MATHEMATICS

CORE PAPER – IX
NUMBER THEORY
(120 Hours)

SUBJECT CODE:


Unit 3: Quadratic residues – Gauss lemma – Quadratic reciprocity – Jacobi symbol.

Unit 4: Greatest integer function – Arithmetic function – Moebius inversion formula, recurrence relations.

Unit 5: Diophantine Equations – Solution of equations of the form \( ax + by = c \), \( x^2 + y^2 = z^2 \), \( x^4 + y^4 = z^4 \) and \( ax^2 + by^2 + cz^2 = 0 \).

REFERENCES

CORE PAPER – X
LINEAR PROGRAMMING
(120 Hours)

SUBJECT CODE:

Unit 1: Linear Programming problem – Graphical solution – Formulation of LPP – Simplex method.


Unit 3: Degeneracy – cycling in LPP – Application of simplex method – Revised Simplex method.


Unit 5: Integer programming – Culty plane method – (Gomarian constraint).

REFERENCES

5. Dr. Paria. (1999). Linear Programming, Transportation, Assignment Game. Dr. Paria, Books and Allied (p) Ltd.

Unit 2: Connectedness: Connected and disconnected graphs – Center – Adjacency Matrix and Incidence Matrix – Operations on graphs.

Unit 3: Bipartite Graphs: Definitions and examples – Characterisation of Bipartite graphs – Trees.

Unit 4: Eulerian and Hamiltonian Graphs: Eulerian graphs – Hamiltonian graphs – Closure and Hamiltonian.

Unit 5: Directed Graphs – Definition and Basic Concepts – Connectedness in Directed Graphs – Tournaments.


REFERENCES


3. Narasingh Deo, (1974). Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall of India,


Unequal intervals: Divided differences – Newton’s divided difference formula – Lagrange’s interpolation formula – Inverse interpolation.


Unit 5: Difference Equations: Definition – Order and degree of difference equation – Linear difference equation – Finding complementary function – Particular integral – Simple applications.

REFERENCES

Unit 1: Forces acting at a point – Resultant and Components – Parallelogram law of forces – Triangle law of forces – Converse – Lami’s theorem – resolution of a force – theorems of resolved parts – Resultant of any number of coplanar forces – Condition of equilibrium.


Unit 3: Projectiles – Path of Projectile is a parabola – Range etc – Range of a particle projected on an inclined plane etc.


Unit 5: Central orbits – Components of velocity and acceleration along and perpendicular to the radius vector – Differential equation of a central orbit – Pedal equation.

REFERENCES

Objectives:
The key objectives of this paper are

- To learn the basic concepts, theories and laws of ray optics and physical optics.
- To understand the various experiments and instruments based on the theories of ray optics and physical optics, particularly to study the optical instruments, interferometers, diffractometer and polarizer.
- To know about the laser theory, Fiber optic principles and devices associated with laser and optical fibers.

UNIT – I: GEOMETRICAL OPTICS (24 hrs)
Convex lens - Optic Centre - Cardinal Points - Principal foci and principal points - Optic centre of a lens - Eye pieces: Huygens and Ramsden - Telescope: Refracting Astronomical - Reflecting Astronomical - Reflecting telescopes - Spherical aberration and lenses - Methods of minimizing spherical aberration - Condition for minimum spherical aberration in the case of two lenses separated by a distance - Chromatic aberration in lenses - Condition for achromatization of two thin lenses (in contact and out of contact) - coma - astigmatism - Constant deviation spectrometer - calculation of characteristic wave number of spectral lines.

UNIT – II: INTERFERENCE (24 hrs)

UNIT – III: DIFFRACTION (24 hrs)
Fresnel assumptions - Rectilinear propagation of light - Zone plate - Fresnel and Fraunhofer Diffraction - Fresnel Diffraction at a Straight edge and Narrow wire - Fraunhofer Diffraction at a Single slit and Double slit - Missing orders in a Double slit, Diffraction pattern - Plane Transmission grating - Dispersive power of gratting - Overlapping spectra Rayleigh’s criteria - Resolving power of telescope and grating.

UNIT – IV: POLARISATION (24 hrs)
Polarisation - Double refraction - Nicol prism - Huygen’s theory for uniaxial crystals - Quarter wave plate and half wave plate - Production and detection of Plane, Circularly and Elliptically Polarized light - Babinet’s compensator - Optical activity - Fresnel’s Explanation of optical rotation - Experimental verification - Specific rotation: Laurent’s half shade polarimeter. - Kerr effect and Faraday effect.

