Structure of Four year Integrated Programme B.Sc. B.Ed. Mathematics

SEMESTER V

Part	Study Components – Course Title	Insti.hrs.per week	Weeks per semester	Hours per semester	Exam Hrs	Max. Marks		Total
						Int	Ext	
III	Core Paper -IX Number theory	6	20	120	3	30	70	100
III	Core Paper - X Linear Programming	6	20	120	3	30	70	100
III	Core Paper - XI Graph Theory	6	20	120	3	30	70	100
III	Core Paper - XII Numerical Methods	6	20	120	3	30	70	100
III	Core Paper - XIII Mechanics (Application of Mathematics)	6	20	120	3	30	70	100
IV	EPC 3 – Critical Understanding of ICT	3	20	60		50	--	50
V	Environmental Studies	3	20	60	3	30	70	100
Total		**36**		**720**				**650**

Structure of Four year Integrated Programme B.Sc. B.Ed. Physical Science

(PHYSICS)

SEMESTER V

Part	Study Components – Course Title	Insti.hrs.per week	Weeks per semester	Hours per semester	Exam Hrs	Max. Marks		Total
						Int	Ext	
III	Core Paper- V – Optics	6	20	120	3	30	70	100
III	Core Paper- VI - Atomic Physics and spectroscopy	6	20	120	3	30	70	100
III	Core Paper -VII- Mathematical Physics	6	20	120	3	30	70	100
III	Core Paper VIII- Classical Mechanics and Quantum Mechanics	6	20	120	3	30	70	100
III	Core Practical - III	3	20	60	--	--	--	--
III	Core Practical - IV	3	20	60	--	--	--	--
IV	EPC 3 - Critical Understanding of ICT	3	20	60	--	50	--	50
V	Environmental Studies	3	20	60	3	30	70	100
Total		**36**		**720**				**550**

Structure of Four year Integrated Programme B.Sc. B.Ed. Physical Science

(CHEMISTRY)

SEMESTER V

Part	Study Components – Course Title	Insti.hrs.per week	Weeks per semester	Hours per semester	Exam Hrs	Max. Marks		Total
						Int	Ext	
III	Core Paper V- Inorganic Chemistry –I	6	20	120	3	30	70	100
III	Core Paper VI- Organic Chemistry –I	6	20	120	3	30	70	100
III	Core Paper VII- Physical Chemistry –I	6	20	120	3	30	70	100
III	Elective paper-IAnalytical Chemistry	6	20	120	3	30	70	100
III	Core Practical - III	6	20	120	--	--	--	--
IV	EPC 3 - Critical Understanding of ICT	3	20	60		50	--	50
V	Environmental Studies	3	20	60	3	30	70	100
Total		**36**		**720**				**550**

Structure of Four year Integrated Programme B.Sc. B.Ed. Biological Science

(BOTANY)

SEMESTER V

Part	Study Components – Course Title	Insti.hrs.per week	Weeks per semester	Hours per semester	Exam Hrs	Max. Marks		Total
						Int	Ext	
III	Core Paper V Cell Biology and Molecular Biology	6	20	120	3	30	70	100
III	Core Paper VI Physiology and Biochemistry	6	20	120	3	30	70	100
III	Core Paper VII Genetics, Plant Breeding And Evolution	6	20	120	3	30	70	100
III	Core Paper VIII Plant Pathology	6	20	120	3	30	70	100
III	Core Practical - III	3	20	60	--	--	--	--
III	Core Practical - IV	3	20	60	--	--	--	--
IV	EPC 3 – Critical Understanding of ICT	3	20	60		50	--	50
V	Environmental Studies	3	20	60	3	30	70	100
Total		**36**		**720**				**550**

Structure of Four year Integrated Programme B.Sc. B.Ed. Biological Science

(ZOOLOGY)

SEMESTER V

Part	Study Components – Course Title	Insti.hrs.per week	Weeks per semester	Hours per semester	Exam Hrs	Max. Marks		Total
						Int	Ext	
III	Core Paper- V – Developmental biology	6	20	120	3	30	70	100
III	Core Paper- VI- Evolution	6	20	120	3	30	70	100
III	Core Paper -VII- Animal Physiology	6	20	120	3	30	70	100
III	Core Paper VIII- Biochemistry	6	20	120	3	30	70	100
III	Core Practical - III	3	20	60		--	--	--
III	Core Practical - IV	3	20	60		--	--	--
IV	EPC 3 - Critical Understanding of ICT	3	20	60		50	--	50
V	Environmental Studies	3	20	60	3	30	70	100
Total		**36**		**720**				**550**

SEMESTER - V

MATHEMATICS

CORE PAPER – IX
NUMBER THEORY
(120 Hours)

SUBJECT CODE:

Unit 1: Divisibility – Euclidean algorithm – primes – Fundamental theorem of arithmetic.

Unit 2: Congruences – Fermat, Euler and Wilson theorem – Lagrange theorem – Chinese remainder theorem – Solution of congruences – Properties of the Euler function – Prime modulus – Power residue.

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

1. G.E Andrews (1992). *Number theory*, Hindustan publishing corporation.
2. T.M. Apostal (1980). *Introduction to analytic number theory*, Narisa publishing house.
3. D.M. (1993). *Burton Elementary number theory*, Universal book stall,
4. I. Niven and H.S. Zuckerman, (1984). *An introduction to the theory of numbers*, Wiley eastern.
5. Hall. H.S., and Knight. S.R. (1994). *Higher algebra.* HM Publications.

CORE PAPER – X
LINEAR PROGRAMMING
(120 Hours)

SUBJECT CODE:

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

Unit 2: Standard Maximization case – Minimization problem – Artificial variables – Big-M method – Two phase method.

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

Unit 4: Concept of duality – Duality theorems – Duality and simplex methods – Dual simplex method – Sensitivity analysis.

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

REFERENCES

1. Kantiswarup, Gupta and ManMohan, (2016).*Operations Research*, Sultan Chand and Sons.
2. Kapoor, V.K.,(1997).*Operations Research*, Sultan Chand and Sons,
3. Goel and Mittal, S.K.,(1991).*Operations Research*, Pragati Prakashan,
4. Sharma,J.K.,(1997).Operations Research theory and application, Macmillan,
5. Dr. Paria. (1999). *Linear Programming, Transportation, Assignment Game.* Dr. Paria, Books and Allied (p) Ltd.

CORE PAPER – XI
GRAPH THEORY
(120 Hours)

SUBJECT CODE:

Unit 1: Basic Concepts: Introduction – Graph models – Vertex degrees – Isomorphism – Subgraphs – The pigeonhole principle and Turan's theorem.

