SEMESTER-1

Course Title/Code	**CHEMISTRY-I** **Atomic Structure and Bonding (CHH135)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-1-2-0)**
Objectives	To develop an understanding of principles of Atomic structure and Chemical Bonding.

Chemistry-I Atomic Structure and Bonding (CHH135)

SECTION A

ATOMIC STRUCTURE

Discuss the processes on an atomic scale and show how the familiar concepts of classical mechanics have their basis in quantum theory. List the Characteristics of Black-body radiation, heat capacity of solids, Compton effect and explain how quantum theory accounts for them. Bohr's model of hydrogen atom and its limitations, significance of Ψ and Ψ^2, postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals , Multi-electron atoms , Aufbau and Pauli exclusion principles and Hund's multiplicity rule-Electronic configurations of the elements, effective nuclear charge. Slaters' rule , Energy level diagram for multi –electron atoms. **(8 L)**

SECTION B

PERIODIC PROPERTIES AND S AND P-BLOCK ELEMENTS

Periodic table as an expression of regularity as a basis for organising information. Atomic radius, Covalent, ionic and Vander waal radii-explanation with examples. Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.Factors influencing ionization energy in a group and a period. Electronegativity – Variation in a group and a period, Relationship between Electronegativity, Ionisation Energy and

Electron Affinity. Pauling Scale of Electronegativity.

Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls –salient features of hydrides, Action of Liquid Ammonia , Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium,.

To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16

(10 L)

SECTION C

CHEMICAL BONDING I

Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule, valence bond and band theories. Weak interactions – Hydrogen bonding, van der Waals forces. Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2, and H_2O.**(8 L)**

SECTION D

MOLECULAR ORBITAL THEORY, BORANES AND XENON COMPOUNDS

Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO – H^+_2 ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ^*, Π, Π^* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. 3

.

Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and NO) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference. **(10 L)**

References Books and Readings:

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee
3. An Introduction to Inorganic Chemistry : Mackay and Mackay

Chemistry-I Atomic Structure and Bonding Practical (CHH135-P)

TITRATIONS

1. Estimation of Sodium Carbonate and Sodium Bicarbonate in a mixture.
2. Estimation of Ammonia in Ammonium Salt by Back Titration.
3. Estimation of Ferrous ions using Potassium Permanganate
4. Estimation of Oxalic acid using Potassium Permanganate
5. Estimation of Ferrous ions Using Potassium Dichromate with Internal & External Indicators.
6. Standardisation of Sodium Thiosulphate using Potassium Dichromate and estimation of Iodine.
7. Estimation of Copper in a Copper salt by Iodimetry
8. Standardisation of EDTA solution using Zinc Sulphate and determination of Mg or Ca
9. Standardization of EDTA and estimating the hardness of water.
10. Determination of Alkali content of antacids.

Reference :

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel

Course Title/Code	**PHYSICS-I (PHH121)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O	**(3-1-2-0)**

Structure	
Objectives	-To enable students to : • understand Newtonian mechanics. • apply Newton's laws to explain natural physical phenomena. -To provide training in the broad methodology of science throughinvestigatory type and open-ended laboratory exercises

PHYSICS-I (PHH121-T)

SECTION A

PARTICLE DYNAMICS AND WORK AND ENERGY

Particle dynamics (review), Newton's First, Second and Third Law of Motion, Newton's I Law as a basic kinematical law defining a frame of reference, Newton's II Law as a basic dynamical law of mechanics and Newton's III law as an interaction law, Frames of reference, inertial and non inertial, pseudo forces, Force laws, weight and mass, static procedure for measuring forces, Application of Newton's law, free body diagrams representing forces on the body and frictional forces. Discussion of importance of friction in daily life.

Work and Energy: Work done by a constant force and by a variable force–one andtwo dimensional cases. Kinetic energy and work-energy theorem and its Significance, The importance of language in Physics to be highlighted by differentiating the meaning of 'work', 'power', 'energy' as defined in Physics and in daily life.

SECTION B

CONSERVATION LAWS AND COLLISIONS

Conservation Laws: Introduction, conservative forces, potential energy, completesolution for one, two and three dimensional systems, non-conservative forces, conservation of energy, conservation of energy to be seen as a spreading out and appearing in different forms, mass and energy.

Conservation of Linear Momentum: Centre of mass, motion of the center of mass,linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of momentum principle, systems having variable mass – Rocket equation.

Collisions: Definition and types of collisions. Impulse and momentum, conservationof

momentum during collisions, collision in one and two dimensions.Illustration with examples of collisions during accidents and collisions at atomic and sub-atomic level.

SECTION C

GRAVITATION AND CENTRAL FORCE

Gravitation *:*Historical Introduction, Newton's law of Universal Gravitation,inertial and gravitational mass, variation in acceleration due to gravity with altitude and depth, motion of planets and satellites, gravitational field and potential, gravitational potential energy, potential energy for many particle systems, calculations of field and potential for (a) a spherical shell, (b) a sphere, energy consideration in the motion of planets and satellites.

Central Force: Kepler's laws of planetary motion, the inverse square law, Derivation of Kepler's Law from Universal law of Gravitation.

SECTION D

ROTATIONAL KINEMATICS

Rotational variables, angular velocity, angular acceleration. Rotation with constant angular acceleration, Linear and angular variables, kinetic energy of rotation, rotational inertia, calculation of rotational inertia – of a rod, sphere and cylinder, torque, Newton's laws of rotation, work, power and work – kinetic energy theorem.

References Books and Readings:

1. Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley and Sons Inc.

2. University Physics, Revised Edition, Harris Benson, John Wiley and Sons, Inc.

PHYSICS-I Practical (PHH121-P)

(A minimum of TEN experiments out of the following)

1. Study of the rate of flow of water through a capillary tube under different pressure heads.
2. Study of the motion of an air bubble.

3. To study the relation between force and extension produced in a stretched spring.

4. To study the relation between length and time period of a simple pendulum.
5. Study of the motion of a freely falling body.

6. Study of the dependence of the period of oscillation of a spring-mass system on mass.

7. Study of the acceleration of a body subjected to different unbalanced forces.

8. Study of accelerations of different masses under a constant unbalanced force.

9. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.

10. Study of conservation of momentum and energy of a collision in a plane.
11. Conservation of momentum in an explosion.

12. Study of the relation between pressure and volume of a gas at constant temperature.

References :

1. PSSC Physics Laboratory Guide.
2. Practical Physics, E Armitage, John Murray.

Course Title/Code	**BOTANY : Diversity of Microbes and Thallophytes (EDH113)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to: • Develop an understanding of the classification of living organisms • Understand the diversity that exists in microorganisms • Comprehend the organization, morphology and reproduction in Virus, Bacteria, Algae and Fungi • Appreciate the role of microorganisms in human welfare • Identify some of the diseases caused by microorganisms and study their

	symptoms Practicum: • To develop the skills of staining and mounting microbes • To develop the skills of drawing and labelling • Todeveloptheskillofpreparingbacterial cultures • To develop the skill of identifying diseasescausedbymicroorganismsbasedon their symptoms • To develop the skill of observing and identifying microbes using temporary and permanent slides.

Diversity of Microbes and Thallophytes (EDH113-T)

SECTION A

a) Classification of living organisms
b) Brief history, discovery, characteristics, structure, mode of nutrition, reproduction: Bacteriophages, Viruses, Prions (Special mention: Chronic Wasting Disease, Bovine Spongiform Encephalopathy, Yellow Mosaic of Bean, Human Immunodeficiency Virus)
c) Brief history, discovery, characteristics, structure, classification based on morphology and flagellation, mode of nutrition and reproduction: Bacteria, Mycoplasma, Cyanobacterium (Special mention:*Xanthomonascitri*, *Clostridium botulinum, Rickettsiae, Sandal spike phytoplasma, Spirullina, Nostoc, Oscillatoria*)

SECTION B

a) Brief classification of Thallophytes
b) General account, classification (Fritsch), occurrence,thallus organisation, reproduction and life cycle: Algae- Chlorophyceae (*Oedogonium, Chara*), Xanthophyceae (*Vaucharia*), Phaeophyceae (*Sargassam*), Rhodhophyceae (*Polysiphonia*), Bacillariophyceae (Pinnate diatoms)

SECTION C

a) General account, classification (Alexopoulos and Mims), occurrence, thallus organisation, reproduction and life cycle: Fungi- Myxomycetes (*Stemonites*), Phycomycetes (*Albugo*), Ascomycetes (Yeast, *Penicillium*), Basidiomycetes (*Puccinia, Agaricus*), Deuteromycetes (*Cercospora, Collectotrichum*)

SECTION D

a) General account, distribution, types, structure, reproduction, ecological and economic importance: Lichens (Crustose, Foliose, Fruticose)
b) Role of microorganisms in human welfare with respect to Environment, Agriculture, Pharmaceuticals and Industry.

References Books and Readings:

1. Alexopoulos.C.J. *Introductory Mycology.*
2. Chopra.*A Class book of Fungi*. Jullandar: S.Nagin& Co.
3. Dubey H.D. *A Text book of Fungi, Bacteria and Viruses.*
4. Kumar, H.D., *A Textbook of Algae.*
5. Pandey, B.P.*A Text book of Algae*.New Delhi:Sultanchand& Co.
6. Sharma, P.D. (2005).*The Fungi*.Meerut: Rastogi Publications.
7. Sharma, O.P. (1992).*Text book of Thallophytes*, New Delhi: TMH Publishing House.
8. Singh,V., Pande,P.C. &Jain,D.K.(2006). *A Text book of Botany*. Meerut:Rastogi Publications.
9. Singh,V., Pande,P.C. &Jain,D.K. (2007). *Diversity of Microbes and Cryptogams*. Meerut:.Rastogi Publications.
10. Smith, G.M.(1971). *Cryptogamic Botany Vol.I, Algae & Fungi*. New Delhi: TMH Publishing Co.

Diversity of Microbes and Thallophytes Practical (EDH113-P)

1. Observation of disease symptoms in hosts infected by virus, mycoplasma and bacteria.
2. Gram staining of bacteria.
3. Preparation of bacterial media and culture of bacteria.
4. Study of genera included in theory under Cyanobacteria, algae and fungi by making temporary micropreparations and using permanent slides.

5. Study of crustose, foliose and fruticose lichens.

Semester-I

Course Title/Code	CALCULUS AND ANALYTICAL GEOMETRY-I (MAH117B)
Course Type	Core
Course Nature	Hard
L-T-P-O	(3-1-0-0)

Structure	
Objectives	To equip the students with the concept of calculus of one variable especially differential calculus and the geometry of 2D for analyzing and solving the mathematical problems.
Outcomes	The students would be able to; • apply the concept of limit, continuity and differentiability of the function of one variable. • understand and analyses the various shape of 2D structures.

	Sections	Weightage
Syllabus	A	25%
	B	25%
	C	25%
	D	25%
	TOTAL	100%

Unit I: Continuity and Differentiation - I

Limits, one-sided limits, Infinite limits and limits at infinity, Continuous functions, Discontinuous functions, Continuity theorems, Uniform continuity. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem. Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection.

Unit II: Differentiation - II

Polar coordinates, angle between the radius vector and the tangent at a point on a curve, angle of intersection between two curves. Differentiability theorems, Rolle's theorem, Lagrange's Mean Value theorem, Cauchy's Mean Value Theorem, Taylor's theorem, Maclaurin's theorem, Generalised Mean Value theorem, Taylor's Infinite series and power series expansions, Maclaurin's infinite series, Indeterminate forms.

Unit III: Analytical Geometry – I

General equation of second degree: Introduction, Condition for a pair of straight line, Condition for general equation of second degree to be a circle , parabola , hyperbola and ellipse.

Tracing of conics: Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic.

Unit IV: Analytical Geometry – II

Confocal conics: Introduction, equation of confocals to an Ellipse, properties of confocal conics Polar equation of a conic: Polar equation of a straight line , polar equation of a circle, polar equation of conic, focal chord tangent and normal to the conic, pair of tangents. System of co-ordinates.

References:

1. Calculus by Anton, Addison-Wiley.
2. Calculus with Analytical Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry, Thomas and Finney, S.Chand and Co. Ltd.
4. Differential Calculus by Gorakh Prasad, Pothishala Ltd.
5. Elements of Analytical Solid Geometry by Shanti Narayan

Course Title/Code	**ZOOLOGY-ANIMAL DIVERSITYI (EDH114)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To enable students to understand invertebrates, the organizational hierarchies and complexities; the evolutionary trends in external morphology and internal structure; identification and classification with examples; to enable them to understand various modes of adaptations in animals. -To develop in students the skills; of staining and mounting of materials (temporary and permanent); of dissection, display and labelling; of preparation of cultures of invertebrates by using common culture methods; of laboratory observation of animals

ZOOLOGY-I (EDH114-T)

SECTION A

ANIMAL CLASSIFICATION, PROTOZOA AND PORIFERA

a) Principles of classification: Binomial nomenclature and outline classification of animal kingdom.

b) Protozoa: General characters and classification of Phylum Protozoa up to orderswith examples; Type study: Plasmodium– External morphology,lifecycle and pathogenicity; Nutrition in Protozoa – Holozoic, holophytic,saprozoic and parasitic nutrition ; Locomotion in Protozoa – Locomotor organellesand types of movement; Reproduction in Protozoa: Asexual – fission, budding,sporulation; Sexual – conjugation (amphimixis), syngamy and autogamy.

c) Porifera: General characters affinities and classification of Phylum Porifera up toorders with examples ; Type study: Sycon – External morphology and cellularorganization ; Skeletal system in sponges ; Canal system – Ascon, sycon andleucon types; Reproduction in sponges: Budding and gemmule formation, lifecycle with reference to Amphiblastula and Parenchymula larvae.

SECTION B

CNIDARIA AND ACNIDARIA

Cnidaria: General characters and classification of Phylum Cnidaria up to orderswith examples; Type study: Obelia– External morphology, metagenesis and lifecycle Mesenteries in Metridium; Polymorphism in Cnidaria ; Corals andcoral reefs, their types, formation, theories and importance .

b) Acnidaria (Ctenophora): General characters and classification of PhylumAcnidaria up to orders with examples ; Type study – Pleurobrachia, Affinitiesof Acnidaria

SECTION C

HELMINTHES – PLATYHELMINTHES AND NEMATHELMINTHES

a) Platyhelminthes: General characters and classification of PhylumPlatyhelminthes up to orders with examples ; Type study: Fasciola hepatica– Externalmorphology, digestive system, excretory system and reproductive system – asexual,sexual and regeneration .

b) Nemathelminthes: General characters and classification of PhylumNemathelminthes up to orders with examples ; Type study: Ascaris– Externalmorphology, digestive system, excretory system, reproductive system and life-cycle.

c) Mode of infection and pathogenicity of i) Fasciola hepatica, ii) Taeniasolium,iii) Ancylostomaduodenale, iv) Trichinellaspirallis(2); Host parasite relationshipand parasitic adaptation in Helminthes .

SECTION D

ANNELIDA

General characters and classification of Phylum Annelida up to orders with examples; Type study: Pheretima– External morphology, coelom, locomotion, digestivesystem, blood vascular system, excretory system, reproductive system, life-historyand regeneration ; Comparative study of a) digestive system, b) coelomoduct andnephredia in Pheretima, Nereisand Hirudinaria); Trochopore larva ;metamerism in Annelida.

References Books and Readings:

1. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (RastogiPublications, Meerut, 10th Revised Edition).
2. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal –(Rastogi Publications, Meerut).
3. Invertebrate Zoology by E.L.Jordon and P.S. Verma – S. Chand & Co., Delhi).
4. Invertebrate Zoology by J.K. Dhami and P.S. Dhami – S. Chand & Co.,Delhi).
5. A Textbook of Invertebrate Zoology by S.N. Prasad – (KitabMahal,Allahabad).
6. Life of Invertebrates by Russel and Hunter – (Macmillan)
7. The invertebrate series of L.H.Hyman – (McGraw Hill)
8. A student's textbook of Zoology by Adam Sedgwick Vol. I, II & III – (CentralBook Depot, Allahabad).
9. A Text book of Zoology vol.1 by Parkar and Haswell – (Macmillan)

ANIMAL DIVERSITY -I Practical (EDH-114P)

1. Study of microscopes: Simple and compound, handling of microscopes.

2. Study of permanent slides of Protozoa:
   a) Amoeba b) Entamoebac) Euglena d) Paramoeciume) Giardia f) Plasmodium

3. A. Study of specimens and permanent slides of Porifera:
   a) Syconb) Spongillac) Euplectellae) Sponge spicules of various types f) Sponginfibres g) Sponge gemmule h) T.S. Sycon i) L.S. of Sycon.
   B. Preparation of permanent and stained slides:
   a) Sponge spicules b) Sponge gemmules

4. A. Study of specimens of Cnidaria:
   a) Physaliab) Porpitac) Valellad) Pennatulaf) Alcyonium g) Madreporah) Meandrinai) Astreaj) Gorgonia.

B. Study of permanent slides of Cnidaria:

a) Hydrab) Obeliacolonyc) Obeliamedusad) Tubulariae) Pennariaf) Metridium g) T.S. of Metridiumh) Aureliai) Ephyra larva.

C. Preparation of permanent and stained slide ofObeliacolony

5. A. Study of specimens of Helminthes:

a) Dugesiab) Fasciolac) Taeniasoliumd) Ascarise) Enterobiusf) Ancylostomag) Trichinella.

B. Study of permanent slides of Helminthes

a) Cercaria of fasciola b) Redia of Fasciola c) Miracidium of Fasciola

6. A. Dissection of Pheretima(Study of dissected specimens)a) Digestive system b) Nervous system c) Reproductive system

B. Study of specimens of Annelida:

a)Pheretimab) Nereisc) Heteronereisd) Hirudinariae) Aphroditef) Sipunculus

C.Study of permanent slides of Annelida:

a) T.S. of Pheretima b) T.S. of Nereis c) T.S. of Hirudinaria d)Parapodium of Nereis. E) trochophore larva of leech

*D.*Preparation of permanent and stained slides:

*a) Nereis*parapodia b) Jaws of Leech c) Nephredia of Leech

Field Visit- Any national park/ sanctuary/ biosphere reserve / botanical garden

Course Title/Code	**Foundations of Education (EDH 102)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To examine the bases of education in philosophical and sociological context. - To critically examine the issues and concerns of education in the socio-economic contexts of India. -To reflect upon the educational philosophy of Indian and western thinkers and its implications in education. -To enhance their capacity to accomplish the process of education. -To reflect philosophically and ethically on their own personal, professional and civic lives.

SECTION A

BASICS OF EDUCATION AND PHILOSOPHY

Education: Concept, meaning, aims and functions of education, Critical understanding of various related terms: Training, Instruction, Teaching and Indoctrination, Education as a discipline and its interdisciplinary nature, Role of Education in promotion of Culture and value inculcation.

Introduction to philosophy with special reference to its branches, Relation between Education and Philosophy, Nature and Scope of Educational Philosophy

SECTION B

EDUCATIONAL THOUGHTS AND THEIR IMPLICATIONS

Contribution of following thinkers with respect to meaning of education, aims, curriculum development and techniques of maintaining discipline in present scenario.
Indian Educationists: Mahatma Gandhi, Rabindranath Tagore, Swami Vivekananda, Jiddu Krishnamurthy and Dr. B.R Ambedkar.
Western Educationists**:** Plato, Rousseau, John Dewey, and Paulo Frieri

SECTION C

EDUCATION AND SOCIETY

Relation between Education and Society, Education as an agent of Social Change, Education and Culture, Socio-cultural influences of Globalization on Education, Socialization of child and social agencies of education, Constitutional values and Education

SECTION D

NATIONAL CONCERNS IN EDUCATION

Equalization of Education Opportunities- Accessibility, Affordability and Equality to all.
Constitutional Provisions for ensuring equity and equality in Education-with special reference to Right to Education (RTE).
Education and Gender Equality, Nature of Democracy and its implications, Secularism and Religious Pluralism, National and Emotional Integration in Indian context.

Reference Book and Readings

1. Anand, C L and et al (1993). *Teacher and Education in the Emerging Indian Society*. New Delhi: NCERT.
2. Bhatia, K. & Bhatia, B.(1974) *The Philosophical and Sociological Foundations of Education*. Delhi: Doaba House.
3. Delors, Jacques (1996). *Learning the Treasure Within*. Report to UNESCO of the International Commission on Education for Twenty-first Century. UNESCO.
4. Dewey J (1966). *Democracy in Education*, New York: Macmillan.

5. Gandhi M K (1956). *Basic Education*. Ahmedabad, Navajivan.
6. Goel, A. & Goel S.L. (2005). *Human values and Education*. New Delhi: Deep and Deep Publications Pvt. Ltd.
7. Govt. of India (1952). *Report of the Secondary Education Commission*. New Delhi.
8. Govt. of India. MHRD (1986, Revised 1992) *National Policy of Education*, New Delhi.
9. NCERT (2014*). Basics of Education*. NCERT: Publication Division.
10. R. S. Peters (Ed.) (1967) *The concept of education*. London: Routledge & Kegan Paul.
11. Rajput, J.S. (2006). *Human Values and Education*. New Delhi: Pragun Publications.
12. Saraswathi T S (1999). *Culture, Socialization and Human Development*. Sage Publication.
13. Sharma, A. P. (2010). *Indian and Western Educational Philosophy*. New Delhi: Unicorn Books.
14. Walia, J.S. (2011). *Philosophical, Sociological and Economic Bases of Education.*
15. Jalandhar: Ahim Paul Publishers.

Foundations of Education Practical (EDH 102P)

1. *Report writing based on visits made to schools practicing innovative philosophies in areas of education like inclusive education, gender sensitization, secularism and any other crucial area.
2. *A Survey regarding ground realities of implementation of the provisions of RTE in any one school in the neighborhood.
3. Group discussions on any suitable topics concerning contemporary society like aggression among youth, misuse of democracy, implications of secularism etc. and to reflect upon different viewpoints.
4. Organization of and participation in street plays /dramas/ declamation/ debates/ any other suitable activity on any theme of Philosophical perspectives of Socio-Political scenario in India.
5. Preparation of quotation boards to display quotes of great philosophers in the college premises.
6. Any other suitable activity.

*-Field Activity

Course Title/Code	**Communicative English- I (EDS 116)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O	**(1-0-2-0)**

Structure	
Objectives	-To get acquainted with the basics of English language and communication. -To speak English with an unaffected accent using stress and intonation. -To use English language in a more meaningful way with an enriched word power. -To communicate in a professional way using various communication strategies.

Communicative English- I (EDS 116)

SECTION A

GRAMMAR

Grammar and Usage – Grammaticality and Acceptability, Descriptive and Prescriptive approach to language, Parts of Speech , Sentence (Declarative, Affirmative, Negative, and Interrogative, Simple, Complex and Compound sentences), Clause, Phrase, Transformation of sentences.

SECTION B

COMPONENTS OF LANGUAGE

Tenses , Word order and concord, Verbs (Finite, Nonfinite, linking verbs, auxiliary verbs, modals, phrasal verbs), Nouns, Determiners, Word formation, Punctuation, Some common errors in English.

SECTION C

COMMUNICATION

Meaning, importance, process, principles and objectives of communication, verbal and non-verbal communication, barriers to communication (psychological, linguistic, socio- cultural), receptive and active skills in communication, fluency and accuracy in communication
Theories of communication, Types of communication (Oral and written), Features of oral communication- word stress, intonation, falling and rising tones.

SECTION D

LANGUAGE AND CONVERSATION

Conversations: Introducing you, Body Language, Public speaking, Debates, Group Discussion Skills, Interview skills and Etiquettes, Meetings, Voice and delivery, Dress code, Class seminar presentation, Viva voce.

Reference Books and Readings:

1. Brown, G., & Yule. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.
2. Brumfit, C. (1984). *Communicative methods in Language Teaching*. Cambridge: Cambridge University Press.
3. CBSE 1993). *Interact In English: Teacher's Book*. Delhi: CBSE Publication.
4. Eastwood, J. (1999). *Oxford Practice Grammar.* New York: Oxford University Press.
5. Kohli , A. L. (1993). *English Grammar, Reading and Writing Skills.* Chandigragh: Kohli Publishers.
6. Kumar,S.& Lata, P. (2012). *Communication Skills*. New Delhi: Oxford University Press.
7. Mohan, K. & Banerji, M. (1990). *Developing Communication Skills*. New Delhi: MacMillan India Ltd.
8. Terban, M. (2002). *Building Your Vocabulary.* Noida: Scholastic Inc.
9. Washburn, P. (2010). *The Vocabulary of Critical Thinking.* New York: Oxford University Press.

Communicative English- I Practical (EDS 116)

1. Developing Telephonic skills by Handling calls , Leaving messages , Making enquiries , Placing an order , Booking and arrangements , Change of plan ,Handling complaints.
2. Combating stage fright by Classroom Presentations, Power Point Slides presentation, Debate, Discussions, Extempore, Public Speaking.
3. Conducting interviews among peer groups
4. Role plays
5. Any other suitable activitty

Course Title/Code	**Critical Understanding of ICT in Education-I (CSW 114 B)**
Course Type	**Workshop**
Course	**Soft**

Nature	
L-T-P-O Structure	**(0-0-3-0)**
Objectives	- To demonstrate the understanding of the main components of the computer hardware and software in use. - To integrate technology tools for teaching learning and material development. - To integrate use of ICT to simplify record keeping, information management in education administration. - To implement various ICT's for project / problem based constructivist learning environments. - To reflect critically on application of ICT in teaching-learning process. - To provide the hands on experience on ICT

Critical Understanding of ICT in Education-I (EDW 105)

SECTION A

INTRODUCTION TO INFORMATION AND COMMUNICATION TECHNOLOGY

Information and Communication Technology: Meaning, nature and advantages.Hardware and Software Fundamentals: H**a**rdware fundamentals and Software fundamentals: meaning and types,Introduction to Office Applications: MS Office (word processing, spreadsheets, presentations, drawings**)**
Multimedia: meaning, types, advantages and evaluation of multimedia resources, development and use of multimedia in education.

COMPUTER SECURITY: hacking, virus, spyware, misuse, abuse, antivirus, cybercrime, firewall and safe practices (user security)

SECTION B

TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPCK): Approaches to integrating ICT in teaching-learning process. Subject specific ICT tools for creating and facilitating learning.Subject Specific online resources and their use. Designing technology integrated learning experiences.

Reference Books and Readings

1. Bharihok, D. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi.
2. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft Powerpoint. NISCOM, CSIR: New Delhi.
3. Lee, William w., Dianna, L. Owens, (2001) Multimedia based Instructional Design: Computer based training. Jossey-Bass
4. Mishra, S.(Ed.) (2009). STRIDE handbook 08: E-learning. IGNOU: New Delhi.
5. National Policy on ICT in Education. (2010). New Delhi: Department of School Education and Literacy. Ministry of HRD, GOI, Retrieved from: http://mhrd.gov.in/ict_school
6. Roblyer, M.D. (2008). *Integrating Educational Technology into Teaching*. New Delhi: Pearson Education, South Asia, India.

Critical Understanding of ICT in Education Practical (EDW 105 P)

1. Construction of an portfolio and question papers of his teaching subjects
2. Preparing and transacting a lesson infusing ICT resources (usingappropriate hardware and software) and evaluating it.
3. Students progress record- Tabulation, and graphical representation of results of an Academic test.
4. Project/Problem based learning (PBL): Role of ICT, developing technology integrated PBL unit
5. Development and use of multimedia in education
6. Use ICT integrated Unit Plan: Web 2.0 for creating constructivist learning environment
7. Prepare a Digital storytelling and Storyboarding.
8. Create an interactive quiz(Hot potatoes, Content generator)
9. Encourage student to create news article
10. Create a power point presentation- add timings, graphics, sounds, etc to it
11. Use photoshop and similar graphic package to alter photograph to predict change in landscape.
12. Use excel to create a drag and drop

Course Title/Code	**Environmental Sciences (CHH 137)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(2-0-0-2)**

Objectives	-To understand about the concept of environmental education. -To develop sense of awareness about the environmental pollution, and possible hazards and its causes and remedies. -To build up a sense of responsibility towards conservation of environment, bio-diversity and sustainable development. -To widen reasonable understanding about the role of school and education in fostering the idea and learning to live in harmony with nature. -To enable the students to understand about the various measures available to conserve the environment for sustaining the development

Environment Sciences (CHH 137)

Course Content :

Unit 1 : Multidisciplinary nature of environmental studies

Definition, scope and importance (2 lectures)

Need for public awareness.

Unit 2 : Natural Resources :

Renewable and non-renewable resources :

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribalpeople.
b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits andproblems.
c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, casestudies.
d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles. (8 lectures)

Unit 3 : Ecosystems

- **Concept of anecosystem.**
- Structure and function of anecosystem.
- Producers, consumers anddecomposers.
- Energy flow in theecosystem.
- Ecological succession.
- Food chains, food webs and ecologicalpyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans,estuaries)

Unit 4 : Biodiversity and its conservation

- **Introduction – Definition: genetic, species and ecosystemdiversity.**
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversitynation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlifeconflicts.
- Endangered and endemic species ofIndia
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

(8 lectures)

Unit 5 : Environmental Pollution

Definition

- Cause, effects and control measures of:-

  a. Air pollution
  b. Waterpollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermalpollution

g. Nuclear hazards

- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Diaster management : floods, earthquake, cyclone andlandslides.

