Objectives: To develop an understanding of principles of Atomic structure, Bonding and Analytical Chemistry. To develop an understanding of the Periodic trends and to relate the properties of compounds in terms of their chemical bonding.

Unit I: Atomic Structure
Bohr model of hydrogen atom, Bohr’s equation for the energy of electron in hydrogen atom, the hydrogen spectrum, limitations of Bohr theory, photoelectric effect, idea of de Broglie matter waves, Heisenberg’s uncertainty principle and its significance, Schrodinger wave equation (derivation not expected), wave functions, significance of ψ (psi) and ψ², atomic orbitals, Nodal planes in atomic orbitals, quantum numbers (n, l, m), Zeeman effect, Stern-Gerlac experiment, spin quantum number (s), shapes of s, p and d orbitals. Aufbau and Pauli’s exclusion principles, Hund’s rule, energy level diagram of a multielectron atom, concept of effective nuclear charge, Slater’s rules and applications, Electronic configuration of atoms.

Unit II: Periodic Properties

Unit III: Chemical Bonding -I
Ionic bond: Factors that favour the formation of ionic bonds, Lattice energy, Born-Lande’s equation (no derivation), Born-Haber cycle, setting up of Born-Haber cycle for 1:1 ionic solids. Numerical calculations of LE and EA based on Born-Haber cycle for 1:1 ionic solids, uses of Born-Haber cycle. Role of lattice energy and hydration energy and their importance in the context of stability and solubility of ionic solids. Covalent bond: Factors favouring the formation of covalent bond (ionization energy, electron affinity, electronegativity, nuclear charge, inter nuclear distance and number of valence electrons). Valence bond approach – explanation with examples to illustrate valence bond approach. Sigma and Pi bonds. Fajan’s rules of polarization and their explanation. Bond length, bond order, bond energy and their significance, polarity of covalent bonds, polar and
non-polar molecules, Dipole moment and polarity of molecules to be explained by taking HCl, CO₂, CCl₄ and H₂O as examples.

**Unit IV: Chemical Bonding – II**

Hybridization-directional property and geometry of sp, sp², sp³, sp³d and sp³d² hybrid orbitals with examples respectively. VSEPR theory. Coordinate bond: with examples. Molecular Orbital Theory: An elementary account of MOT, linear combination of atomic orbitals (no mathematical approach). Bonding and antibonding molecular orbitals, conditions for the combination, energy levels of molecular orbitals, Molecular orbital structures and bond orders of simple molecules and ions, prediction of magnetic properties.

**Unit V: Analytical Chemistry**


Statistical treatment of results of quantitative analysis: Classification of errors, accuracy, precision, minimization of errors (calibration of apparatus, running of blank determination, running parallel determination to be mentioned), significant figures and computation, mean and standard deviation (explanation with an example), distribution of random errors (explanation with the help of curve), reliability of results (F-test and t-test).

**Textbooks:**

**References:**
1. C. N. R. Rao, University General Chemistry, Macmillan, India
6. G. D. Christian, Analytical Chemistry, John Wiley and Sons

**PRACTICALS**

**VOLUMETRIC ESTIMATIONS**
1. Estimation of Sodium Carbonate and Sodium Bicarbonate in a mixture.
2. Estimation of Ammonia in Ammonium Salt by Back Titration.
3. Estimation of Ferrous ions using Potassium Permanganate
4. Estimation of Oxalic acid using Potassium Permanganate
5. Estimation of Ferrous ions Using Potassium Dichromate with Internal & External Indicators.
7. Estimation of Copper in a Copper salt by Iodimetry
8. Standardisation of EDTA solution using Zinc Sulphate and determination of Mg or Ca

References:
A Text Book of Quantitative Inorganic Analysis, A. I. Vogel

18CHY112 NUCLEAR CHEMISTRY, STATES OF MATTER AND CHEMISTRY OF S AND P BLOCK ELEMENTS 3 0 2 4

Objectives: To enable students to develop an understanding of properties of Solids, Liquids and Gases, understand the shapes of molecules in terms of symmetries and to relate the properties of the matter in solid state to the structure and develop an understanding of the periodic trends, preparations, properties and uses of s and p block elements and their compounds.

