and understand contradictions/paradoxes of economy a Case study/project work on Big Dams or SEZ and any other pressing economic issues may be undertaken.) (Critical study of alternative schooling in the light of education as a fundamental right of every child)

Suggested Readings:

1. Avijit Pathak (2004). Social Implications of Schooling: Knowledge, Pedagogy & Consciousness, Rainbow Publishers, New Delhi.
2. Baxi, Upendra (1995). The Human Rights Education: The promise of the Third Millennium, New Delhi.
3. Dube, S.C. (2005). Indian Society, National Book Trust of India, New Delhi.
4. Kumar, Krishna, (1991). The Political Agenda of Education: A Study of Colonial & Nationalist Ideas, Sage Publication, New Delhi.
5. Levin, Leah, (1998). Human Rights-Questions and Answers, New Delhi.
6. Naik, J.P. (1975). Equality, Quality and Quantity: The Elusive Triangle in Indian Education, Allied Publishers, Bombay.
7. Nehru, Jawaharlal (1989). The Discovery of India, Oxford University Press, Delhi.
8. PROBE Team, (1999). Public Report on Basic Education in India, New Delhi, Oxford University Press.
9. Sharma, S.K. (1998). Children and The Human Rights, New Delhi.
10. Tawney, R.H. (1964). Equality, Unwin Books, London

School Management & Leadership

Maximum Marks – 40

Contact Periods/week: 03

Min. Pass Marks – [illegible]

Internal – [illegible]

Objectives:

After completing this paper, student- teachers will be able:

- To develop understanding about the basic concepts and process of school management.
- To understand different components of school management.
- To realize the multifaceted role of a teacher/head teacher.
- To develop the understanding about different school managements in India.
- To develop understanding about the role of different agencies in school management.
- To understand and appreciate the process of becoming an effective teacher.
- To understand the role of individuals as followers and leaders within organizations.
- To critically examine the core and contemporary leadership theories relevant to school practice and settings.

- To sensitize the students about new changes and challenges in leadership of institutions
- To develop capacities for being efficient and effective educational leaders.
- To enable them to recognize the importance of management of resources and effective use of ICT in the context of school management.

Course Content:

Unit I: School management and its Components

1.1 Meaning, scope and process of school management.

1.2 Characteristics of Successful School Management.

1.3 Role of the Head master, Teacher and students

1.4 Managing internal organization: Curricular and co- curricular activities

Unit II: School as an Organization

2.1 School Organization: Meaning, Aims and Objectives

2.2 Resource Requirements of School. i.e., Physical, Human and Financial Resources

2.3 Schools under Different Managements –

i) Government - Central, State and Local Bodies.

ii) Private – Aided and Unaided.

2.4 Study of Specific Managements –

i) Residential Schools Run by Social Welfare Corporations

ii) Navodaya Vidyalayas/ Kendriya Vidyalayas / Sainik Schools /Railway Schools and Public Undertaking

iii) National / State Open Schools

UNIT III: School Leadership

3.1 Meaning and Nature of leadership

3.2 Theories of Leadership

3.3 Leadership traits: Responsible, self- disciplined, innovative, imaginative, visionary

3.4 Leadership skills: Decision making, Planning, Coordinating, Communicating Evaluating and Feed Back

3.5 Styles of Leadership: Autocratic, Democratic and Laissez-faire

UNIT IV: Dimensions of leaderships: Challenges and Perspectives

4.1 Responsibilities of leaders: Supervision as leadership, Leadership for the learning community, Leading and managing educational change and improvement

4.2 Obstacles to leadership: Resources and priorities, political pressure, social pressure and personal antagonism

4.3 Issues of diversity in educational organizations, including issues related to gender and multiculturalism

4.4 ICT-A Tool for Resource Management

Sessional work (Any One)

- Study of leadership quality of school administrator / Head of the institution.
- Each student will frame an ideal school timetable.
- Students in group of 4 to 5 will prepare outline of curricular and co-curricular activities in school.
- Write an essay on application of ICT in school management,obstacles to leadership in managing teaching- learning

Suggested Readings:

- Aggarwal, J.C. (2007). School management.Shipra publication. Daryaganj, New Delhi.
- Bhatnagar, R. P. and Agarwal, V. (2006). Educational Administration Supervision Planning and Financing.R.Lall Book Depot, Meerut.
- Carlson, R. V. (1996). Reframing and reform: Perspectives on organization, leadership and school change. White Plains, NY: Longman Publishers.
- Davies, B. and Ellison, L. (2001). School leadership for the 21st century RoutledgeFalmer,London.
- Famulavo Joseph, (1986): Hand book of Human resource Administration M C Graw Hills, New York.
- Freire, P. (1998). Teachers as cultural workers. Boulder, CO: Westview Press.
- Taj, H .(2008). Current challenges in education. Neelkamal publications,Hyderabad.
- Mohanthy, J. (2007). Educational management supervision schoolorganization Neelkamal Publications Private Limited. Hyderabad.
- Tilak, J.B.G. (1992). Educational planning at Grass roots.Ashishpublishing house, New Delhi.
- Kochhar, S.K. (2011). School Administration and Management.Sterling Publishers Pvt.Ltd.,New Delhi
- Krishnamacharyulu V. (2011). School management and systems of education Neelkamal Publications Private limited, Hyderabad.

- Marshall, P.L. (2002). Cultural diversity in our schools. Belmont, CA: Wadsworth Publishing.
- National curriculum Frame work for teachers, (2009). NCTE
- National curriculum frame work. (2005). NCERT, New Delhi.
- Nieto, S. (1999). The light in their eyes: Creating multicultural learning comm... ColumbiaUniversity:Teachers College Press.
- Walia, J.S. (2004). Education in emerging Indian Society. Paul Publishers
- Walker James W. (1980)..Human resource planning.McGraw Hill, N.Y