(8 lectures)

Unit 6 : Social Issues and the Environment

- **From Unsustainable to Sustainabledevelopment**
- Urban problems related toenergy
- Water conservation, rain water harvesting, watershedmanagement
- Resettlement and rahabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possiblesolutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wastelandreclamation.
- Consumerism and wasteproducts.
- Environment ProtectionAct.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution)Act
- Wildlife ProtectionAct
- Forest Conservation Act
- Issues involved in enforcement of environmentallegislation.
- Public awareness.

(7 lectures)

Unit 7 : Human Population and the Environment

- **Population growth, variation amongnations.**
- Population explosion – Family WelfareProgramme.
- Environment and humanhealth.
- HumanRights.
- Value Education.

- HIV/AIDS.
- Women and ChildWelfare.
- Role of Information Technology in Environment and humanhealth.
- Case Studies.

(6 lectures)

Unit 8 : Field work

- **Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain**
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects,birds.

Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

Reference Books and Readings:

a) **Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.**

b) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net(R)

c) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p

d) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

e) Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p

f) De A.K., Environmental Chemistry, Wiley EasternLtd.

g) Down to Earth, Centre for Science and Environment(R)

h) Gleick,H.P.1993.Waterincrisis,PacificInstituteforStudiesinDev., Environment & Security.Stockholm Env.Institute Oxford Univ. Press. 473p

i) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay(R)

j) Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press1140p.

k) Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.

l) Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition.639p.

m) Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)

n) Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.(TB)

o) Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,574p

p) Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd.345p.

q) Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House,Meerut

r) Survey of the Environment, The Hindu(M)

s) Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

t) Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media(R)

u) Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)

v) WangerK.D.,1998EnvironmentalManagement.W.B.SaundersCo. Philadelphia, USA 499p

(M) Magazine

(R)Reference

(TB) Textbook

Further Readings:

1. CunninghamWP,CooperTH,GorhaniBharuchaErach,2003.TheBiodiversityofIndia,MapinPublishingPvt.Ltd,Ahmedabad–380013, India. Email:mapin@icenet.net

2. BrunnerRC,1989,HazardousWasteIncineration,McGrawHillInc.480pgs.

3. ClarkRS,MarinePollution,ClandersonPress,Oxofrd(TB).

4. E&HepworthMT,2001.EnvironmentalEncyclopaedia, JaicoPublishingHouse,Mumbai,1196pgs.

5. DeAK,EnvironmentalChemistry,WileyEasternLtd.

6. DowntoEarth,CenterforScienceandEnvironment(R)

7. GleickHP,1993.WaterinCrisis,PacificInstituteforStudiesinDevelopment,Enviro nmentandSecurity.StockholmEnvironmentalInstitute,OxfordUniversity Press,473pgs.

8. HawkinsRE,EncyclopediaofIndianNaturalHistory,BombayNaturalHistorySoci ety,Bombay (R)

9. Heywood VH, and Watson RT, 1995. global Biodiversity Assessment. Cambridge University Press1140pgs.

10. JadhavHandBhosaleVM,1995.EnvironmentalProtectionandLaws.Himalay aPublishingHouse, Delhi284pgs.

11. MckinneyMLandSchochRM,1996.EnvironmentalScienceSystemsandSolutions .Weben- hanced edition,639pgs.

12. MhaskarAK,MatterHazardous,Techno-SciencePublications(TB)

13. MillerTG,Jr.EnvironmentalScience,WadsworthPublishingCO.(TB)

14. OdumEP,1971.FundamentalsofEcology.WBSaundersCo.USA,574pgs.

15. RaoMNandDattaAK,1987.WasteWaterTreatment.OxfordandIBHPublishingCo.Pvt.Ltd. 345pgs

SEMESTER-2

Course Title/Code	**CHEMISTRY-II** **States of Matter and Nuclear Chemistry (CHH 136)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-1-2-0)**
Objectives	-Illustrate how a scientific model can be constructed based on the experimental observations of the behaviour of gases and to explain the properties in terms of microscopic organization. -To develop an understanding of properties of Gases, Liquids and Solutions. -To understand the shapes of molecules in terms of symmetries and to relate the properties of the matter in solid state to the structure. -To develop an Understanding of the Periodic Trends, Preparation, properties and uses of s and p block elements and their Compounds in terms of structure and bonding.

Course Content :

SECTION A

GASEOUS AND SOLID STATE

Explanation of the macroscopic properties of solids in terms of structure, bonding and defects.Definition of space lattice, unit cell.

Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystals.

X-ray diffraction by crystals.Derivation of Bragg equation. Predicting crystal structure . Defects in solids , Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of state.the law of corresponding states, reduced equation of state.

Molecular Velocities:Root mean square, average and most probable velocities.

Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. **(8 L)**

SECTION B

LIQUIDS AND COLLOIDS

Accounting the Isotropic and intermediate behaviour of liquids as a link between solids and gases. Also tracing the role of liquids as solvents and reaction regulators Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases.

Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases.Thermography and seven segment cell.Definition of colloids, classification of colloids.

Solids in liquids (sols): Properties – kinetic, optical and electrical; stability of colloids, protective action, Hardy – Schulze law, gold number.

Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifier.

Liquids in Solids (gels): Classification, preparation and properties, inhibition, general applications of colloids. **(10 L)**

SECTION C

ACIDS AND BASES

A discussion on changing concepts of acids and bases involving concentrations and effects of solvent medium.Arrhenius, Bronstead-Lowry and Lewis concepts of acids and bases.

Hard and Soft Acids and Bases (HSAB) -Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness.Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.**(8 L)**

SECTION D

NUCLEAR CHEMISTRY

To familiarise with the nuclear properties and phenomenon in order to understand the mechanism of some chemical reactions and synthesis of new elements. Fundamental particles of Nucleus, Concept of Nuclides isotopes, isobars and isotones (with specific examples), Qualitative idea of stability of the nucleus (n/p ratio), Natural and artificial radioactivity,

Radioactive Disintegration, half life, average life, artificial transmutation, nuclear fusion and fission. Application of Radioactivity and Radio isotopes as tracers in analysis.**(8 L)**

References Books and Readings:

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee
3. An Introduction to Inorganic Chemistry : Mackay and Mackay
4. Principles of Physical Chemistry : Marron and Prutton
5. Elements of Physical Chemistry : Samuel Glasstone and Lewis
6. Physical Chemistry : P W Atkins

States of Matter and Nuclear Chemistry Practical (CHH 136-P)

1. To evolve a scheme of analysis of anions and cations based on solubility products and common ion effect.
    a) classification of anions and cations.
    b) Quantitative inorganic analysis of mixtures containing four radicals.
2. Determination of density by specific gravity bottle and viscosity of the given liquid by Ostwald's viscometer.
3. Determination of density by specific gravity bottle and surface tension of the given liquid by stalagnometer.
4. Measurement of vapour pressure of pure liquids and solutions, finding enthalpy of vapourisation of water.
5. Determination of refractive index of pure liquids and mixtures.
6. Determination of concentration of a given substance by colorimetry.

References :

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Practical Physical Chemistry, A Findlay

Course Title/Code	**PHYSICS** **Elasticity, Waves, Heat and Thermodynamics (PHH122)**
Course Type	**Core**

Course Nature	**Hard**
L-T-P-O Structure	**(3-1-2-0)**
Objectives	-To enable students to •see relation between linear and rotational motion. •understand the production and propagations of waves in elastic media. •understand the laws of thermodynamics and its applications. -To provide training in the broad methodology of science throughinvestigatory type and open-ended laboratory exercises.

PHYSICS-II Elasticity, Waves, Heat and Thermodynamics (PHH125-T)

SECTION A

ELASTICITY AND WAVES

Hooke's law, Modulii of elasticity, Relation between elastic constants.Poisson's ratio – limiting values.Elastic potential Energy, bending moment.Theory of the cantilever. Torsion – calculation of couple per unit twist. The torsional pendulum.

Static torsions, Searle's double bar experiment. (4L)

Oscillations :Simple Harmonic Motion (SHM), the restoring force along with itskinematical model, force law, SHM equation and idea of phase and phase difference, energy considerations in simple harmonic motion. Superposition of the SHMs, Lissajous figures, Equation for damped vibrations, forced vibrations. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave. (5L)

Waves in elastic media: Review of Mechanical waves, types of waves, travellingwaves, the superposition principle, wave speed, power and intensity in wave motion, expression for transverse waves in a stretched string, interference of waves, standing waves, resonance, simulation and demonstrations using ripple tank (3L).

Sound Waves: Audible, ultrasonic and infrasonic waves, propagation and speed oflongitudinal waves, travelling longitudinal waves, standing longitudinal waves, vibrating systems and source of sound, beats and Doppler effect, wave equation for sound pressure, sound power and measuring unit (decibel).

Model of sound being a pressure wave caused by longitudinally oscillating particles must be developed. (5L)

SECTION B

KINETIC THEORY OF GASES

Introduction, Kinetic Theory of Gases, kinetic theory as particle model and usefulness of the model in explaining the regular structure of crystals (Review), an ideal gas – a macroscopic description, an ideal gas – a microscopic description, kinetic calculation of pressure, kinetic interpretation of temperature, ideal gas scale, intermolecular forces, specific heat of an ideal gas, law of equipartition of energy. (6L)

Mean free path, Maxwell' distribution law, distribution of molecular speeds, van der Waal's equations of State, critical constants, application to liquefaction of gases. (3L)

SECTION C

HEAT AND FIRST LAW OF THERMODYNAMICS

Thermal equilibrium, Zeroth law of thermodynamics, ideal gas temperature scale, heat as a form of energy, quantity of heat and specific heat, molar heat capacities of solids, the mechanical equivalent of heat, heat and work; First law of thermodynamics, Discussion on usefulness of First Law of Thermodynamics in Meteorology, some special cases of the first law of thermodynamics – (i) adiabatic process, (ii) isothermal process, (iii) isochoric process, (iv) cyclic process, (v) free expansion. (9L)

SECTION D

ENTROPY AND SECOND LAW OF THERMODYNAMICS

Introduction, reversible and irreversible processes, the Carnot cycle, Carnot engine, Carnot theorem, absolute scale of temperature, second law of thermodynamics, efficiency of engines, the thermodynamic temperature scale, entropy in reversible and irreversible processes, entropy and the II law, entropy and disorder, consequences of II and III law of thermodynamics, Second law of thermodynamics as a probabilistic statement.

Low temperature Physics – Porous Plug experiment, temperature of inversion, principle of regenerative cooling, liquefaction of air by Linde's method. (10L)

References Books and Readings:

1. Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jay Walker, John Wiley and Sons, Inc.

2. University Physics, Revised Edition, Harris Benson, John Wiley and Sons Inc.
3. Heat and Thermodynamics, Zeemansky, McGraw Hill.
4. Physics of Vibration and Waves, H J Pain.

PHYSICS-II Elasticity, Waves, Heat and Thermodynamics Practical (PHH125-P)

(A minimum of TEN experiments out of the following).

1. Study of velocity of waves on a slinky under tension.

2. Study of the oscillations of a column of water as a function of its length and study of damped oscillation.

3. To determine the velocity of sound at 0^{o} C and the end correction by setting up a resonance column (first resonance length).

4. Study of the variation of the time period of a bar pendulum with different length and determination of 'g' at the given place.

5. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire.

6. Study of the motion of a steel sphere in a viscous liquid and determination of the coefficient of viscosity of the liquid.
7. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method.
8. Study of Newton's law of cooling.
9. Melde's experiment – determination of frequency.
10. Determination of solar constant.
11. Study of variation of pressure and temperature of a gas at constant volume.
12. J by Joules Calorimeter.
13. Lees and Charlton disc – Thermal conductivity of a bad conductor.
14. Specific heat of a solid by the method of mixtures.

References :

1. PSSC Physics Laboratory Guide.
2. Physics Department Instruction Sheets, RIE, Mysore.
3. Practical Physics, E. Armitage, John Murray.

Course Title/Code	**BOTANY** **BRYOPHYTES AND PTERIDOPHYTES (EDH132)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to: -get acquainted with the structure, classification and life history of Bryophytes and Pteridophytes -understand the Geological time scale and the importance of fossils -analyse the evolutionary trends among Pteridophytes **Practical** -To observe and identify temporary micro-preparations and permanent slides -Study of the taxa included under Bryophytes and Pteridophytes by observing temporary micro-preparations and permanent slides. -To develop the skill of freehand sectioning, staining and mounting,Bryophytes and Pteridophytes. -To prepare temporary, double-stained micro-preparations.

Bryophytes and Pteridophytes (EDH132-T)

SECTION A

a) Bryophytes- Origin, General characteristics, distribution, structure, reproduction, alternation of generation, classification and economic importance.

b) Study of morphology, anatomy and reproduction in-
Hepaticopsida: *Marchanti*a
Anthocerotopsida: *Anthoceros*

Bryopsida: *Funaria*

c) Affinities of bryophytes – brief account

SECTION B

a) General account of geological time scale, types of fossils, fossilization process, radioactive carbon dating, and importance of fossils.

b) Study of *Rhynia, Lepidodendron, Lepidostrobus.*

SECTION C

a) Pteridophytes- General characters, distribution, structure, reproduction, life cycle, classification and economic importance.

b) Study of morphology, anatomy and reproduction in-
Psilopsida: *Psilotum*

Lycopsida: *Lycopodium, Selaginella*
Sphenopsida: *Equisetem*
Pteropsida: Marsilea

SECTION D

a) Evolution of steles in Pteridophytes
b) Origin and significance of heterospory and seed habit
c) Apogamy and Apospory

References Books and Readings:

1. Smith.G.M. (1971).*Cryptogamic Botany Vol.II*. New Delhi: TMH Publishing House.

2. Sporne, K.R. (1974).*Morphology of Pteridophytes*. London: Hutchinson & Co.
3. Rashid, A. (1999). *An Introduction to Pteridophyta*.Vikas Publishing House.

4. Pandey, Mishra & Trivedi.(2004). *A Textbook of Botany Vol.II*, Meerut: Rastogi Publications.

5. Singh,V., Pande, P. &Jain,D.K.(2006).*A Textbook of Botany*. Meerut:Rastogi

Publications.

6. Singh,V., Pande, P. &Jain, D.K. (2005).*Diversity and Systematics of Seed plants*. Meerut: Rastogi Publications.

7. Parihar, N.S. (1961). *Bryophyta.*Central Book Depot.
8. Parihar, N.S. (1966).*PteridophytesAn Introduction of Embryophyta: Volume II*.Central Book Depot.
9. Vashishta, P.C. (1982).*Peridophyta*. New Delhi: S.Chand& Co. Ltd.

10. Gangulee H.C., Kar, A.K. (1982).*College Botany Vol.II*. Calcutta: New Central Book Agency.

11. Anrold, C.A.(1947).*An Introduction to Palaeobotany*. London: McGraw-Hill Book Company Inc.

Bryophytes andPteridophytes Practical (EDH132-P)

Activities:

1. Study of the morphology, thallus organization and reproductive structures of taxastudied in Bryophytes and Pteridophytes through permanent slides.

2. Preparation and submission of 2 double-stained slides.

Course Title/Code	NUMBER THEORY, THEORY OF EQUATIONS AND MATRICES (MAH118B)
Course Type	Core
Course Nature	Hard
L-T-P-O Structure	(3-1-0-0)
Objectives	To equip the student the concept of • the basic structure and properties of integers. • characterization and analysis of matrix.
Outcomes	The students would be able to • apply the concept of numbers system for higher level. • prove results involving divisibility and greatest common divisors; • find integral solutions to specified linear Equations;

	• apply the concept of rank to solve system of equation. • analyze the concept of Eigen value's and eigen vectors and their properties.

	Sections	Weightage
Syllabus	A	25%
	B	25%
	C	25%
	D	25%
	TOTAL	100%

SECTION I: Theory of Numbers

Division Algorithm – Prime and Composite Numbers – proving the existence and uniqueness of GCD and the Euclidean Algorithm – fundamental theorem of Arithmetic - the least common multiple – congruences – linear congruences – Wilson's theorem – Simultaneous congruences – Theorem of Euler – Fermat and Lagrange.

SECTION II : Theory of Equations

Relation between roots and coefficients, Symmetric functions, Transformations,Reciprocalequations, Descarte's rule of signs, Multipleroots,Solving cubicequations by Cardon's method, Solving quartic equations by Descarte's method and Ferrari's method.

SECTION III: Matrices – I

Matrices of order $m \times n$, Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

SECTION IV : Matrices - II

System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems, Criterion for uniqueness of solutions.Eigen values and Eigen vectors of a square matrix, Characteristic equation of a square matrix, Eigen values and Eigen vectors of a real symmetric matrix properties, Diagonalisation of a real symmetric matrix, Cayley – Hamilton theorem, Applications to determine the powers of square matrices and Inverse of non-singular matrices.

Books;

1. Elementary Number Theory by David M. Burton.
2. Algebra by Natarajan, M. Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
3. Theory of Equations by Uspensky, McGraw Hill Book Co. Ltd.
4. Matrices by Frank Ayres, Schaum Publishing Co.
5. Textbook of Matrix Algebra by SuddhenduBiswas.

Course Title/Code	CALCULUS AND ANALYTICAL GEOMETRY-II (MAH119B)
Course Type	Core
Course Nature	Hard
L-T-P-O Structure	(3-1-0-0)
Objectives	To equip the students with the concept of calculus of one and two variable and the geometry of 3D for analyzing and solving the mathematical problems.
Outcomes	The students would be able to; • apply the concept of integaral calculus to evaluate the arc length, area, volume of surface of revolution. • apply the concept of limit, continuity and differentiability of the function of two variable. • understand and analyses the various shape of 2D structures.

	Sections	Weightage
Syllabus	A	25%
	B	25%
	C	25%
	D	25%
	TOTAL	100%

SECTION I: Curves and Surfaces-I

Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres,radical plane of two spheres. Co-axial system of spheres.
Cones. Right circular cone, enveloping cone and reciprocal cone.

SECTION II: Curves and Surfaces-II
Cylinder: Right circular cylinder and enveloping cylinder.
Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a conicoid. Enveloping cylinder of a coincoid, Paraboloids.

SECTION III: Partial Derivatives
Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Partial Derivatives of higher order, Taylor's Theorem, Derivate of Implicit functions, Jacobians.

SECTION IV: Integration
Reduction formulae: Derivations and illustrations of reduction formulae.Rectification: Length of arc of curves (cartesian, parametric and polar form).Quadrature: Area enclosed by curves (cartesian, parametric and polar form).Solids of Revolution: Volume and surface area of solids of revolution

Books:

1. Calculus by Anton, Addison-Wiley.
2. Calculus and Analytical Geometry, Thomas and Finney, S.Chand and Co. Ltd.
3. Integral Calculus by Shanti Narayan, S.Chand and Co.Ltd.
4. Elements of Analytical Solid Geometry by Shanti Narayan

Course Title/ Code	**Maths Lab (MAH120B)**
Course Type:	Core
Course Nature:	Hard
L-T-P-O Structure	(0-0-2-0)

Objectives	Students would be able to understand and apply Mathematical software for solving mathematical problems and its applications.
Learning Outcomes	Students would be able to CO1 get the basic understanding of Mathematical software CO2 use various commands available in Mathematical software to find limit continuity and differentiability CO3 implement the commands in Mathematical problems.to compute differentiation ,integration CO4 implement the commands in finding maxima, minima, application of integrals

LIST OF EXPERIMENTS:

1 Introduction to Mathematical Software and use of some simple Mathematical Software commands.
2 To define matrices and compute matrix operations.
3 Introduction to graphics: Basic Two-Dimensional Graphs, Labels, Multiple plots on the same axes, Line styles, Markers and color, Axis limits and Subplots.
4 To find limit & continuity of function of single variable.
5 To find differentiability of function of single variable.
6 6. Perform advanced operation on Matrices.
7 To find limit & continuity of function of several variables.
8 To find differentiability of function of several variables.
9 Compute differentiation of a function of single and several variables.
10 To find maxima and minima of function of several variables.
11 To find integral of a given function.
12 Multiple Integrals

Reference Books:

1. GNU Octave Beginner's Guide -by Jesper Schmidt Hansen (Author)

2 Introduction to GNU Octave -by Jason Lachniet (Author)

Course Title/Code	**ZOOLOGY : ANIMAL DIVERSITY - II** **(EDH131)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To enable students to understand invertebrates and vertebrates, their organizational hierarchies and complexities; the evolutionary trends in external morphology and internal structure; identification and classification with examples; to enable them to understand various modes of adaptations in animals. -To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and labelling; of collection, preservation, mounting, identification and labelling of collected specimens; of field observation of animals.

ZOOLOGY-II (EDH163-T)

SECTION A

ARTHROPODA AND ONYCHOPHORA

a) Arthropoda: General characters and classification of Phylum Arthropoda up to orders with examples.Type study: Palaemon– External morphology, digestive system, circulatory system,respiratory system, excretory system and reproductive system ; Mouth parts in Insects ; Metamorphosis in insects ; Crustacean larvae (Nauplius, Zoaea, Mysis andMegalopa) and their significance .Insects as vectors a. mosquito b. housefly c. sand-fly d. tsetse fly. Social behavior in Honey Bees.

b) Onychophora: Salient features of Peripatus, systematic position and phylogeny of Onychophora .

SECTION B

MOLLUSCA

General characters and classification of Phylum Mollusca up to orders with examples (1); Type study: Pila– External morphology, digestive system, respiratory system and life cycle ; Modifications of foot in Mollusca ; Comparative account of shells in Mollusca ; Torsion and detorsion in Mollusca .Pearl formation in Mollusca Molluscan larvae :Glochidium and Veliger

SECTION C

ECHINODERMATA

General characters and classification of Phylum Echinodermata up to orders with example ; Type study: Asterias– External morphology, digestive system, water- vascular system, haemocoelomic system and reproductive system ; Life-cycle and metamorphosis;Pedicellaria ; Skeletal system in Echinoderm , Echinoderm larvae and their significance- Bipinnaria and Auricularia

SECTION D

CHORDATA – PROTOCHORDATA AND CYCLOSTOMATA

a) Chordata: General characters and outline classification of Phylum Chordata up to orders with examples

b) Protochordata: i) Balanoglossusand its affinities (1); Tornaria larva ; ii) Amphioxus – Digestive system, circulatory system and nervous system .

b) Cyclostomata : General characters, affinities and classification of Class Cyclostomataup to orders with examples; Type study: Petromyzon– External morphology, digestive system and respiratory system (2); Structure and metamorphosis of Ammocoetes larva ; Comparison of organ systems between Petromyzonand Myxine.

References Books and Readings:

1. Invertebrate Zoology by E.L.Jordon and P.S. Verma – S. Chand & Co., Delhi).
2. Invertebrate Zoology by J.K.Dhami and P.S.Dhami – S. Chand & Co., Delhi).
3. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal – (Rastogi Publications, Meerut, 2008).
4. A Textbook of Invertebrate Zoology by S.N. Prasad – (KitabMahal,Allahabad).
5. A life of Invertebrates by Russel and Hunter – (MacMillan)
6. Invertebrate Zoology by R.D.Barnes – (W.B.Saunders, Philadelphia)
7. The Invertebrate series of L.H.Hyman – (McGraw Hill).
8. A student's textbook of Zoology by Adam Sedgwick Vol. I, II & III –

(CentralBook Depot, Allahabad).
9. A Textbook of Zoology vol.1 by Parkar and Haswell – (MacMillan).
10. Destructive and Useful Insects- Their habits and control by Metcalf and Flint – (Tata McGraw Hill, New Delhi).
11. Protochordates by K.S. Bhatia.
12. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (RastogiPublications, Meerut, 10th Revised Edition, 2008).
13. Modern Textbook of Zoology: Vertebrates by R.L. Kotpal – (RastogiPublications, Meerut, 3rd Edition, 2008).

ZOOLOGY-II Practical (EDH131-P)

1. A. Dissection of Palaemon and flag labelling: a) Digestive systemb) Nervous system ii) Mounting of appendages.
   B. Study of specimens of Arthropoda and Onychophora:a) Lepasb) Balanusc) Hippad) Cancere) Limulusf) Scolopendrag) Spirobolush) Peripatus
   C. Study of mouth parts: a) Culex/Anopheles b) Periplanetac) Apisd) butterfly
   D. Study of Crustacean larvae: a) Naupliusb) Zoaeac) Mysisd) Megalopa
   E. Preparation of permanent slides of fresh water and marine crustacean specimens.
   F. Identification and classification of Anopheles, Culex and Aedes mosquitoes.

2. A. Study of specimens and permanent slides of Mollusca:
   a) Pila b) Unio c) Sepia d) Octopuse e) Chiton
   f) Dentalium g) Radula of Pila i) T.S. of Ctenidium
   j) Glochidium
   B. Dissection and mounting of Pila(Study of dissected specimen):
   a) Nervous system b) radula

3. Study of specimens and permanent slides of Echinodermata:
   a) Astropecten/ Asterias b) Ophiothrix c) Echinus
   d) Holothuria e) Antedon f) Bipinnaria larva
   g) Ophiopluteuslarvah) Echinopluteuslarva i) Pedicellaria

4. Study of specimens and permanent slides of Protochordata:
   i) Balanoglossus:a) Entireb) T.S. through proboscis
   c) T.S. through collar d) T.S. through trunk region
   ii) Ascidia
   iii) Doliolum
   iv) Salpa

v) Amphioxus: a) Entireb) T.S. through oral cirri
c) T.S. through pharynx d) T.S. through intestinee) T.S. through tail

5. Study of specimens of Cyclostomata:
a) Petromyzonb) Myxine

Field Visit- Zoo

Course Title/Code	**Learner and Learning Process (EDH 133)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To understand the meaning nature and scope of education psychology -To understand learning and learning theories -To aware of intelligent theories and its applicability. -To understand the importance of motivation and its relevance in learning process. -To know the concept of creativity and its various dimensions To aware about the growth and development with special reference to adolescence -To understand the various human developmental theories

Learner and Learning Process (EDH 133)

SECTION A

EDUCATIONAL PSYCHOLOGY, LEARNING AND MOTIVATION

Educational Psychology - Meaning, Scope and Importance, Concept & factors affected to the learning

Approaches to learning- Behaviourism, Cognitivism, Humanism, Social Constructivism

Theories of learning (Pavlov, Skinner,Thorndike, Kohler, Roger , Vygotsky) and their educationalimplications

Motivation in learning: Concept, types and educational implications, Abraham Maslow's Motivational Theory, Role of Teacher in Motivation.

SECTION B

INTELLIGENCE, CREATIVITY AND PERSONALITY

Intelligence: Meaning, theories of intelligence-Spearman, Thorndike, Thurstone, Gardener and Guilford, Measurement of intelligence, uses and limitations of intelligence test.

Creativity - concept, identification of creative potential, educational programme for developing creativity Intelligence and Creativity

Personality- concept, big five theory, and Jung's theory

SECTION C

ADOLESCENTS AND DEVELOPMENT

Role of Heredity and Environment in human development

Concept of growth and development, Principles of development, Dimensions and stages of development, Factors influencing development (with special reference to Adolescents)

Developmental characteristics of an adolescent: Physical, Cognitive, Social, Emotional, Moral & Language

Role of teacher, Parents and Society in catering the needs and problems of Adolescents

SECTION D

THEORIES OF GROWTH AND DEVELOPMENT

Piaget's Cognitive Development Theory- Concept, Stages and Implications

Kohlberg's Theory of Moral Development- Concept, Stages and implications

Erickson's Theory of social and moral development- Concept, stages and implications with special reference to Indian context.

Maria Montessori's Planes of development.