Unit I: Nuclear Chemistry
Nuclear particles, nuclear forces, nuclear size, nuclear density, stability of nucleus, binding energy, packing fraction, n/p ratio. Nuclear models – liquid drop model and shell model. Natural radioactivity, modes of decay, decay constant, half-life period, average life, radioactive equilibrium, Geiger-Nuttall rule, units of radioactivity, radiation dosage. Induced radioactivity, nuclear reactions induced by charged projectiles, neutrons and γ rays, fission reactions, fusion reactions, spallation reactions, preparation of transuranic elements, Q values of nuclear reactions. Fertile and fissile isotopes, chain reaction, stellar energy. Application of Radioactivity and Radio isotopes as tracers in analysis, Reaction mechanism through tracer chemistry in medicines, in biological field, in agriculture and industry.

Unit II: Gases

Unit III: Liquids
Intermolecular forces in liquids (qualitative idea only)- viscosity, the viscometer method  

Unit IV: Solids  

Unit V: Chemistry of s and p block elements  
General characteristics of elements- Electronic configuration, oxidation state, inert pair effect, melting points and boiling points, densities, metallic character, nature of bonds formed, hydration of ions and ionic conductance in solution (only alkali metals), flame colouration. Reactivity, electrode potentials and reducing properties, reaction with water. Compounds – Oxides and peroxides-formation and reaction with water, basic character of oxides and hydroxides. Carbonates- thermal stability. Reasons for anomalous behaviour of Li and Be, diagonal relationship of Li and Mg. Hydrides- classification of boron hydrides, diborane-preparation from BCl₃, properties (reactions with ammonia and Lewis acid properties) and structure (based on VBT). Halides- comparison of Lewis acid character of boron trihalides. Catenation, allotropic forms of carbon- diamond, graphite and fullerenes (C₆₀) and their structures, carbon nanotubes (brief mention without structural details). Silicates- Classification, structures of ortho and pyrosilicates.

Textbooks:
2. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandhar,

References:
1. H. J. Arnikar, Essentials of Nuclear Chemistry, New Age  
2. R. Gopalan, Elements of Nuclear Chemistry, Vikas Publ. House  
3. K. L. Kapoor, A Textbook of Physical chemistry, Volumes 1, Macmillan India Ltd  
5. F. A. Albery and R J Silby, Physical Chemistry, 3 rd Edn, John Wiley
PRACTICALS
1. Systematic semi-micro qualitative analysis of a mixture of two simple salts (with no interfering radicals). Constituent ions in the mixture to be restricted to the following.
   Anions: $\text{HCO}_3^-$, $\text{CO}_3^{2-}$, $\text{SO}_3^{2-}$, $\text{Cl}^-$, $\text{Br}^-$, $\text{NO}_3^-$, $\text{SO}_4^{2-}$, $\text{BO}_3^{3-}$, $\text{PO}_4^{3-}$.
   Cations: $\text{Pb}^{2+}$, $\text{Bi}^{3+}$, $\text{Cd}^{2+}$, $\text{Al}^{3+}$, $\text{Fe}^{2+}$, $\text{Fe}^{3+}$, $\text{Mn}^{2+}$, $\text{Zn}^{2+}$, $\text{Ba}^{2+}$, $\text{Ca}^{2+}$, $\text{Sr}^{2+}$, $\text{Mg}^{2+}$, $\text{K}^+$, $\text{Na}^+$ and $\text{Mg}^{2+}$.
   Note: Mixtures requiring elimination of borate and phosphate to be avoided. Combination of anions of 2nd group shall be avoided. The combination of two cations in the mixture should belong to different groups.
2. Determination of density by specific gravity bottle and viscosity of the given liquid by Ostwald’s viscometer.
3. Determination of density by specific gravity bottle and surface tension of the given liquid by stalagnometer.
4. Determination of refractive index of pure liquids and mixtures.

18CHY201 HYDROCARBONS, ALKYL AND ARYL HALIDES 3 0 2 4

Objectives: To enable students to develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.

Unit I: Fundamentals of organic reaction mechanism
Addition reactions- mechanisms of addition of Bromine and hydrogen halides to double bonds- Markownikoff’s rule and peroxide effect. Polymerisation reactions - Types of polymerisation - free radical, cationic and anionic – polymerisations – including mechanism.