UNIT – V: LASERS AND FIBRE OPTICS (24 hrs)
REFERENCES

7. http://www2.warwick.ac.uk/fac/physics/teach/module/home/px207
CORE PAPER –VI
ATOMIC PHYSICS AND SPECTROSCOPY
(120 Hrs)

SUBJECT CODE:

Objectives:
Students know the structure of the atom, atomic models, laws of optical spectra, characteristics of rays and spectroscopic techniques.

UNIT-I: STRUCTURE OF THE ATOM (24 hrs)

UNIT- II: ATOM MODEL (24 hrs)

UNIT- III: OPTICAL SPECTRA (24 hrs)

UNIT- IV: MOLECULAR SPECTRA AND RAMAN EFFECT (24 hrs)

UNIT-V: SPECTROSCOPIC TECHNIQUES (24 hrs)

REFERENCES
5. Guptakumar Sharma , (2011).Elements of Spectroscopy, Meerut, Pragatiprakashan,
6. Gurdeep Chatwaland, Spectroscopy, ShamAnand
11. http://www2.warwick.ac.uk/fac/physics/teach/module/home/px207
CORE PAPER –VII
MATHEMATICAL PHYSICS
(120 Hrs)

SUBJECT CODE:

Objectives:
To understand the basics of vector calculus, matrices, Laplace transforms and statistics. With these background, students are made to gain the knowledge of concept of theoretical/analytical physics oriented courses like classical mechanics, quantum mechanics, electromagnetic theory and its applications.

UNIT – I: VECTOR CALCULUS (24 hrs)

UNIT – II: MATRICES (24 hrs)

UNIT – I-II: MATRICES FOR PHYSICS (24 hrs)

UNIT – IV: LAPLACE TRANSFORMS (24 hrs)

UNIT – V: STATISTICS (24 hrs)

REFERENCES
2. Gupta B.D., (1997), Mathematical Physics, Vikas Publishing house

SEMESTER - V
CORE PAPER – VIII
CLASSICAL MECHANICS AND QUANTUM MECHANICS
(120 Hrs)

UNIT – I: LAGRANGE’S FORMULATION (24 hrs)
Mechanics of system of particles– Conservation theorem for linear and angular momentum -
energy – Degrees of freedom – constraints – Generalized co-ordinates – transformation
equations – Generalized displacement, velocity, acceleration, momentum and force –
Principle of virtual work – D’Alembert’s principle —Lagrange’s equation of motion from
D’Alembert’s Principles – Applications : linear Harmonic Oscillator, Simple Pendulum and
Compound Pendulum.

UNIT – II: HAMILTONIAN FORMULATION
Phase Space – Hamiltonian function H– Hamilton’s equations- physical significance -
Hamiltonian Principle – Hamilton’s canonical equations of motion – Physical significance of
H – Applications of Hamiltonian equations of motion of Simple Pendulum, Compound
Pendulum and Linear Harmonic Oscillator.

UNIT-III: FORMULATION OF QUANTUM MECHANICS(24 hrs)
Inadequacy of classical mechanics - Black body radiation – plancks hypothesis- Photoelectric
effect - Einstein's light quantum hypothesis and photoelectric equation - Matter waves - Phase
and group velocity - wave packet - expressions for deBroglie wavelength - Davisson and
Germer's experiment - G.P. Thomsonsexperiment - electron microscope

UNIT-IV: WAVE MECHANICS(24 hrs)
Wave function $\psi$ - significance of wave function $\psi$ -properties of wave functions- -
Heisenberg's uncertainty principle - its consequences - - operator formalism - linear
operators – adjoint operators - expectation values - eigen value and eigen function-Postulates
of quantum mechanics

UNIT-V: SCHRÖDINGER EQUATIONS AND ITS APPLICATIONS (24 hrs)
Schrödinger equation - time dependent and time independent - application of Schrödinger
equations - linear harmonic oscillator - zero point energy - particle in a one dimensional box -
barrier penetration and tunneling effect - rigid rotator - hydrogen atom.