Reference Books and Readings

1. Claridge, Gordon & Davis, Caroline (2003).*Personality and Psychological Disorders*. New Delhi: Atlantic Publishers.
2. Arnes, Peter at al (Ed.), (1984). Personality Development and learning, A Reader Kent
3. Bower, G. H., (1986). The Psychology of Learning and Motivation, Academic Press
4. Chauhan S. S., (1983). Advanced Educational Psychology, (5th revised edition) New Delhi; Vikas Publishers
5. Gange R. M. and Briggs, L. J., (1979). Principles of Instructional Design, New York; Halt,

6. Hodder and Stoughton Bernard, H. W., (1954). Psychology of Learning and Teaching, New York; MgGraw Hill
7. Joshi, Kirit. (2011). Child, Teacher and Teacher Education. Gandhinagar : Children University.
8. Kochar, S. K., Method & Techniques of Teaching, New Delhi; Sterling Publishers.
9. Kratochwill, Thomas R., (1983). Advances in School Psychology, New Jersey; Lawrence Erlbaum Associated Publishers.
10. Kundu, C. L., and Tutoon, D. N. (1985). Educational Psychology, New Delhi; Sterling Publishers.
11. Rinehart and Winston Gange, R. M. and Briggs, L. J., (1979). The Conditions of Learning and Theory ofInstruction, New York; Halt, Rinehart and Winston
12. Malek Parveenbanu M.,(2014). Technology & Teacher, Ahmedabad; SSTCT Publication.
13. Cole, M., Cole, S. R. and Lightfoot, C. (2004). *The Development of Children.* New York: Worth Publishers
14. D. K. Behera (Ed.), *Childhoods in South Asia.* New Delhi: Pearson Education India.
15. Farrell, M. (2009).*Foundations of Special Education: An Introduction*. (4th ed.). Wiley Blackwell
16. Gardner, H. (1980). Frames of mind: The theory of multiple intelligence.London:
17. H.Havighurtst, R. et al.(1995). *Society and Education*. Baston: Allyen ad Bacon
18. Piaget, J. (1952). *The Origins of Intelligence in Children*. New York: International University Press.
19. Newman, B. M. and Newman, P.H. (2007). *Theories of Human Development.* London: Lawrence Erlbaum Associates, publishers.Paladin Books
20. Saraswathi, T.S. (Ed). (1999). *Culture, Socialisation and Human Development: Theory, Research and Application in India*. New Delhi: Sage.
21. Sharma, K.N. (1990). *Systems, Theories and Modern Trends in Psychology*.Agra: HPB
22. Singh, Agya Jit (2012). *Development of the Learner and Teaching-Learning Process*.Patiala: Twenty First Century Publications.
23. Woolfork, A (2014). *Educational Psychology(12th ed.). New Delhi: Pearson Education.*

Learner and Learning ProcessPractical (EDH 133)

1. Prepare your own SWOT analysis
2. Prepare a case study on an adolescent near you and mention his/her problems during that period and provide remedial measures after discussing the case with your teacher.
3. Study of a case and prepare a report on influential factors of learning
4. *Conduct a Sociometric Test in the class and interpret the result
5. Discuss the role of Emotions in the learning process
6. Presentation on educational implications of any one learning or development theory
7. Administration and Interpretation of any one psychological test - Intelligence test/Personality test/Creativity test/Attitude test/Aptitude test.

8. Conduct an experiment on transfer of learning
9. Preparation of learner profile based on cognitive/non-cognitive characteristics
10. Analysis of classroom teaching episode in the light of teaching skills / strategies

Course Title/Code	**Creating An Inclusive Classroom (EDS 103)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To understand the meaning and need of inclusion in education -To get familiarized with various policies, programmes and schemes promoting inclusive education -To identify the social, economic and physical diversity that exists amongst learners -To recognize the challenges in Inclusive Education -To appreciate the role of a teacher and various other stakeholders in making inclusion a success -To develop the skills to manage a classroom in an inclusive setup

Course Content:

SECTION A

FROM SEGREGATION TO INCLUSION

Inclusion as a Universal Human Right, Concept and Need of Inclusion in Education, Policies, programmes, Schemes with respect to Inclusive Education- Policy guidelines on inclusion in education, UNESCO (2009), National Policy for Persons with Disabilities (2006), SarvaShikshaAbhiyaan (2002).

SECTION B

ADDRESSING DIVERSITY THROUGH INCLUSIVE EDUCATION

Inclusive Education- Goals and Guiding principles, Diversity amongst learners-Social, Economic and Physical

Nature of physical and mental disabilities- Developmental (Learning disabilities, autism, Motor skill disorders), Behavioural(ADHD, ODD); Physical (Impairment, Disability, Handicap). Nature of Social and Economic diversity- Caste, Class, Gender

SECTION C

CHALLENGES IN INCLUSIVE EDUCATION

Attitudinal barriers amongst-Administrators, Teachers, Parents, Peers and Community, Assessment and Evaluation, Architectural barriers

SECTION D

OVERCOMING THE BARRIERS TO ADDRESS SPECIAL EDUCATIONAL NEEDS (SEN) OF LEARNER

Role of a teacher in an inclusive set up, Making learning more meaningful through- curricular accommodations, instructional adaptations, celebrating differences, creative educational aids and empathetic practices. Parent-School partnership, Universal Design in Learning; Individualised Education Programme

Reference Books and Reading:

1. Ballard, K. (1999). *Inclusive Education*: Falmer Press
2. *Beyond Tokenism-A guide for teachers on how to implement inclusive education in regular class*. National Trust Publications
3. Jha, M.M. (2002). *School without walls: Inclusive Education for All*. Oxford: Heinemann
4. Kapur, M. (1997). *Mental Health in Indian Schools*. New Delhi: Sage Publications
5. Menon, S.M. (1990). *Psychosocial rehabilitation: Current Trends.* NIMHANS Journal, 14,4,295-305
6. Mohapatra, C.S.(ed.) (2004). *Disability management in India: Challenges and commitments*. New Delhi: Indian Institute of Public Administration
7. National Curriculum Framework (2005). *Position Paper on Education of Children with Special Needs*
8. NCERT. (2006b). *Position paper- National focus group on education with special needs (NCF 2005)*. New Delhi: NCERT
9. RCI (2013). Status of Disabilityin India. New Delhi: Kanishka Publishers
10. Sebba. Judy, Sachdev. Darshan (1998).*What works in Inclusive Education?* Bernardo
11. UNESCO. (2009). *Policy guidelines on* inclusion *in education*. UNESCO

Creating an Inclusive Classroom Practical (EDS 312-P)

1. Conduct an interview with a special education teacher and write a report on her/his challenges in addressing the needs of her students.
2. Visit a school having a Special Educational Needs (SEN) department and enlist the provisions that exist there to cater to the diverse needs of learners with special needs.*
3. Read the story 'A Different Kind of School' from Class-6 NCERT English book and mention two activities that you as a teacher would conduct to sensitize your students on disability.
4. Study in detail the symptoms of Autism/ ADHD and enact those symptoms through a role play.
5. Prepare a 10-15 point questionnaire for children of economically weaker section attempting to identify their challenges.
6. Any other suitable activity

***Field Activity**

Course Title/Code	**Communicative English- II (EDS 134)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To read and comprehend the major points discussed in various types of written texts. -To use acceptable English in academic writing. -To build up their vocabulary. -To make academic presentations precisely, logically and effectively.

Course Content:

SECTION A

EXPLORING LANGUAGE

- Difference between language as a school subject and language as an important component in day- to- day life
- Impact of socio- cultural variations on English language.

SECTION B

READING

Sub-skills of reading, understanding the importance of developing reading skills, reading aloud and silent reading, study skills including using thesauruses, dictionary, encyclopedia etc.

SECTION C

COMPREHENSION

Comprehension Skills: Reasons for Poor Comprehension, Techniques for Good Comprehension (Skimming and Scanning), Non-verbal signals ,Structure of the text, Structure of Paragraphs, Author's Viewpoint, Reader's Anticipation, Summarizing, Reading Comprehension.

SECTION D

ACADEMIC WRITING

Note Making: Methods of preparing notes. Précis: Summary, Abstract, Synopsis, Paraphrase Letter and Resume: Letter structure and element, types of letter (Application, Cover, Acknowledgement, Recommendation, Appreciation, Acceptance, Apology, Complaint, Inquiry, Order). Résumé:Features and Types, Essay Writing

Reference Books and Readings:

1. CBSE 1993). *Interact In English: Teacher's Book*. Delhi: CBSE Publication.
2. Cohen, R. F., & Miller, J. L. (2003). *Reasons to Write: Strategies for success in Academic Writing*. New York: Oxford University Press.
3. Hunter, D. A. (2009). *A practical guide to critical thinking*. New Jersey: Wiley.
4. McCarthy, M., & O'Dell, F. (2002). *English idioms in use*. Cambridge: Cambridge University Press.
5. Terban, M. (2002). *Building Your Vocabulary.* Noida: Scholastic Inc.
6. Washburn, P. (2010). *The Vocabulary of Critical Thinking.* New York: OUP.

Communicative English- II Practical (EDS 134)

1. Paraphrase and reflect on any one of the editorial article from any National Level English News paper.
2. Give a critical review of 'Wings of Fire' by Dr. A. P. J. Abdul Kalam
3. Write an essay on any one of the following topics:

- Globalization
- Stress: Coping strategies among adolescents
- Use of English language on social media
- Relevance of writing skills in computer age

Course Title/Code	**Drama and Arts in Education (EDW 125)**
Course Type	**Workshop**
Course Nature	**Soft**
L-T-P-O Structure	**(0-0-3-0)**
Objectives	-To enable student teachers to use drama and art in teaching learning process effectively. -To motivate student teachers to think about significant developments within diverse social contexts through the medium of Arts and Drama. -To develop the ability to feel empathy for and relate with the others through drama based on experience, emotion and interpretation. -To promote the understanding of the self and provide a platform for self-expression and enhancing creativity.

Drama and Arts in Education (EDW 125)

SECTION A

THEORETICAL FRAMEWORK

Meaning and concept of Arts and Aesthetics and its significance at secondary level of School Education**,** Role of Art (Visual arts, Literary Arts and performing Arts), Theatre: Introduction, Importance and role of Drama in education, the impact of Music on Human behavior.

SECTION B

EDUCATIONAL IMPLICATIONS

Need and importance of Art and Drama in Teaching and Learning, Planning lessons based on Art Integrated Learning, Role of teacher as facilitator of learning Arts and Drama, Role Plays and Skits, Ethics of drama practice by students,

Reference Books and Readings:

1. Sahi, J. and Sahi, R. (2008). *Learning through Art*. Eklavya, Bangalore.
2. Chawla, S. S. (1986). *Teaching of Art.* Publication Bureau, Punjabi University, Patiala.
3. Minhas, N. S. (1974). *Art and Education*. N.B.S Educational Publishers, Chandigarh.
4. NCERT (2006).*Position Paper, National Focus Group on Arts, Music, Dance and Theatre.*. Publication department, NCERT

Drama and Arts in Education Practical (EDW 125-P)

1. Role Playing' activity for historical / contemporary personalities wherein students play the role of that personality to advocate his/her philosophy and contributions
2. Make and submit a sample advertisement for a product with the help of visual art.
3. Activities based on Floral and Geometrical (Rangoli).
4. Participation in any Musical/theatrical/visual art activity
5. Presentation of any 4 folk dances of India with costumes and instrument.
6. Presentation of any four folk songs
7. Project work on any five Indian festivals and its artistic significance.
8. Monotype surface-printing, Thread-print, spray-print, Simple block making and print, vegetable print, Potato-cut-print,– any two medium.
9. Poster-Designs
10. Visual art in writing - calligraphy
11. Teaching a lesson plan through one Act Play, Skit, Mono Acting, Storey Board etc.
12. TWO lessons through drama. The contents will be from or based on the lesson to teach in the class.
13. Preparation of 2 Teaching Aids: Chart, Flash Card, Transparencies, Folders and Model etc.

Course Title/Code	**Critical Understanding of ICT in Education-II(EDW 218)**
Course Type	**Workshop**
Course Nature	**Soft**
L-T-P-O Structure	**(0-0-3-0)**
Objectives	- To demonstrate the understanding of the main components of the computer in use. - To integrate technology tools for teaching learning and material development.

	- To integrate use of ICT to simplify record keeping, information management in education administration. - To reflect critically on application of ICT in teaching-learning process. - To create and share resources online - To relate with the concept of Virtual Communities - To correlate with daily application of technology in education

Critical Understanding of ICT in Education-II (EDW 218)

SECTION A

ICT IN EDUCATION

ICT for educational administration: Scheduling, record keeping, student information, electronic grade book, connecting with parents and community.
Electronic Assessment portfolio: concept, types, e-portfolio tools
Online and offline assessment tools: Rubrics, survey tools, reflective journal..
Proprietary and Open Source Software
Licensing of Software and Content

SECTION B

LATEST TRENDS IN ICT

Open Educational Resources (OER)
Concept of Mind mapping
Sharing thoughts and ideas: Blogs, Social networking websites, Discussion forums and mailing lists
Virtual Communities: Educational Implications.
Concepts of Robotics

Reference Books and Readings:

1. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi.
2. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft Powerpoint. NISCOM, CSIR: New Delhi.
3. Lee, William w., Dianna, L. Owens, (2001) Multimedia based Instructional Design: Computer based training. Jossey-Bass
4. Mishra, S.(Ed.) (2009). STRIDE handbook 08: E-learning. IGNOU: New Delhi.

5. National Policy on ICT in Education. (2010). New Delhi: Department of School Education and Literacy. Ministry of HRD, GOI, Retrieved from: http://mhrd.gov.in/ict_school
6. Roblyer, M.D. (2008). Integrating Educational Technology into Teaching. New Delhi: Pearson Education, South Asia, India.
7. Shiksha Mein Computer (2001). Available on website of Indira Gandhi National Open University, Delhi: http://www.ignou.ac.in
8. Singh, Kamal Deep. (2012). Lesson through Multimedia. N. Delhi: Arya Book Depot.
9. Singh, Kamal. D., & Kaur, D. (2008). Using Computers in Education. New Delhi: Dhanpat Rai Publishing Company (Pvt.) Limited.
10. Varanasi, L., Sudhakar, V. & Mrunalini, T. (2004). Computer Education. New Delhi: Neelkamal Publications Pvt. Ltd.
11. Walia, J.S. (2008). Foundations of Computer Education and Applications. Punjab: Ahim Paul Publishers.

Critical Understanding of ICT in Education-II Practical (EDW 218 - P)

1. Developing a model based on basic robotics concept.
2. Developing an electronic teaching portfolio.
3. Combining text, graphic and audio- visuals in developing a digital story.
4. Create an Educational Blog
5. Set up a collaborative wiki
6. Using movie maker prepare a movie on educational theme
7. Create a word search
8. Create a crosswords related to pedagogical content for secondary level students.
9. Create a peer networking platform for sharing information and resources
10. Create a mind map on your pedagogical subject.
11. Make a presentation on current trends in Technology and Education
12. Learn to recover the deleted data.
13. Installation of Window's operating system and application software

SEMESTER-3

Course Title/Code	**CHEMISTRY-III** **Organic Chemistry – I (CHH 237)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To develop an understanding of chemistry of hydrocarbons and their halogenated derivatives. -To develop basic skills in organic synthesis and purification of organic compounds

Course Content:

SECTION A

STEREOCHEMISTRY OF ORGANIC COMPOUNDS

Review of Concept of Isomerism and Types of isomerism with examples.

Optical Isomerism: Structural changes responsible for properties: elements ofsymmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion
Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism: Determination of configuration of geometric isomers. Cis–trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism: Difference between configuration and conformation.Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives. Review of Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

(10 L)

SECTION B

ALIPHATIC HYDROCARBONS

Alkanes: Review of IUPAC nomenclature of branched and unbranched alkanes.Isomerism in alkanes and industrial source. Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes : orientation, reactivity and selectivity.

Cycloalkanes: Nomenclature, methods of formation (from acetoacetic ester / malonicester and Dieckmann reaction), chemical reactions (halogenation), Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Alkenes: Accounting for Reactions due to unsaturation in compounds. Nomenclatureof alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism.Regioselectivity in alcohol dehydration.The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.

Cycloalkenes: Methods of formation and chemical reactions of cycloalkenes.

SECTION C

AROMATIC HYDROCARBONS

Factors responsible for the characteristic reactions of Aromatic compounds.Nomenclature of benzene derivatives. Structure of benzene : molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity :The Huckel rule, aromatic ions.

Aromatic electrophilic substitution: General pattern of the mechanism, Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/ para ratio.Side chain reactions of benzene derivatives.Birch reduction.

SECTION D

ALKYL AND ARYL HALIDES

Alkyl halides: A study of Alkyl halides highlighting its synthetic applications.Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams.

Aryl halides: Methods of formation of aryl halides, nuclear and side chain reactions.The addition- elimination and the elimination-addition mechanisms of nucleophilic aromatic

substitution reactions.

Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.Synthesis and uses of DDT and BHC. **(8 L)**

Reference Books and Readings:

1. Organic Chemistry : Seyhand N Ege
2. Organic Chemistry : Morrison and Boyd
3. Organic Chemistry : I L Finar
4. Organic Chemistry : Hendricson, Cram and Hammond
5. Organic Chemistry : Stanley H. Pine

Organic Chemistry – I Practical (CHH 237-P)

Laboratory Techniques:

1. Calibration of Thermometer using naphthalene / acetanilide / urea

2. Determination of melting point of Benzoic acid / cinnamic acid / m – dinitro benzene / p-dichlorobenzene

3. Distillation of water – alcohol mixture using water condenser; Distillation of chlorobenzene – nitrobenzene mixture using air-condenser

4. Crystallization: Benzoic acid from hot water, naphthalene from ethanol
5. Sublimation of camphor / phthalic acid/succinic acid

Electrophilic Substitution Reactions

1. Preparation of Iodoform from ethanol / acetone
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration

3. Preparation of *p*-bromoacetanilide from acetanilide by bromination

References :

A Text Book of Qualitative organic Analysis, A I Vogel

Course Title/Code	**PHYSICS** **Electricity and Electromagnetism** **(PHH 226)**

Course Type	Core
Course Nature	Hard
L-T-P-O Structure	(3-0-2-0)
Objectives	-To enable students to acquire a broad conceptual framework ofelectromagnetic phenomena. -To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.

Course Content:

SECTION A

ELECTROSTATICS & ELECTRIC CURRENTS

Vector Calculus : Scalar and Vector fields, Gradient of a Scalar, Divergence andCurl of a vector, Line, surface and volume integrals.

Review of Coulomb's law – Electric field and potential – Field due to a monopole,

dipole, torque on a dipole in uniform and non-uniform E fields, Flux of an electric field. Gauss's law, applications to deduce electric fields, P.E. of a system of two charges, of many charges.

Basic circuit analysis – Kirchhoff's laws.Voltage and Current divider Rules. Single loop and two loop circuits, Mesh analysis, RC circuits, Maximum power transfer theorem. (9L)

SECTION B

ELECTRIC FIELDS IN MATTER

Electric Fields: Capacitance, parallel plate capacitor, calculation of capacity ofa spherical and cylindrical capacitor, energy stored in a capacitor, capacitor with dielectric, atomic view of dielectrics, polarization, electric field due to a polarised material, Gauss's law in dielectrics, Dielectric constant, Energy density of an electrostatic field (with and without dielectric).

Polarisability and susceptibility – Frequency dependence of polarisability, Clausius-Mossotti equation. (10L)

SECTION C

MAGNETOSTATICS

Review of Ampere's law, B near a long wire, Magnetic lines of induction, force between two parallel conductors, definition of ampere, B for a solenoid, Biot-Savart's law, applications.

The magnetic field, Lorentz force and definition of magnetic field, magnetic induction, magnetic force on a current element, circulating charges, Cyclotron resonance frequency, Cyclotron. Magnetisation, magnetisation current density, magnetic field intensity, magnetic susceptibility and permeability.(10L)

SECTION D

ELECTROMAGNETIC INDUCTION

Review of Faraday's law, Faraday's experiment, Lenz's law, Time varying magnetic fields, Application in Betatron.

Inductance: Self inductance, LR circuit, energy in a magnetic field, magneticenergy density.

AC circuits: Sinusoidal voltage, current voltage relation in resistance, capacitanceand inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance, mutual inductance and transformers.(11L)

References Books and Readings:

1. Electricity and Magnetism, Fewkes and Yarwood.
2. Electricity and Magnetism : A N Matveev, Mir Publishers, Moscow.
3. Fundamentals of Physics, 6th Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley, Inc.
4. Electricity and Magnetism, F.W.Sears, Addison Wesley Co.
5. Fundamentals of Electricity and Magnetism : A F Kipp, McGraw Hill.

PHYSICS-III - Electricity and Electromagnetism Practical (PHH226-P)

A. Resistance measurements.
B. Capacitance measurements.
C. EMF measurements.
D. RC circuits.
E. Magnetic Induction measurements

F. Ampere's Law

Reference :

1. Advanced Practical Physics, Worsnop and Flint.

Course Title/Code	**BOTANY-III** **Gymnosperms and Reproduction in Angiosperms(EDH204)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to: • understand the morphology, anatomy, reproduction and classification of Gymnosperms • the structure, development and processes associated with Angiosperm embryology Practical • To observe and identify temporary and permanent slides of Gymnosperms and Angiosperm Embryology. • To develop skills of free hand sectioning, staining and mounting embryological materials.

SECTION A

Gymnosperms

a) General characters, distribution, classification, affinities and economic importance.

b) Study of morphology, anatomy and reproduction in- Cycadopsida: *Cycas*

Coniferopsida: *Pinus*

Gnetopsida: *Gnetum*

SECTION B

Reproductive structures Angiosperms

a) Flower: Review of structure, morphology, embryological perspective.

b) Microsporangium: Development of wall layers, Tapetal types, microsporogenesis, tetrad types.

c) Male gametophyte: Development and structure; vegetative and generative cells; male gametes.

d) Megasporangium (ovule): Development, types, megasporogenesis, tetrad types.

e) Female gametophyte: Development, ultrastructure, mono, bi and tetrasporic embryo sacs.

SECTION C

Reproduction in Angiosperms

a) Pollination and fertilization -Definitions, Types of Pollination, Pollen-Pistil interaction, Self-incompatibility, Double-fertilization.

b) Endosperm: Definition, Types–Cellular, Nuclear and Helobial; Endosperm haustoria.

SECTION D

a) Embryo: Classification, types, development of Crucifer type.

b) Fruit and Seed: Development, structure of Monocot and Dicot seeds, dispersal mechanisms, importance.

c) Brief account of Apomixis and Polyembryony.

References Books and Readings:

1. Sporne, K.R. (1974). *Morphology of Gymnosperms*. London: Hutchinson & Co.

2. Gangulee, S.C., Kar, Ashok Kumar. (1982).*College Botany Vol.II*.Calcutta: Central Book Agency.

11. Singh,V., Pande,P.C. &Jain,D.K. (2007). *Diversity and systematics of seed plants.* Meerut:Rastogi Publications.

3. Pandey, S.N., Mishra, S.P. & Trivedi, P.S. (2004). *A Textbook of Botany Vol.II*, Delhi:Vikas Publishing House.
4. Chopra G.L. (1972).*Gymnosperms*.Jullandar: S. Nagin & Co.

5. Bhojwani, S. S. and Bhatnagar, S.P. 000. *The Embryology of Angiosperms*. Delhi: Vikas Publishing House.

6. Raven, P.H., Evert, R.F.and S.E.Eichhorn. (1999).*Biology of Plants, 5th Ed*., New York: W.H.Freeman and Co., Worth Publishers.

7. Swamy, B.G.L. and Krishnamurthy, K.V.(1980).*From Flower to Fruit*.New Delhi: TMH Publishing House.

8. Johri, B.M.(Ed.).(1984). *Embryology of Angiosperms*. Germany: Springer-Verlag.

Gymnosperms and Reproduction in AngiospermsPractical (EDH204-P)

Activities:

- Study of morphology, anatomy and reproductive structures of genera of Gymnosperms included in theory syllabus.

- Study of structure of anther, microsporogenesis and pollen grains using permanent slides and mounts.

- Study of structure of ovules and embryosac development (monosporic type) using permanent slides.

- Examination of a wide range of flowers for study of pollination.
- *In vitro* germination of pollen grains.

Course Title/Code	**MATHEMATICS (MAH 219B-T)** **REAL ANALYSIS**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	

COURSE CONTENT:

Unit I: Real Numbers

The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important subsets of Intervals, Countable and Uncountable sets.

Unit II: Neighborhoods and Limit Points

Introduction, Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness.

Unit III: Sequences

Introduction, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, Subsequences.

Unit IV: Infinite Series

Introduction, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Maclaurin's integral test.

References:

Real Analysis by J.M.Howie, Springer 2007.
Real Analysis by Malik, Wiley Eastern.
Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.

Mathematical Analysis by Malik and SavitaArora, New Age International Pvt. Ltd.

Real Analysis by Royden, Prentice Hall of India Pvt. Ltd.

Mathematical Analysis by T M Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition.

Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.

Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006.

Elementary Analysis – The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.

Real Functions by G. Goffman.

Course Title/Code	**Zoology-Animal Diversity III And Comparitive Anatomy Of Vertebrates (EDH205)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	- To enable students to understand in respect of vertebrates; their organizational hierarchies and complexities; the evolutionary trends in external morphology and comparative studies of internal structures; Identification and classification with examples; to enable them to understand various modes of adaptations in animals. -To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and labelling; of micro techniques (fixing, embedding, section cutting, staining and mounting); of collection, preservation, mounting, identification and labelling of collected specimens; field observation of animals.

Course Content:

SECTION A

PISCES AND AMPHIBIA

a) Pisces: General Characters and Classification of SuperclassPiscesupto classes with examples and comparison of chondrichthyes and osteichthyes ; Type study: Scoliodon– External morphology, respiratory system, structure of heart and arterial system, structure of brain and lateral line system ; Dipnoi, air bladder,migration in fish

b) Amphibia: General characters and classification of class Amphibia, origin ofAmphibia, parental care in Amphibia

SECTION B

REPTILIA, AVES AND MAMMALIA

Reptilia: General characters and classification of class Reptilia up to orders with examples.

Aves: General characters and classification of class Aves up to orders withexamples (5 important orders only), salient features of Archaeornithes andNeornithes, flight adaptation and migration in birds

c) Mammalia: General characters and classification of class Mammalia up to orderswith examples; General characters of Prototheria ; Adaptive radiation inMarsupialia and Primates ; Adaptive features of Chiropetera and Cetacea ;Dentition in mammals.

SECTION C

TYPE STUDY – RABBIT AND COMPARATIVE ANATOMY–I

a) Type study: Oryctolagus(Rabbit) – Respiratory system and structure of brain Sense organs – eye and ear.

b) Comparative studies in amphibians, reptiles, birds and mammals:i) Digestive system and associated glands ii) Respiratory organs

c) Evolution of heart in vertebrates

d) Evolution of aortic arches in vertebrates

SECTION D

COMPARATIVE ANATOMY–II

a) Comparative studies in amphibians, reptiles, birds and mammals:

i) Brain

ii) Eye and ear of birds and mammals

iii) Cranial and spinal nerves, Autonomous nervous system

b) Different types of vertebrae in vertebrates

c) Structure and evolution of kidneys in vertebrates

d) Structure of gonads and gonoducts formation

References Books and Readings:

1. Modern Textbook of Zoology: Vertebrates by R.L. Kotpal – RastogiPublications, Meerut, 3rd edition, 2008.

2.A Text Book of Zoology Vol.II by Parkar and Hasswel – (MacMillan).

3.A Text Book of Zoology Vol.II by R.D.Vidyarthi – (S. Chand & Co., Delhi).

4.Life of Vertebrates by J.Z.Young – (Oxford University Press).

5.The Vertebrate Body by A.S.Romer – (Vakils, Ferrer& Simons, Bombay).

6.Elements of Chordate Anatomy by Weichert – (McGraw Hill).

7.The Birds by R.L Kotpal (4th edition) – (Rastogi Publications, 2008).

8.Bird Migration by D.R. Griffin – (Doubleday, Garden City, USA).

9.The Book of Indian birds by Salim Ali

10. Hand Book of the Birds of India & Pakistan by Salim Ali, Ripley, Dillon –(Oxford University Press, Delhi).

11. Fish and Fisheries by K. Pandey and J.P. Shukla (2nd Edition) (RastogiPublications, 2008).

12.Indian Fishes by Qureshi and Qureshi – (Brij Brothers, Bhopal).

13.Comparative anatomy of the vertebrates by George C Kent – 3rd saint Louis: The C.V. Mosby Company, 1973.

ZOOLOGY-III Practical (EDH205-P)

1. Study of specimens of Chondrichthyes:
a) Zygaenab) Pristis
d) Trygone) Skate
2. Study of specimens of Osteichthyes:
a) Echeneisb) Clariasc) Hippocampusd) Anguilla
e) Belonef) Synaptura g) Tetradonh) Diodon
3. Mounting of fish scales:
a) Placoid scalesb) Cycloid scales
4. Dissection of Scoliodon(Study of dissected specimens):
a) Afferent and efferent branchial system.
b) Cranial nerves (5th, 7th, 9th and 10th).
5. Study of specimens of Amphibians:
a) Ranab) Bufo c) Hylad) Rhachophorus
e) Salamanderf) Ichthyophisg) Axolotal larva.
6. Study of specimens of Reptilia:
a) Chameleon b) Varanusc) Draco
d) Tortoisee) Crocodile
7. Identification of poisonous and non-poisonous snakes:
a) Cobrab) Kraitc) Rat snake
d) Vipere) Dryophisf) Hydrophis
8. Study of specimens of Aves:
a) Barn owlb) Water henc) Wood pecker
d) Cattle egret e) Koelf) King fisher
9. Local field visit to identify and classify 10 fauna (common birds and mammals); submission of report.
10. Dissection of rat (demonstration):
a) Digestive system
b) Urinogenital system
c) Arterial system
11. Osteology:
a) Study of skulls of Frog, Varanus/Calotes, Bird and Rabbit.

b) Study of fore and hind limb bones of Frog, Varanus/Calotes, Bird and Rabbit

12. Study of different types of vertebrae:

13. Study of pectoral and pelvic girdles of Frog, Varanus/Calotes, Bird

	After the completion of the course, the students would be able to
Learning Outcomes (COs)	**CO1** Understand and explain basic concepts of Biophysics **CO2** Understand and explain the multidisciplinary dimensions of Biophysics **CO3** Understand the principles of Biophysics and underlying fundamentals **CO4**Understand and explain about the various Bio-molecular mechanisms **CO5**Appreciate the invention of instruments for welfare of human beings and life

Rabbit

14. Study of stained slides of mammals – T.S. of a) Stomachb) Intestine
c) Kidneyd) Liver
15. Assignment on fishes:

a) Morphological adaptationb) Accessory respiratory organs
c) Parental care

Field Visit- Sultanpur Bird sanctuary

Course Title/Code	**Basics of Biophysics (EDH221)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objective	Students would be able to develop basics concepts of Bio-physics To develop an understanding of principles of Biophysics To develop apply the knowledge of Biophysics in working of different scientific instruments.