Unit II: Stereochemistry of Organic Compounds
Optical Isomerism: Structural changes responsible for properties: elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization and asymmetric synthesis. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism: Determination of configuration of geometric isomers. Cis – trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism: Difference between configuration and conformation. Conformational
analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives.


Unit III: Aliphatic Hydrocarbons

Alkanes: Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity. Cycloalkanes: methods of formation (from acetoacetic ester / malonic ester and Dieckmann reaction), chemical reactions (halogenation), Baeyer’s strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings.


Unit IV: Aromatic Hydrocarbons


Unit V: Alkyl and Aryl Halides


Textbooks:

References:

PRACTICALS

COURSE CONTENT:

   - Acids
   - Alcohols
   - Aldehydes
   - Amides
   - Amines
   - Halogenated hydrocarbons
   - Hydrocarbons
   - Ketones
   - Nitro compounds
   - Phenols

18CHY211 THERMODYNAMICS, CHEMICAL EQUILIBRIUM AND ELECTROCHEMISTRY

Objectives: To enable students develop an understanding of Thermodynamics, Chemical Equilibrium and Phase Equilibria, Solutions and Electrochemistry.

Unit I: Thermodynamics
Introduction, definition of thermodynamic terms, intensive and extensive properties, path and state functions, exact and inexact differentials, zeroth law of thermodynamics First law of thermodynamics, reversible and irreversible processes, internal energy and enthalpy, heat capacity, Cp and Cv relation in ideal gas systems, change in thermodynamic properties of an ideal gas during (i) isothermal/adiabatic, reversible/irreversible processes. Joule-Thomson experiment, Joule-Thomson coefficient, inversion temperature.
Second law: Limitations of first law – statements of second law, Carnot’s cycle – efficiency of heat engines, Carnot theorem. Entropy – entropy change for various reversible/irreversible processes,
spontaneous and non spontaneous processes. Change in entropy of an ideal gas with pressure, volume and temperature.

Third law of thermodynamics—statement and significance.


Unit II: Chemical Equilibrium and Phase Equilibria
Recognising a system at Chemical Equilibrium. Attributes of Chemical Equilibrium, Thermodynamic derivation of law of mass action, Equilibrium constant and free energy. Factors that affect the chemical equilibrium and Le Chatelier’s principle. Calculations involving equilibrium constant, Ionic equilibria in aqueous solutions, sparingly soluble salts, solubility product common ion effect, selective precipitation, applications in qualitative analysis.

Ionisation of water, pH scale, weak acids and bases, hydrolysis, buffer solutions, acid Base indicators, acid base titrations and multi stage equilibria. Reaction isotherm and reaction isochore Statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system – water, CO_2 and S systems.

Phase equilibria of two component system – solid-liquid equilibria – simple eutectic –Pb-Ag.

Unit III: Solutions
Solutions of Gases in liquids. Henry’s law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction.

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

Solid solutions – compound formation with congruent melting point (Mg – Zn) and incongruent melting point (NaCl – H_2O), (FeCl_3 – H_2O) and (CuSO_4 – H_2O) system. Freezing mixtures, acetone dry ice. Liquid – liquid mixtures: Ideal liquid mixtures, Raoult’s and Henry’s law. Non-ideal system – Azeotropes – HC – H_2O and ethanol – water systems. Partially miscible liquids – Phenol-water, trimethylamine – water, nicotine – water systems. Immiscible liquids, steam distillation.

Nernst distribution law – thermodynamic derivation, applications.

Unit IV: Electrochemistry
Migration of ions Kohlrausch law, Arrheniues theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald’s dilution law, its uses and limitations.