REFERENCES
   & Co.,
2. SathyaPrakash, (2010). Quantum mechanics by , Meerut, , PrgatiPrakashan,
5. Ghatak A, (2002).Basic quantum mechanics ,New Delhi, McMillan India
CORE PRACTICAL -III
(60 Hours)

SUBJECT CODE:

Any 12 experiments:

1. Spectrometer – i -i’ curve
2. Spectrometer – Cauchy’s constant
3. Spectrometer - µ of a glass prism - i-d Curve
4. Spectrometer - Grating N and λ - minimum deviation method
5. Newton’s Rings - Refractive Index of Liquid
7. Air wedge - Thickness of a wire
8. Kundt's Tube – Determination of velocity of sound
9. Comparison of emfs of the given cells using B.G.
10. Ballistic Galvanometer – Figure of merit
11. Potentiometer – High range voltmeter
12. Hartley oscillator
13. Colpitt’s oscillator
14. FET characteristics
15. Band gap energy of the semiconductor
16. Laser Diffraction – Determination of wave length of the diode laser
17. Resolving power of a lens using He-Ne laser
18. Verification of Malus law using diode laser
19. Astable multivibrator using 555 timer.

REFERENCES

2. Sasikumar R.,(2011). Practical Physics, New Delhi,PHI Learning Pvt. Ltd, ,
Any 12 experiments:

**8085 MICROPROCESSOR PROGRAMMING:**

1. Program to transfer data between memories
2. Program to find the 1’s and 2’s complement of 8 - bit data
3. Program to perform 8 – Bit Addition and Subtraction
4. Program to perform 8 –Bit Ascending order
5. Program to perform 8 –Bit Descending order
6. Program to perform 8 –Bit Multiplication
7. Program to perform 16 Bit Addition
8. Program to perform BCD Addition
9. Program to find the smallest and largest in a data Array

**C – PROGRAMMING in Physics**

1. Conversion of temperature from $^\circ$C to $^\circ$F and $^\circ$F to $^\circ$C
2. Determination of ‘G’ by Boy’s Method
3. Young’s Modulus - Uniform bending
4. Spectrometer - Refractive index & Dispersive power of prism
5. Newton’s Rings - Radius of curvature
6. Determination of Velocity of light - Foucault’s Rotating Mirror Method
7. Determine the Square root of the Quadratic equations
8. Matrix multiplication of a given 2 x 2 matrices
9. Determination of escape Velocity of a satellite

**REFERENCES**

UNIT - I
Coordination chemistry - terminology, classification of ligands, chelation, nomenclature of complexes, Werner’s theory and Effective Atomic Number (EAN) concept. Isomerism in complexes-structural isomerism-coordination, ionisation, hydrate, ligand and linkage isomerism. Stereoisomerism-geometrical isomerism in 4 coordinated complexes – $M_a b_2$, $M_a b c$, $M(ab)_2$ and 6 coordinated complexes - $M_a b_2$, $M_a b_3$, $M(aa)_2 b_2$. Optical isomerism and conditions for optical isomerism- optical isomerism in 6 coordinated complexes - $M(aa)_3$ and $M(aa)_2 b_2$.

UNIT – II
Theories of metal - ligand bonding in complexes - valence bond theory (VBT), formation of outer orbital and inner orbital complexes, magnetic behaviour of the complexes and limitations of VBT. Crystal field theory (CFT) - crystal field splitting in octahedral and tetrahedral complexes. Strong and weak ligands, factors affecting $\Delta_o$ values, spectrochemical series, high spin and low spin complexes. Application of CFT to magnetic properties and colour of complexes, crystal field stabilisation energy (CFSE) and its uses. Limitations of CFT. Comparison between VBT and CFT.

UNIT – III
Applications of coordination compounds in quantitative analysis - gravimetric estimation of nickel using DMG and aluminum using oxine, estimation of hardness of water using EDTA. Structures and functions of chlorophyll and hemoglobin. Metal carbonyls-general methods of preparation, nature of M-CO bond, structure of $\text{Ni(CO)}_4$, $\text{Fe(CO)}_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Mn}_2(\text{CO})_{10}$ and $\text{Co}_2(\text{CO})_8$.

UNIT – IV
Calculation of number of atoms in simple cubic (SC), face centered cubic (FCC) and body centered cubic (BCC) unit cells. Symmetry in crystals - symmetry operations and symmetry elements - plane of symmetry, axis of symmetry and centre of symmetry. Symmetry elements of a cubic crystal. Semiconductors - intrinsic and extrinsic - n-type and p-type. Electron gas theory and band theory of metals.