Section A

(BT1, BT2, BT3)

Introduction to Bio- Physics

Meaning, Nature, Scope, Need and Importance of Biophysics

Dynamic nature of Biophysics and Instrumentation

Fundamental of Biophysics in understanding the dynamics of Bio- Molecules

Section B

(BT1, BT2, BT3, BT4, BT5, BT6)

Biophysical properties and Cellular Bio-physics

Surface tension, adsorption, diffusion, osmosis, dialysis and colloids

Molecular alphabets of life Amino acids, nucleic acid bases and lipids, classification and properties of amino acids, peptides and poly peptides.Nucleosides, nucleotides, polynucleotides, pentose and hexose poly saccharides.Cell membrane and Transport Structure and function of cell membrane.Types of transport across cell membrane.Transport of ions and molecules through cell membranes.

Section C

(BT1, BT2, BT4)

Fundamentals of Bio-Physics and instrumentation

Basic of Bio-Physics instrumentation system,

Functional component in design of biomedical instrumentation systems,

Fundamentals of microscopic imaging Physics of light and color, basic concepts in microscopy, anatomy of the microscope, (light microscopy), specialised microscopy techniques- phase contrast and dark field microscopy, simple fluorescence microscopy, confocal microscopy, time lapse fluorescence, fluorescence resonance energy transfer (FRET), labeling biomolecules for fluorescence microscopy, electron microscopy, interaction of electron beam with samples, scanningand transmission

electron microscopy (SEM and TEM)

Section D

(BT1, BT2, BT4, BT6)

Principles of x-ray crystallography

Unit cell, cell content, crystal symmetry, crystal systems, Bravais lattices, symmetry elements and operations, point groups and space groups. Bragg's law.Diffraction of x-rays by crystals, Atomic scattering factors and structure factors, amplitude and phase.

Text Books

References

1. Physical Chemistry for Life Sciences by Barrow C, MC-Grow Hill

2. Biophysical Chemistry by Bloomfield V A and Harrington R E, W A Freeman and Co.

3. Biophysical Chemistry by Cantor C R and Schimmel

, P R, W A Freeman and Co.

4. Protein, by Hasehemyer R N and Hasehemyer ACBV,John Willy and Sons

5. Aspects of Biophysics, Hughe S W, John Willy andSons.

Course Title/Code	**Knowledge and Curriculum (EDH 206)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To understand the epistemological basis of education and various dimensions of curriculum development. -To understand a theoretical base to desirable pedagogical practices. -To examine the concerns and issues related to curriculum. -To assess the different sources of knowledge and modern child based methods of gaining knowledge. -To reflect on the epistemological thoughts of philosophers and recent prominent documents with respect to curriculum framework.

Knowledge and Curriculum (EDH 206)

SECTION A

KNOWLEDGE AND EDUCATION

Concept of knowledge, Methods of acquiring knowledge, Different kinds of knowledge, Nature of knowledge, belief, information, skill, perception

Epistemological thoughts of M.K. Gandhi, Rabindranath Tagore, Rousseau, John Dewey, Plato and Paulo Freire in context to activity/ discovery/ dialogue as defined for contemporary education

SECTION B

SOCIAL SYSTEMS AND KNOWLEDGE

Aims of Education and Society, Impact of social structure on concept of knowledge and teaching practices, Role of teacher in knowledge construction, concept of Academic Freedom, Interrelationship of education with culture, secularism, economy, politics, modernization and History

SECTION C

CURRICULUM- BASICS AND DEVELOPMENT

Concept of Curriculum and Syllabus, Core and Hidden Curriculum- Meaning and Role, Curriculum Development- Basic considerations, Principles, Determinants, Different Approaches of Curriculum Development, Process of Curriculum Development, Interrelationship between market forces, assessment, and curriculum

SECTION D

CURRICULUM FRAMEWORK AND TRANSACTION

Meaning of Curriculum Framework and Curriculum Transaction**,** Critical analysis of NCF2005 and its recommendations**,** Role of National and State level agencies in framing of the Curriculum- NCERT,SCERT, Boards of Education**,** Role of textbooks in Curriculum transaction**,** Addressing critical issue through Curriculum: Environmental concern, Gender Difference, inclusiveness and value inculcation

Reference Books and Readings:

1. Bawa, M. S. & Nagpal, B. M. eds (2016). *Developing Teaching Competencies*. New Delhi: Viva Books pvt. ltd.

2. Butchvarov, P. (1970). *The Concept of Knowledge*. Evanston, Illinois: North Western University Press.
3. Dewey, J. (1997). *Experience and Education*. Touchstone, New York.
4. Kelly, A. V. (2006). *The Curriculum: Theory and Practice*(Fifth Edition). Sage Publications
5. Krishna, D. (1997). *Gyan Mimansa*. Jaipur : Rajasthan Hindi Granth Academy.
6. NCERT (2005). *National Curriculum Framework*. New Delhi: NCERT.
7. NCERT (2006). *Position Paper, National Focus Group on Curriculum, Syllabus and textbooks*. New Delhi: NCERT.
8. NCERT (2006). *Position Paper, National Focus Group on Systematic Reforms for Curriculum Change.* New Delhi: NCERT.
9. Sarangapani, P. (2003). *Construction of School Knowledge*. New Delhi: Sage Publication.

Knowledge and Curriculum Practical (EDH 206)

1. Analyze and make report on the transactional curriculum of any one upper primary and secondary class in any one school subject in light of various considerations of Curriculum Development
2. *Write a report on different methods used by school teacher for construction of knowledge based on survey and observation in school
3. Analyze NCF 2005 with respect to different areas of Curriculum and prepare a presentation on it.
4. Draft out a few activities related to social concerns which can be incorporated in the curriculum transaction.
5. Any other suitable activity.
   *Field activity

Course Title/Code	**Gender, School and Society (EDS 207)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To understand paradigm shift in gender studies -To formulate a positive notion on sexuality amongst young people -To develop an insight into mental and physical abuse

	-To develop a healthy perspective towards unconventional gender roles -To understand and examine the role of curriculum and text books in challenging gender inequalities -To understand and examine the role of school, peers, and teachers in reinforcing gender parity -To develop a positive attitude towards the third gender -To prepare pedagogic material to develop abilities in their students to challenge gender inequalities

Course Content

SECTION A

PARADIGM SHIFT GENDER ROLES

Concept of gender, difference between gender and sex, available resources/ opportunities based on gender. Paradigm shift from women studies to gender studies: Brief discussion of landmarks in social reform from Vedic period to 21st century. Patriarchy vs. Matriarchy, Polyandrous, Matrilineal and Matriarchal Societies: Relevance and status of education.

SECTION B

SOCIAL CONSTRUCTION OF GENDER

Gender Identity and socialization in the family, school, society, media, Gender roles and stereotypes. Gender and its intersection with Poverty, Caste, Class, Religion, Disability and Region (rural, urban and tribal).

Social Construction of Gender during childhood and adolescence with reference to mental and physical abuse, Child Protection Act.

SECTION C

GENDER EQUALITY: Need and importance.LGBT, Gender dysphoria- Identification, and handling in daily life situation.

SECTION D

GENDER AND SCHOOL

GENDER INEQUALITY IN SCHOOL: School curriculum, text books, activities and student-teacher interaction**.**Policy interventions in school education.Teacher in India: An analysis from gender perspective.

Reference Books:

1. Bordia,A. (2007). *Education for gender equity.* The Lok Jumbish experience, p. 313-329.
2. Chatterji,S.A. (1993). *The Indian Women in Perspective.* New Delhi: Vikas Publishing.
3. Government of India (1975).*Towards Equality: Report of the committee on the status of Women in India*. Delhi: Department of Social Welfare, Government of India.
4. Kumar, K. (2010). Culture, State and Girls: An Educational Perspective.*Economic and Political Weekly*,XLV(17), p. 24.

Gender, School and Society Practical (EDS 207)

1. Analysis of folk songs in different languages to identify the myths prevailing in different regions.
2. Poster making: A society with complete gender parity.
3. Short plays with Gender equality as theme.
4. A case study based on Gender bias and intervention given to create awareness.
5. *Covert observation: To observe the distribution of roles and responsibilities among different gender groups in the school and identify their significance in promoting gender bias/ parity.
6. Develop and present a skit that portrays gender inequality (Group activity).
7. Choose any one woman achiever from an unconventional field and analyze the various gender biases she would have overcome to achieve her goals.

***Field activity**

Course Title/Code	Foreign language French- (FLS103)--
Course Type	Audit
Course Nature	Elective
L-T-P-O Structure	(1-1-0)
Objectives	• To introduce the basic level of French, enabling them to understand & communicate in simple phrases with the focus on their Vocabulary,

	Grammar, Semantics, Phonology, Reading and Writing skills in the target language • To encourage the production of accurate, authentic and fluent French, both written and spoken, in different formats • To help in broadening their understanding & command over the language by giving them brief insights into France & its culture. • To acquire a knowledge and understanding of the structures and registers and further using them in professional way.

Unit A

- Les alphabets
- Les salutations & forms of politeness
- Expression on taking leave
- Self Introduction

Unit B

- La culture de France
- Presentation on French Language
- Présentez-vous
- Les Pronoms Sujets
- "ER" verbs
- "IR" verbs

Unit C

- Les articles définis et indéfinis
- Les Nombres en Cardinal (0-1000)
- Les Nombres en Ordinal (0-1000)
- Les noms et les Adjectifs
- Les verbes (avoir, être, faire, aller, venir)
- Masculin et Féminin
- Les Pluriels

Unit D

- Moments of the day
- Days of the week & related questions
- Months of the year & related questions
- Les couleurs
- Les verbes (vouloir, pouvoir, savoir, devoir)
- Les Nationalités

Suggested Readings:

1. Apprenons le français, Méthode de français part 2, Mahitha Ranjit, Saraswati House Pvt.ltd
2. Apprenons le français, Méthode de français part 3, Mahitha Ranjit, Saraswati House Pvt.

SEMESTER-4

Course Title/Code	**CHEMISTRY-IV** **Thermodynamics, Equilibrium and Solutions** **(CHH 238)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermo chemical equations. -Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts. -Apply the concept of equilibrium to construct and interpret the phase diagrams.

Course Content:

SECTION A

THERMODYNAMICS – I

Concept of Energy, Historical perspectives, Generalisation of laws of Thermodynamics based on human experience with Nature and natural Processes. Language of thermodynamics : system, surroundings, etc. Types of system, intensive and extensive properties.State and path functions and their differentials.Thermodynamic process.Concept of heat and work.

First Law of Thermodynamics **:** Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.Joule, Joule–Thomson coefficient and inversion temperature. Calculation of w.q. dU and dT for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry: Standard state, standard enthalpy of formation. Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume.Enthalpy of neutralization.**(10 L)**

SECTION B

THERMODYNAMICS – II

Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics , different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.

Concept of Entropy : Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical changes, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change.Variation of G and A with P, V and T.

Third law of thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. **(10 L)**

SECTION C

CHEMICAL EQUILIBRIUM AND PHASE EQUILIBRIA

Recognising a system at Chemical Equilibrium. Attributes of Chemical Equilibrium, Thermodynamic derivation of law of mass action, Equilibrium constant and free energy.Factors that affect the chemical equilibrium and Le Chatelier's principle.

Calculations involving equilibrium constant Ionic equilibria in aqueous solutions, sparingly soluble salts, solubility product common ion effect, selective precipitation, applications in qualitative analysis.

Ionisation of water, pH scale, weak acids and bases, hydrolysis, buffer solutions, acid Base indicators, acid base titrations and multi stage equilibria.Reaction isotherm and reaction isochore.

To establish a systematic way of discussing the changes systems undergo when they are heated and cooled and when their composition is changed. Clapeyron equation and Clausius.

Phase equilibria of two component system – solid-liquid equilibria – simple eutectic – Bi – Cd. Pb-Ag. Systems, desilverisation of lead.Simple eutectics, systems forming compounds with congruent melting points.**(8 L)**

SECTION D

SOLUTIONS

To unify the equilibrium properties of simple mixtures on the basis of chemical

potential.Solutions of Gases in liquids.Henry's law and its applications, solutions of solids in liquids.Distribution law, application of distribution law to association, dissociation and extraction.

Dilute Solution : Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.

Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes – HC – H_2O and ethanol – water systems.

Partially miscible liquids – Phenol-water, trimethylamine – water, nicotine – water systems. **(8 L)**

Reference Books and Readings:

4. University Chemistry : Bruce Mahan
5. Concise Inorganic Chemistry : J D Lee
6. An Introduction to Inorganic Chemistry : Mackay and Mackay
7. Concise Inorganic Chemistry : J D Lee
8. An Introduction to Inorganic Chemistry : Mackay and Mackay
9. Principles of Physical Chemistry : Marron and Prutton
10. Elements of Physical Chemistry : Samuel Glasstone and Lewis
11. Physical Chemistry : P W Atkins

Thermodynamics, Equilibrium and Solutions Practical (CHH 238-P)

1. Determination of heat of neutralization of acids and bases.
2. Verification of Hess's law of constant heat summation.
3. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
4. pH titration of acid versus base (observation of change in pH).
5. Construction of phase diagram for a two component system. (solid-solid, liquid-liquid).
6. Determination of equivalent constant of hydrolyses of an ester.
7. Determination of dissociation constant of a weak acid.
8. A comparative study on methods of finding pH using universal indicator, pH paper strips (both wide and narrow range), pH meter.
9. Determination of solubility product constant (Ksp) of a sparingly soluble salt.
10. Determination of dissociation constant of phenol phthalin/methyl orange by colorimeter.

References :

A Text Book of Qualitative organic Analysis, A I Vogel

Course Title/Code	**CHEMISTRY-IV** **Paper-2 Organic Chemistry – II (CHH 313)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To develop an understanding of the chemistry of Functional groups and mechanisms of Organic Reactions. -To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification

Course Content:

SECTION A

ALCOHOLS AND PHENOLS

Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).

Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols - oxidative cleavage [$Pb(OA_c)_4$ and HIO_4] and Pinacol-pinacolone rearrangement.

Trihydric alcohols: Nomenclature and methods of formation(from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI). Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2- naphthols (one method each). Physical properties and acidic character of phenol. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation.

(10 L)

SECTION B

CARBONYL COMPOUNDS ALDEHYDES AND KETONES

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with

particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villager oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.
(8 L)

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SECTION C

ORGANIC SYNTHESIS VIA CARBANIONS

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of α – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; α,β – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.

Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; α, β – unsaturated acids – crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. **(8 L)**

SECTION D

ORGANIC COMPOUNDS OF NITROGEN

Nitro Compounds: Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Aliphatic and Aromatic amines: Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsberg's method). Structural features effecting basicity of amines. Amine salts as phase – transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations by aryl diazonium salts, azo coupling. **(10 L)**

Reference Books and Readings:

6. Organic Chemistry : Seyhand N Ege
7. Organic Chemistry : Morrison and Boyd
8. Organic Chemistry : I L Finar
9. Organic Chemistry : Hendricson, Cram and Hammond
10. Organic Chemistry : Stanley H. Pine
11.

Organic Chemistry – II Practical (CHH 313-P)

1. Qualitative organic analysis

(i) Separation of organic mixtures containing two solid components using water , $NaHCO_3$, NaOH

(ii) Analysis of an organic compound: Detection of extra elements (N,S and X) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides) in simple organic compounds. Identification of organic compound based on functional group analysis, determination of physical constant (mp / bp).

2. Chromatographic Techniques

(i) Thin Layer Chromatography

Determination of R_f values and identification of organic compounds:

(a) Separation of green leaf pigments (spinach leaves may be used)

(b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone using toluene : light petroleum (2:3 ratio)

(c) Separation of mixture of dyes

(ii) Paper Chromatography

Determination of R_f values and identification of organic compounds:

(a) Separation of mixture of amino acids

(b) Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water (4:5:1) ; Spray reagent: anilinehydrogenphthalate

(iii) Column Chromatography: Separation of ortho and para nitroanilines

References :

1. A Text Book of Qualitative Organic Analysis, A I Vogel
2. A Text Book of Quantitative Organic Analysis, A I Vogel

Course Title/Code	**PHYSICS-IV** **Optics (PHH227)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To enable students to •understand that light is a wave phenomenon; •apply the understanding of wave phenomenon to light. -To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.

Course Content: INTERFERENCE

Huygen's principle, explanation of reflection and refraction, Conditions for Sustained Interference, Coherent Sources, Young's Double Slit Experiment, Interference based on the Division of Wave Front, Interference based upon Division of Amplitude, Fresnel Bi-Prism and its Applications, Interference in Thin Films, Newton's Ring and its Applications, Michelson Interferometer and its Applications. (10L)

SECTION B

DIFFRACTION

Difference between interference and diffraction; Fraunhoffer and Fresnel diffraction; Fraunhoffer diffraction through a single slit; plane transmission diffraction grating (N-slits); absent spectra; Resolving power-Rayleigh's criterion of resolution; Dispersive power; Resolving power of a grating. (10L)

SECTION C

POLARISATION

Polarized and Un-Polarized Light; Brewster's law, Malus Law; Uniaxial crystals, Double Refraction; Nicol Prism; Quarter and Half Wave Plates; Detection and Production of Different Types of Polarized Light; Polarimetry; Bi-Quartz and Laurent's Half Shade Polarimeter (10L)

SECTION D

Laser: Stimulated absorption, Spontaneous and stimulated emission, Population inversion, Conditions for laser action, Types of laser: He-Ne laser, Ruby Laser, Semiconductor laser, Laser properties and applications;

Fiber Optics: Introduction; Propagation of light through a fiber; Numerical aperture; Types of fiber; Modes of propagation (simple idea); V-number, applications of optical fibers; (10L)

References/ Text Books:

1. Textbook of Optics, Brijlal and Subramaniam
2. Optics- A K Ghatak
3. Fundamentals of Optics- Jenkins and White
4. Optics- Eugene Hecht
5. Fundamentals of Optics- Khanna and Gulati
6. Engineering Physics- Satya Parkash
7. Modern Physics- S P Taneja
8. Fundamentals of Engineering Physics-M S Khurana
9. Principals of Lasers-O. Svelto

PHYSICS-IV Optics Practical (PHH-P)

List of Experiments:

1. To determine the wavelength of sodium light by Newton's rings experiment.
2. To determine the wavelength of sodium light by Fresnel's biprism experiment.
3. To determine the wavelength of various colors of white light with the help of a plane transmission diffraction grating.

4. Determination of dispersive power of the given grating.
5. To determine the refractive index and Cauchy's constants of a prism by using spectrometer.
6. To determine the wavelength of sodium light by Michelson interferometer.
7. To determine the resolving power of a telescope.
8. To determine the pitch of a screw using He-Ne laser
9. To determine the specific rotation of optically active solution by using Laurent's half shade polarimeter.
10. To determine the numerical aperture of an optical fiber using laser light.

References:

1. Advanced Practical Physics- B. L. Worsnop and Flint.
2. Practical Physics- S. L. Gupta and V. Kumar
3. B. Sc. Practical Physics- Harnam Singh and P. S. Hemine
4. Advanced Practical Physics- Chauhan and Singh

Course Title/Code	**BOTANY-IV** **Angiosperm Anatomy, Evolution and Economic Botany (EDH224)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to: • understand the development, organization and functions z various plant tissues. • understand the histological complexity in plants. • appreciate the utility of plants and plant products in human welfare Practical • To develop the skill of free hand sectioning, staining and mounting of plant parts for anatomical study. • To observe and identify different types of tissues using temporary

	and permanent slides.

Course Content:

SECTION A

Angiosperm Anatomy

a) Meristems: Characteristics, Classification, Theories of meristematic activity, Organization of shoot-apex.

b) Epidermis: Structure and function, Stomatal types, Trichomes.

c) Simple tissues: Definition, Types **(**parenchyma, collenchyma, sclerenchyma), Structure, Function.

d) Vascular tissues: Xylem and Phloem-Structure, function, primary and secondary vascular tissues, Types of wood

.

SECTION : B

a.) Review of anatomy of stem, root and leaf in Dicots

b). Review of anatomy of stem, root and leaf in Monocots.

c.) Secondary growth in root and stem.

d.) Brief account of Anomalous secondary growth– *Bougainvillea*, *Dracaena*.

SECTION C

Evolution:

a.) Brief account of origin of life.

b.) Concept of evolution.

c.) Evolutionary theories – Lamarckism, Darwinism, Germ plasm and Mutation theories.

d.) Neo-Darwinism, Isolation, Mutation, Speciation, Genetic drifts.

SECTION D

ECONOMIC BOTANY

Brief account (botanical name, family, extraction/ processing where necessary) and uses of

the following:

i. **Cereals and Pulses**: Rice, wheat, maize, millets, pigeon, pea, bengal gram, green gram, black gram.
ii. **Fibers**: Cotton, jute, linen, coir.
iii. **Vegetable oils**: Groundnut, coconut, sunflower, safflower, castor.
iv. **Timber and bamboos**: Rosewood, teakwood, canes and bamboos.
v. **Beverages**: General account, coffee, tea, cocoa.
vi. **Spices and condiments**: General account, cardamom, clove, pepper, ginger, cinnamon, saffron, turmeric, mustard.
vii. **Rubber**: General account, Hevea, Ficus.
viii. **Medicinal plants**: Brief account of ethnobotany, uses of Cinchona, Rauwolfia, Phyllanthes, Catharanthus, Ocimum, Tylophora and other locally available medicinal plants.

References Books and Readings:

1. **1**. Esau, K. (1977). *Anatomy of Seed Plants, 2nd Ed*. New York: John Wiley & Sons.

2. Fahn, A. (1974). *Plant Anatomy 2nd Ed.*Oxford: Pergamon Press.

3. Mouseth J.D. (1988).*Plant Anatomy*. California:The Benjamin Cummings Publishing Co. Inc.

4. Singh,V., Pande,P.C. &Jain,D.K. (2007). *A textbook of Botany Angiosperms.* Meerut: Jullandar: Rastogi Publications.

5. Vashishta, P.C. *A Text book of Plant Anatomy*.Predeep Publications,

6. Gangulee S.C. &Kar, A.K. (1980).*College Botany Vol.I*, Calcutta: Central Book Agency.

7. Sharma, P.D.(2006).*Environmental biology*. Meerut: Rastogi Publications.

8. Mitra, J.N.*An Introduction to Systematic Botany and Ecology*.Calcutta: World Press.

9. Odum, E.P. (1983).*Basic Ecology*. Philadelphia: Saunders.
10. Kormondy, E.J. (1996).*Concepts of Ecology*. New Delhi: Viva Books Pvt. Ltd.
11. Misra, R. (1968).*Ecology Work Book*. New Delhi: Oxford & IBH.

12. Moore P.W. and Chapman, S.B. (1986).*Methods in Plant Ecology*. Blackwell Scientific Publications.

13. Krebs, C.J. (1989).*Ecological Methodology*.New York: Harper and Row.

Angiosperm Anatomy, Evolution and Economic Botany Practical(EDH224-P)

Activities:

- To get familiarized with the techniques of section cutting, double staining maceration and clearing.
- To study anatomical details of angiosperms through permanent slides and laboratory specimens.

Course Title/Code	**MATHEMATICS (MAH 220)** **Multivariate Calculus & Vector Calculus**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	

COURSE CONTENT:

Unit I: Line and Double Integrals

Definition of a line integral and basic property, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas.

Unit II: Triple Integrals

Definition of a triple integral, Evaluation, Volume of a Triple integral.

Unit III: Improper Integrals

Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula.

Unit IV: Vector Calculus

Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane.

References

Calculus by LipmanBers, Vols 1 and 2.

First Course in Calculus by Serge Lang

Calculus – Single and Multivariable by Hughes Hallet

Calculus by Thomas and Finny.

Course Title/Code	**ZOOLOGY- Animal Physiology and Endocrinology (EDH225)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	- To enable students to comprehend the modern concepts of physiological aspects on various organs and systems of animals and human being; to comprehend chemical nature, biological molecules and physiological roles. -To enable students to analyse biochemically the foodstuffs and urine; to analyse he biochemical action of enzymes and to develop the skills of separation of macro molecules using chromatography and electrophoresis; to demonstrate physiological experiments; to develop the skills of haematology and endocrinology.

Course Content:

SECTION A

ENZYME, DIGESTION AND RESPIRATION

a) Enzymes – Nomenclature and classification, mechanism of enzyme action, Coenzymes

b) Digestion – Physiology of digestion, absorption of carbohydrates, proteins andlipids; Role of vitamins and minerals in normal health

c) Respiration – Mechanism of breathing (external respiration) in man; Respiratorypigments – haemoglobin, haemocyanin, haemerythin and chlorocruorin; Transport ofgases - oxygen transport, oxygen equilibrium curve, Bohr effect; Transport of carbondioxide, chloride shift; Control and regulation of respiration; Review of cellular respiration

SECTION B

CIRCULATION, EXCRETION AND HOMEOSTASIS

a) Circulation: Blood – Composition and physiology of blood clotting ;Lymphatic system , myogenic and neurogenic hearts, structure and functioning of human heart, blood pressure

b) Excretion: Nitrogenous waste products – Ammonotelism, ureotelism, uricotelism;Ornithinecycle, structure of human kidney and nephron, physiology of urineformation, counter-current multiplier system

c) Homeostasis – Meaning; Osmoconformers and osmoregulators in marine andfreshwater animals; thermoregulation in animals – Poikilotherms, heterotherms andhomeotherms, adaptive changes in animals

SECTION C

NEURO-MUSCULAR CO-ORDINATION

a) Nervous Co-ordination – Structure of neuron and neuroglia , Physiology oftransmission of impulse along non-myelinated and myelinated axons ; Synapses –Structure, types and mode of impulse transmission

b) Muscle contraction – Types of muscles, ultrastructure of striated muscle,Contractile and regulatory proteins, Mechanism of muscle contraction, Neuro-muscular junction and relaxation, sliding filament theory, chemical changes during muscle contraction .

SECTION D

ENDOCRINOLOGY AND HORMONAL CONTROL OF REPRODUCTION

a) Endocrinology – Outline views of endocrine glands – Pituitary, thyroid, adrenaland pancreas,

their structures, secretion and mode of hormone action (steroid andpeptides); hormone feedback mechanism.
b) Gonads – Microscopic structure, hormones produced and their role ; Hormonal regulation of a) Estrous cycle, b) Menstrual cycle, c) Implantation ; Familyplanning - Need and methods of contraceptives .

References Books and Readings:

1. Animal Physiology and Biochemistry by K.V. Sastry – (Rastogi Publications,2008).
2. Regulatory mechanism in Vertebrates by KamleshwarPandey and J.P. Shukla- (Rastogi Publications, 2008).
3. Animal Physiology by K.A. Goyal and K.V. Sastry – (Rastogi Publications,2008).
4. Endocrinology and Reproductive Biology by K.V. Sastry – (RastogiPublications, 2008).
5. Animal Physiology by Arora M.P. (1989) – Himalaya Publishing House.
6. Textbook of Medical Physiology by Guyton A.C. & Hall J.E. (1996) – (W.B.Saunders & Co.).
7. General and Comparative Physiology by Hoar W.S. (1983) – (Prentice HallPublication).

ZOOLOGY-IV Practical(EDH225-P)

1. Demonstration of endocrine glands in rat and man (Chart).
2. Effect of temperature and pH on the salivary amylase enzyme activity.
3. Detection of various enzymes in the digestive tract of cockroach.
4. A. Preparation of blood smears of Frog and man
   b. Total count of RBC
   c. Total count of WBC
   d. Differential count of Leucocytes
   e. Estimation of haemoglobin by Sahlis method
5. A) Human urine analysis for a) Nitrogenous substances, b) Normal inorganicconstituents, c) Abnormal constituents – (i) glucose, (ii) protein, (iii) ketonebodies.
   B) Analysis of nitrogenous wastes in bird and fish.
6. Separation and analysis of amino acids in body fluids and food using paperchromatography.
1. Demonstration of heart beat in Frog – a) Preparation of simple cardiogram, b)Effect of various chemicals on heartbeat.
2. To set up simple experiments to find out the rate of respiration in terrestrialanimals like cockroach and rat.
3. Qualitative and quantitative estimation of carbohydrates, proteins and lipids infood
4. Demonstration of separation of proteins/enzymes with electrophoresis.