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.

Applications: Wine Bottle problem – Water Jug problem – Seating Arrangement problem – Teleprinter's problem.

REFERENCES

1. Murugan, M., (2003). *Introduction to Graph Theory*, Muthali Publishing House, Chennai,
2. Murugan, M., (2005). *Applications of Graph Theory*, Muthali Publishing House, Chennai
3. Narasingh Deo, (1974).*Graph Theory with Applications to Engineering and Computer Science*, Prentice-Hall of India,
4. Arumugam S. and Ramachandran, S.,(2001).*Invitation to Graph Theory*, Scitech, Chennai.

CORE PAPER – XII
NUMERICAL METHODS
(120 Hours)

SUBJECT CODE:

Unit 1: Solution of Numerical Algebraic and Transcendental Equations: The bisection method – Newtons method – Criterion of order of convergence of Newton's method – Regula false method – Gauss elimination – Gauss Jacobi – Gauss Seidal method.

Unit 2: Finite Differences: First and higher order differences – Forward and backward differences – Properties of operator – Differences of a polynomial – Factorial polynomial – Error propagation Operator E and E^{-1} Relation among Δ, E, δ and D – summation of series.

Unit 3: Interpolation: With equal intervals: Newton's forward – backward interpolation formula – Gauss forward – backward interpolation formula – Bessel's formula.

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

Unit 4: Numerical Differentiation and Integration: Newton's forward and backward differences to compute derivatives – Derivatives using Bessel's formula – Newton – Cote's formula – Trapezoidal rule – Simpson 1/3 and $3/8^{th}$ rule – Weddle's rule.

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

REFERENCES

1. Kandasamy P., Thilagavathy K., Gunavathy K., (2006). *Numerical Methods*, S. Chand & Company Ltd., Edn.
2. Venkataraman.M.K., (1999).*Numerical Methods in Science and Engineering* National Publishing company V Edition.

CORE PAPER – XIII
MECHANICS (APPLICATION OF MATHEMATICS)
(120 Hours)

SUBJECT CODE:

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 2: Forces acting on a rigid body – Parallel forces – Resultant of two like and unlike parallel forces – Moment of a force – Varigon's theorem – three forces acting on a rigid body and simple problems – Law of friction – Coefficient of friction, Angle of friction, Cone of friction – Problems.

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

Unit 4: Impact, impulses – Impact in a fixed plane – direct and oblique impact S.H.M., Equation of motion – Composition of S.H.M's.

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

1. Venkatraman M.K., (1999). *Statistics*, Agasthiyar Publication.
2. Venkatraman M.K., (1999). *Dynamics*, Agasthiyar Publication.

PHYSICS
CORE PAPER –V
OPTICS
(120 Hrs)

SUBJECT CODE:

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(24hrs)

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 achromatism 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)

Coherent sources - Fresnel's Biprism - Theory of thin films - Air wedge - Determination of diameter of a thin wire by air wedge -Colours of Thin Film - Newton's rings - Determination of the wavelength of the sodium light - Refractive index of a liquid - Michelson Interferometer –- Theory – Applications-Jamin'sRefractometer - Rayleigh's Refractometer - Fabry Perot Interferometer.

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)

Lasers: Laser action - Induced absorption - spontaneous emission and stimulated emission – ruby laser-He-Ne laser– semiconductor laser.

Fibre Optics : Introduction – optical fibre – optical fibre system – optical fibre cable – total internal reflection – propagation of light through and optical fibre - critical angle of propagation – acceptance angle – numerical aperture – skip distance and number of total internal reflections – classification of optical fibres – The three types of fibres - single mode step index fibre – multimode step index fibre – graded index fibre –fibre optic communication system – merits of optical fibres.

SEMESTER - V

REFERENCES

1. BrijLal, M.N Avadhanulu and Subramaniam N (2012). *A text book of Optics*, New Delhi, S Chand & Co.
2. Murugeshan, (2012).*Optics and Spectroscopy*, New Delhi,S Chand & Co. Pvt. Ltd.,
3. Ajoy K. Ghatak,(2014). *Modern optics*, New Delhi, McGRaw Hill Inc.,
4. Jenkins A Francis and White E Harvey(1976).*Fundamentals of Optics,* McGRaw Hill Inc, New Delhi.
5. http://physicsdatabase.com/free-physics books/
6. http://bookboon.com/en/physics-ebooks
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)

Introduction- Rutherford experiments on α particle scattering- Experimental verification- -Bohr atom model – Critical potentials - atomic excitation – Experimental determination of critical potentials - Franck and Hertz method – Davis and Goucher's method - Mass spectrograph: Aston's mass spectrograph – Dempster's mass spectrograph.

UNIT- II: ATOM MODEL (24 hrs)

Sommerfeld's relativistic atom model – The Vector atom model – Quantum numbers associated with the vector atom model –The Pauli's exclusion principle – various quantum numbers - angular momentum and magnetic moment -magnetic dipole moment – Coupling schemes – L-S coupling –J J coupling – special quantisation Bohr magnetron -The stern and Gerlach Experiment – Spin orbit coupling.

UNIT- III: OPTICAL SPECTRA (24 hrs)

Spectral terms and notations - selection rules - fine structure of sodium D lines - alkali spectra - fine structure of alkali spectra - spectrum of Helium.

Zeeman effect – Larmor's theorem – Paschen back effect – Stark effect – Production of X-rays – Bragg's law – Bragg's X-ray spectrometer – X- ray spectra – Characteristics of X-ray spectra – Mosley's law – Compton effect – Photo electric effect – Experimental investigation – Einstein's Photo electric equation – Photo voltaic cell

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

Molecular spectra: Introduction – Origin of molecular spectra – Nature of molecular spectra – Rotation of linear system – Non rigid rotator -Theory of the origin of pure rotational spectrum of a molecule – Electronic spectra of molecule.

Raman Effect: Experimental study of Raman effect – Quantum theory of Raman effect – applications- Laser Raman spectroscopy - Classical theory of Raman effect - vibrational Raman spectra of diatomic molecules.

UNIT-V: SPECTROSCOPIC TECHNIQUES (24 hrs)

The energy of a diatomic molecule – vibrating diatomic molecule as a harmonic oscillator - spectroscopic techniques – constant deviation spectrograph – recording the spectrum – UV spectroscopy – Quartz spectrograph for near UV region - Infra red spectroscopy – absorption spectroscopy – Double beam IR spectrometer –Raman spectroscopy – Raman spectrometer.