UNIT – V

REFERENCES

SEMESTER - V
7. https://www.youtube.com/watch?v=MV-o_8ohB2o
UNIT I

UNIT II
Preparation and properties of formic and acetic, benzoic, oxalic and malonic acids. Action of heat on formic, acetic, oxalic, malonic and succinic acids. Mechanism of hydrolysis of esters by $B_{AC}^2$ and $A_{AC}^2$. Diethyl malonate - preparation and synthesis of acetic acid, adipic acid, cinnamic acid, glycine and malonyl urea from diethyl malonate. Ethylacetoacetate - preparation and synthesis of succinic acid, crotonic acid, butanone, 4-methyl uracil and antipyrine from ethylacetoacetate.

UNIT III

UNIT IV

UNIT V
Molecular rearrangements - mechanisms of Pinacol-pinacolone, Beckmann, benzidine, Hoffmann, Curtius, Schmidt, benzil - benzilic acid, Claisen, Cope, Fries and Wolf rearrangements. (Applications not required)

REFERENCES
UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

REFERENCES
5. https://www.youtube.com/watch?v=6qqrdwlhJCI
6. https://www.slideshare.net/MadihahRamily/chapter-6-electrochemistry-49983898
UNIT - I
Storage and handling of chemicals - corrosive, inflammable, explosive, toxic, poisonous and carcinogenic chemicals. First aid procedures for laboratory accidents involving toxic and poisonous chemicals, electrical shock, cuts and burns from hot objects. Laboratory cleansing methods and cleaning agents. Interchangeable glass ground joint apparatus and their advantages. Calibration and grading of pipette, burette and volumetric flask.

UNIT - II
Evaluation of analytical Data - Errors - types-determinate indeterminate and gross errors. Errors in measurements - weighing, measuring solutions, titrations and gravimetric analysis. Absolute error and relative error. Precision and accuracy, difference between precision and accuracy. Significant figures, mean, median and mode, average, deviation-standard deviation. Confidence limits, Q-test, F-test and t-test. SI and derived units.

UNIT - III
Semimicro qualitative analysis - anions (interfering and non-interfering), reactions of some common anions (carbonate, sulphide, sulphate, nitrate, halides, oxalate, borate and phosphate), principle involved in the preparation of sodium carbonate extract and elimination of interfering anions. Classification of cations into groups, reactions of various cations, group reagents, solubility product and common ion effect.

UNIT - IV

UNIT - V
Gravimetric analysis - methods of precipitation, conditions of precipitation, choice of precipitants. Types of organic precipitants, sequestering agents, solubility product and precipitation, factors affecting the solubility of precipitates, co-precipitation and post precipitation, procedure to minimise coprecipitation and post precipitation. Precipitation from homogeneous solution, Washing and drying of precipitates.

REFERENCES
5. https://www.slideshare.net/MarkSelby2/gravimetric-analysis-44916288
6. https://www.slideshare.net/bharat46083610/volumetric-analysis-79371821?qid=7d2d3cf8-43e3-465c-ae12-ab8db3fdd38e&v=&b=&from_search=4
7. http://www.academia.edu/5266578/Analytical_Chemistry_Lecture_Notes_
CORE PRACTICAL - III

A. Gravimetric Analysis
1. Lead as lead chromate
2. Barium as barium chromate
3. Calcium as calcium oxalate monohydrate
4. Nickel as nickel dimethyl glyoxime complex
5. Magnesium as magnesium oxinate
6. Barium as barium sulphate (by insineration)
7. Lead as lead sulphate

B. Physical Chemistry Experiments
1. Determination of transition temperature of a hydrated salt
2. Determination of partition coefficient of Iodine between CCl₄ and H₂O
3. Determination of equilibrium constant for the reaction KI +I₂ → KI₃
4. Determination of critical solution temperature (CST) of phenol-water system
5. Determination of effect of impurity (NaCl) on CST of phenol-water system
6. Determination of effect of impurity (Succinic acid) on CST of phenol-water system
7. Determination of molecular weight by Rast’s macro method
8. Phase diagram- simple eutectic system
9. Determination of rate constant of acid catalyzed hydrolysis of an ester
10. Kinetics of persulphate- Iodide reaction