**Unit V: Photochemistry**

**Textbooks:**

**References:**
1. P. Atkins and J Paula, The elements of Physical chemistry, 7th edn., Oxford University Press,

**PRACTICALS**
1. Determination of heat of neutralization of acids and bases.
2. Verification of Hess’s law of constant heat summation.
3. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
4. pH titration of acid versus base (observation of change in pH).
5. Determination of dissociation constant of a weak acid.
6. Determination of solubility product constant (Ksp) of a sparingly soluble salt.
7. Determination of percentage composition of NaCl by critical solution temperature method (phenol-water system).
8. Determination of distribution coefficient of benzoic acid between water and toulene or acetic acid between water and 1-butanol.
Objectives: To develop an understanding of Transition elements, Coordination compounds, Chemical kinetics, Spectroscopy and Surface Phenomena

Unit I: Chemistry of d and f block Elements
General characteristics of d-block elements with special reference to electronic configuration, oxidation states, variable valency, metallic character, colour, magnetic properties, catalytic properties and ability to form complexes. Comparison of the properties of second and third transition series with first transition series. Chemistry of lanthanides – electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties, spectral properties and separation of lanthanides by ion exchange and solvent extraction methods (Brief study). Chemistry of actinides – electronic configuration, oxidation states, actinide contraction, position of actinides in the periodic table, comparison with lanthanides in terms of magnetic properties and spectral properties (Brief study). Extraction of Thorium, Uranium and Plutonium from burnt nuclear fuels.

Unit II: Coordination Compounds
Werner’s coordination theory and its experimental verification, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of VBT. Elementary treatment of crystal field theory, splitting of d-orbitals in square planar, tetrahedral and octahedral complexes, factors affecting crystal field parameters, Explanation of magnetic behaviour and colour of complexes using CFT, effective atomic number concept. Metal carbonyl, 18 electron rule, Preparation, structure and reactions of Ni(CO)4, Fe(CO)5 and V(CO)6, nature of bonding in metal carbonyls

Unit III: Metallurgy

Unit IV: Chemical Kinetics
Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method. Radioactive decay as a first order phenomenon. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects

Unit V: Spectroscopy

Textbooks:

References:

18CHY311 FUNCTIONAL GROUPS, HETEROCYCLIC COMPOUNDS AND NATURAL PRODUCTS 3003

Objectives:
To develop an understanding of Natural Products, Alcohols and Phenols, Carbonyl Compounds, Organic Compounds of Nitrogen and Heterocyclic Compounds

Unit I: Alcohols and Phenols

Unit II: Carbonyl Compounds
Aldehydes and Ketones: Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Benzoin, aldol,

Unit III: Organic Compounds of Nitrogen

Unit IV: Heterocyclic Compounds

Unit V: Natural Products

**Textbooks:**

**References:**
3. I. L. Finar, Organic Chemistry - Volume I & II - Pearson Education

18CHY381 CHEMISTRY PAPER-VI 0 1 2 2
PRACTICALS

1. To study the effect of dilution on Molar Conductivity of weak and strong electrolytes.
2. Conductometric titrations
3. Potentiometric is titrations.
4. Acid Hydrolysis of Ester
5. Base Hydrolysis of an Ester by Titration and Conductometry
7. Gravimetric estimation of Barium as barium sulphate.

18CHY382 PRACTICALS 0 1 2 2

1. **Organic preparations:**
Recrystallisation and determination of melting point and its importance may be mentioned
(a) Acetylation: Preparation of acetanilide from aniline
(b) Oxidation: Preparation of benzoin acid from benzaldehyde
(c) Nitrilation: Preparation of m-dinitrobenzene from benzene
(d) Hydrolysis: preparation of benzoic acid from ethyl benzoate
2. Quantitative organic analysis (Any four)
   (a) Estimation of aniline by bromate-bromide method
   (b) Estimation of glucose by Fehlings method
   (c) Determination of iodine value of an oil by Vij’s method
   (d) Determination of saponification value of an ester/oil
   (e) Estimation of amino acid by formal titration method
   (f) Estimation of ascorbic acid in Vitamin C tablets by Volumetry
   (g) Estimation of Paracetamol by titrimetric and photo spectrometric methods.
   (h) Gravimetric Analysis of Lead, Iron and Nickel

3. Chromatographic Techniques (Any two)
   (i) Thin Layer Chromatography
       Determination of Rf values and identification of organic compounds:
       (a) Separation of green leaf pigments (spinach leaves may be used)
       (b) Separation of mixture of dyes
   (ii) Paper Chromatography Determination of Rf values and identification of organic compounds:
   (iii) Column Chromatography: Separation of ortho and para nitroanilines

18EDU201 GROWTH AND DEVELOPMENT OF CHILD 2103

Objectives
On completion of the course, the student teacher will
   • situate individual development in a socio-cultural context;
   • develop an understanding about the impact/influence of socio-cultural context in shaping human development, especially with respect to the Indian context;
   • acquire theoretical perspectives and develop an understanding of dimensions and stages of human development and developmental tasks;
   • become aware of the processes of socialisation at home and school that act as shaping factors in identity formation of the school-going child.