REFERENCES

1. Murugeshan R., KiruthigaSivaprasath, (2008).*Modern Physics*, New Delhi S. Chand & Co.,
2. Sehgal D.L., Chopra K.L.and Sehgal N.K.. (1991). *Modern Physics*, New Delhi, Sultan Chand & Sons
3. Rajam J.B., (2004). *Atomic Physics,* New Delhi ,S. Chand & Co., 20th Edition,
4. Subrahmanyam N. and BrijLal, (2000). *Atomic and Nuclear Physics* , NewDelhi , S. Chand & Co.
5. Guptakumar Sharma , (2011).*Elements of Spectroscopy*, Meerut, Pragatiprakashan,,
6. Gurdeep Chatwaland, *Spectroscopy,* ShamAnand
7. White (2003). *Atomic specra* ,Ney York,McGraw Hill Intl. Book Company
8. Semat H. and Albright J.R., (2003). *Atomic and Nuclear Physics* , Chapmanand Hall

9. http://physicsdatabase.com/free-physics books/
10. http://bookboon.com/en/physics-ebooks
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 ,Laplacetran forms and statistics. With these background, students are made to gain the knowledge of concept of theoretical/analytical physics oriented courses like like classical mechanics ,quantum mechanics, electromagnetic theory and its applications.

UNIT – I: VECTOR CALCULUS(24 hrs)

Gradient of a Scalar field – line, surface and volume integral – Divergence of a vector function –examples – Curl of a vector function – Important vector identities – Gauss divergence theorem – Stoke's theorem.- Green's theorem – examples.

UNIT – II: MATRICES(24 hrs)

Eigen values and Eigen functions-Determination of eigen values and eigen vectors of the matrix-problems- Cayley - Hamilton theorem- determination of inverse matrix using Cayley –Hamilton theorem- statement and proof- determination of characteristic equation of matrix, verification .Theorems on eigen values and eigen vectors. Diagonalisation of matrix -Solution of quadratic equations by matrix method.

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

Special types of matrices –diagonal matrix,scalar matrix, identiy matrix, upper/lower triangular matrix-transpose of a matrix-properties-complex-conjugate matrix-properties-Hermitian Conjugate- Hermitian matrix-skew –Hermitian matrix- Properties of unitary and orthogonal matrices-adjoint of a matrix- Inverse of a matrix-problems-non-homogeneous linear equations solving system of equations by matrix method- Cramers rule for solving equations –examples-linear transformations-unitary and orthogonal trans formation-Hermitian forms-diagonalisation of 3x3 symmetric matrices.

UNIT – IV: LAPLACE TRANSFORMS(24 hrs)

Laplace transform:Definition –Laplace transform of L{1}. L{t}. L{eat}. L{e-at}. L{sinat}. L{cosat}. L{sinhat}. L{coshat}.Laplace transform of tsinat, tcosat,e^{at}coswt, e^{at}sinwt, properties of Laplace transforms-methods of finding Laplace transform-direct method –series expansion method – differential equation method-Laplacetransformsof gamma function.

UNIT – V: STATISTICS (24 hrs)

Arithmetic mean-method of finding arithmetic mean –properties –examples –Median-median class-quartiles-deciles-percentiles- mode-empirical relation between mean,median and mode-geometric mean –harmonic mean-measures of dispersion-range –mean deviation-standard deviation –root mean square deviation –Calculation of standard deviation **.**

REFERENCES

1. Murugeshan R., (2008). *Mechanics and Mathematical Physics*, New Delhi, S. Chand & Co.,
2. Gupta B.D., (1997), *Mathematical Physics*, Vikas Publishing house
3. SatyaPrakash , (2014*). Mathematical Physics with Classical Mechanics*, New Delhi, S. Chand & Co.,
4. http://physicsdatabase.com/free-physics books/
5. http://bookboon.com/en/physics-ebooks

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

SUBJECT CODE:

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 eqations- 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. Thomnsonexperiment - electron microscope

UNIT-IV: WAVE MECHANICS(24 hrs)

Wave function ψ - significance of wave function ψ -properties of wave functions- - Heisenberg's uncertainity 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

1. Murugeshan R., (2008). Mechanics and Mathematical Physics, New Delhi ,S. Chand & Co.,
2. SathyaPrakash, (2010). Quantum mechanics by , Meerut, , PrgatiPrakashan,
3. Aruldas G., (2011). Quantum mechanics , New Delhi, PHI learning PVT Ltd.,
4. Gupta,B D., and SathyaPrakash, Classical Mechanics by KedarNath Ram Nath& Co.,
5. Ghatak A, (2002).Basic quantum mechanics ,New Delhi, McMillan India
6. http://physicsdatabase.com/free-physics books/
7. http://bookboon.com/en/physics-ebooks.

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
6. Newton's rings – radius of curvature of a lens.
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. Astablemultivibrator using 555 timer.

REFERENCES

1. Srinivasan S., (2005). *A Text Book of Practical physics*, New Delhi, S. Sultan Chandpublications.
2. Sasikumar R.,(2011). *Practical Physics*, New Delhi,PHI Learning Pvt. Ltd, ,
3. https//www.practicalphysics.org.

CORE PRACTICAL -IV
(60 Hours)

SUBJECT CODE:

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 ^{0}C to ^{0}F and ^{0}F to ^{0}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

1. NagoorKani A, (1999).*Microprocessor and its applications*, RBA Publication, Chennai.
2. Balagurusamy E., (2004). *Programming in ANSI C*, New Delhi,Tata McGraw Hill.

CHEMISTRY

CORE PAPER V
INORGANIC CHEMISTRY – I
(120 Hrs)

SUBJECT CODE:

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 – Ma_2b_2, Ma_2bc, $M(ab)_2$ and 6 coordinated complexes - Ma_4b_2, Ma_3b_3, $M(aa)_2b_2$. Optical isomerism and conditions for optical isomerism- optical isomerism in 6 coordinated complexes - $M(aa)_3$ and $M(aa)_2b_2$.

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 Δ_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 $Ni(CO)_4$, $Fe(CO)_5$, $Fe_2(CO)_9$, $Mn_2(CO)_{10}$ and $Co_2(CO)_8$.

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

Alloys - simple mixtures, solid solutions, substitutional and interstitial alloys. Hume - Rothery ratios and their applications. Structure of the ionic crystals - AX type - NaCl, CsCl and ZnS -(zinc blende and wurtzite structures), AX_2 type - CaF_2 and TiO_2. Limiting radius ratio rule- coordination number and shape of the ionic crystals. Defects in crystal structures: stoichiometric defects - Schottky and Frenkel defects. Non - stoichiometric defects-metal excess and metal deficiency defects.