Electrochemistry Experiments
11. Determination of cell constant
12. Determination of equivalent conductance of a strong and weak electrolyte.
13. Conductometric titration- strong acid vs strong base
14. Conductometric titration- weak acid vs strong base
15. Potentiometric titration- Redox reaction [KMnO₄ vs Fe(II)]
16. Potentiometric titration- acid-base titration [HCl vs NaOH]

C. Demonstration Experiments
1. Polarimetry- Inversion of cane sugar

REFERENCES
3. www.aiktcdspace.org>jspui>bitstream
4. https://www.tau.ac.il/~advanal/PotentiometricTitrations.htm
Unit I
Introduction- scope- cell organisation- prokaryotic and eukaryotic. Cell boundaries- cell wall- gross layer i.e. middle lamella, primary wall, secondary wall- Structure, chemistry and functions of cell wall, pits- (simple and bordered), Plasmodesmata. Plasma membrane- occurrence, structure (fluid mosaic model) chemistry, function and origin. Occurrence, structure function and origin of Endoplasmic reticulum Golgi bodies, lysosomes, ribosomes, mitochondria and plastids.

Unit II
Ultrastructure and functions of Nucleus, nucleolus, chromosomes structure, euchromatin, heterochromatin, Polytene and lampbrush chromosomes-, cell inclusion. Cell cycle, Cell division, Mitosis and Meiosis- their significance.

Molecular Biology
Unit III
Nucleic acid as genetic material, nucleotide, structure of nucleic acid, Genetic code and its properties, mechanisms of protein synthesis.

Unit IV
Gene expression, initiation, enzymes involved and termination of transcription. Translation – codon-anticodon. DNA damage and repairs

UNIT V
Regulation of gene expression in prokaryote operon concept-positive and negative regulation of lac operon

REFERENCES

3. Verma, P.S., Agarwal, V.K,(1995).*Cell Biology, Genetics, Molecular Biology & evolution*. S.Chand
CORE PAPER VI
PHYSIOLOGY AND BIOCHEMISTRY
(120 Hrs)

UNIT I

UNIT II

UNIT III

UNIT IV
Plant growth regulators – auxins, gibberllins, ethylene and abscisic acid, brief account of plant responses to growth regulators, photoperiodism and photomorphogenesis, phytochromes, vernalization, Seed physiology- dormancy, storage and germination of seed.

UNIT V

REFERENCES

SEMESTER - V
CORE PAPER VII
GENETICS, PLANT BREEDING AND EVOLUTION
(120 Hrs)

SUBJECT CODE:

UNIT I

UNIT II

UNIT III: PLANT BREEDING

UNIT IV
Utilization of wild species in crop improvement, inter specific crosses, genomic analysis and evolution of polyploidy crops, cytoplasmic male sterility systems in hybrid seed production, somoclonal variations in crop improvement, nucleic acid hybridization and RFLP in crop improvement

Evolution
Unit-V

REFERENCES
Unit I
Detailed studies of the nature of plant disease and its causal agents (fungi, bacteria, viruses, nematodes, environmental/chemical agents), and of symbionts and their effect on plant health and disease resistance.

Unit II
Common disease its symptoms, disease cycle and control measure. Rots- Late blight disease of potato, Damping off disease of seedlings, Downy mildew –peas, Wilt of cotton, Leaf spot disease of ground nut, Wheat Rust , Citrus canker.

Unit III
Host pathogen interactions, Parasitism/disease development and attack methods, Molecular mechanisms of pathogenesis, recognition phenomenon, penetration, invasion, primary disease determinant, Defense mechanism in plants- phytoalexins, Systemic Acquired Resistance (SAR)

Unit IV
Transgenic approach for crop protection, Elementary genetic engineering .Management of pathogen through satellite, antisense – RNA, Ribosomes, coat protein, hypo virulence cross protection, useful genes and promoter technology.Engineering chemicals that elicit defense response to plants

Unit V
Epidemiological considerations on disease spread and major outbreaks, and disease control and management techniques (including resistance phenomena and impact). Biosafety and bioethics in plant pathology,

Control of plant disease-Cultural, chemical, biological means

REFERENCES
CORE PRACTICAL - III
(60 Hours)

SUBJECT CODE:

CELL BIOLOGY AND MOLECULAR BIOLOGY
1. Study of ultra structure of cell organelles
2. Study of Mitosis stages in Onion root tip
3. Study of Meiosis in Flower bud

REFERENCES
1. Geraald Karp Cell biology
evolution.
Febiger.
5. Old and Primrose 2000 Principles of Gene manipulations