5. Study of permanent slides of mammals: a) Pituitary, b) Adrenal gland,c) Thyroid, dTestis, e) Ovary, f) Placenta, g) Pancreas.

Field Visit- Museum

Course Title/Code	**Assessment of Learning (EDH 122)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To develop a critical understanding of issues in assessment and evaluation from a constructivist paradigm. -To understand the importance of assessment in continuous and comprehensive evaluation. - To develop appropriate assessment tasks and tools to assess learner's performance and competence. -To devise ways to record and report learning landmarks to be supported by feedback. -To develop the habit of reflecting-on and self-critiquing to improve performance.

Course Content:

SECTION A

CONCEPT OF EVALUATION

CONCEPT: concept of measurement, assessment, examination, evaluation and their interrelationships, Distinction between 'assessment of learning' and 'assessment for learning'.

FORMS OF ASSESSMENT: Based on purpose**:** (formative, summative; prognostic, diagnostic; norm referenced, criterion referenced),Based on nature of information gathered: Qualitative (observation, introspection, projection and sociometry) or Quantitative (written, oral, practical), Purpose of assessment in a 'constructivist paradigm'.

CONTINUOUS AND COMPREHENSIVE EVALUATION mandated under RTE and NDP

SECTION B

ASSESSMENT AND RECORD KEEPING

ABILITY TO DEVELOP INDICATORS FOR ASSESSMENT: tasks for assessment (projects, assignments); formulating tasks and questions that engage the learner and demonstrate the process of thinking; scope for original responses.

OBSERVATION of learning process by self, by peers, by teachers, Self appraisal. Organizing and planning for student portfolios and developing rubrics for portfolio assessment, teacher's diaries.

GROUP ACTIVITIES FOR ASSESSMENT (nature of group dynamics, socio-metric techniques, steps for formation of groups, criteria for assessing tasks; criteria's for assessment of social skills in cooperative and collaborative leaning situations)

DIMENSIONS AND LEVELS OF LEARNING, assessing conceptual development, recall of facts and concepts, application of specific skills, problem solving; application of learning to diverse and new situations (Construction of achievement test).

SECTION C

INTERPRETATION OF STUDENT'S PERFORMANCE

Descriptive statistics (measures of central tendency and percentages), Measures of variability, Graphical representations -histogram, frequency curves, pie charts, NPC –percentile, skewness and kurtosis. Grading –meaning, types and uses

SECTION D

FEEDBACK

FEEDBACK: feedback as an essential component of assessment, Role of feedback to stakeholders (students/peers, parents, teachers), to improve teaching-learning process, identifying the strengths and weaknesses of learners.

REPORTING STUDENTS' PERFORMANCE: progress reports, cumulative records, Developing and maintaining a comprehensive learner profile and their uses, portfolios, Challenges of assessment, Remedial Teaching.

References Books:

1. Ved Prakash, et.al. (2000): *Grading in schools*, NCERT, Published at the publication Division by the secretary, NCERT, Sri Aurobindo Marg, New Delhi

2. Popham, W. J. (2002). *Classroom Assessment: What teachers need to know* (Third Edition) Boston: Allyn &Bacon.
3. Gredler, M. E. (1999). *Classroom Assessment and Learning*. USA: Longman.
4. Linn, Robert L. and Gronlund, Norman E. (2000). Measurement and Assessment in Teaching. Pearson Education Inc.
5. Oosterhof, A. (1994). *Classroom Applications of Educational Measurement* (Second Edition). New York: Macmillan College Publishing Company Inc.

Assessment for Learning Practical (EDH 122)

1. Critically read and reflect on the 'National Focus Group Position Paper on Examination Reforms'
2. *A perception scale to explore perceptions of stakeholder (parents, teachers and students) about prevailing examination system and present a report.
3. Critique of prevailing culture of popular tests such as Olympiads.
4. Devise a strategy to incorporate the suggestions given in the first CCE report for the progress of the learner.
5. Essay on 'Effect of assessment on self esteem, motivation and identity of learners'.
6. Critical Analysis of "CCE Manual for Teachers-Elementary level"
7. Prepare rubrics for assessment of a topic of your choice from Elementary School Level.
8. Prepare a PowerPoint presentation on the outline of scholastic and co-scholastic components of CCE.
9. *Constructing a unit test using a table of specification, administering it to a group of students and interpreting the result.

*Field activity

Course Title/Code	**School Organization and Management (EDS 227)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To understand the meaning, nature, scope, functions and principles of Educational Administration of a School. -To get oriented with the concept of supervision and decision making -To realize the multifaceted role of a teacher/head teacher. -To understand and appreciate the process of becoming an effective teacher. -To get a holistic view of quality in education and the agencies concerned with

	quality assurance.

Course Content:

SECTIONA

SCHOOL ADMINISTRATIONAND MANAGEMENT

Meaning and Definition of School Management, Scope of School management, aims, objectives and functions of school management, types and principles of school management.

Education Administration: Meaning, concept, scope, functions and Principles.

Organizational culture in a school to foster a stress- free work environment for Head, teachers, staff and students.

SECTIONB

SCHOOL AS AN ORGANIZATION

The School – its functions and relationship with the society, school plant – location, classroom, furniture, design of the building, sanitary requirements, the environment, laboratory apparatus, library, museum and the hostel.

The school staff – **Headmaster:** his role and responsibilities, leadership qualities, qualifications and duties, relations with subordinates, the guardians and the public.

Teacher: role and responsibilities, Qualities and competencies of teacher and professional ethics and Code of Conduct. **The office staff**, role and responsibilities, records and functions of each record, the service conditions of the staff.

SECTIONC

INSTITUTIONAL PLANNING AND TQM

Role of School Management Committees, Parent Teacher Associations in School Development

Democratic Decision Making: Concept and Procedure in the school functioning

Institutional Planning- Meaning and functions and its importance in school organization

TQM – Meaning and Characteristics and its importance in School organization, Tools and techniques of quality control in education / institutional evaluation, Quality assurance in Education

Regulatory Bodies in Quality Assurance in Education / NAAC, NCTE, NBA, RCI,AICTE and Quality Council, School finance – sources of income and items of expenditure, Mobilization of resources – grants in aid, school budget.

SECTIOND

ELEMENTS OF SCHOOL MANAGEMENT

School Climate: Meaning and Types, School time tables – principles and techniques of time table preparation, School time tables – master time table, subject –wise time table, teacher-wise time table; school records and registers (Academic and Administrative). Organization of co-curricular activities and role of students. School discipline – Concept and Approaches, the value of moral training, Problems faced in School Management: Issues of Security, influence of media and Disaster Management, Student Unrest and how to deal with it.

Reference Books and Readings

1. Agarwal, J.C. and Sharma, K. R.(2006): *Basic School Organisation*, Doaba House, Delhi
2. Agarwal, J.C.(2006): *School Administration*, Arya Book Depot, Delhi.
3. Bhatnagar, R.P. and I.B. Verma (2000): *Educational Administration*. Loyal Book Depot, Meerut.
4. Kimbrough, R.B. and Nunnery, M.Y.(1983). *Educational Administration : An Introduction*, MacMillan Publishing Co. Inc., N.Y.
5. Mohanthy, Jagannath (2007). *Educational Management,Supervision,School Organization*. Hyderabad: Neelkamal Publications Pvt. Ltd.
6. Owens, Robert G (1970).:*Organizational Behaviour in Schools*. Prentice Hall Inc., Englewood Cliffs, N.J.,
   Publishing House.
7. Safaya, R.N. and Shaida,B.D.(2000*). School Administration and Organization*. Dhanpat Rai and Sons, Delhi
8. Sidhu, K. S.(1996). *School Organisation and administration*. Sterling Publishers Private Limited
9. Tilak, Jandhyala B.G. (1992.) *Educational Planning at Grass Roots*. New Delhi: Ashish
10. NAAC (2003). *Total Quality Management for Tertiary Education* Bangalore: NAAC. Retrievedfrom:
    *www.**naac**.gov.in/.../**Total**%20**Quality**%20**Management**%20for%20**Tertia**.*.

School Organization and Management Practical (EDS 227-P)

1. Prepare an annual calendar for the schools co-curricular activities for the current session.
2. Write an assignment on how NAAC is ensuring external & internal quality at higher education
3. *Survey any hostel and library and make a report of the problems faced by the students.
4. Preparation of an outline of an institutional planning on any aspect of school

organization.

5. Prepare an Academic Calendar of School
6. Critically analyze the allocation of budget to the education sector in the current Financial Year
7. *Identify different ICT resources used by School Management and Administration
8. Organize a group discussion on the Code of Conduct for teachers.

*Field Activity

Course Title/Code	**E- Learning – EDW228**
Course Type	**Core**
Course Nature	**Workshop**
L-T-P-O Structure	**(0-0-3)**
Objectives	• Understand concept of e-learning and types of e-learning • Use blended learning approach in e-learning • Use different online tools and resources in assessment • Explore and use the potentialities of Information Communication Technology for collaborative, constructive & inquiry based learning • Identify and use suitable Open Educational Resources • Use Record keeping and scheduling tools, Communicative tools, School management tools/software for effective administration • Apply different application software in education.

E- Learning – EDW228

Week 1:

- Concept of e-learning
- Types of e-learning

Activity

- Learners create mind map of e-learning

Week 2 & 3

Use of ICT in administration

- Record keeping and scheduling tools
- Communicative tools
- School management tools/software

Activity

- Create and communicate google group through google group
- Use google drive and dropbox for storing document
- Analyse school management software and have discussion on it through discussion forum

Week 4 to week 6

ICT for teaching learning process

- Blended learning approach for e-learning
- Digital tools for effective learning-Webquest, webinars discussion forum, blog

Activity:

- Prepare a week plan of teaching using blended learning approach
- Create a webquest
- Make a seminar using webinar
- Create a blog for learning
- Select a case study/report related to legal and ethical issues in use of ICT. Discuss your case using any mode of online discussion forum. Submit the screenshots of your group discussion.

Week 7 & 8

OER

- Open educational resources

Activity

- Identify suitable Open educational resources
- Select any topic and collect Open Educational Resources (Text, Multimedia, Website references) and analyze the type of license used in the Open Educational Resources. Submit the report for the same with evidences.

Week 9 & 10

ICT in Assessment:

- Computer assisted assessment
- Computer adaptive testing

- Use of e-portfolios, Rubrics and webquest in assessment

Activity

- Create e portfolio of this workshop
- Create rubric to assess group discussion
- Generate a test
- Submit a reflective report on it.

Course Title/Code	**Basics of Economics – MCS231**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	

Basics of Economics – MCS231

Unit I

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

Unit II

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, degrees of Price elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Unit III

Meaning of production and factors of production, laws of production, various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost and opportunity cost. Shape of short run cost curves.

Unit IV

Meaning of Market, Types of Market -Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets). Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

TEXT BOOKS:

1. Principles of Economics: P.N. Chopra (Kalyani Publishers).
2. Economics for Engineers- T R Jain & O P Khanna
3. Micro Economic Theory – M.L. Jhingan (S.Chand) .
4. Micro Economic Theory - H.L. Ahuja (S.Chand) .
5. Modern Micro Economics : S.K. Mishra (Pragati Publications).
6. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand& Co.).
7. Indian Economy: RudarDutt& K.P.M. Sundhram

Course Title/Code	**Introduction to Finance – MCS232**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	

Introduction to Finance – MCS232

Unit 1

Financial Management: An Overview—forms of business organization, financial decision in a firm, Financial System, Financial Markets and Intermediaries.

Unit 2

Financial Analysis and Planning : Financial Statements-Balance sheet, Statement of Profit and Loss, Taxes and Cash Flow , Financial Ratios, Break Even Analysis.

Unit 3

Sources of Long term Finance – Equity Capital, Preference Capital, Terms Loans, Debentures; Raising Long term Finance

Unit 4

Time Value of Money, Capital Budgeting- Techniques of Capital Budgeting, Net Present Value and Payback Period, Capital Structure and Cost of Capital

Suggested Readings:

1. Pandy, I.M., Financial Management, Vikas Publishing House, New Delhi
2. Khan M.Y, and Jain P.K., Financial Management, Tata McGraw Hill, New Delhi
3. Keown, Arthur J., Martin, John D., Petty, J. William and Scott, David F, Financial Management, Pearson Education
4. Chandra, Prasanna, Financial Management, TMH, New Delhi
5. Van Horne, James C., Financial Management and Policy, Prentice Hall of India
6. Brigham & Houston, Fundamentals of Financial Management, Thomson Learning, Bombay.
7. Kishore, R., Financial Management, Taxman's Publishing House, New Delhi .

Course Title/Code	Foreign language French-(FLS107)-
Course Type	Core
Course Nature	Audit Course
L-T-P-O Structure	(1-1-0)
Objectives	• To introduce the basic level of French, enabling them to understand & communicate in simple phrases with the focus on their Vocabulary, Grammar, Semantics, Phonology, Reading and Writing skills in the target language • To encourage the production of accurate, authentic and fluent French, both written and spoken, in different formats • To help in broadening their understanding & command over the language by giving them brief insights into France & its culture. • To acquire a knowledge and understanding of the structures and registers and further using them in professional way.

Course Content:

UNIT A

- Les saisons avec les expressions
- Les adjectifs possessives
- Les articles partitifs
- La famille
-

UNIT B

- Les profession (M/F)
- L'adjectif
- Qu'est ce que c'est & Qui est ce
- La date et l'heure

Unit C

- La Negation
- Les trois forms d'interrogation
- Giving/Asking personal information:-
- Name, Age, Residence
- Nationality, Profession, Telephone Number
- Email Address, Languages spoken

Unit D

- Talking about likes and dislikes
- Les articles contractes (à et de)
- Les adjectifs demonstrative

Suggested Readings:

3. Apprenons le français, Méthode de français part 2, Mahitha Ranjit, Saraswati House Pvt.ltd
4. Apprenons le français, Méthode de français part 3, Mahitha Ranjit, Saraswati House Pvt.ltd

SEMESTER-5

Course Title/Code	**CHEMISTRY-V** **Transition Elements, Coordination Compounds and Chemical Kinetics (CHH 312)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	To develop an understanding of Principles of Chemical Kinetics and Surface Chemistry. To explain the properties of d and f block elements and their compounds in terms of their electronic configuration and bonding. To understand the properties of coordination compounds in terms of bonding theories.

Course Content:

SECTION A

D-BLOCK AND F-BLOCK ELEMENTS

To relate the electronic configuration to the properties and structure of transition metals and their compounds.Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.
Chemistry of Elements of Second and Third Transition Series
General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.Powder metallurgy – extraction of tungsten.Position of lanthanaides and actinides in the periodic table, lanthanide contraction, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides.

SECTION B

COORDINATION COMPOUNDS

Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics , different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.

Concept of Entropy : Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical changes, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Gibbs and

Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change.Variation of G and A with P, V and T.

Third law of thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. **(8 L)**

SECTION C

CHEMICAL KINETICS

Understanding the factors that influence a chemical reaction and rationalizing them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical
characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method.Radioactive decay as a first order phenomenon.

Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy, .Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis).Expression for the rate constant based on equilibrium constant and thermodynamic aspects. **(8 L)**

SECTION D

SURFACE PHENOMENA

Study of Characteristics of Solid surface, surface phenomenon to explain various applications in daily life situations.Catalysis, characteristics of catalysed reactions, classification of catalysis, miscellaneous examples.Physical and Chemical adsorptions.Derivation of Langmuir Adsorption Isotherm.Statement and explanation of BET and Gibbs Isotherms.Determination of surface area of adsorbent using Langmuir equation. Adsorption theory of Catalysts using Langmuir's Equation **(8 L)**

Reference Books and Readings:

1. Concise Inorganic Chemistry : J D Lee
2. An Introduction to Inorganic Chemistry : Mackay and Mackay
3. Principles of Physical Chemistry : Marron and Prutton

4. Elements of Physical Chemistry : Samuel Glasstone and Lewis
5. Physical Chemistry : P W Atkins
6. Inorganic Chemistry : James Huhey

Transition Elements, Coordination Compounds and Chemical Kinetics Practical (CHH 312-P)

Chemical Kinetics

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar

Coordination Complexes

Preparation of Cobalt and Chromium Complexes and analysing them titrimetrically and Spectrophotometrically.

References :

2. A Text Book of Quantitative Inorganic Analysis, A I Vogel
3. Practical Physical Chemistry, A Findlay

Course Title/Code	**PHYSICS- V** **Basic Electronics (PHH330)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**

Objectives	-To enable students to understand the physics of semiconductors andtheir applications in basic electronic circuits. -To develop the ability to design and connect simple electronic circuitsand to collect and analyse the data using these circuits; -To develop skills in using electronic instruments like multimeters and oscilloscopes.

Course Content:

SECTION A

Introduction to Electronics: Electronics around us, Autonomous systems, logic sensing actuation cycle, Sensing in autonomous systems, examples,transducers, sensors, their types and specifications, Actuators, their types and specifications , logic, logic operations, logic implementation devices, practical examples of sensing logic actuation cycle,

SECTION B.

Basic Electrical and Electronic Components and their measurement: Basic electronic components, passive and active components, resistors, capacitors, inductors, active components, diodes, transistors, ICs, power supply batteries, basic test and measurement equipment, oscilloscope, multimeter, function generator or signal generator**.**

SECTION C.

Basic circuit theory: Relationship between quantities, Ohms law, Kirchoff's law, series and parallel networks, combining laws, resistance values and colour coding, practical inductance and capacitance values, representation, data sheets of various electronic components, open circuit, short circuit, closed circuit.

Fundamental circuits in electronic devices: Wheatstone bridge, Voltage divider, operational amplifier, characteristics, op-amp circuits, open loop and closed loop gain, Designing a sensor circuit.

SECTION D.

Signals and signal processing: Signals, types of signals, signal parameters, amplitude , frequency, form actor, energy, power, sound and image signals, high fidelity sound, sound as waves and voltage value, waves for different sounds, sound of a sine wave, sound as a combination of various sine waves, sound in frequency domain, noise, filtering and amplification of sound

References Books and Readings:

1. Electronic Devices and Circuits, Millman and Halkias.
2. Electronic Principles, Malvino.
3. Basic Electronics, Theraja B L
4. Basic Electronics, Mittal G K.
5. Digital Principles and Applications, Malvino and Leech.
6. Principles of Communication Systems, Taub and Schilling.

Physics-V Basic Electronics Practical (PHH330-P)

(A minimum of TEN experiments to be selected from the following.)
Experiments on :

A. Junction diode characteristics
B. Zener diode characteristics
C. Junction Transistor characteristics
D. FET characteristics
E. Rectifier circuits
F. Transistor amplifier CE configuration
G. Transistor amplifier Emitter follower
H. Transistor Oscillator
I. Logic gates
J. Experiments on OP-AMP
K. Lissajous figures

L. Experiments on modulation and demodulation

References :

1. Physics Laboratory Instructions.

Course Title/Code	**BOTANY-V** **Plant Systematics ,and Angiosperm Phylogeny (EDH301)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to: • appreciate the evolution of taxonomic thought and the various systems of classification • understand the diversity that exists among angiosperms • make a detailed study of selected families Practical • To acquaint students with the technical terms and identification keys for describing and identifying angiosperms. • To familiarize the students with local plants belonging to families included in the study (only those available during the season). • To enable the students to describe the vegetative and floral characteristics, draw floral diagram and write floral formulae of angiosperms. • To develop the skill of undertaking field study and preparing herbarium sheets.

Course Content:

SECTION A

PLANT SYSTEMATICS

a) ICN (formerly known as ICBN), principles and aims; type Concept, Concept of genus and specific epithet, Principle of priority, Units of classification.

b) Brief history, Development of taxonomic thought, Outlines of artificial, natural and phylogenetic systems of classification.

c) Salient features and outline classification of Bentham & Hooker and Cronquist. Brief

introduction to Angiosperm Phylogeny Group classification (APG).

SECTION B

ANGIOSPERM PHYLOGENY-I

a) Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families:

Magnoliaceae

Malvaceae

Rutaceae

Euphorbiaceae

Capparidaceae

Fabaceae

SECTION C

ANGIOSPERM PHYLOGENY-II

a) Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families:

Apiaceae

Amaranthaceae

Apocyanaceae

Acanthaceae

Lamiaceae

SECTION D

ANGIOSPERM PHYLOGENY-III

a.) Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families:

Poaceae

Asclepiadaceae

Solanaceae

Liliaceae

Arecaceae

References Books and Readings:

1. Jones, A.B. and Luchsinger, A.(1979). *Plant Systematics*. New York: McGraw-Hill Book Co.
2. Shukla Pritiand Misra.(1988).*Taxonomy of Angiosperms*, New Delhi: Vikas Publishing House.
3. Hutchinson, J.(1959).*The families of Flowering Plants*.Oxford: Clarendon Press.
4. Davis, P.H. and Heywood,V.H.(1963).*Principles of Angiosperm Taxonomy*.London:
5. Oliver and Boyd.
6. Heywood, V.H. and MooreD.M.(1984).*Current concepts in Plant Taxonomy*. London: Academic Press.
7. Singh, G. (1999). *Plant Systematics: Theory and Practice.*New Delhi: Oxford and IBH Pvt. Ltd., New Delhi.
8. Stace, C.A. (1989).*Plant Taxonomy and Biosystematics (2nd Ed.*). London: Edward Arnold.
9. Singh V. andJain,D.K.(2005).*Taxonomy of Angiosperms*. Meerut.Rastogi Publications.
10. Kochhar S.L.(1981).*Economic Botany in the Tropics*. Delhi: MacMillan India Ltd.
11. Vashista P.C. (1980).*Taxonomy of Angiosperms*.New Delhi: Sultan Chand & Co.
12. Lawrence, G.H.M. (1950).*Taxonomy of Vascular Plants*. London: MacMillan.

Plant Systematics, and Angiosperm Phylogeny Practical (EDH301-P)

Activities:

1. To identify common taxa using taxonomic keys.

2. Detailed study of at least one plant specimen per family as given in theory syllabus.

3. Field study (3-5 days) to a nearby forest, for collection, identification and submission of 5 herbarium sheets.

Course Title/Code	MATHEMATICS- (MAH 319) DIFFERENTIAL EQUATIONS
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	

Unit I

Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form – Reducible to homogeneous form, Linear equations, Bernoulli's equation, Exact equations, Equations reducible to exact equations.

Unit II:

Equations of the first order and higher degree, Clairaut's equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendre's differential equations, Simultaneous differential equations.

Unit III:

Equations which do not contain x, Equation whose one solution is known, Equations which can be solved by changing the independent variable and dependent variable, Variation of parameters, Total differential equation :Pdx + Qdy + Rdz = 0, Simultaneous equations of the form dx/P = dy / Q = dz / R.

Unit IV:

Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrange's linear equations Pp + Qq = R,

Standard types of first order non-linear partial differential equations, Charpit's method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

References :

Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
An Introduction to Partial Differential Equations by Stephenson, ELBS.
A Short Course in Differential Equations by Rainville and Bedient, IBH.
Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
Introductory Course in Differential Equations by Murray, Orient Longman.
Differential Equations by Simmons, TMH.
Differential Equations by Ayres, Schaum Publishing Company.
Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co.
Differential Equations by Vasishta and Sharma, Krishna PrakashanMandir.
A Textbook of Differential Equations by Mittal, HarAnand Publications.

Course Title/Code	**ZOOLOGY-Ecology and Animal Behaviour (EDH302)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	To enable students to understand the energy sources, flow of energy and conservation; to understand the recycling of minerals and nutrients in ecosystems; to understand the dynamics of population; to understand causes of pollution and suggest measures; to understand behavioural patterns in animals.

Section A

COMMUNITY

a) Population- Unitary and modular populations, its unique and group attributes- population density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex

ratio. Population dispersal and distribution patterns.

b) Characteristics of community diversity, diversity index, types of biodiversity species richness, abundance, species area relationship, community stratification, ecotone/edge effect, succession, stages of primary succession, climax community.

SECTION B

Dynamics of Ecosystem

a) Food chains, food web, trophic levels, grazing and detritus type of food chain, Y-shaped food chain in forest, one example of food web- Terrestrial or Aquatic, Nutrient cycle.

b) Ecological pyramids (review), energy flow in ecosystem, productivity; Biogeochemical cycle – nitrogen, phosphorus and sulphur cycles; recycling of organic nutrients .

c) Application of the study of ecology in wild life conservation and sustainable development.

SECTION C

Animal behavior

a) Concepts and patterns of behavior, Contributions of Lorenz, Tinbergen and C V Frisch, Instinct and learning, types of learning,

b) Genetic basis of behavior, Control of behavior, Neural control, Hormonal control.

c) Concept of motivation and releaser in behavior; Innate behaviour, taxes, reflexes.

SECTION D

a) Social organization, Communication, Living in groups, Evolution of sociality. Study of interspecific association between cattle and egrets. Social behaviour in birds and primates ; Aggressive behaviour; Control of behavior.

b) Habituation in earthworms/mosquito larvae, Biological rhythms and biological clock

References Books and Readings:

1. Fundamentals of Ecology by E.P. Odum – W.B. Saunders, Philadelphia).
2. Environmental Studies by S.V.S. Rana – (Rastogi Publications, 2008).
3. Animal Ecology by S.P. Singh, 6th Revised Edition – (Rastogi Publications,2008).
4. Basic Ecology by E.P Odum (Holt, Rinehart & Winston, New York).
5. Ecology by S.K.Charles – (Prentice Hall Of India, New Delhi)
6. Animal Behaviour by V.G.Dethier and E Stellar -(Prentice hall of India, NewDelhi)

7. Current Problems in Animal Behaviour by W.H. Thorpe and L.Zangwill
8. Experimental Animal Behaviour-A selection of Lab. Exercises by H Hansell and JJ Aitken – (Blakie& Sons, Glasgow)
9. The study of Instinct by N Tinbergen.
10. The Dancing Bees by K V Frisch
11. Learning and Instincts in Animals by W H Thorpe and W Homan.
12. Animal behaviour: An evolutionary approach by AICOK J (1984) – Sinauer Associates.
13. Ecology: Principles and Applications by Chapman E (1988) – Cambridge University Press.
14. Modern Concept of Ecology by Kumar HD (1986) – Vikas Publishing House.
15. Ecology and Environment by Sharma PD (1991) – Rastogi Publications.
16. Environmental Biology by Trivedi PR &Gurudeep Raj (1992).

ZOOLOGY-V Practical (EDH302-P)

1. Estimation of dissolved oxygen in the pond water.
2. Estimation of dissolved alkalinity in the pond water.
3. Estimation of dissolved salinity in the pond water.
4. Gut content analysis in fish.
5. Qualitative analysis of marine plankton to identify the most common mero- andholo-plankton.
6. Identification of the most common benthos, and Nekton in aquatic environment (marine and fresh water).
7. Population study of Local insects and ciliates in the culture medium for growthpattern (logistic and exponential curves).
8. Collection and qualitative and quantitative analysis of soil organisms – Depictionof histogram and pie diagram.
9. Animal adaptation in different habitats- Study of specimens: a) Morphologicalb) physiological adaptation with respect to excretion
10. Study of Preferences, a) Preening behaviour in birds, b) Photo–, chemo–, andGeotaxes in Drosophila (Project work).
11. a) Stimuli eliciting aggressive displays in male Siamese fighter fish; b) colour change in female Siamese fighter fish (demonstration).
12.Experiments with maze for studying behavioural motivation in rat.

Field Visit- Lake or pond

Course Title/Code	**BOTANY-V** **Paper 2-Cell Biology and Genetics**

	(EDH 303)
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to**:** • understand the structural complexity of a eukoryotic cell; • understand the structure and function of various cell organelles • get acquainted with the structure and significance of nucleus and chromosomes • review Mendelian inheritance in the light of gene interactions Practical • To develop skills of staining cells and observing cell organelles. • To prepare temporary and permanent cytological preparations of suitable plant materials to study mitosis and meiosis. • To verify Mendelian laws of inheritance.

Course Content:

SECTION A

Cell and Cell organelles

a) Ultrastructure of Prokaryotic and Eukaryotic cells.

b) Ultrastructure and functions- Cell wall, Plasmamembrane, Golgi complex, Endoplasmic reticulum, Mitochondrion, Microbodies.

C.) **Nucleus** –Ultrastructure of eukaryotic nucleus.

SECTION B

a.) Ultrastructure and functions- Chloroplast, Ribosome, Lysosome and

b.) Cell Division: Cell-cycle, events of cell division (karyokinesis, cytokinesis)

c.) Mitosis, Meiosis and their significance.