REFERENCES

1. Puri, B.R. and. Sharma, L.R, (2011). *Principles of Inorganic Chemistry*, Delhi, Milestone publishers & distributors.
2. Madan, R.D., (2008). *Modern Inorganic chemistry*, New Delhi, S. Chand & Company Private Limited.
3. Malik, W.U., Tuli, G.D., and Madan, R. D., (2001). *Selected Topics in Inorganic Chemistry*, New Delhi, S. Chand & Company Private Limited.
4. http://www.askiitians.com/revision-notes/chemistry/coordination-compounds/
5. http://www.sparknotes.com/chemistry/organic1/orbitals/section1.rhtml

6. http://www.brainkart.com/article/Extrinsic-semiconductor--N-and-P--type-semiconductor_2979/
7. https://www.youtube.com/watch?v=MV-o_8ohB2o

CORE PAPER VI
ORGANIC CHEMISTRY - I
(120 HRS)

SUBJECT CODE:

UNIT I

Preparation and properties of benzene suphonic acid and suphanilic acid.Preparation and bacterostatic action of sulphanilamide. Phenol - preparation, resonance structures, bromination, nitration, oxidation, reduction, Schotten-Baumann, phthalein fusion and coupling reactions. Mechanisms of Reimer-Tiemann and Kolbe-Schmidt reactions.Tests for phenol.Preparation and properties of o-cresol, catechol, resorcinol and pyrogallol.

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

Preparation of nitrobenzene.Reduction of nitrobenzene in acid, neutral and alkaline media.Electrolytic reduction of nitrobenzene.Preparation and properties of aliphatic primary, secondary and tertiary amines.Separation of amines by Hinsberg and Hofmann methods. Aniline - preparation and reactions. Basicity of aliphatic and aromatic amines.Preparation of benzene diazonium chloride, coupling reaction with aniline.Synthesis of phenol, benzene, benzoic acid, halo benzenes and nitrobenzene from benzene diazonium chloride.

UNIT IV

Heterocyclic compounds- preparation and reactions of pyrrole and pyridine.Comparison of basicities of pyridine and pyrrole.Synthesis and reactions of quinoline, isoquinoline and indole. Vitamins - classification, sources and deficiency diseases. Terpenoids-isolation and isoprene rule. Structural elucidation and synthesis of geraniol and α-terpeniol. Alkaloids - structural elucidation and synthesis of coniine and nicotine.

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

1. Bahl, B.S. and Arun Bahl, (2010). Advanced Organic Chemistry, New Delhi, S. Chand & Company Private Limited.
2. Agarwal, O.P., (2016). Reactions and Reagents, Meerut, Krishna Prakashan Media Private limited.
3. Jain, M.K., Sharma, S.C., (2017). Modern Organic Chemistry, Jalandhar, Vishal publishing company.
4. https://www.cliffsnotes.com/study-guides/chemistry/organic-chemistry-ii/summary-of-reactions/reactions-phenols

5. http://www.askiitians.com/iit-jee-carboxylic-acids-and-its-derivatives/general-methods-of-preparations.html
6. http://echemistry.in/preparation-of-amines-2/
7. https://www.britannica.com/science/heterocyclic-compound/Major-classes-of-heterocyclic-compounds

CORE PAPER VII
PHYSICAL CHEMISTRY - I
(120 Hrs)

SUBJECT CODE:

UNIT – I

Ohm's law and electrical units. Electrolysis – Faraday's law of electrolysis. Conductance of electrolytes - specific conductance, equivalent conductance and molar conductance - experimental determination of molar conductance.Types of electrolytes.Variation of specific and molar conductance with dilution. Transport number and ionic mobilities - determination of transport number - Hittorf's and moving boundary methods. Kohlrausch's law and its applications.Abnormal mobilities of hydrogen and hydroxyl ions.

UNIT – II

Arrhenius theory of electrolytic dissociation and its limitations.A qualitative discussion of interionic forces and their influence on conductance.Applications of conductance measurements - determination of solubility product, degree of dissociation, ionic product of water and conductometric titrations – acid-base and precipitation.Activity and activity coefficient of strong electrolytes (definition only).

UNIT – III

Dissociation of weak acids and bases – relative strengths.pH - definition, common ion effect and solubility product - applications of solubility product principle. Buffer solutions - types of buffers and buffer action - Henderson's equation. Hydrolysis of salts - hydrolysis constant and degree of hydrolysis of salts - weak bases and strong acids , weak acids and strong bases and weak acids and weak bases.

UNIT – IV

Electromotive force - electrochemical cells - galvanic cells - cell terminology - representation of cell - calculation of EMF of the cell.Reversible and irreversible cells - Weston standard cell.Experimental determination of EMF of a cell.Single electrode potential - determination.Electrochemical series - applications.Thermodynamic significance of electrode potential.Relation between EMF and thermodynamic quantities ΔG, ΔH, ΔS and their significance.Nernst equation for electrode and cell potentials. Types of electrodes - metal ion electrode, amalgam electrode, metal insoluble salt electrode (calomel and Ag/AgCl),oxidation reduction electrode, gas electrode (standard hydrogen electrode).

UNIT – V

Concentration cells - types - derivation of EMF of concentration cells with and without transference. Liquid Junction potential - definition (derivation not necessary) and its elimination. Application of EMF measurements - potentiometric titrations - acid base, precipitation and redox titrations – determination of solubility of a sparingly soluble salt, determination of pH using glass, quinhydrone and hydrogen electrodes. Commercial cells – Acid storage battery. Rechargeable cells – nickel cadmium and lithium ion cells. Fuel cells.Electrochemical principle of rusting of iron.

REFERENCES

1. Puri, B.R. and Sharma, L.R, (2011), Principles of Physical Chemistry, Jalandhar, Vishal publishing company.
2. Arun Bahl, Bahl, B.S., and Tuli, G.D., (2012), Essentials of Physical Chemistry, Jalandhar, S. Chand Publishing.
3. Soni, P.L. and Dharmarha, O. P., (2016) Text Book of Physical Chemistry, New Delhi, Sultan Chand & Sons.
4. http://www.askiitians.com/iit-jee-chemistry/physical-chemistry/electrochemistry/

5. https://www.youtube.com/watch?v=6qqrdwlhJCI
6. https://www.slideshare.net/MadihahRamly/chapter-6-electrochemistry-49983898

ELECTIVE PAPER - I
ANALYTICAL CHEMISTRY
(120 Hrs)

SUBJECT CODE:

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

Volumetric analysis - classification, standard solution, primary and secondary standard substances, concentration units.Acid-base titrations - choice of indicators and theory of acid base indicators.Redox titrations-self indicators and external indicators.Precipitation titrations - halides, thiocyanates, indicators of precipitation titrations.Complexometric titrations (EDTA titration only).