PHYSIOLOGY AND BIOCHEMISTRY
Experiments to be performed by the students individually:
1. Determination of solute potential by gravimetric method.
2. Effect of temperature and chemicals on membrane permeability
3. Comparison of relative rate of transpiration in xerophytes and mesophytes.
4. Separation of plant pigments by paper chromatography.
5. Study of rate of photosynthesis under different light intensities.
6. Study of rate of photosynthesis under varying concentration of carbon dioxide
7. Comparison of rate of respiration in germinating seeds and flower buds using
respiroscope.
8. Determination of water absorption and transpiration by weighing method.
9. Comparison of rate of stomatal and cuticular transpiration by four leaves method.

DEMONSTRATION EXPERIMENTS
1. Test for starch
2. Activity of catalase.
3. Test for carbohydrates.
4. Test for proteins.

REFERENCES
Publishing Company Inc.
3. Verma SK and MohitVerma. 2007. A text book of plant physiology, biochemistry and
biotechnology. S Chand & Company Ltd.
publications.

GENETICS, PLANT BREEDING, EVOLUTION
1. Monohybrid and Dihybrid crosses
2. Test and back crosses
3. Complementation, supplementary and epistasis
4. Linkage and crossing over
5. Gene mapping

SEMESTER - V
REFERENCES

PLANT PATHOLOGY
1. Identification of diseases and pests of common crops
2. Sectioning of the Pathological specimen

REFERENCES
CORE PRACTICAL – IV
(60 Hours)

SUBJECT CODE:

PLANT ECOLOGY AND ENVIRONMENTAL BOTANY
1) Morphological, anatomical adaptations of Hydrophytes, mesophytes and xerophytes
2) Identification of vegetational zones using maps.
3) Study of Soil Profile, Soil pH.

REFERENCES

MICROBIOLOGY
1. Preparation of culture media for bacteria, fungi- sterilization procedures.
2. Isolation of rhizosphere, rhizoplane, phylloplane microorganisms.

REFERENCES

BIOTECHNOLOGY
1. Demonstration of Tissue culture (Visit to Tissue culture lab).

REFERENCES

BIOTECHNIQUES
1. Separation of Pigments using Paper and Thin Layer Chromatography
2. Demonstration of Instruments like Centrifuge, Colorimeter, Spectrophotometer, Electrophoresis.

REFERENCES
3. William BL Wilson (1980), *Principles and techniques of practical biochemistry* 
   Edward Arnold.
UNIT I
Theories of preformation, epigenesis and germplasm, germ layers and derivatives.
Spermatogenesis and Oogenesis

UNIT II
Fertilization Mechanism and Physiology. Parthenogenesis - Definition & types Cleavage -
Types. Different types of blastulae. Gastrulation: General principles

UNIT III
Development of Frog: Fertilization, Cleavage, Blastulation, Morphogenetic movement and
formation of germ layers, neurulation & notochord formation, mesoderm and coelom
formation, organogenesis of brain and eye, hormonal control of amphibian metamorphosis

UNIT IV
Development of chick: Structure of egg, fertilization, cleavage, blastulation, gastrulation and
formation of germ layers. Salient features of chick embryo at primitive streak stage, 24, 33,
48 hour stage

UNIT V
Regeneration, Cell Differentiation and Gene action during development

REFERENCES
   Co.,
   Publishing
   Co. Ltd.
5. http://www.ebooksread.com/authors-eng/william-erskine-kellicott/a-textbook-of-
   general-embryology-hci.shtml
7. http://www.freebookcentre.net/medical_books_download/Embryology-by-Ken-
   Muneoka.html.
CORE PAPER VI
EVOLUTION
(120 Hours)

SUBJECT CODE:


UNIT II  Ideas of evolution before Darwin – Lamarckism and Neo-Lamarckism – Darwinism and Neo-Darwinism – Germplasm theory – Mutation Theory – Modern Synthetic theory


UNIT IV  Isolating mechanisms – different types – species concepts – definition of species – Origin of species – Allopatric and Sympatric speciation. Hardy Weinberg law


REFERENCES
UNIT I
Nutrition – Types and food requirements Enzymes - classification and nomenclature- Properties of enzymes. Factors affecting enzyme action.; Metabolism of carbohydrates, proteins and lipids - Glycogenesis, glycogenolysis, glycolysis, Kreb's cycle, Beta oxidation of fatty acids, deamination, transamination and decarboxylation of amino acids