SECTION C

Genetics and Inheritance of genes:

a) Mendelism – Review of Mendel's laws of inheritance

b) Solving problems related to Mendel's laws.

c) Incomplete dominance, complementary gene action (flower colour in sweet pea).

d) Supplementary gene action (coat colour in mice),

SECTION D

a) Epistasis (fruit colour in summer squash)

b) Multiple factor inheritance (ear size in maize).

c) Sex determination in plants – *Melandrium.*

d) **Cytoplasmic inheritance** –plastid inheritance in *Mirabilis*

e) *C*ytoplasmic male sterility in maize.

References Books and Readings:

1. Snustad, D.P. and Simmons, M.J.(2000).*Principles of Genetics*. USA: John Wiley & Sons, Inc.

2. Gupta, P.K.(1999).*A Textbook of Cell and Molecular Biology*.Meerut: Rastogi Publications.

3. Wolfe,S.L. (1993).*Molecular and Cell Biology*.California: Wadsworth Publishing Co.

4. Harris, N. and Oparka,K.J.(1994). *Plant Cell Biology: A Practical Approach*.Oxford: IRL Press, Oxford Univ.Press.

5. Singh, S.P. and Tomar,B.S.(2006).*Cell Biology*, Meerut: Rastogi Publications.
6. Gupta, P.K. (2005).*Elements of Genetics*. Meerut: Rastogi Publications.
7. Gardner, A. (1990).*Principles of Genetics (6th Ed.)*. USA: John Wiley & Sons Inc.

8. Gupta P.K. (2000).*Cytology, Genetics and Evolution*. Meerut: Rastogi Publications.

9. Atherly, A.G., Girton, J.R. and MacDonald,J.F.(1999).*The Science of Genetics*. Fortworth: Saunders College Publishing.

10. Russel,P.J. (1998). *Genetics*. USA: The Benjamin/Cummings Publishing Co. Inc.

11. Gunning, B.E.S. and Steer, M.W.(1999).*Plant Cell Biology, Structure and Function*. Massachusettes: Jones & Bartlett Publishers.

Cell Biology and Genetics Practical (EDH 303-P)

Activities:

1. Comparative study of cell structure in onion cells *Hydrilla* and *Chara*/*Spirogyra*.

2. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, *Lycopersicon* and *Capsicum*)

3. Examination of electron micrographs of virus, bacteria, Cyanobacteria. and eukaryotic cells with special reference to organelles

4. Study of various stages of mitosis and meiosis by preparing slides of suitable plant materials (onion root tips and onion flower buds).

5. Working out genetic problems related to Mendelian laws of inheritance and interaction of genes.

Course Title/Code	**Education in Contemporary India (EDH 214)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To equip themselves with system and structure of Indian Education. -To identify various concerns related to education of socially disadvantaged sections of society. -To be aware with provisions of equality of educational opportunities and impediments in achieving equity. -To understand the Govt. policies of education and will evaluate the same with respect to quality education and universalization of education.

Course Content:

SECTION A

INDIAN SOCIETY AND CONSTITUTION

Stratification of Indian Society on the basis of Castes, Languages, Tribes, Religions and Regions.Preamble of Constitution, Directive principles, Article 45,21A, Fundamental rights and duties of Indian citizen. Equality of opportunities in education: Constitutional Provisions: Article 28,29,350,351. Education of socially disadvantaged segments namely Dalits, SC, ST, OBC, Women, PWD'S and minorities.Impediments in achieving equity and justice in education-Inequality, discrimination and marginalization in Indian context. UEE- policy and problems

SECTION B

EDUCATION AND POLICY FRAMEWORK

Overview of educational reformation in the Pre-independence period: Charter Act, Macaulay'minutes, Wood & Despatch, Hunter Commissions, Sargent Report, Basic education, Nayee Talim

Education in Post Independence Period: Mudaliar Commission (1952), Education Commission (1964-66), NPE 1968; NPE 1986 and its modified version 1992, Knowledge Commission, Yashpal Committee Report, Medium of Learning and three language formula, National Curriculum Framework-2005

SECTION C

EDUCATION SYSTEM AND STRUCTURES

Prominent characteristics of education in India during colonial rule**,** Concurrent status of education, Public Private Stratification in education, Types of schools in India - Govt. schools, Private schools**,** Role of educational agencies-NCERT, SCERT, CBSE, ICSE**,** Role of Directorates of Education, local bodies e.g.Panchayati Raj Institutions, Municipal Boards

SECTION D

EQUITY AND QUALITY ISSUES IN EDUCATION

Common School System, Right to Education Act 2009: Right of children to free and compulsory education. Modernization and Privatisation of Education: Concept, merits and demerits. Role of teacher in universal and inclusive education

National System of Education, Mid Day Meal Programme, Sarva Shiksha Abhiyan (SSA), Kasturba Gandhi Balika Vidyalaya, Rashtriya Madhyamik Shiksha Abhiyan(RMSA). Women education- concept, need, problems and reforms.

Reference Books and Readings

1. GOI. (1966). *Report of the Education Commission-1964-66*. New Delhi: Ministry of Education.
2. GOI. (1992*). National policy on education, 1986* (As modified in 1992). Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/NPE86-mod92.pdf
3. GOI (1993). *Learning Without Burden*. Report of the National Advisory Committee retrieved from http://www.teindia.nic.in/Files/Reports/CCR/Yash%20Pal_committe_report_lwb.pdf
4. GOI. (2009). The right of children to free and compulsory education act, 2009. Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/rte.pdf
5. Kashyap, S.C. (2009). *The constitution of India,* New Delhi: National Book Trust.
6. Mishra, B.K. & Mohanty, R.K. (2003). *Trends and issues in India Education,* Meerut: Surya publications.
7. Nambissan, G. B. (2009). *Exclusion and discrimination in schools: Experiences of dalit children*. Indian Institute of Dalit Studies and UNICEF.
8. NCERT. (2006). *Position paper-National focus group on problems of scheduled caste and scheduled tribe children (NCF2005).* New Delhi: NCERT
9. Rajput, J.S. (1994). *Universalisation of Elementary Education,* New Delhi: Vikas Publishing House.
10. Sachdeva,M.S. et.al (2011). *Philosophical, Sociological and Economic bases of Education,* Patiala: Twenty First Century Publications.
11. Shankar, M. (2007*). Contemporly issues in modern Indian education,* New Delhi: Authors Press.
12. Stormquist, N. P.(2002). *Education in a Globalised world.* New York: Rowman & Little field publishers.
13. Walia,J.S.(1979). *Modern Indian Education and its Problems,* Jalandhar City: Paul Publishers, Gopal Nagar.

Education in Contemporary India Practical (EDH 214)

1. Collaboration with any NGO working for Marginalized groups---Conducting field visits, case studies, and participating in their projects.
2. Review of Mid-day meal programme in a particular rural area.
3. Review of recent articles, editorials, research papers etc. on emerging issues e.g. implementation of RTE/ Equal opportunities for all/ various govt. schemes for universalization of education, girl education/and modernization of education etc.

4. Group discussion on fundamental rights, duties and directive principles.
5. Debate on true women empowerment

Course Title/Code	**Pedagogy- I (Biological Science) (EDH 109)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To critically examine science as a domain of inquiry and exploration. -To understand the epistemology of biology as a school subject in the school curriculum. -To implement various pedagogical approaches to teaching of biology at different stages of school. -To theoretically understand how children in diverse social contexts construct knowledge of concepts in biology. -To plan units and lessons through thematic approach in a holistic manner. -To revisit theories of learning (Piaget, Vygotsky, Bruner, Chomsky) to understand how learning take place among children. -To critically examine teaching-learning process that incorporate enquiry, discovery, activity based learning, problem solving situations and investigatory projects etc within the classroom. -To facilitate self-assessment in children with insights about meta-learning.

Course Content:

SECTION A

NATURE OF SCIENCE

Introduction to Pedagogy: Concept; Cardinal Principles of Learning; Why study Science;What is Science? Science as a domain of inquiry and exploration.Scope of biological sciences for understanding the diversity of the living world, origin of life and its evolution.History of Biological Sciences. Some Eminent Biologist's contributions and reflections on society: William Harvey, Lamarck, Charles Darwin, Rosalind Franklin, M.S. Swaminathan. Recent advancements and research in biological sciences. An illustration of how children learn science?

SECTION B

AIMS AND OBJECTIVES OF LEARNING BIOLOGICAL SCIENCES

Aims of learning Sciences, Development of scientific attitude and scientific temper- Respect for evidence, open mindedness, Truthfulness in reporting observation, Critical thinking, logical thinking, Skepticism, objectivity, Nurturing the natural curiosity, creativity and Aesthetic sense.

Meaning of learning objectives, Developing learning objectives; Anderson and Krathwohl's Taxonomy. Writing learning objectives: Remembering, understanding, Applying, Analyzing, Evaluating, Creating. Learning objectives in Constructivist perspective.

SECTION C

PEDAGOGICAL SHIFTS IN BIOLOGICAL SCIENCES

Pedagogical Shift: biological science as fixed body of knowledge to the process of Constructing Knowledge, nature of science, knowledge, learners, learning and teachers, assessment, science curriculum and planning. Democratizing science learning: Critical Pedagogy. Need of Inclusion in science curriculum, approaches, ICT and professional development of teachers (*with special reference to Reflective practices and its role*).

Content cum methodology: concept and nature, steps to content cum methodology, pedagogical analysis (any three topics). Approaches and Strategies of learning Biology: Expository approach, investigation, projects, peer interactions, collaborative approach, experiential learning, concept mapping and self learning.

SECTION D

ASSESSMENT OF LEARNING

Development of Assessment Framework.CCE, Diagnostic tests, remedial/enrichment measures and monitoring learner's progress, Learner's record in biological sciences: laboratory investigation, reports of field visits and excursions, projects work, portfolio, Assessment through participation in collaborative learning: peer interaction, group discussions, seminars and presentations, Assessment through creative expression: Essays, posters, Drama, poetry, riddles etc.Assessment as a reflected process and as a reflecting process, Recording and reporting of learning evidences/outcome: measurement of student's achievement- marks and grading.

References Books and Readings

1. CBSE (2009). Teacher's manual on CCE. New Delhi: CBSE.
2. Chikara, M.S. and S. Sarma (1985). *Teaching Biology*. Ludhiana: Prakash Brothers.

3. Das, R.C. (1985). *Science teaching in Schools.* New Delhi: Sterling Publications Private Ltd.
4. Krathwohl, D.R., Bloom B.S. and Maria B.B. (1964). *Taxonomy of Educational Objectives, Handbook II, Affective Domain,* New York: David McKay.
5. L.Steffe and J. Gale (Eds.) 1995). *Constructivism in Education,* New Jersey: Lawrence Erlbaum Associates Inc.
6. Lindfors, J. (1984). *How children learn or how teachers teach? A Profound confusion*: Language Arts, 61 (6), 600-606.
7. National Curriculum Framework 2005, NCERT, New Delhi.
8. Ramakrishna, A. (2012). *Methodology of Teaching Life Sciences*. New Delhi: Pearson.

Pedagogy of Biological Science Practical (EDH 109)

1. Critical review of a Textbook of Science/ Biology.
2. Planning and conducting awareness programs/ camps.
3. Diagnosis and preventive measures of Epidemics.
4. Report of one Action Research carried out in the practicing school.
5. Concept mapping in selected units in Biological Sciences Planning learning situations for constructing knowledge in Biological Sciences.
6. Group Discussion on pedagogical issues.
7. *Hands on experience through visits to botanical gardens/ flower shows/ garden of five senses/Department of Science Education at NCERT/SCERT.
8. Report on measures being taken for inclusive teaching-learning in practicing schools.
9. Exploration of alternative conceptions held commonly by students and planning of approaches towards re-conceptualizations – Project

***Field activity**

Course Title/Code	**Pedagogy- I (Mathematics) (EDH 110)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To get introduced with mathematics education. -To understand the nature of mathematics. -To develop an understanding of correlation of mathematics with other subjects. -To select appropriate methods of teachings to teach mathematics. -To understand and apply appropriate evaluation technique in mathematics.

	-To develop an achievement test

Course Content:

SECTION A

NATURE AND SCOPE OF MATHEMATICS

Meaning, nature, and scope of mathematics education, Aims and Objectives of teaching Mathematics.Historical development of notation and number system.Contribution of Indian mathematicians- Ramanujam, Aryabhatta, Bhaskarachatya, Shakuntala Devi. Vedic mathematics

SECTION B

EXPLORING MATHEMATICS

Correlation of mathematics with other subjects, Writing objectives in Behavioral Terms- Blooms Taxanomy, Professional competencies of mathematics teacher, The building blocks of mathematics- undefined terms, definitions, axioms, theorems, postulates, Maxims and Principles of Teaching

SECTION C

PEDAGOGY IN TEACHING- LEARNING OF MATHEMATICS

Teaching methods in mathematics: Inductive, Deductive, Analytic, Synthetic, Heuristic, project, Activity method, Co-operative learning, Problem solving, Constructive approach in teaching learning of mathematics

Micro teaching, unit teaching, lesson planning and Models of Lesson Planning, Audio Visual Aids- Selection, Types, Importance in Mathematics Teaching, Strategies and techniques used in Teaching of Mathematics, Mathematics Laboratory- Meaning and Importance

SECTION D

EVALUATION IN MATHEMATICS

Evaluation: Meaning, importance, and types of evaluation, Criteria or parameters of a good mathematics textbook, Diagnostic test and remedial testing in mathematics, Achievement test: Need and importance of class test, Continuous and comprehensive evaluation, Action Research- Meaning, Steps, Its difference with Fundamental Research, Critical evaluation of the curriculum in use in Mathematics at the secondary stage according to NCF

Reference Books and Readings:

1. Aggarwal, J. C. (2008). *Teaching of mathematics*. UP: Vikas Publishing House Pvt. Ltd.

2. Boyer, C. B. (1969). *A history of mathematics*. New York: Wiley
3. Chambers, P. (2010). *Teaching mathematics: Developing as a reflective secondary teacher*. New Delhi: Sage Publication
4. Davis, D. R. (2005). *The teaching of Mathematics*. London: Addison Wesley Press.
5. Ediger, M.; & Rao, D. B. (2000). *Teaching mathematics successfully*. New Delhi: Discovery Publishing House.
6. Gupta, H. N.; & Shankaran, V. (1984). *Content cum methodology of teaching mathematics*. New Delhi: NCERT.
7. James, A. (2005). *Teaching of mathematics*. New Delhi: Neelkamal Publication.
8. Kapur, S. K. (2005). *Learn and teach Vedic mathematics*. New Delhi: Lotus press.
9. Kulshreshtha, A. K. (2012). *Teaching of mathematics*. UP: Lal & Sons.
10. NCF (2005). *Position paper- National focus group on teaching of mathematics*. New Delhi: NCERT.
11. Pamaela, C. (2006). *Teaching mathematics: A handbook for primary and secondary school teachers*. New York: Routledge.
12. Polya, G. (1965). *Mathematical discovery: On understanding learning and teaching problem solving*. NJ: John Wiley & Sons.
13. Roy, H. (1990). *Development of mathematical skills*, London: Blackwell Publishers.
14. Schonnel, F. J. (1965). *Diagnostic and remedial teaching in Arithmetic*. London: Lever and Boyd.
15. Shetty, B. (2013). *What is mathematics*? India: National Book Trust.
16. Skemp, R. R . (1971). *The psychology of learning mathematics*. New York: Routledge.B

Pedagogy of Mathematics Practical (EDH 110)

1. Organizing and participating in mathematic fairs, quiz, games, puzzles, Olympiad, talent hunt programs
2. Critically evaluate the present curriculum in mathematics at the secondary stage according to NCF
3. Critically analyze a mathematics text book of secondary grade
4. Prepare an achievement test of mathematics
5. Develop a multi media lesson plan using appropriate ICT resources and transacting the same in class
6. Prepare teaching aid for teaching of mathematics at secondary school level
7. NTeQ Model in Mathematics

Course Title/Code	**Yoga and Health Education (EDW 304)**
Course Type	**Core**
Course Nature	**Workshop (2 Credits)**
L-T-P-O Structure	**(0-0-3-0)**
Objectives	After completing the course, the student-teacher will be able to ➢ Acquire knowledge of theoretical concepts of Yoga and Meditation in relation to holistic health ➢ Apply knowledge of Yogic and meditation based practices in developing sound physical and mental wellbeing ➢ Develop their personality with a sense of identity and meaning through the practice of Meditation ➢ Build awareness of the importance of Yoga and Meditation in educational context

Yoga and Health Education (EDW 304)

SECTION A

YOGA – THEORETICAL FRAMEWORK

Yoga – History, Meaning, Need and Importance. The two schools of Yoga: Rāja Yoga and Haṭha Yoga. The streams of Yoga: Karma Yoga, Bhakti Yoga and Jñāna Yoga –main features and educational implications. Eight limbs of Yoga: Eyama, Niyama, Asana, Pranayama, Prathiyagara, Dharana, Dhiyana and Samathi. Meditation – Origin, Meaning and Types with focus on Mindfulness Meditation. Pranayama: Correct Breathing Exercise, Anulome-vilom, Surya-bhedhan and Bhramari.

SECTION B

YOGA AND HEALTH – EDUCATIONAL IMPLICATIONS

Holistic Health – Yogic Concept of Holistic Health and its Components. Yoga for developing concentration, creativity, coping with stress and anxiety. Meditation in classrooms for positive Mental Health, Role of Meditation and Spirituality in developing Identity, Sense of Meaning and Value in students' life.

Practicum: Task and Assignment

- Create a portfolio exhibiting performing of basic Yogic Asanas (any two) with documentary video and/or relevant photographs.
- Visit to a Yoga Institute/Centre and make a record of your observations in context of practices being followed along with other relevant details.
- Prepare a brief write up on Practical benefits of Yoga based on research evidence by reviewing two papers from reputed yoga journals.
- Write a reflective account of the changes in oneself after practicing meditation for a consistent period of time.
- Conduct a survey and write a report on the experiences of at least three persons who have been practicing yogic practices for a period of minimum two years.
- Exploring one's self concept through Mindfulness based reflection and present it through creative mode of expressions.
- Making a report of one's analysis of documentary screening/ Expert session on yogic and meditation practices
- Any other suitable activity

Reference Books and Readings

- Anantharaman, T.R. (1996). Ancient Yoga and Modern Science. New Delhi: MunshiramManoharlal Publishers Pvt Ltd.
- Besant, A. (2005). An introduction to yoga, New Delhi: Cosmo.
- Bhogal, R.S. (2010). Yoga & Mental Health & Beyond. Lonavla: Kaivalyadhama SMYM Samiti
- Goel, A. (2007). Yoga Education, Philosophy and Practice. New Delhi: Deep and Deep Publications.
- Nath, S.P. (2005). Speaking of Yoga. New Delhi: Sterling Publishers.
- NCERT. 2015. Yoga: A Healthy Way of Living, Secondary Stage, New Delhi.
- NCTE. 2015. Yoga Education-Bachelor of Education Programme, New Delhi.
- MDNIY. 2010. "Yoga Teachers Manual for School Teachers‖, New Delhi
- Mangal, S.K., Mangal,U.and Mana, S. K.(2009). Yoga education, New Delhi: Arya Publication.
- Nagendra, H.R. (1993). Yoga in Education. Banglore, Vivekananda Kendra.
- Taimini, I.K. (1979). The Science of Yoga. Madras, Adyar Publication.

SEMESTER-6

Course Title/Code	**CHEMISTRY-VI** **Electrochemistry and Photochemistry (CHH 314)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	- Explain the nature of Electrolytic conduction involving theories of electrolytes. -Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.

Course Content:

SECTION A

ELECTROCHEMISTRY – I

To study the behaviour and reactions of ions in a variety of environments through the laws that govern them. Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

SECTION B

ELECTROCHEMISTRY – II

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-metal insoluble salt, Amalgam and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes – standard electrode potential, sign conventions, electrochemical series and its significance.

To draw up a scheme for discussing the equilibrium position for an ionic reaction in terms of the electrode potential. Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells.

SECTION C

ELECTROCHEMISTRY – III

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. , polarization, over potential and hydrogen over voltage Power storage, Lead Battery,Ni-Cd cells, Fuel Cells, Hydrogen – Oxygen cell. Thermodynamic and Kinetic basis of corrosion, methods of inhibition of corrosion.

SECTION D

PHOTOCHEMISTRY

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

Reference Books and Readings:

7. Concise Inorganic Chemistry : J D Lee
8. An Introduction to Inorganic Chemistry : Mackay and Mackay
9. Principles of Physical Chemistry : Marron and Prutton

Electrochemistry and Photochemistry Practical (CHH 314-P)

1. To study the effect of dilution on Molar Conductivity of weak and strong electrolytes.
2. Conductometric titrations
3. Construction and measurement of EMF of Cells.
   Potentiometric Titrations

References

3. A Text Book of Quantitative Inorganic Analysis, A I Vogel
4. Practical Physical Chemistry, A Findlay

Course Title/Code	**PHYSICS-VI** **Relativity and Quantum Mechanics** **(PHH331)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	- To enable students to understand the essentials of relativity andquantum mechanics, the two theories of 20^{th} century. - To develop the ability to set up apparatus, collect data and to analyse the data for determining the desired physical quantity.

Course Content:

SECTION A

THEORY OF RELATIVITY

Galilean transformation and Newtonian relativity, Earth as an inertial frame of reference, Ether hypothesis, speed of light, Michelson-Morley experiment, Einstein's principle of relativity, Lorentz transformations - derivation, time dilation and length contraction, velocity addition theorem, variation of mass with velocity, relativistic momentum, energy and momentum conservation, relativistic energy, mass energy equivalence, examples from chemical and nuclear reactions, fission and fusion, Doppler effect in light.

SECTION B

PARTICLES AND WAVES

Inadequacies in Classical Physics, Blackbody Radiation: Quantum Theory of Light, Photoelectric Effect, Compton Effect; Wave Nature of Matter : de Broglie Hypothesis, Wave-

Particle Duality, Davisson-Germer Experiment, Wave description of Particles by Wave Packets, Group and Phase Velocities and Relation between them, Heisenberg's Uncertainty Principle :Derivation from Wave Packets.

SECTION C

QUANTUM MECHANICS

Basic Postulates and Formalism : Energy, Momentum and Hamiltonian Operators. Time dependent and Time-independent Schrödinger Wave Equation, Properties of Wave Function. Interpretation of Wave Function, Probability Density and Probability, Normalization, Linearity and Superposition Principles, Eigenvalues and Eigenfunctions.Expectation Values. Wave Function of a Free Particle, Particle in a One Dimensional Box. One Dimensional Simple Harmonic Oscillator : Energy Levels and Wave Functions, Zero Point Energy.

SECTION D

QUANTUM STATISTICS

Limitations of classical statistics, phase space, phase cells, postulates of quantum statistics, indistinguishability, Bose-Einstein statistics – derivation of distribution function, Application to Photon concept, derivation of Planck's radiation formula.
Elementary idea of Bose-Einstein condensation.

Fermi Dirac statistics – derivation of distribution function, Application of FD statistics to free electrons in metals – Fermi energy.

References Books and Readings:

1. Perspectives of Modern Physics, Beiser.
2. Introduction to Quantum Mechanics, Pauling and Wilson.
3. Statistical Mechanics, K Huang.

PHYSICS-VI Relativity and Quantum Mechanics Practical(PHH-331P)

Experiments on:

A. Electromagnetic induction
B. A.C. and D.C. Bridges
C. Laser diffraction
D. Ballistic galvanometer
E. Elasticity
F. Galvanometers

References :

1 Advanced Practical Physics, Worsnop and Flint.

Physics Laboratory Instructions, RIE, Mysore.
2.

Course Title/Code	**PHYSICS-VI** **Paper-2 Atomic and Molecular Physics** **(PHH432)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To enable students to apply the basic knowledge of classical andquantum mechanics at the atomic and molecular level. -To develop the ability to set up apparatus, to collect and analyze the data to determine the desired physical quantity.

Course Content:

SECTION A

Atomic Spectra: Bohr atomic model & its inadequacy correction due to finite mass of the nucleus, Rydberg's constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, vector model of an atom, Electron spin, space quantization, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

SECTION B

Spin-orbit interaction and Fine structure of spectral lines.Quantum numbers and selection rules.Pauli's exclusion principle.Electronic configuration of atoms.

Valence electron and a brief mention of L-S and J-J coupling.
Zeeman effect: Explanation of Zeeman effect on the basis of vector model ofatom, Expression for Zeeman shift and experimental details. Anomalous Zeeman effect, A qualitative mention of Paschen – Back effect.

SECTION C

Molecular Spectra

Molecular formation, the H_2^+ molecular ion, H_2 – molecule. Magnetic Moment of the Electron, Lande g-Factor, Pauli Exclusion Principle, Shell Structure. Hund's Rule, Spectroscopic Terms of Many Electron Atoms in the Ground State Diatomic Molecules– Rotational and Vibrational Energy Levels, Basic Ideas About Molecular Spectra, Raman Effect and Its Application to Molecular Spectroscopy (Qualitatively).

SECTION D

Electromagnetic Theory And Maxwell's Equations

Displacement current, Setting up of Maxwell's equations in SI units, Hertz experiment, Travelling electromagnetic wave, Wave equations (qualitative and quantitative) – Energy transport and Poynting vector, Poynting theorem. A radiation pressure (Normal and Oblique incidence). Concept of electric dipole, magnetic dipole, expression for energy radiated by a dipole (No derivation)

References Books and Readings:

1. Introduction to Modern Physics, Mani and Mehta.
2. Perspectives of Modern Physics Beiser.
3. Electromagnetism, Reitz and Milford.

PHYSICS-VII Atomic and Molecular Physics Practical (PHH-432P)

Experiments on

A. Biprism
B. Spectrometer
C. Series and Parallel Resonance

D. Current balance-magnetic induction
E. Coupled oscillations
F. Polarimeter
G. Interference – air wedge
H. Resolving power
I. Michelson interferometer

References

1. Practical Physics, E. Armitage, John Murray.
2. Advanced Practical Physics, Worsnop and Flint.
3. Physics Laboratory Instructions, RIE, Mysore.

Course Title/Code	**BOTANY-VI** **Plant Physiology and Metabolism** **(EDH310)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to**:** • understand the water relations in plants • understand the functioning of plant from the physiological point of view • understand various facets of growth, differentiation and physiology of flowering and fruit ripening in angiosperms • understand the process of cellular respiration and photosynthesis **Practical** • To understand the functioning of a plant from the physiological point of view. • To enable students to handle glassware and equipment for setting up physiology experiments. • To study responses of plants by manipulating the variables.

Course Content:

SECTION A

Water relations in plants

a) Importance of water to plant life, properties of water.

Review of diffusion, osmosis and imbibition – definitions, concept of water potential, osmotic potential, pressure potential, solute potential, role of aquaporins (AQP).

b) **Absorption of water**: Root as an absorbing organ, mechanism and pathwaysof water movement from root hair to root xylem - symplast, apoplast and trans-membrane pathways.

c) **Ascent of sap**: Vertical pathway of water in plants, structural properties ofxylem, root pressure theory, cohesion – tension hypothesis.

d) **Transpiration:** Definition, types, mechanism of stomatal opening andclosing (role of K^+ and Abscisic acid), anti-transpirants, factors and significance of transpiration, guttation.

SECTION B

Nutrition-Transport and Assimilation

a) Transport of Organic Substances: Ultrastructure and functions of phloem,(sieve tube), mechanism of phloem transport, source – sink relationship, theories and factors affecting photosynthesis.

b) Mineral Nutrition and Assimilation: Major and micro-nutrients, absorption of mineral salts,mechanism and theories of mineral uptake; passive absorption – mass flow, Donnan's equilibrium: active absorption –carrier concept, cytochrome pump hypothesis.

Role of N, P, K, Ca, Mg, Fe, N & Zn in metabolism.

SECTION C

Physiology of plant growth and development

a) Growth and Development: Definitions, phases of growth and development,photomorphogenesis, brief account of phytochromes – discovery,

physiological role and mechanism of action.

b) **Plant growth regulators**: General account, discovery, chemical nature,physiological effects and applications of auxins, kinins, gibberellins, ethylene and abscisic acid. Brief account of plant movements.

c) **Physiology of flowering and fruit ripening**: (i) Brief account of photoperiodism, short day,long day and day-neutral plants, night interruption phenomenon, florigen concept, role of phytochromes,vernalization, role of growth hormones in flowering; Ripening of fruit.

SECTION D

Metabolism in Plants

a) **Cellular Respiration:** Introduction, respiratory quotient, aerobic andanaerobic respiration, structure of mitochondrion, glycolysis, synthesis of Acetyl CoA, Krebs cycle, oxidative phosphorylation, electron carrier complexes, chemiosmotic hypothesis, proton pump theory, synthesis of ATP (Paul Boyer's hypothesis), pentose phosphate pathway.

b) **Photosynthesis:** Introduction, ultrastructure of chloroplast, photosynthetic pigments, absorption and action spectra, photochemical (light) reaction, photophosphorylation, Z-scheme, Calvin cycle, C_4 pathway, CAM pathway, photorespiration, factors and significance of photosynthesis

References Books and Readings:

1. **1**. Taiz, L. and Zeiger, E.(1998).*Plant Physiology (2nd Ed.)*. USA: Sinauer Associates Inc.