UNIT -V

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

REFERENCES

1. Gopalan, R., Subramanian, P.S. and Rengarajan, K., (2004) Elements of Analytical Chemistry, New Delhi, Sultan Chand & Sons.
2. Srivastava, A.K., and Jain, P.C., (2009) Instrumental Approach to Chemical Analysis, Jalandhar, S. Chand Publishing.
3. Venkateswaran, V., Veeraswamy, R. and Kulandaivelu, A.R, (2006), Basic Principles of Practical Chemistry, New Delhi, Sultan Chand & Sons Private Limited
4. https://goo.gl/HDiSJP
5. https://www.slideshare.net/MarkSelby2/gravimetric-analysis-44916288

SEMESTER - V

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 CCl_4 and H_2O
3. Determination of equilibrium constant for the reaction $KI + I_2 \rightleftharpoons KI_3$
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 [$KMnO_4$ vs Fe(II)]
16. Potentiometric titration- acid-base titration [HCl vs NaOH]

C. Demonstration Experiments

1. Polarimetry- Inversion of cane sugar

REFERENCES

1. Venkateswaran, V., Veeraswamy, R. and Kulandaivelu, A.R, (2006), Basic Principles of Practical Chemistry, New Delhi, Sultan Chand & Sons Private Limited.
2. Mani. P.K., Thomas, A.O., (1981), Practical Chemistry, Cannanore, Scientific Book Centre.
3. www.aiktcdspace.org>jspui>bitstream
4. https://www.tau.ac.il/~advanal/PotentiometricTitrations.htm
5. https://www.tau.ac.il>conductometry-titrations.

BOTANY

CORE PAPER V

CELL BIOLOGY AND MOLECULAR BIOLOGY

(120 Hrs)

SUBJECT CODE:

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, initation, 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

1. Geraald Karp,(2010).*Cell biology,* John wiley and sons
2. Rrastoel, S.C, (1996). *Cell and Molecular Biology*- New age international publishers.
3. Verma, P.S., Agarwal, V.K.(1995).*Cell Biology, Genetics, Molecular Biology & evolution.*S.lChand
4. De Robertis, E.D.P.,DeRobertis, E.M.F.Jr., (1987).*cell and Molecular Biology* Lea Febiger.
5. Old and Primrose, (2000).*Principles of Gene manipulations,*Blackwell Scientific Publications.

CORE PAPER VI
PHYSIOLOGY AND BIOCHEMISTRY
(120 Hrs)

SUBJECT CODE:

UNIT I

Water relations of plants – Diffusion, Permeability, Osmosis , Mechanism of absorption of water-passive and Active transport, Transpiration – structure of stomata and mechanism of stomatal regulation, types and significance, factors affecting transpiration. Mineral salt absorption – passive absorption, active absorption- carrier concept, cytochrome pump theory, carrier mechanism involving ATP, Mineral Nutrition in plants – Macro and micro nutrients, Occurrence and functions of essential elements.

UNIT II

Photosynthesis – Radiant energy, Emerson's enhancement effect, Absorption spectrum, action spectrum, Light reaction, pathways of carbon fixation– Calvin Cycle, Hatch and Slack pathway, photorespiration, CAM pathway, factors affecting photosynthesis.

Respiration- Aerobic respiration and Anaerobic respiration, Glycolysis, Krebs cycle, electron transport system, mechanism of oxidative phosphorylation, cyanide resistant respiration, RQ, factors affecting respiration.

UNIT III

Nitrogen metabolism- significance of nitrogen, Nitrate reduction in plants, Nitrogen fixation-biological and non biological, biochemistry of nitrogen fixation, nitrogen cycle.

Enzymes- nomenclature and classification of enzymes, properties of enzymes, mechanism of enzyme action, factors affecting enzyme activity.

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

Plant Biochemistry- chemical bonds, buffers, pH, structure and types of carbohydrates-monosaccharides, oligosaccharides and polysaccharides, lipids- phospholipids, glycolipids and sterols, amino acids and proteins – classification of amino acids and proteins, structure of proteins.

REFERENCES

1. Tiaz L.,Zeiger.E., (2011), *Plant Physiology(3rd edition)* Benjamin/ Cummings Publishing Company Inc.
2. Jain V.K,(2010). *Fundamentals of plant physiology.* S Chand & Company Ltd.
3. Verma S.K,MohitVerma, (2007)*A text book of plant physiology, biochemistry and biotechnology.* S Chand & Company Ltd.
4. Srivastava. H.S, (2010), *Plant Physiology, Biochemistry and Biotechnology.*Rastogi publications.
5. Salisbury F.B, Ross C.W, (1991), *Plant Physiology,* CBS publishers and distributors.

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

SUBJECT CODE:

UNIT I

Monohybrid and Dihybrid cross, test cross, back cross, Mendel's Laws. Deviation fromMendelian ratio – incomplete dominance, lethal factor, complementary factor, supplementary factor, duplicate and inhibitory. Polygenic inheritance – Inheritance of Wheat Kernel and ear length in Maize.

Unit II

Linkage – Crossing over and recombination. Gene Mapping. Chromosome theory of inheritance. Sex determination in plants, Sex Linked Inheritance, Sex linked diseases, Haemophilia, Colour blindness.

Extra nuclear inheritance - male sterility in corn, Population genetics, Hardy-Weinberg's principles, factors affecting.

UNIT III: PLANT BREEDING

Plant Breeding: Objectives, Plant introduction, selection, hybridization techniques, Hybrid Vigor, heterosis, Interspecific and intergeneric. Mutation -Polyploidy and its applications in plant breeding. Breeding for crop improvement for paddy, Groundnut and Sugarcane.

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

Origin of life-Spontaneous and biochemical theories-Theories of Organic evolution-Darwin, Lamarck ,deVeries and modern synthetic theory.Variation-sources-mutation.recombination.Adaptation and selection.