Unit I: Learner as a Developing Individual
   1.1 Meaning of childhood, Concept of growth and development, Stages of development
   1.2 Developmental Characteristics of a child
       ➢ Vygotsky’s and Piaget’s - Cognitive development
       ➢ Erikson- psycho social development

Unit II: Adolescence
   2.1 Meaning and characteristics
   2.2 Developmental tasks of an adolescent and their implications
   2.3 Factors influencing development - heredity and environment

Unit III: Personality
   3.1 Concept of personality
3.2 Approaches to personality
3.3 Balanced personality - endocrine system

Unit IV: Contexts of Socialization
4.1 Concept of socialization – role of family
4.2 Schooling: peer influences, relationships with teachers
4.3 Social, economic and cultural differences in socialization

Unit V: Current Issues in Child Development
5.1 Understanding concept of legal childhood
5.2 Constitutional provisions for the young child
5.3 Protecting the rights and cultural practices and ethnic identity of minority children

Suggested activities/practicals/tutorial
- Principles of growth and development
- Influence of media on adolescents
- Adjustment concept and barriers
- Defense mechanisms with examples
- The major requirements of socialization
- The role of school in general and teacher in particular in promoting culture.
- Right to Education Act, 2009, emerging positions of early childhood and the young child in the current five year plan.
- Protection of child’s right to participation (responsive environment) and prevention of child abuse, neglect and protection from punishment.
- Prevention of children at work, protecting and promoting child’s right to play, rest and leisure

References:
- Jeanne, Ellis Ormrod. Educational Psychology: Developing Learners. Fourth Edition
Objectives:
On completion of the course, the student teacher will

- develop basic understanding and familiarity with key concepts—gender, gender bias, gender stereotype, empowerment, patriarchy and feminism;
- analyse gender issues in school, curriculum, textual materials across disciplines and pedagogical processes.
- critically analyse the impact of policies, programmes and scheme for promotion of gender equality and empowerment.
- understand on how school as an institution addresses gender concerns in curriculum, textual materials and pedagogy.
- understand how gender relates to education and schooling.

Unit I:
Gender Roles
1.1 Patriarchy, feminism and gender.
1.2 Meaning of gender roles, influences of gender roles.
1.3 Gender bias, trans-gender, gender stereotyping.

Unit II:
Women Empowerment
2.1 Women empowerment – concept, meaning and need.
2.2 Policy initiatives relating to women empowerment-schemes and programmes relating to various commissions and committees.

Unit III:
Gender and Education
3.1 Gender Identities and Socialisation practices in- family, schools.
3.2 Girls education- issues of access, retention and exclusion-National Policy Beti Bachao Beti Padhao.
3.3 Violence against women- Family, school, work place and media (print and electronic)

Unit IV:
Elimination of Gender Disparity
4.1 Gender disparity and Curriculum-role of Co-Education in eliminating gender disparity.
4.2 Teacher as an agent of change in eliminating gender disparity and gender In-equality.
4.3 Role of society, family, school, counselors,women and Child Welfare Department and Media.

Unit V:
Gender Equality - Issues and Challenges
5.1 Indian Constitutional Provisions relating to women; Violence against women - female infanticide, human trafficking.
5.2 Legal provisions relating to protection of rights of women. Role of UNO.
5.3 Institutions for redressal of sexual harassment and abuse

Suggested Activities / Practicals / Tutorials

- Debate on how boys and girls perceive role models in their own lives
- Preparing analytical report on portrayal of women in print and electronic media
- Organising debates on equity and equality cutting across gender, class, caste, religion, ethnicity disability, and region.
- Preparation of project on critical analysis of recommendations of commissions and policies on capacity building and empowerment of girls and women.
- Project on women role models in various fields with emphasis on women in unconventional roles.
- Debates and discussions on violation of rights of girls and women
- Role plays on women empowerment.
- Brain storming sessions after watching videos of great women.