2. Salisbury, F.B. and Ross, C.W.(1992).*Plant Physiology (4th Ed.).* USA: Wadsworth Publishing Co.

3. Leo, P.J. and R.C.Leegood, R.C.(1999).*Plant Biochemistry and Molecular Biology*. England: John Wiley & Sons.

4. Hopkins, W.J. (1995).*Introduction to Plant Physiology*. New York: John Wiley and Sons, Inc.

5. Lehninger A.B.(1982).*Principles of Biochemistry*.New Delhi: CBS Publishers and Distributors.

6. John, J.L. (1994).*Fundamentals of Biochemistry*.New Delhi:Sultan Chand & Co.

7. Srivastava, H.S. (2005).*Plant Physiology, Biochemistry and Biotechnology*.Meerut: Rastogi Publications.

8. Srivastava H.S. and N Shankar, N.(2006).*Plant Physiology and Biochemistry*. Meerut: Rastogi Publications.

Plant Physiology and Metabolism Practical (EDH310-P)

Activities:

1. Preparation of different types of solutions – molal, molar, percent and normal solutions.

2. Determination of osmotic potential by plasmolytic method.
3. Determination of water potential of potato tuber.

4. Calculation of stomatal index, frequency and area of stomatal aperture in the 2 surfaces of leaves.

5. Determination the mechanism of stomatal opening and closing.

6. Demonstration of transpiration pull.
7. To study the impact of environmental factors on transpiration.
8. Demonstration of necessity of light, CO2 and Chlorophyll for photosynthesis.
9. Separation of photosynthetic pigment using paper chromatography

Course Title/Code	**MATHEMATIC (MAH351)** **GROUP THEORY**
Course Type	**CORE**
Course Nature	**Hard**
L-T-P-O	**(3-0-2-0)**

Structure	
Objectives	

COURSE CONTENT:

Unit I: Group Theory – I

Properties, Permutations, group Permutation, Alternating Group, Powers and Index laws, Order of an element of a group, Sub-group

Unit II: Group Theory – II

Cyclic groups, Coset decomposition of a Group, Index of a subgroup, Lagrange's theorem, Consequences, Caley's Theorem.

Unit III: Group Theory – III

Cayley's Theorem, Structure of finite and infinite cyclic groups, Normal subgroups, Quotient groups, Groups of Transformations.

Unit IV: Group Theory – IV

Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, Dihedral groups, Fundamental theorem of Homomorphism.

References :

Topics in Algebra by Herstein, Vikas.
A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
Modern Algebra by Vasishtha, Krishna Prakashan Media Pvt. Ltd.
Higher Engineering Mathematics by Kreyszig, Wiley

Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.

Basic Abstract Algebra, 2nd Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.

Linear Algebra by K. Hofman and R. Kunze, Pearson Education.
Modern Algebra – An Introduction by Durban, 5th Edition, Wiley.
Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH

Course Title/Code	**MATHEMATICS** **PAPER I (MAH 452)** **RINGS AND FIELDS**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	

COURSE CONTENT:

Unit I:

Rings, Integral Domains, Division Rings, Fields embedding and ring into another ring, Field of quotients.

Unit II :

Ideals, Maximal Ideals and Prime Ideals, Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

Unit III:

Binomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorisation Theorem, Prime Ideals, Quotient rings.

Unit IV :

Homomorphism of a ring, Kernal of a ring homomorphism, Fundamental theorem of Homomorphism, Eisenstein's Criterion of irreducibility.

References:

Topics in Algebra by Herstein, Vikas.
A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
Modern Algebra by Vasishtha, KrishanPrakashan Media Pvt. Ltd.
Higher Engineering Mathematics by Kreyszig, Wiley.

Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.

Basic Abstract Algebra, 2nd Edition by P B Bhattacharya, S K Jain and S R Nagpal, Cambridge University Press.

Linear Algebra by K.Hofman and R.Kunze, Pearson Education.
Modern Algebra – An Introduction by Durban, 5th Edition, Wiley.

Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

Course Title/Code	**ZOOLOGY- Developmental Biology and Applied Zoology (EDH311)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	To enable students to comprehend the modern concepts of developmental biology; to understand the developmental sequences in vertebrates; to compare the development of organs and systems; to identify the useful animals for harvesting the benefits and preventing the harmfulness with effective control measures.

SECTION A

GAMETOGENESIS AND EARLY DEVELOPMENT

a) Historical perspective, aim and scope of developmental biology

b) Gametogenesis – Differentiation of spermatozoa and oocyte in mammals Different types of eggs, classification based on amount and distribution of yolk(deutoplasm)

c) Fertilization– approach and interaction of gametes, monospermy, polyspermy; Parthenogenesis and its significance

d) Types of cleavage and fate map – Types of cleavages – holoblastic,meroblastic, radial, spiral, discoidal, superficial; planes of cleavages – meridional,vertical, equatorial, latitudinal.

SECTION B

DEVELOPMENT OF FROG AND REGENERATION

a) Gastrulation – Morphogenetic movement of cells, mechanism of gastrulation and change in cell shape

b) Neurulation– Formation, position and fate of three germinal layers, role of microtubules and microfilaments in neurulation

c) Primary organizer in frog – Organizer concept of Spemann, chemical nature and distribution of inductors – competence, determination and differentiation ; Outline of organogenesis ; metamorphosis of tadpole .

c) Gastrulation in frog and chick up to the formation of three germ layers.

SECTION C

DEVELOPMENT OF CHICK AND MAMMAL

a) Development of Chick: Overview of early development; formation of primitive streak and germinal layers ; Salient features of chick embryos of 13 hrs, 19 hrs, 24 hrs, 33 hrs and 48 hrs of incubation ;

b) Foetal membranes – Development, structure and functions of a) amnion, b) chorion, c) yolk sac, d) allantois. Placenta in mammals – Structure, classification, physiology.

c) Concept of competence, determination and differentiation.

d) Regeneration: morpholaxis and epimorphosis; regeneration in Dugesia and salamander; Factors influencing regeneration .

SECTION D

APPLIED ZOOLOGY

a) Beneficial animals: Basic principles of practices in culturing of i) silkworms (Sericulture), ii) bees (Apiculture), iii) Aquaculture – fish, prawn and shell fish

b) Harmful animals: Pests -morphology, life cycle, damages caused and control measures of common insect pests of stored food grains and crops, nematode pests of crops, insect vectors (each two) ; Control – biological control and integrated pest management (IPM) .

References Books and Readings:

1. Developmental Biology by K.V.Sastry& Vinita Shukla – (Rastogi Publications, 2008).
2. Introduction to Embryology by B.I. Balinsky – (W.B. Saunders, Philadelphia,1976).
3. Foundations of Embryology by B.M Paten and B.M.Carison.
4. Foundations of Animal Development by A.F.Hopper and N.H.Hart (OxfordUniversity Press, New York, 1980).

5. Vertebrate Embryology by R.S.McEwen (Oxford & IBM Publishing CO.,New Delhi)
6. C.S.I.R. Wealth of India (Supplement) on Fish and Fisheries. (CSIR, NewDelhi).
7. Bee keeping by J.E.Eckert and F.R.Shaw.
8. Developmental Biology by J.W.Brookbank.
9. Patterns and Principles of Animal Development by J.W. Saunders. Jr.
10. Fish and Fisheries of India by V.G.Jhingran (Hindustan Publishing Corpn;New Delhi)
11. Economic Zoology by G.S. Shukla& V.B. Upadhyay.Elements of Entomology by Rajendra Singh.
12. Embryology by Barth IG (1966) – Holt Rinehart & Winston.
13. Development by Berril N & Karp G (1978) – Tata McGraw Hill Publ. Co.
14. Modern Embryology by Bodemer CW (1960) - Holt Rinehart & Winston.
15. Fundamentals of Comparative Embryology of Vertebrates by Huettner AF(1967) – McMillan Co.
16. Chordate Embryology by Mohan Arora (1985) – Atma Ram & Sons.
17. Laboratory manual of Vertebrate Embryology by Rugh R – Allied Pacific Pvt.Ltd.
18. Chordate Embryology by Verma PS &Agarwal VK – Chand & Co.

ZOOLOGY-VI Practical (EDH311-P)

1. i) Study of different types of eggs (Insect, Frog, Hen).

ii) Study of permanent slides of different developmental stages in Frog
a) Section of egg, b) early cleavage, c) blastula, d) morula, e) Gastrula
2. i) Study of permanent slides of a) neural plate, b) neural fold of Frog.
ii) Study of different developmental stages of Frog tadpole:
a) Early tadpole, b) hind limb stage, c) hind limb and fore limb stage, d) shorttailed stage, e) young Frog.
3. Preparation of window on hen's egg to study development of embryo.
4. Incubation of fertilized egg of chick, preparation of permanent mounting of embryo from incubated egg and identification of age of the embryo.
5. i)Study of permanent slides of chick embryos of
a) 13 hrs, b) 19 hrs, c) 24 hrs, d) 33 hrs, e) 48 hrs of incubation
6. Study of sections of chick embryos of
a) 19 hrs, b) 24 hrs, iii) 48 hrs of incubation
7. Rearing of two races of silkworm from egg to cocoon stages – conditions required, quality and quantity of food provided, precaution taken duringfeeding, moulting and spinning.
8. Harvesting cocoons, reeling of silk from the cocoons, study of some economic traits – fecundity, larval duration, cocoon weight, shell weight and silk weight.
9.a.Study of common insect pests of stored grains and crops.
b.Study of common nematode pests of crops.
c.Study of common insect vectors.

10.Study of economically important
a) Fishes, b) crustaceans, c) molluscs

Field Visit- Agricultural college or farm

Course Title/Code	**Pedagogy II (Physical Sciences) (EDH 128)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To understand the epistemology of science as a school subject in the school curriculum. -To implement various pedagogical approaches to teaching of science at different stages of school. -To plan units and lessons through thematic approach in a holistic manner. -To critically examine teaching-learning process that incorporate enquiry, discovery, activity based learning, problem solving situations and investigatory projects etc within the classroom. -To integrate knowledge of science with other school subjects -To facilitate self-assessment in children with insights about meta-learning.

Course Content:

SECTION A

NATURE AND SCOPE OF SCIENCE

Definition of Science, Nature of Science.Concept, facts, theories and generalizations. Contributions of Indian and International Physicists and Chemist (Issac Newton, John Dalton, J.C. Bose, Albert Einstein, Niel Bohr, C.V. Raman to name a few) to the knowledge domain of Physical Science with special reference to the methods of discovery/ Investigation adopted. Science as a process of constructing knowledge; Scientific methods: A critical view, How science works; role of science teacher. Integration and Application of knowledge of Physical Sciences with other school subjects and in daily life.

SECTION B

PLANNING, DESIGNING AND TRANSACTION

Aims and objectives of teaching physical science, Development of scientific attitude and temper, Development of Unit plan, Lesson Plan, Concept maps using variety of approaches. Developing and writing Learning Objectives: Anderson and Krathwohl's Taxonomy.

Teaching Learning Process with a focus on: Lecture cum demonstration method, Heuristic/ Inquiry approach, Problem solving approach, Project method, Constructivist approach, peer learning/ group learning, team teaching, Experiential learning, Cognitive conflict, Analogy strategy.

Appreciating every child's natural curiosity of observation and drawing conclusion, facilitating lifelong learning in students with special educational needs.

Science Laboratory: Organization and Management, Using Laboratory as a learning resource approaches to laboratory work, safety in laboratory, handling hurdles in utilization of resources.

SECTION C

PEDAGOGICAL SHIFT IN PHYSICAL SCIENCES

Each learner is Unique, Pedagogical shift from science as a fixed body of knowledge to the process of constructing Knowledge. Content cum methodology, Pedagogical Analysis (any three topics from physics and chemistry)

Need of Inclusion in all aspects of teaching-learning of Physical sciences-science curriculum, approaches, ICT and professional development of teachers. Improvisation of Apparatus, identifying some inexpensive sources of chemicals

SECTION D

ASSESSMENT OF LEARNING

Continuous and Comprehensive Evaluation (CCE): need and importance; Assessment and evaluation as intertwined process of classroom experience.

Learning Indicators (LIs) and its types, developing LIs for activity, presentation, group work, assignments etc.

Tools and techniques of Assessment: assessment of written and oral work, project work, laboratory work, field trips, journal writing, concept map; Assessment of learners with special needs.

Recording and reporting of learning evidences- measurement of achievement, process skills and aptitude of learners; Portfolio- its role in evaluating students' performances. Role of reflection in students' achievement.

Reference Books and Readings:

1. Alsop, S. and Hicks, K. (2007): *Teaching Science: A Handbook for Primary and Secondary school teachers,* Kogan Page, N.Delhi .
2. CBSE (2009). Teacher's manual on CCE. New Delhi: CBSE.
3. Chikara, M.S. and Sarma, S. (1985). Teaching Science. Ludhiana: Prakash Brothers.
4. Das, R.C. (1985). *Science teaching in Schools.* New Delhi: Sterling Publications Private Ltd.
5. Krathwohl, D.R., Bloom B.S. and Maria B.B. (1964) *Taxonomy of Educational Objectives, Handbook II, Affective Domain*, New York: David McKay.
6. Lindfors, J. (1984). *How children learn or how teachers teach?* A Profound confusion: Language Arts, 61 (6), 600-606.
7. National Curriculum Framework 2005, NCERT, New Delhi.
8. Ramakrishna, A. (2012). *Methodology of Teaching Integrated Sciences.* New Delhi: Pearson.
9. Steffe, L. and Gale, J. (Eds.) 1995). *Constructivism in Education*, New Jersey : Lawrence Erlbaum Associates Inc.

Pedagogy of Physical Sciences Practical (EDH 128-P)

1. Designing laboratory experiences for using in teaching-learning process in classroom situation- two innovative activities and two improvised apparatus.
2. Prepare a First Aid box equipped with all the essential things in it.
3. *Report of one Action Research carried out in the practising school.
4. Report on measures being taken for inclusive teaching-learning in practicing schools.
5. Concept mapping in selected units in Physical Science Planning learning situations for constructing knowledge in Physical Science.
6. Group Discussion on pedagogical issues.

Course Title/Code	**Reading and Reflecting on Texts (EDW 104)**
Course Type	**Workshop**
Course	**Soft**

Nature	
L-T-P-O Structure	**(0-0-3-0)**
Objectives	-To read and respond to a variety of texts in different ways -To enhance his/her capacities as a reader and writer -To read a wide variety of texts about schools, teaching, learning and other aspects of education -To interactively engage in individual and groups reading sessions -To reflect on the text using personal experiences

Reading and Reflecting on Texts (EDW 104)

SECTION A

Reading Skills

Acquisition of reading skills, Reading as resource, Reading a wide variety of texts such as Descriptive, Narrative, Literary,Factual, Expository, Historical work, Policy documents, Ethnographies, Process of critical and reflective reading

SECTION B

Writing and Reflecting Skills

Concept and distinguishing features of reflective writing, writing with a sense of purpose, Writing Skills for Teachers:writing letters, applications, reports, minutes, and essays; writing about research; writing annotations, references and bibliography; writing journals and reflective diaries, etc.

Reference Books and Readings:

1. Badheka, G. (2006). *Divasvapan*. National Book Trust. Retrieved from http://www.arvindguptatoys.com/
2. Bhatt, H. (n.d).*The diary of a school teacher.* An Azim Premji University Publication. Retrieved from www.arvindguptstoys.com/arvindgupta/diary-school-teacher-eng.pdf
3. Butler, A. and Turbill, J. (1984). *Towards Reading-Writing Classroom*. New York: Primary English Teaching Association Cornell University.
4. California Yule, G. (2006).*The study of language*. Delhi: Cambridge University Press.
5. Grellet, F. (1981). *Developing reading skills: A practical guide to reading comprehensionexercises*. Cambridge University Press.

6. Reading Development Cell, NCERT (2008).*Reading for meaning*. New Delhi: NCERT.
7. Watton, P., Collings, J. and Moon, J. (2001). *Reflective Writing- Guidance notes for students.* University of Exeter. Retrieved from www.exeter.ac.uk/fch/work-experience/reflective-writing-guidance.pdf
8. 32 Ways to Use Google Apps in the Classroom - Google Slides. Retrieved fromhttps://docs.google.com/presentation/d/1_6fh7wXkugHQbbA2ILrjsFqysvclJCbul2I3Oc912D8/present#slide=id.i0

Reading and Reflecting on Texts Practical (EDW 104)

1. Engaging with narrative and descriptive accounts in stories or chapter.
2. Re-telling the account (in one's own words) from different points of view after reading a specified content given by teacher.
3. Writing based on text e.g. summary of any given text, extrapolation of a story, converting a situation into a dialogue etc.
4. Read a journal article, newspaper article or a chapter and write personal responses and summary.
5. Assessment of reading comprehension based on a given passage. The chosen text should befrom different genres like story, description, conversation, poem etc.
6. GROUP ACTIVITY-Take two reference books on any one topic of your choice and conduct a comparative study.
7. Prepare presentations on literary (Autobiography/ ethnographic) text.
8. Prepare a Vocabulary Book (50 words) with Meanings and Usage.
9. Make a report based on reflection & analysis of any one Educational Policy/Document like Kothari commission, NPE 1986, POA – 1992, RTE Act, NCF 2005 etc.
10. Make your students read and then write a reflective summary of a text given by you. After assessing their reflective abilities submit a brief account of the same.*
11. Any other suitable activity

***Field Activity**

SEMESTER-7

SCHOOL INTERSHIP (EDO3+EDO404+EDO405+EDO15+EDO16)

BA B.Ed/ BSc B.ED/B.Ed School Internship
Skill in Pedagogy
Evaluation Criterion Grand Total – 1700
Total credits 34

Phase 1 Pre Internship bridge course Assessment			
S.No	**Component**	**Number *Marks**	**Total Marks**
1 2 3 4.	Micro lesson Simulated lesson	5* 20 5 * 20	100 100
5	**Workshop sessions**	5*10 Time table Reflection Research Case study Action Research	50
	Total		**250**
Phase II School Internship			
	PT1 after first month		
1	File Maintenance(Lesson Plans(10*3)		30
2	Preparing teaching learning Material 2*10		20
3	Attendance 95-100 =20 90-94= 15 85-89=10 80-84=5		20
4	Visit to campus 2*5		10
5	Overall performance Analysis and Viva (By teacher Educator)		20(15)
	Total		**100 (75 for BEd)**
	PT2 after second month		
1	File Maintenance(Lesson Plans(10*3)		30
2	Attendance		20
3	Event organised by student teacher 2*10		20(10 for BEd)
4	Visit to campus 2*5		20(5 for B.Ed)
4	Overall performance Analysis and Viva (By teacher		20(10 for B.Ed)

	Educator)	
	Total	**100 (75 for B.Ed)**
	PT3 at the end	
1	File Maintenance-Lesson Plan File(30lessons total 25 total for B.Ed)	**100 (50)**
4	**Achievement Test**	**40 (20)**
5	**Constructivist practices to teach**	**20 (10)**
6	Overall Performance-Internal	**40 (20)**
		200 (100 for B.Ed)
b	**Informal** **Any Invigilation duty - 20 (10)** **Any additional responsibility- 20 (10)** **Employer(school) feed back- 20(10)** **Professional Ethics (punctuality, dress code)- 40(20)**	**(100) 50 for B.Ed**
Note:	**Same structure to be followed for pedagogy (II)**	**250+500=750** **300 (B.Ed)**
C	Case Study/Action research	**100**
	Reflective notes in the form of maintaining a diary	**100 Marks**
	Total	**200**

Highlighted is for integrated only.

SEMESTER-8

Course Title/Code	**CHEMISTRY-VIII** **Spectroscopy, Natural Products and Heterocyclics (CHH 315)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To develop an understanding of basic principles of Spectroscopy and apply the principles in the structural elucidation of simple organic compounds. -chemistry of natural products, dyes and drugs, macromolecules and heterocyclic compounds -To develop skills of synthesis and Estimation of organic compounds

Course Content :

SECTION A

SPECTROSCOPY

UV and Visible spectroscopy: Introduction, absorption laws, instrumentation,formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward – Fieser rules for calculating absorption maximum in dienes and α,β-unsaturated carbonyl compounds.

IR spectroscopy: Introduction, theory of molecular vibrations, vibrational frequency,factors influencing vibrational frequencies, finger print region and applications of ir spectroscopy.

NMR spectroscopy: Introduction, instrumentation, number of signals, position ofsignals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts- inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemicalexchange and coupling constant.

Structural determination of simple organic compounds using uv, ir and nmr spectral data.

(10 L)

SECTION B

NATURAL PRODUCTS

Carbohydrates: Introduction, classification and nomenclature. Configuration ofmonosaccharides.Erythro and threo diastereomers. Interconversions in carbohydrates

– glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters.Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation.Constitution of disaccharides - maltose, sucrose and lactose.Introduction to polysaccharides (starch and cellulose) without involving structure determination.

Alkaloids : Introduction, general methods of structural determination, structuralelucidation of Conine, Nicotine and piperine

Terpinoids : Introduction, isoprene rule, structural elucidation of Citral and Menthol

Amino acids, Peptides, Proteins and Nucleic acids

Classification, structure and stereochemistry of amino acids.Acid-base behaviour, isoelectric point and electrophoresis.Preparation and reactions of - amino acids.Classification of proteins.Peptide structure determination - end group analysis, selective hydrolysis of peptides.Solid-phase peptide synthesis.Primary and secondary structures of proteins.Protein denaturation. **(10 L)**

SECTION C

DYES, DRUGS AND MACROMOLECULES

Dyes: Introduction, Classification of dyes, Colour and constitution (electronicconcept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.

Drugs: Introduction, classification, structure and synthesis of sulpha drugs-sulphapyridine, sulphathiozole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials – plasmaquin, mepacrine and chloroquin.

Macromolecules: Introduction, Classification, Types of polymerization–chainpolymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers – buna S, butyl rubber and neoprene. Synthetic fibres – nylon 6, nylon 6,6, terylene. Conducting polymers – polypropylenes and polyanilines.Bio-degradable polymers. **(8 L)**

SECTION D

HETEROCYCLIC COMPOUNDS

Introduction, methods of formation of five membered heterocycles – furan, thiophene and pyrrole.Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and their chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Six membered heterocycles: methods of formation of pyridine, mechanism of nucleophilic substitution reactions 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, Skraup synthesis and Bischler-Napieralski synthesis.**(8 L)**

Reference Books and Readings:

1. Organic Chemistry : Morrison and Boyd
2. Organic Chemistry : I L Finar
3. Organic Chemistry : I L Finar Vol II
4. Application of absorption Spectroscopy to Organic Compounds : John R Dyer
5. Organic Spectroscopy : William Kemp
6. Fundamentals of Molecular Spectroscopy : C N Banwell

Spectroscopy, Natural Products and Heterocyclics Practical (CHH 315-P)

1. Two step organic synthesis

(a) Synthesis of p-bromoaniline from acetanilide
(b) Preparation of O-iodobenzoic acid from anthranilic acid
(c) Preparation of m-nitrobenzoic acid from methyl benzoate
(d) Preparation of paracetamol
(e) Synthesis of Quinoline

2. Quantitative organic analysis

(a) Estimation of aniline by bromate-bromide method
(b) Estimation of glucose by Fehlings method
(c) Determination of iodine value of an oil by Vij's method
(d) Determination of saponification value of an ester / oil
(e) Estimation of amino acid by formal titration method
(f) Estimation of ascorbic acid in Vitamin C tablets by Volumetry

(g) Estimation of Paracetamol by titrimetric and photo spectrometric methods.
(h) Gravimetric Analysis of Lead, Iron and Nickel

References:

4. A Text Book of Quantitative Inorganic Analysis, A I Vogel
5. A Text Book of Qualitative organic Analysis, A I Vogel

Course Title/Code	**PHYSICS-VIII** **Nuclear and Solid State Physics** **(PHH433)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	- -To enable students to apply the basic knowledge of classical and quantum mechanics for an understanding of physics of nuclei and of solids. -To develop the ability to set up apparatus, to collect and analyze data to determine the desired physical quantity.

Course Content:

SECTION A

ATOMIC NUCLEUS

Nuclear structure; Neutron, its discovery and properties; Basic properties of nucleus-charge, spin, radii, mass, magnetic moment; Nuclear forces and their characteristics; Yukawa's Theory (Qualitative); Packing fraction and Binding energy; Nuclear stability, Nuclear Models-Liquid drop model; Semi-empirical mass formula; Shell model and magic numbers (qualitative) (10L)

SECTION B

RADIOACTIVITY AND PARTICLE PHYSICS

Radioactive decay: Half life, mean life, Decay constant, Radioactive displacement laws, Theory of α decay (qualitative); Geiger-Nuttal law; Beta decay, Beta spectra, Neutrino hypothesis, Gamma decay, pair production; successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions; nuclear fission and fusion, Nuclear reactors, Quarks and gluons, GM counter. (10L)

SECTION C

CRYSTAL STRUCTURE AND THERMAL PROPERTIES OF SOLIDS

Crystal Structure: Concepts of a lattice, unit cell and Bravais lattice, Fundamental lattice systems and their types, Miller indices, Coordination number, packing fraction for cubic crystals (sc, bcc and fcc),Various types of bonding, cohesive energy and compressibility of ionic crystals, Madelung constant, Thermal Properties: Specific heat of solids, Einstein and Debye theories (10L)

SECTION D

ELECTRICAL AND MAGNETIC PROPERTIES OF SOLIDS

Electrical Properties: Free electron model of a metal, Distinction between metals, semiconductors and insulators, Hall effect, Expression for Hall coefficients, Magnetic Properties: Langevin's theory of Dia and Para magnetism, Curie-Weiss Law, Qualitative description of Ferromagnetism, Superconductivity: Qualitative description, critical temperature and Meissner Effect, Applications of High temperature superconductors (10L)

References Books and Readings:

1. Perspectives of Modern Physics, Beiser
2. Nuclear Physics, Kaplan.
3. Nuclear Physics, Subramanyam and Brijlal.
4. Concepts of Nuclear Physics, Cohen.
5. Solid State Physics, A J Dekker.
6. Introduction to Solid State Physics, C Kittel.
7. Modern Physics, Kiein

PHYSICS-VIII Nuclear And Solid State Physics Practical (PHH433-P)

Experiments on:

A. Magnetic susceptibility
B. e/m of electrons by helical method
C. Rutherford model
D. G M tube
E. Millikan oil drop
F. Planck's constant
G. Energy gap of a semiconductor using Four probe method
H. Fermi energy
I. Rydberg constant
J. Hall effect

References

1. Physics Laboratory Instructions, RIE, Mysore.
2. Practical Physics- S. L. Gupta and V. Kumar
3. B. Sc. Practical Physics- Harnam Singh and P. S. Hemine
4. Advanced Practical Physics- Chauhan and Singh

Course Title/Code	**MATHEMATICS (MAH 401B)** **LINEAR ALGEBRA**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	

COURSE CONTENT:

Unit I: Vector Spaces – I

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space – some properties.

Unit II: Vector Spaces - II

Quotient spaces, Homomorphisms of vector spaces, Isomorphism of vector spaces, Direct sums, Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Orthogonal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

Unit III: Linear Transforms – I

Linear maps as matrices, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

Unit IV : Linear Transforms - II

Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation and Eigen vectors, Characteristic polynomial, Cayley, Hamilton Theorem, Minimal Polynomial.

References :

Theory and Problems of Linear Algebra, SaymourLipschitz, Schaum Outline Series.

Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.

Modern Algebra, Vol.II, by Narayanan and ManicavachagamPillay, S. Vishwanathan and Co.

Brief Survey of Modern Algebra, Brikhoff and Maclane, IBH
Linear Algebra by Sergr Lang, Addison Wesley Publishing company Inc.
Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.
Linear Algebra by Larry Smith, SpingerVerlag.

Elementary Linear Algebra with Applications, Keith Nicholson, PWS – Kent Publishing Company

Linear Algebra, SurjithSinth, Vikas Publishing House Pvt. Ltd.
Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.

Course Title/Code	**BOTANY-VIII** **Biochemistry, Plant tissue culture and Biotechnology (EDH410)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	After going through this course, the learner will be able to: • understand the structure and functions of biological macromolecules; • get acquainted with the techniques, branches and applications of plant tissue culture • get acquainted with the tools and techniques of biotechnology, the processes involving gene manipulation and their applications.

	Practical • To understand the molecular mechanisms operating in cells. • To familiarize with techniques in biochemistry and biotechnology

Course Content:

SECTION A

BIOCHEMISTRY

Carbohydrates: Introduction, classification, chemical structures of mono, oligo and polysaccharides, synthesis and breakdown of sucrose and starch.

Lipids: Introduction, classification, chemical structures, saturated and unsaturated fatty acids, synthesis and breakdown of fatty acids, □- oxidation.