REFERENCES

1. Acquaah, G, (2007). *Principles of Plant Genetics & Breeding*. Blackwell Publishing.
2. Babcock, E.B., (2009),*Genetics & plant breeding*, Agrobios India.
3. Chaudhari, H.K, (1984),*Elementary Principles of Plant Breeding*. Oxford – IBH. 2nd edition.
4. Gardner EJ, Simmons MJ, Snustad DP (2008),*Principles of Genetics.* 8th Ed. WileyIndia.
5. Pierce B.A, (2011),*Genetics: A Conceptual Approach*, 4th Ed., Macmillan Higher Education Learning
6. Singh, B.D, (2005),*Plant Breeding: Principles and Methods.*Kalyani Publishers. 7th edition.
7. Snustad, D.P, Simmons, M.J. (2010),*Principles of Genetics,* John Wiley & Sons Inc., India. 5th edition.

SEMESTER - V

CORE PAPER VIII

PLANT PATHOLOGY

(120 Hrs)

SUBJECT CODE:

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

1. Rangaswami, G.,Bhagyaraj, D.J, (2004), *Agricultural Microbiology* Prentice Hall of India (P) Ltd., New Delhi.
2. Sharam, P,(1996), *Plant Pathology*.Rastogi Publications, Meerut.
3. Rangaswami., G, Mahadevan, A,(2002), *Diseases of crop plant inIndia,* Prentice Hall of India (P) Ltd. New Delhi.
4. Trigiano, R.N., Windham,M.T.,Windham,A.S, (2003), *Plant Pathology: concepts and laboratory exercises*,CRC PresS
5. Pandey, B.P, (1999),*Plant Pathology,*S.Chand& Co., New Delhi.

SEMESTER - V

6. Chatterjee P.B, (1997), *Plant Protection Techniques*,BharatiBhawan,Patna.
7. Arora J.S, (1990), *Introductory Ornamental Horticulture*, Kalyani Publications
8. Bailey L.H, (1991), *The Standard Cyclopaedia of Horticulture Vol 1,2& 3,* Mcmillan Publications.
9. Bose T.K,Mukerjee D, (1987), *Gardening in India*, Oxford Book House.
10. Manibhushan Rao K, (1991), *Text Book of Horticulture*, Macmillan Publications.

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
2. Rrastoel, S.C.1996- Cell and Molecular Biology- New age international publishers.
3. Verma, P.S. and Agarwal, V.K.1995- Cell Biology, Genetics, Molecular Biology & evolution.
4. De Robertis, E.D.P. and De Robertis, E.M.F.Jr. 1987 cell and Molecular Biology Lea Febiger.
5. Old and Primrose 2000 Principles of Gene manupulations

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

1. Tiaz L. and Zeiger.E.2011.Plant Physiology(3rd edition) Benjamin/ Cummings Publishing Company Inc.
2. Jain VK 2010. Fundamentals of plant physiology. S Chand & Company Ltd.
3. Verma SK and MohitVerma. 2007. A text book of plant physiology, biochemistry and biotechnology. S Chand & Company Ltd.
4. Srivastava. H. S. 2010.Plant Physiology, Biochemistry and Biotechnology. Rastogi publications.
5. Salisbury FB & Ross C.W 1991. Plant Physiology. CBS publishers and distributors

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

REFERENCES

1. Babcock, E.B., (2009),*Genetics & plant breeding*, Agrobios India.
2. Gardner EJ, Simmons MJ, Snustad DP (2008),*Principles of Genetics.* 8th Ed. WileyIndia.
3. Snustad, D.P, Simmons, M.J. (2010),*Principles of Genetics,* John Wiley & Sons Inc., India. 5th edition.
4. Pierce B.A, (2011),*Genetics: A Conceptual Approach*, 4th Ed., Macmillan Higher Education Learning
5. Singh, B.D, (2005),*Plant Breeding: Principles and Methods.*Kalyani Publishers. 7th edition.
6. Chaudhari, H.K, (1984),*Elementary Principles of Plant Breeding*. Oxford – IBH. 2nd edition.
7. Acquaah, G, (2007). *Principles of Plant Genetics & Breeding*. Blackwell Publishing.

PLANT PATHOLOGY

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

REFERENCES

1. Rangaswami, G.,Bhagyaraj, D.J, (2004), *Agricultural Microbiology* Prentice Hall of India (P) Ltd., New Delhi.
2. Sharam, P,(1996), *Plant Pathology*.Rastogi Publications, Meerut.
3. Rangaswami., G, Mahadevan, A,(2002), *Diseases of crop plant inIndia,* Prentice Hall of India (P) Ltd. New Delhi.
4. Trigiano, R.N., Windham,M.T.,Windham,A.S, (2003), *Plant Pathology: concepts and laboratory exercises*,CRC PresS
5. Pandey, B.P, (1999),*Plant Pathology,*S.Chand& Co., New Delhi.
6. Chatterjee P.B, (1997), *Plant Protection Techniques*,BharatiBhawan,Patna.
7. Arora J.S, (1990), *Introductory Ornamental Horticulture*, Kalyani Publications
8. Bailey L.H, (1991), *The Standard Cyclopaedia of Horticulture Vol 1,2& 3,* Mcmillan Publications.
9. Bose T.K,Mukerjee D, (1987), *Gardening in India*, Oxford Book House.
10. Manibhushan Rao K, (1991), *Text Book of Horticulture*, Macmillan Publications.

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

1. Odum, E.P., (1998), *Fundamentals of Ecology*, Nataraj Publications
2. Agarwal, K.C, (2001),*Environmental Biology,*Nidi Publ. Ltd. Bikaner.
3. BharuchaErach, (1995), *The Biodiversity of India,*Mapin Publishing Pvt. Ltd., Ahmedabad – 4.Kormondy, E.J, (1996). *Concepts of Ecology*. Prentice Hall, U.S.A. 4th edition.
4. Sharma, P.D. (2010), *Ecology and Environment*,Rastogi Publications, Meerut, India. 8th edition.
5. Simpson, M.G. (2006). *Plant Systematics*. Elsevier Academic Press, San Diego, CA, U.S.A.

MICROBIOLOGY

1. Preparation of culture media for bacteria , fungi- sterilization procedures.
2. Isolation of rhizosphere, rhizoplane, phylloplane microorganisms.
3. Isolation of pure culture from soil – serial dilution. Gram staining.