UNIT II
Respiration – respiratory organs in animals - Respiratory pigments - Adaptations to high altitude and diving. Transport of oxygen and carbondioxide – Anaerobiosis. Circulation - Types - Composition, Properties and functions of blood - Types of Heart. Human - Cardiac cycle - Cardiac rhythm - origin of heart beat - regulation of heart beat - ECG - Blood pressure

UNIT III

UNIT IV

UNIT V
Reproduction- male and female reproductive system in mammals, menstrual cycle Endocrine glands - structure, hormones and their functions in vertebrates - Gastrointestinal hormones. Receptors - Photoreceptor - vertebrate mammalian eye - Structure - Physiology of vision - Phonoreceptors - Mammalian ear - working mechanism

REFERENCES
UNIT I
Aqueous solutions - properties of water, Acids, Bases Concept and their relevance to Biological system, Buffers and electrolytes their functions in biological system, acidity, alkalinity determination

UNIT II
Biochemistry of carbohydrates, - structure, classification and biological significance, Protein structure - Primary, Secondary, Tertiary and quaternary, characteristics of proteins, Biological significance

UNIT III
Biochemistry of lipid - classification and functions, Vitamins -classification, function, source, deficiency

UNIT IV
Enzymes – classification – physico- chemical properties – enzyme kinetics – mechanism of enzyme action, factors affecting enzyme activity

UNIT V
Biochemistry of hormones and their mode of action – biochemistry of antibiotics and their mode of action – biochemistry of visual pigments and their mode of action - biochemistry of pheromones and mode of action

REFERENCES
2. Lehninger , 1992 Biochemistry worth publications, New Delhi,Inc Cbs publication
3. H.S. Srivastava , 2013, Elements of Biochemistry,Meerut, Rastogi Publications

SEMESTER - V
DEVELOPMENTAL BIOLOGY

Study of the following prepared slides, museum specimens and materials.
1. Sections of mammalian testis and ovary showing the maturation stages of gametes.
2. Slides of mammalian Sperm and Ovum.
4. Slides of cleavage stages, blastula, gastrula and neurula of frog.
5. Slides of different stages of chick embryo. 18 Hours (primitive streak stage), 24 Hours, 48 Hours, 72 hours and 96 Hours.
6. Placenta of sheep, Pig and Man.

REFERENCES

EVOLUTION
1. Fossils: Ammonite, Trilobite, Archaeopteryx
2. Study of evolution of man with the help of Model/chart.

REFERENCES

ANIMAL PHYSIOLOGY
1. Influence of body weight on oxygen consumption of fish
2. Influence of temperature on oxygen consumption of fish
3. Determination of oxygen uptake by a terrestrial animal.
4. Qualitative tests for ammonia, urea and uric acids
5. Determination of bleeding time
6. Determination of clotting time
7. Measurement of arterial blood pressure in man using sphygmomanometer
8. Determination of amylase activity with starch

REFERENCES


BIOCHEMISTRY

1. Qualitative identification of carbohydrate, protein and lipoid.
2. Analysis of urine for identification of sugar, albumin, ketone bodies

REFERENCES

2. Lehninger , 1992 Biochemistry worth publications, New Delhi, Inc Cbs publication
3. H.S. Srivastava, 2013, Elements of Biochemistry, Meerut, Rastogi Publications
CORE PRACTICAL IV
(120 Hours)

SUBJECT CODE:

ENVIRONMENTAL BIOLOGY
1. Estimation of Dissolved oxygen, salinity, pH, free CO2 in water samples.
2. Use of Rain gauge, Maximum & minimum thermometer, Hygrometer, photometer
3. Plankton study – Fresh water and marine water zooplankton.
4. Study of Adaptations of aquatic and terrestrial animals, rocky, sandy, muddy shore animals, flying and burrowing animals with museum specimens
5. Study of wild animals with the help of stuffed preparations/models/charts/photographs.
6. Study of natural ecosystem and field report of the visit.

REFERENCES

BIO STATISTICS
1. Calculation regarding mean, median, mode, SD and SE from given plant/animal specimens.
2. Preparation of histogram and pie diagram with the help of plant/animal specimens provided.