Enzymology: Discovery, nature, nomenclature and classification, mechanism ofenzyme action, lock and key hypothesis, induce-fit hypothesis, regulation of enzyme action, inhibitors, prosthetic groups and coenzymes, factors affecting enzyme action

SECTION B

Plant Tissue Culture

a) Brief history, cellular totipotency, culture media and techniques

b) Brief account of anther/ pollen culture, endosperm, embryo and protoplast culture
c) Applications of tissue culture.

SECTION C

BIOTECHNOLOGY

a) Tools and techniques, cloning vectors,

b) Brief account of genomics and c-DNA library,

c) Interferons, transposable elements

d) PCR, Bio-Informatics.

SECTION D

a.) Applications of Biotechnology – functional definition and applications.

b.) Brief account of DNA finger printing

c.) Agrobacterium – mediated gene transfer

d.) Achievements in crop improvement, transgenic plants.

References Books and Readings:

1. Lodish, H., Berk,A., Zipursky,S.L., Matsudaiva, P., Baltimoe, D. and Darnell, J. (2000). *Molecular Cell biology*. New York: W.H. Freeman & Co.

2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., and Watson, I.O. (1999).*Molecular Biology of Cell*. New York: Garland Publishing Co., Inc.

3. Malacinski, G.M., (2005).*Essentials of Microbiology (4th Ed.)*. New Delhi: Narosa Publishing House.
4. Lea, P.J. and Leegood,R.C.(1999). *Plant Biochemistry and Molecular Biology*. England: John Wiley & Sons.
5. Srivastava, H.S. (2005).*Plant Physiology, Biochemistry and Biotechnology*. Meerut: Rastogi Publications.
6. Jain.J.L. (1994). Fundamentals of Biochemistry, New Delhi: Vikas Publishing House.
7. Old, R.W. and Primrose, S.B. (1989). *Principles of Gene Manipulation*. Oxford: Blackwell Scientific Publication

Biochemistry, PLANT Tissue Culture and Biotechnology Practical (EDH410-P)

1. To test for the presence of carbohydrates, proteins and lipids
2. Isolation of DNA from coconut endosperm.
3. Effect of pH and temperature on activity of amylase in germinating seeds.
4. Effect of pH and temperature on activity of catalase and peroxidase.
5. Separation of amino acids by paper chromatography.
6. Study of root nodules in leguminous plants.

Course Title/Code	**MATHEMATICS-VIII** **Paper I (MAH 453)** **COMPLEX ANALYSIS**
Course Type	**Core**
Course Nature	**Hard**

L-T-P-O Structure	**(3-0-2-0)**
Objectives	To develop the understanding application of the concepts of complex analysis in problem solving situations. To enable and apply Numerical methods in solving problems related to real life situations with help of computers, which have become indispensable in modern world

Course Content:

Unit I: Analytic Functions

Introduction, Functions of a Complex Variable, Limits, Theorems on Limit, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions, Conformal Mappings.

Unit II: Transformations

Introduction, Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations, Some Special Bilinear Transformatiions, Discussion of mapping of $w = z$.

Unit III: Complex Integration

Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula,

Higher Derivatives.

Unit IV : Power Series

Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions.

References:

Complex Analysis by Ahlfors McGraw Hill International Edition.

Introduction to the Theory of Functions of a Complex Variable by Palka, Springer Verlag.

Complex Analysis by Serge Lang, Springer Verlag

Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.

Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.

An Introduction to the Theory of Functions of a Complex Variable by Copson, Oxford University Press.

Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.

Functions of One Complex Variable by Conway, Narosa Publishing House.

Theory and Problems of Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.

Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.

Course Title/Code	**MATHEMATICS-VIII** **Paper II (MAH 455)** **NUMERICAL ANALYSIS**

Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	

COURSE CONTENT:

Unit I: Numerical Methods

Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Iteration method, Newton-Raphson method, Secant Method, Numerical solutions of first order linear differential equations, Euler-Cauchy method, Modified Euler's method, Runge-Kutta fourth order method, Picard's method.

Unit II: Finite Differences and Interpolation

Finite differences, Forward and Backward differences, Shift operator, Derivative operator, Weierstrass theorem, Interpolation, Newton-Gregory forward and backward interpolation formulae, Divided differences, Lagrange's interpolation formula,

Finding first and second derivatives using interpolation formulae, Difference equations.

Unit III: Numerical Integration

General quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Newton-Cotes quadrature formula, Gauss quadrature.

Unit IV: Riemann Integration

Upper and lower sums, Criterion for inerrability, Inerrability of continuous functions and monotone functions, Fundamental theorem of Calculus, Change of variables, Integration by parts, First and Second Mean Value Theorems of Integral Calculus.

References

Numerical Analysis by Guptha, S. Chand and Co. Ltd.
Finite Differnece and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
Introductory Methods of Numerical Analysis by Shstry, PHI.
Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
Numerical Calculus by William Edmund Milne, Princeton University Press.

Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.

Numerical Analysis by Schield, Schaum's Outline Series.
Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.
Principles of Real Analysis by Malik, New Age International Ltd.

Textbook of Mathematical Analysis by Leadership Project, Bombay University, Tata McGraw Hill Publishing Media Pvt. Ltd.

Course Title/Code	**ZOOLOGY- Human Genetics and Palentology (EDH411)**
Course Type	**Core**
Course Nature	**Hard**
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To enable students to comprehend the modern concepts of genetics; to create awareness regarding the inheritance and hereditary diseases; to comprehend origin of life and theories of evolution; to understand the evolution from the evidences. -To develop the skill of rearing Drosophila; to conduct breeding experiment for identifying inheritance and mutation in Drosophila; to understand pattern of inheritance in human traits; to understand mimicry and adaptation in animals; to have the skill of making models of fossil forms.

SECTION A

General Genetics

a) Sex determination – Chromosomal basis of sex determinations (XX–XO, XX–XY, ZZ–ZW types); multiple sex chromosomes; Genic balance theory;Gynandromorphs and sex mosaic; Sex determining genes; Barr body .
b) Linkage and crossing over: Linkage and crossing over in Drosophila;Cytological evidences for crossing over; Linkage maps.

c) Karyotype, banding, nomenclature of chromosome subdivisions and genetic map. Study of Human and Phlox/ Allium Karyotype (normal and abnormal)

SECTION B

a) Human Genetics: Pedigree of Mendelian human traits ; Eugenics, Euthenics,Euphenics; Inborn error of metabolism –Phenylketoneuria, Galactosemia;
b) Genetic disorders, Chromosomal aneuploidy (Down, Turner and Klinefelter syndromes), Chromosome translocation (chronic myeloid leukemia) and deletion (“cry of cat” syndrome), Gene mutation (cystic fibrosis)

c) Genetic screening and counselling; Introduction to applications of genetic engineering,

Molecular diagnosis of genetic disorders and gene therapy, Crop and livestock improvement

SECTION C

a) Transgenic Animal Technology Production of transgenic animals-nuclear transplantation, Retroviral method, DNA microinjection method, Applications of transgenic mice, sheep, goat, pig, birds and fish, Dolly and Polly, Scientific significance, Therapeutic applications, Human cloning, Ethical issues of transgenic animals.

b) Molecular diagnosis of genetic diseases (Cystic fibrosis, Huntington's disease, Sickle cell anemia), RFLP, RAPD and DNA fingerprinting, Vaccines and therapeutic agents, Recombinant DNA in medicines (recombinant insulin and human growth hormone), Gene therapy, Enzymes in detergents and leather industries, Heterologous protein production, Bioremediation.

SECTION D

PALEONTOLOGY AND ZOOGEOGRAPHY

a) Geological time and its significance in evolution

b) Fossils – Fossils and fossilization; Living Fossils – Latemaria and Sphenodon the emergence and disappearance of invertebrates and vertebrates (Trilobites,Fishes and Reptiles) ; Paleontological history of man

c) Zoogeography, with emphasis to oriental region and fauna

References Books and Readings:

1. Genetics by Stricksberger – (MacMillan).
2. Principles of Genetics by Sinnott, Dunn and Dobzhansky – (McGraw Hill).
3. Genetics by E. Altenberg – (Holt, Rinehart & Winston, New York).
4. Principles of Genetics by Gardner – (John Willey).
5. Principles of Genetics by Irwin H. Herskowitz – (Little Brown &Co.,Boston).
6. Elementary Genetics by Singleton WR – (Van Nostrand).
7. Basic Human Genetics by Elain J. Mange & Arthur P. Mange – (RastogiPublications, 2008).
8. Cytogenetics by P.K. Gupta – (Rastogi Publications, 2008)
9. Evolutionary Biology by B.S. Tomar& S.P. Singh – (Rastogi Publications,2008).

10. The origin of life by K.John – (Reinhold Publishing Corpn).
11. The evolution of Man by G.W.Lasker – (Holt, Rinehart & Winston).
12. Organic Evolution by R.S.Lull – (MacMillan).
13. Evolution by J.M.Savage (Holt, Rinehart and Winston)
14. Genetics and Evolution by RL Kochhar (S.Nagin& Co, New Delhi 1970)
15. Evolution in Action by J.Huxley (New American Library, New S.Nagin& Co,New Delhi 1970).
16. The Origin of Species by D.I.Charles (Collier Book, New York, 1966).
17. Evolution by Ayala F.G, Stebbins G.L & Valentine J. (1965) – SinauerAssociates.
18. Animal Evolution by Carter GS (1960) – Sedgenick& Johnson Ltd.
19. Zoogeography by Hubbs CL (1962) – AAAAS Washington
20. Evolution & Genetics by Morrel DJ (1962) – Holt Rinehart and Winston.
21. Vertebrate Paleontology by Romer AS (1966) – University Chicago Press.
22. The Process of Organic Evolution by Stebbins GL (1970) – Prentice HallPublication.
23. Genetics by Winchester AM (1966) – Oxford & IBH Publishing CO.

ZOOLOGY-VIII Practical (EDH411-P)

1. a) Fruit flies – Collection, handling, rearing and maintenance of culture.
   a) Identification of sexes of Drosophila.
   b) Study of the life cycle of Drosophila.
2. Sorting out and study of mutant flies of Drosophila with reference to their various contrasting characters in comparison with normal flies-vestigial wings, ebonybody, curled wing, sepia eye, white eye and bar eye.
3. Study of Barr body in human buccal epithelial cells.
4. Identification of blood groups (ABO) and Rh factor in man.
5. Study of various types of beaks of local birds.
6. Study of five animals for mimicry.
7. Study of fossil models of Trilobites and fishes.
8. Study of teeth and skulls of horse, elephant and man.
9. Study of vestigial organs, models of dinosaurs, living fossils.

Field visit to Natural Science Centre, Delhi.

Course Title/Code	**ZOOLOGY-MOLECULAR BIOLOGY, IMMUNOLOGY AND CANCER (EDH402)**
Course Type	**Core**
Course	**Hard**

Nature	
L-T-P-O Structure	**(3-0-2-0)**
Objectives	-To enable students to comprehend the modern concepts and applied aspects of molecular biology and immunology.

SECTION A

a) Genome Structure, Chromatin and the Nucleosome
Genome Sequence and Chromosome Diversity, Chromosome Duplication and Segregation, The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin. Regulation of Chromatin Structure and Nucleosome Assembly.

b) The Replication of DNA (Prokaryotes and Eukaryotes) Chemistry of DNA synthesis, general principles - bidirectional replication, Semi- conservative, Semi discontinuous, RNA priming, Various models of DNA replication including rolling circle, D-loop (mitochondrial), Θ (theta) mode of replication, Enzyme involved in DNA replication – DNA polymerases, DNA ligase, Primase, Telomerase and other accessory proteins

SECTION B

a) Mechanism of Transcription- RNA Polymerase and the transcription unit Transcription in Prokaryotes Transcription in Eukaryotes Unit 2. RNA Modifications, Split genes, concept of introns and exons, removal of Introns, spliceosome machinery, splicing pathways, alternative splicing, exon shuffling, RNA editing, and mRNA transport.

b) Transcription Regulation in Prokaryotes (Ch 16 Watson) Principles of transcriptional regulation, regulation at initiation with examples from lac and trp operons , Gene Silencing

c) Translation (Prokaryotes and Eukaryotes) Assembly line of polypeptide synthesis - ribosome structure and assembly, various steps in protein synthesis. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides. Regulation of translation.

SECTION C

Components of immune system

a) Innate, Adaptive (cell mediated and humoral) - Immunity. Cells and Organs of the Immune System, Primary and Secondary lymphoid organs, Lymphatic system.

b) Antigens- Antigenicity and immunogenicity, Immunogens, Adjuvants and Haptens,

Factors influencing immunogenicity,B and T-cell epitopes.

c) Immunoglobulins- Structure and Functions, Basic structure, deducing antibody structure, classes and function, Antigenic determinants on immunoglobulins, Antigen-antibody interactions, Polyclonal sera, Monoclonal antibodies,

SECTION D

a) Major Histocompatibility Complex- Structure, polymorphism and functions, MHC and immune responsiveness. Cytokines: properties and functions, Complement system: components, activation and functions.

b) Hypersensitivity, Immune System in Health & Disease, Vaccines: bacterial, viral, toxoid and III generation vaccines, Immunodeficiency, Autoimmunity.

c) Cytology of Cancer – Characteristics of cancer cell, hypothesis about cancer;somatic mutation, viral mutation; types and causes of cancer, treatment .

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References Books and Readings:

1. Cell and Developmental Biology by Sastry, Singh &Tomar – (RastogiPublications, 2008).
2. Cell and Molocular Biology by P.K. Gupta – (Rastogi Publications, 2008).
3. Cell Biology by C.B.Powar – (Himalya Publishing House, Bombay).
4. Cell Biology by De Robertiset.al – (W.B. Saunders, Philadelphia).
5. A Textbook of Cytology by R.C.Dalela&S.R.Verma – (Jaiprashnath& Co.,Meerut).
6. Cell Biology by J.D. Burke – (Scientific Book Agency, Calcutta).
7. Cell Biology: A molecular approach by R.D. Dyson – (Allyn& Bacon,Boston).
8. Cell Biology by R.M.Dowben – (Harper & Row, New York).
9. Cell function by L.L.Langley – (Affiliated East West Press, New Delhi).
10. Cytology by C.D. Darlington.
11. Immunology by S.S. Lal&Sanjeev Kumar – (Rastogi Publications, 2008).
12. Immunology by Janis Kuby.
13. Genes (Vol. I – VII) by Levin B. – CBS Publishers.
14. Cell and Molecular Biology by De Robertis EDP & De Robertis EMI. Jr(1996) – Holt WB

Saunders International.
15. Essentials of Molecular Biology by Feirfelder I (1997) – Narosa Publ. NewDelhi.
16. Cytology, Genetics & Evolution by Gupta PK (1992) – Rastogi Publications.
17. Molecular Cell Biology by Harvey L, Baltimore D, Berk A. et al., (1999) –Scientific American Source Book.
18. Principles of Biochemistry by Lehninger AL, Nelson DL & MM Cor (1993) –Kalyani Publishers, New Delhi.
19. Cytology &Cytogenetics by Swanson CP (1972) – MacMillan Co.
20. Animal Cytology and Evolution by MJD White – Cambridge University Press.

ZOOLOGY-VII Practical (EDH402-P)

1. Staining of mitochondria in the buccal epithelial cells of man and ovary ofearthworm using vital stain.
2. Study of mitosis in onion root tips.
3. Micrometry: Use of ocular and stage micrometers to measure cell and nucleardimensions of human buccal epithelial cells.
4. Study of slides of grasshopper (Poecilocerapicta) testis for the various stagesof meiosis.
5. Study of salivary gland chromosomes of Drosophila for banding patterns.
6. Study of salivary gland chromosomes of chironomous larva.
7. Study of Karyotype and idiogram of man.
8. Isolation of DNA from kidney/spleen of rat (demonstration).
9. Demonstration of antigen-antibody reaction in gels.
10. Cytological characterization of DNA by Feulgen staining (demonstration)

Course Title/Code	**Life Skills Education (EDS219)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To Understand the Meaning and Need of Life Skills Education -To Identify the 10 core life skills in Life Skills Education -To Design activities to develop Life Skills at school level -To Evaluate the methods of enhancing Life Skills in students -To Assess the development of Life Skills in the learners

Course Content:

SECTION A

LIFE SKILLS OVERVIEW

Meaning and need of Life Skills Education, Global Perspective (World Health Organisation) and Indian Perspective (National Curriculum Framework) on Life Skills Education, Models of Life Skills development- Behaviour prevention model vs. Positive development model

SECTION B

LIFE SKILLS EDUCATION

Life Skills Education as co-scholastic component of evaluation in CBSE**,** Core Life Skills- Overview, Significance and linking with school curriculum**,** Parent -School partnership in making Life Skills Education a success.

SECTION C

CORE LIFE SKILLS

Detailed study of Core Life Skills: Self-awareness, Interpersonal relationships, Effective communication, Empathy, Coping with emotions, Coping with stress, Critical thinking, Creative thinking, Problem-Solving, Decision-Making

SECTION D

DEVELOPMENT OF LIFE SKILLS IN LEARNERS

Brief introduction to other important Life Skills (Study skills, Time management, Attitude towards sexuality, Environmental care, Value system, Dealing with persons in authority, Handling money)

Methods for enhancing Life Skills in school setup (Group tasks, Performing arts, Creative tasks, written tasks, and Community based tasks)

Reference Books and Reading:

1. Board of Secondary Education Rajasthan and National Rural Health Mission. (2005). *Life Skills Education.* Ajmer: Board of Secondary Education
2. Institute of Health Management. (2002). *Life Skills for Adolescent Girls*. Pachod. Maharashtra.
3. Lions-Quest Skills for Adolescence. Extracted from www.lions-quest.orgSrivastav, Gouri&Yadav, Mona.(2002). *Module on integrating Life Skills with Education at Elementary Stage.* New Delhi: NCERT.
4. Ministry of Youth Affairs and Sports. (2004).*Financial Assistance for Development and Empowerment of Adolescents*. Government of India.
5. National Institute for Educational Development. Ministry of Education. (2006). *Life Skills Syllabus Grades 8-10*. Namibia: NIED
6. NCERT. (2005). *National Curriculum Framework*. New Delhi: NCERT.

Life Skills Education Practical (EDS 219- P)

1. Through a Skit highlight the importance of any one core life skill -Group activity
2. Develop a tool, using art and craft material, for enhancing any one core life skill
3. Present your views in a discussion forum on- Relevance of Life Skills education
4. * Case study of change in behavioural pattern of a school student after imparting Life Skills Education.
5. Make a power point presentation (min. 10 slides) on Study skills
6. Any other suitable activity

***Field Activity**

Course Title/Code	**Value Education (EDS 220)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To understand the nature of values and importance of value education in present day Indian society -To get oriented with the need and role of yoga and meditation for inner harmony -To understand impact of social processes on moral development -To get oriented with various strategies of value orientation -To be familiarized with transactional modalities of value education

Course Content :

SECTION A

VALUES: CONCEPTUAL FRAMEWORK

Values - Nature, Sources, Determinants, Social malaise and need for value inculcation, Classification of values, Nature and need of family values, social values, moral values, religious values, environmental values

SECTION B

ESSENTIALS OF VALUE DEVELOPMENT

Value development – a lifelong process, Development of right attitude through introspection and self control, Human values in relation to Religious Pluralism, Role of Yoga and Meditation

SECTION C

UNDERLYING PERSONAL-SOCIAL PROCESSES

Role of family and community in preservation of culture and value development, Impact of electronic media on value inculcation in children, Value Conflict and Resolution

SECTION D

VALUE EDUCATION: TRANSACTIONAL ASPECTS

Value Education: Meaning and need, Direct approach and integrated approach to Value Education, Co-curricular approach to Value Development, Methods and techniques for inculcation of values, Role of a teacher and institute climate

Reference Books and Readings

1. CBSE (2012). *Values Education A Handbook for Teachers.* Retrieved from http://cbseacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf
2. Goel, A. & Goel S. L. (2005). *Human values and Education*. New Delhi: Deep and Deep Publications Pvt. Ltd.
3. Kulshrestha, S.P. (1979), Emerging Value Pattern of Teachers & Value Pattern of Teachers & New Trends, Education in India, New Delhi: Light & Life Pub.
4. Passi, B.K. & Singh, P. (1987). *Value Education*. Agra: National Psychological Corporation.
5. NCERT (2012). *Education for Values in Schools – A Framework*. NCERT: Department of Educational Psychology and Foundations of Education. Retrieved from http://www.ncert.nic.in/departments/nie/depfe/Final.pdf
6. Rokeach, M. (1973). *The nature of human values*. New York: Free Press.
7. Ruhela, S. P. & Bhargava, V. *Dimensions of Value education*.Agra: H.P. Bhargava Book House
8. Singh, Samporn (1979) Human Values, Jodhpur: Faith Pub.

Value Education Practical (EDS 220-P)

1. *Case study of any one private school with respect to its approaches to value education
2. Preparation of collage with the relevant cuttings from printed media highlighting issues and latest updates on values inculcation.
3. Making a report on national and international initiatives for value education with help of online resources.
4. Role Plays/Dramas/ Street Plays on the current issues highlighting the emerging issues and challenges regarding value crisis.
5. Making a brief report on the basis of autobiography of any relevant great personality, with respect to values being followed and promoted.
6. Reflective note on contribution of great educational thinkers such as Rabindranath Tagore, Mahatma Gandhi, Aurobindo, Swami Vivekananda, Dalai Lama etc. in value education
7. Any other suitable activity

*Field Activity

Course Title/Code	**Guidance and Counselling (EDS 221)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To understand the need and types of guidance and counseling in education -To imbibe the essentials for a teacher as a counsellor -To learn basic counselling skills -To understand the approaches toguidance and counselling -To develop sensitivity towards the problems faced by students including exceptional students -To recognize the role of career guidance and counselling -To plan a guidance and counselling set up for a school -To appreciate the role of a teacher in guidance and counselling -To understand the need for parent-school partnership

Course Content:

SECTION A

GUIDANCE AND COUNSELLING: OVERVIEW

Difference between Guidance and Counselling, Purpose and assumptions of Guidance and Counselling in Education, Types of guidance- Educational, Vocational, and Personal, Types of Counselling: Directive, Non-directive and Eclectic.

SECTION B

GUIDANCE AND COUNSELLING: FUNDAMENTALS

Essentials of a teacher as a Counsellor: Commitment, Confidentiality, Congruence, Empathy, Genuineness, Interpersonal skills, Mental and physical wellbeing, Objectivity, Pace, Positive regard, Understanding Self, Warmth.

Basic counselling skills: Observing, Listening, Rapport building, History taking, Questioning, Responding, Maintaining records/portfolios.

SECTION C

GUIDANCE AND COUNSELLING: INTERVENTIONS

Approaches to Counselling: Humanistic approach, Cognitive behavioral approach, Social learning approach, Integrative approach.

Issues in school requiring Counselling: Abuse, Anxiety, Behavioral problems, Bullying, Career choices, Peer pressure, Reproductive health, Self-image, Stress, Study habits, Substance abuse.

Counselling Exceptional children: Gifted, Talented, Creative; Differentlyabled.

Career Guidance and Counselling; Factors affecting Vocational choice; Strategies of disseminating Career Information (Individual, group-talks, orientations, workshops, internships, exhibitions); Stepsof career counselling (Attending to the need, enabling self-understanding, exploring options, forming strategies and plans).

SECTION D

GUIDANCE AND COUNSELLING: OPTIMIZING OUTCOMES

Provisions for Guidance and Counselling in schools: Manpower provisions-Teachers, Counsellors/ psychologists, social workers; Physical provisions -Space, Testing tools (Aptitude Test, Personality Inventories and Interest Inventory),Print material.

Role of a teacher in Guidance and Counselling, Enhancing Guidance and Counselling outcomes through Parent-School partnership.

Reference Books and Readings

1. Bhatnagar,Asha&Gupta,Nirmala. (2000). *Guidance & Counselling -Vol. 1*. New Delhi:Vikas Publishing House.
2. Chandra,Ramesh. (2002). *Guidance &Counselling.* Delhi: Kalpaz Publications.
3. Dave,Indu. (1983).*The Basic Essentials of Counselling.* New Delhi: Sterling Publishers.
4. Chauhan,S.S. (2001). *Principles & Techniques of Guidance*. New Delhi: Vikas Publishing House.
5. Gibson,Robert. (2008). *Introduction to Counselling & Guidance*. New Delhi:Prentice Hall of India.
6. Kalia,H.L. (2006). *Counselling in Schools*. New Delhi: ICON.

7. Nugent, Frank A. (1990). *An Introduction to the Profession of Counselling*. Columbus: Merrill publishing Co.
8. Panda,N.P. *Education & Exceptional Children*. New Delhi: Deep & Deep Publisher.
9. Pietrofesa, J.J, Bernstein, B.& Stanford, S. (1980). *Guidance: An Introduction*. Chicago: Rand McNally.
10. Rao,Narayana. (2004). *Counselling Guidance*.New Delhi: Tata McGraw-Hill.
11. Rao,S.N. (2014).*Guidance &Counselling*. New Delhi: Discovery Publishing House.
12. Shrivastava, K.K. (2006). *Principles of Guidance &Counselling.* New Delhi: Kanishka Publishers and Distributors.
13. Singh,Raj. (1994).*Educational & Vocational Guidance*. New Delhi: Commonwealth.
14. Steffler & Stewart (2008). As in Kinra, A.K. *Guidance and Counselling.* Delhi: Pearson Education.
15. Vashist,S.R. (2001). *Methods of Guidance.*New Delhi: Anmol Publications.

Guidance and Counselling Practical(EDS221P)

1. *Map the Guidance and Counselling services in your internship school and prepare a report mentioning various provisions available there.
2. Make a power point presentation on 'Handling examination stress'.
3. Prepare a collage on Bullying or Peer pressure.
4. Prepare a chart showing various career options available for student from different subject streams.
5. Conduct a workshop in your faculty on substance abuse/ reproductive health-Group activity
6. Any other suitable activity

***Field Activity**

Course Title/Code	**Human Rights Education (EDS222)**
Course Type	**Audit**
Course Nature	**Soft**
L-T-P-O Structure	**(1-0-2-0)**
Objectives	-To inculcate the knowledge of the Human Rights. -To Realize the importance and need of human rights -To Comprehend the role of the Constitution in human rights -To Comprehend the role of human rights in their life -To Get awareness about the role of Human right organizations -To Identify various agencies to protect Human rights. -To Know the meaning, significance, the growing advocacy of Human Rights.

Course Content :

SECTION A

HISTORICAL BACKGROUND OF HUMAN RIGHTS

Human Rights: Concept, Foundations, and Historical Background; Universal declaration of Human Rights and Indian Constitution Provisions

Constitutional and Institutional safeguards to Human Rights, National Human Rights Commission (NHRC) and its role·

SECTION B

HUMAN RIGHTS EDUCATION

Human Rights Education: Meaning, Objectives, Strategies. Role of Education towards duty-consciousness, Methods of Teaching Human Values, Human Rights Education at Secondary Level Curriculum

SECTION C

VIOLATION AND PROTECTION OF HUMAN RIGHTS

Human Rights Violation: Meaning and factors affecting human rights violation
Human Rights Organizations: UN, UNESCO and Indian constitution

SECTION D

TRENDS OF HUMAN RIGHTS

Growing Advocacy and Declining Trends of Human Rights
Role of Media, School and NGOs in protecting Human rights

Reference Books and Readings:

1. Arjun Dev, Source Book on Human Rights, NCERT, New Delhi
2. Bipan Chandra, India after Independence. Roopa, New Delhi 2000.
3. Borgohain, Bani, Human Rights: Social Justice and political challenge, New Delhi: Kanishka Publishers, 1999
4. Chandra, Ashish, Human Rights and Conflict Resolution, New Delhi: Rajat, 2000.
5. Dev, Arjun and India Arjun Dev and Others, Ed. Human Rights: A source Book, New Delhi: NCERT, 1996.
6. Dhand, Harry, Teaching Human Rights: A handbook, Bhopal: Ashian Institute of Human Rights, 2000.
7. Human Rights in India : Theory and Practice, National Book Trust, 2001
8. Jois, M. Rana, Human Rights and Indian Values, New Delhi: NCTE, 1998.
9. Khanna, S.K., Children and Human Rights, New Delhi: Commonwealth, 1998.
10. Mohanty, Jagannath Ed., Human Rights Education, New Delhi: Deep and Deep Pub., 2000.
11. Pachami, S.K., Children and Human Rights, new Delhi, APH Publishing, 1999.
12. Palai, Arun Kumar, National Human Rights Commission of India: Formation, Functioning and Future Prospects, New Delhi: Atlantic Pub., 1999.
13. Paul, R.C., Protection of Human Rights, New Delhi: Commonwealth, 2000.

Human Rights Education Practical (EDS 222-P)

1. Prepare a report on the role of UNESCO in protecting Human Rights
2. Collect 10-12 articles related to human right violation
3. Write a reflective journal on role of media in protecting Human rights. Mention some latest cases of Human right violation
4. Prepare a case study on the violation of Human Rights.
5. Mention the constitutional provisions related to human rights
6. *Prepare a report on a NGO's contribution towards the protection of Human rights

*Field activity