REFERENCES

1. Adams M.R., Mass, M.O, (1995), *Food microbiology,*. The Royal Society of Chemistry. Cambridge.
2. Frazier W.C,Westhoff D.C,(2007),. *Food Microbiology,*TMH Publishing Company Ltd. New Delhi.
3. Dubey R.C.,Maheshwari, O.K, (2011),*Practical Microbiology,*S.Chand&Co.Ltd., New Delhi.
4. Michael J. Pelczar, JR. E.C.S Chan, Noel R. Krieg, (2004), *Microbiology,* TMH Publishing Co. Ltd New Delhi.
5. Dubey,R.C, Maheshwari,D.K, (2012), *A Textbook of Microbiology*,S.Chand& Company Ltd. New Delhi.

BIOTECHNOLOGY

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

REFERENCES

1. Dubey, R.C., (1993), *A Text book of Biotechnology*- S.Chand Publishers
2. Ignacimuthu (1998), *Biotechnology,* Tata McGraw Hill Publishers.
3. R Palanisamy(1997), *Research Methodology* Paramount Publishers
4. Ramawat,ShailyGoyal (2000), *Comprehensive Biotechnology,*S.Chand Publishers

BIOTECHNIQUES

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

REFERENCES

1. Skoog, D.S, (1980), *Principles of Instrumental analysis*. HL. Saunders
2. Jayaraman J (1980),*Laboratory Manual of Biochemistry* 1980. Wiley Eastern

3. William BL,Wilson (1980), *Principles and techniques of practical biochemistry* Edward Arnold.
4. Wilson and Walker,(2000),*Practical biochemistry*, 9th Edition, Cambridge Press
5. Plumer D.T., (1987), *An introduction to Practical Biochemistry*, McGraw Hill

ZOOLOGY

CORE PAPER V
DEVELOPMENTAL BIOLOGY
(120 Hours)

SUBJECT CODE:

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

Extra-embryonic membranes. Placentation in Mammals. Nuclear Transplantation. Regeneration, Cell Differentiation and Gene action during development

REFERENCES

1. Verma P.S., V.K.Agarwal and Tyagi 1995, Chordate Embryology, New Delhi,S. Chand & Co.,
2. Arumugam N. 2010 . A Textbook of Embryology , Nagercoil, Saras Publication
3. Balinsky, B.L. 1981, Introduction to Embryology, Philadelphia Saunders College Publishing
4. Berrili, N.J., 1986, Developmental Biology, Chennai ,Tata McGraw Hill Publishing Co. Ltd.
5. http://www.ebooksread.com/authors-eng/william-erskine-kellicott/a-textbook-of-general-embryology-hci.shtml
6. https://allmedicalstuff.com/download-langmans-embryology-pdf-free/
7. http://www.freebookcentre.net/medical_books_download/Embryology-by-Ken-Muneoka.html.

CORE PAPER VI
EVOLUTION
(120 Hours)

SUBJECT CODE:

UNIT I Origin of life – Theories – creation – cosmozoic – spontaneous generation – Chemical evolution – Urey Miller experiment. Evidences favouring evolution – Comparative anatomical, vestigial organs, physiological, embryological and Biochemical evidences

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

UNIT III Geological eras – Fossils and fossilization – Dating of fossils – Extinctions - Living fossils. Adaptations – Variations & its origin – Polymorphism – Transient and stable

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

UNIT V Mimicry & Colouration - Batesian and Mullerian. Convergent, Divergent and Parallel evolution - Co-evolution. Evolution of Man - Biological & Cultural.

REFERENCES

1. Simpson, G.C. 1967 The meaning of Evolution. Revised Edition - New Haven, Tale University Press.
2. Colbert, E.H. 1969 , Evolution of vertebrates, New York, Wiley.
3. Mayr, Ernst, 1973 ,Animal species and Evolution, England , The Belknap Press of Harvard University, Cambridge.
4. Dobzansky, T. 1976 , Genetics and the origin of species. New Delhi, Oxford and TBH Publishing Co.
5. http://www.freebookcentre.net/biology-books-download/The-Foundations-of-the-Origin-of-Species.html
6. http://www.freebookcentre.net/biology-books-download/Evolution.html
7. http://www.freebookcentre.net/biology-books-download/Outlines-of-evolutionary-biology.html.

CORE PAPER VII
ANIMAL PHYSIOLOGY
(120 Hours)

SUBJECT CODE:

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

Excretion – Excretory organs in animals – Kinds of excretory products – ornithine cycle - mechanisms of urine formation in mammals – hormonal regulation of excretion. Osmo-conformers & osmo-regulators – organs concerned with osmo-ionic regulation (skin, gills and kidneys) – osmo-ionic regulation in aquatic and terrestrial vertebrates. Thermoregulation - acclimation and acclimatization

UNIT IV

Nervous tissue - Neuron - structure, types. Nerve Impulse - definition - conduction of impulse - synapse - synaptic transmission of impulses - Neurotransmitters, Autonomic nervous system. Muscle tissue: Mechanism of contraction - Theories of muscle contraction

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

1. Parameswaran, Anantha Krishnan and Anantha Subramaniam, 1975. Outlines of Animal Physiology, Chennai , S. Viswanathan, Printers and Publishers, Pvt. Ltd.
2. General and comparative Animal Physiology , 1966, William Hoar, California , Englewood Cliffs, N.J., Prentice-Hall.
3. https://www.researchgate.net/publication/286456096_DrPBReddy's_TEXT_BOOK_OF_ANIMAL_PHYSIOLOGY
4. http://www.ebooksread.com/authors-eng/wesley-mills/a-text-book-of-animal-physiology-with-introductory-chapters-on-general-biology--lli.shtml
5. http://www.freebookcentre.net/biology-books-download/ANIMAL-PHYSIOLOGY.html

CORE PAPER VIII
BIO CHEMISTRY

(120 Hours)

SUBJECT CODE:

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

1. L.Stryer , 1999 Biochemistry IV edition, New York, Freeman Company
2. Lehninger , 1992 Biochemistry worth publications , New Delhi ,Inc Cbs publication
3. H.S. Srivastava , 2013 , Elements of Biochemistry ,Meerut , Rastogi Publications
4. Veerakumari L, 2004, Biochemistry , Chennai , MJP publications
5. G.P.Talwar & L.M. Srivastava 2003 Text book of Biochemistry and Human biology , New delhi Eastern economy, Printice Hall of India
6. http://www.freebookcentre.net/chemistry-books-download/Principles-of-Biochemistry-Lecture-Notes.html
7. http://www.freebookcentre.net/chemistry-books-download/Biochemistry-Free-and-Easy.html
8. http://www.freebookcentre.net/chemistry-books-download/Fundamentals-of-Biochemistry.html