REFERENCES

IMMUNOLOGY
1. Study of T.S. of primary and secondary Lymphoid organs using prepared slides
2. Study of ABO blood group
3. Spotters - Principle and application of immunoelectrophoresis (using animated videos/kits)
4. Spotters - Principle and application of antigen–antibody reactions – agglutination, precipitation; Immunodiffusion, ELIZA, RIA (using animated videos/kits)
REFERENCES

BIOTECHNOLOGY
1. Identification of vectors (diagrams/slides)
2. Spotters - Autoclave, Refrigerated centrifuge, Micropipette, Electrophoretic apparatus, Trans illuminator, PCR, Laminar flow hood, CO2 incubator

REFERENCES
EDUCATION

EPC 3 - CRITICAL UNDERSTANDING OF ICT
(60 Hours)

SUBJECT CODE:

The aim of this course is to enhance the professional capacities of a student teacher in integrating Information and Communication Technologies (ICTs) with effective teaching and learning in a classroom.

Course objectives: To enable the student-teachers:

1. To teach effectively in a “technology enhanced classroom” (previously referred to as “smart classroom”).
2. To achieve knowledge-comprehension, practice skills and presentation skills in ICT.

How to prepare a student teacher for a technology enhanced classroom?
The teachers in Colleges of Education should train the student-teachers:

1. To operate /use various ICT tools such as computer, laptop/Internet, Interactive whiteboard, Tablet PC, iPad, iPhone, Mobile phones, Digital cameras, Multimedia equipments (audio/video), Skype and video -conferencing.
2. To browse the Internet, using a computer /laptop, identify and use education related websites and video/audio resources in teaching- learning.
3. To prepare teaching material/learning resource materials: e-content, e-booklet for selected school subject areas and to create edu(cational) blogs for individual/ group students for strengthening sharing and learning.
4. To use a laptop /PC for preparing slides for PowerPoint presentations/ lectures and also download the video resources available on the internet and use them embedded with slide presentations.
5. To teach a content /lesson using an Interactive whiteboard (by connecting a desktop computer to a whiteboard and project Google images onto it).
6. To use a visualizer/document camera (visual projector) to display and share an information to the whole class.
7. To use a mobile device/a camera phone to take a series of snapshots of children’s actions events/ scenes/ activities and prepare a photo documentary or photo album with explanatory notes/ descriptions.
8. Prepare videos on different teaching styles of experienced teachers/ peers and keep them available for viewing as a stream on a computer.
9. Organize a few video-conferencing classes (organize Skype-based video conferencing) inviting experts in school subjects and encourage the students to share the learning experiences through WhatsApp with their classmates and others.
10. To create educational blogs (Edublogs) for individual/group students for sharing and learning articles/ class notes/ assignments and participating in active blogging community.

Tasks and Assignments

1. Write a report based on your preparation of e-content and presentation of it to the class with different ICT tools.
2. Write a report on the organization of video-conferencing with an educational expert.
ENVIRONMENTAL STUDIES  
(60 Hours)

SUBJECT CODE:

Unit I:
Multi disciplinary nature of environmental studies - Definition, scope and importance, need for public awareness.

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

Unit II
   • Ecosystems
      a. Concept of an ecosystem.
      b. Structure and function of an ecosystem.
      c. Producers, consumers and decomposers.
      d. Energy flow in the ecosystem.
      e. Ecological succession.
      f. Food chains, food webs and ecological pyramids.
   • 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 III
Biodiversity and its conservation
   • Introduction – Definition: genetic, species and ecosystem diversity.
   • Bio geographical 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-diversity nation
   • Hot-sports of biodiversity.
   • Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
• Endangered and endemic species of India
• Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit IV
Environmental Pollution
Definition
• Cause, effects and control measures of :
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
• Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
• Role of an individual in prevention of pollution.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit V
Social Issues and the Environment
• From Unsustainable to Sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management
• Resettlement and rehabilitation of people; its problems and concerns.
• Environmental ethics : Issues and possible solutions.
• Climate change, global warming, acid rain, ozone layer depletion.
• Wasteland reclamation.
• Consumerism and waste products.
• Environment Protection Act.
• Air (Prevention and Control of Pollution) Act.
• Water (Prevention and control of Pollution) Act
• Wildlife Protection Act
• Forest Conservation Act
• Issues involved in enforcement of environmental legislation.
• Public awareness.

Human Population and the Environment
• Population growth, variation among nations.
• Population explosion – Family Welfare Programme.
• Environment and human health.
• Human Rights.
• Women and Child Welfare.

REFERENCES