SEMESTER - V

CORE PRACTICAL III
(120 Hours)

SUBJECT CODE:

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.
3. Study of Egg types – Frog's egg, Hen's egg.
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

1. Verma P.S., V.K.Agarwal and Tyagi 1995, Chordate Embryology, New Delhi,S. Chand & Co.,
2. Arumugam N. 2010 . A Textbook of Embryology , Nagercoil, Saras Publication
3. Balinsky, B.L. 1981, Introduction to Embryology, Philadelphia Saunders College Publishing
4. Berrili, N.J., 1986, Developmental Biology, Chennai ,Tata McGraw Hill Publishing Co. Ltd.
5. http://www.ebooksread.com/authors-eng/william-erskine-kellicott/a-textbook-of-general-embryology-hci.shtml
6. https://allmedicalstuff.com/download-langmans-embryology-pdf-free/
7. http://www.freebookcentre.net/medical_books_download/Embryology-by-Ken-Muneoka.html

EVOLUTION

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

REFERENCES

1. Simpson, G.C. 1967 The meaning of Evolution. Revised Edition - New Haven, Tale University Press.
2. Colbert, E.H. 1969 , Evolution of vertebrates, New York, Wiley.
3. Mayr, Ernst, 1973 ,Animal species and Evolution, England , The Belknap Press of Harvard University, Cambridge.
4. Dobzansky, T. 1976 , Genetics and the origin of species. New Delhi, Oxford and TBH Publishing Co.
5. http://www.freebookcentre.net/biology-books-download/The-Foundations-of-the-Origin-of-Species.html
6. http://www.freebookcentre.net/biology-books-download/Evolution.html
7. http://www.freebookcentre.net/biology-books-download/Outlines-of-evolutionary-biology.html

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

1. Parameswaran, Anantha Krishnan and Anantha Subramaniam, 1975. Outlines of Animal Physiology, Chennai , S. Viswanathan, Printers and Publishers, Pvt. Ltd.
2. *General and comparative Animal Physiology*, 1966, William Hoar, California , Englewood Cliffs, N.J., Prentice-Hall
3. https://www.researchgate.net/publication/286456096_DrPBReddy's_TEXT_BOOK_OF_ANIMAL_PHYSIOLOGY
4. http://www.ebooksread.com/authors-eng/wesley-mills/a-text-book-of-animal-physiology-with-introductory-chapters-on-general-biology--lli.shtml
5. http://www.freebookcentre.net/biology-books-download/ANIMAL-PHYSIOLOGY.html

BIOCHEMISTRY

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

REFERENCES

1. L.Stryer , 1999 Biochemistry IV edition, New York, Freeman Company
2. Lehninger , 1992 Biochemistry worth publications , New Delhi ,Inc Cbs publication
3. H.S. Srivastava , 2013 , Elements of Biochemistry ,Meerut , Rastogi Publications
4. Veerakumari L, 2004, Biochemistry , Chennai , MJP publications
5. G.P.Talwar & L.M. Srivastava 2003 Text book of Biochemistry and Human biology , New delhi Eastern economy, Printice Hall of India
6. http://www.freebookcentre.net/chemistry-books-download/Principles-of-Biochemistry-Lecture-Notes.html
7. http://www.freebookcentre.net/chemistry-books-download/Biochemistry-Free-and-Easy.html
8. http://www.freebookcentre.net/chemistry-books-download/Fundamentals-of-Biochemistry.html

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

1. Rastogi V.B. and M.S. Jayaraj, 1988-89. Animal Ecology and distribution of animals, Meerut , Kedar Nath Ram Nath
2. Eugene P. Odum, 1971. Fundamentals of Ecology. Saunders International Student Edition, Philadelphia , W.B. Saunders Company
3. Verma, P.S. and V.K. Agarwal, 1986. Environmental Biology, Chennai ,S. Chand & Co. Ltd.
4. http://www.freebookcentre.net/chemistry-books-download/Interactive-Concepts-in-Biochemistry.html
5. http://www.freebookcentre.net/chemistry-books-download/Biochemistry-And-Molecular-Biology.html
6. http://www.freebookcentre.net/chemistry-books-download/Fundamentals-of-Biochemistry.html

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

1. Elementary statistical methods 2007 , S.P.Gupta, London, Majestic books
2. Jerold H. Zar 1984 , Biostatistics (2nd edition) Printice Hall of International edition
3. Gurumani N.2004 Introduction to Biostatistics , delhi, MJP Publishers.
4. Sokal RJ and Rohlf SJ 1981 Introduction to Biostatistics London , W.H.Freeman .
5. http://www.mv.helsinki.fi/home/jmisotal/BoS.pdf
6. http://ugymoen.info/ytinu.pdf
7. https://www.amazon.in/Introduction-Biostatistics-Gurumani-N-ebook/dp/B00U9I5YBS

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

1. Kindt T.J. Goldsby , R.A. Osborne, B. A., Kuby , J(2006) Vi edition. Immunology W.H. Freeman and Company
2. Roitt , 2017 , Essential Immunology ,New jersey, Blackwell publishing.
3. http://www.freebookcentre.net/medical_books_download/Immune-System-and-Immunology-(PDF-63P).html
4. http://www.ebook777.com/kuby-immunology-7th-edition/
5. https://archive.org/details/FundamentalImmunology7thEdition2013PDF_201511

BIOTECHNOLOGY

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

REFERENCES

1. S.S.Purohit & S.K Mathur. 2002 , Biotechnology Fundamentals and applications
2. A. Brown., Higgins I.J., Best G.J., and Jones J. 1996, Gene cloning and Introduction to Biotechnology – Principles and applications, Oxford London, ,Blackwell Scientific Publications,
3. Brown.C.H., Campbell I and Priost.F.G (1987) Introduction of Biotechnology,Oxford Blackwell Scientific Publications.
4. R.C.Dubey , 2014 A Text Book of Biotechnology , New Delhi ,S.Chand & Co.
5. http://www.freebookcentre.net/biology-books-download/Biotechnology-Fundamentals.html
6. http://www.freebookcentre.net/biology-books-download/Biotechnology-Recombinant-DNA-Technology-(PDF-82P).html
7. http://www.freebookcentre.net/biology-books-download/BIOTECHNOLOGY-PRINCIPLES-and-PROCESSES-(PDF-19P).html.

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.
- Diaster 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

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil,M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.

SEMESTER - V

3. Gleeson, B. and Low, N.(eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick,P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security StockholmEnv. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co.Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R.2012. Environment. 8th Edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
20. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press.