References:


18EDU211 LEARNING AND TEACHING 2103

Objectives:
On completion of the course, the student teacher will

- comprehend the meaning of teaching and learning
- justify the role of teacher as facilitator
- substantiate teaching as profession
- reflect on his/her own experiences to comprehend the nature and different approaches to learning.
- explore the possibilities of comprehending and analyzing human cognition, designing learning environment and experiences at school.
- acquire knowledge of various theories of learning and analyse their implications for teaching and learning.
- analyse the existing individual differences and influencing factors.
- analyse the nature and process of learning in the context of various learning theories.

Unit I:
Learning and Learning Process
1.1. Educational Psychology – meaning, branches, need and importance for teachers, methods of psychology.
1.2. Learning - meaning, relationship with development, maturation and readiness.
1.3. Issues related to learning – motivation, Memory and Forgetting, Transfer of Learning
   Intelligence - A brief description of theories of intelligence - Modern theories (Howard Gardner, Robert Sternberg).

Unit II:
Learning - Constructivist Perspective:
2.1. Learning as 'construction of knowledge' - 'transmission and reception of knowledge'.
2.2. Perspectives and Theories on human learning: Behaviourist (Pavlov and Skinner),
   cognitive constructivist (Bruner, Piaget, Vygotsky).
2.3. ‘Construction of knowledge’- Experiential learning, reflection and meta-cognition as
   facilitating factors of understanding.

Unit III:
Teaching:
3.1. Meaning, importance, teaching as a profession.
3.2. Preparation for teaching - Need, analysing teaching in diverse contexts, Teacher as a
   guide, facilitator and counselor.
   3.3. Modes of Transaction- Teacher centered, student centered, subject centered,
   co-operative, team approaches, Different strategies and skills of teaching.

Unit IV:
Individual differences among Learners
4.1. Individual differences: Nature, Dimensions of differences in psychological attributes—cognitive abilities, interest, aptitude, creativity, personality, values.
4.2. Accommodating individual differences in the class-room.
4.3. Measurement of individual difference with reference to cognitive attributes (intelligence, aptitude and creativity and non-cognitive attributes (attitude, interest and values)
4.4. Guidance and Counselling: Meaning, types and importance.

Unit V:
Learning and Environment
5.1. Class room as a group and its impact, socialization of the learner, concept of social
   learning, Group cohesiveness, Sociometry.
5.3. Mental Health and hygiene, Adjustment and defense mechanisms.

Suggested Activities / Practical’s / Tutorials
- Study of behavioural patterns of VIII/IX std. students.
- Activities leading to the emergence of creativity or divergent thinking.
• Analysis of a situation and identification of the type of transfer of learning
• Identification of the characteristics of a well-integrated personality by taking the example of celebrities Dr. Radhakrishnan, Mother Theresa, Sir M. Vishweshwaraiah, Mahatma Gandhi, and Aurobindo
• Preparation of a sociogram.
• Case study of a well-adjusted or maladjusted student/person.
• Finding out the educational implications by analyzing the learning theories
• Ravens progressive matrices- nonverbal intelligence test Creativity test.
• Process – Episode, Social Constructivism
• Different situations – Styles and instructional strategies
• Tools – checklist, rubric
• Environment – Facilitating learning, games (group dynamics– facilitating hands on learning) simulations, models and projects.
• Measures to motivate students.
• Defence mechanisms with examples.
• Characteristics of educationally backward and gifted children.

References:

18EDU212 INCLUSIVE SCHOOL 2002

Objectives:
On completion of the course, the student teacher will
• trace the historical perspective of Inclusive Education
• distinguish the concepts of special education, integrated education and inclusive education
• justify the need for Inclusive Education
• analyze critically the needs, problems, causes and educational provisions meant for challenged children
• critically review issues and challenges in inclusive education
• interpret the policies and procedures for inclusive education.

Unit I:
Introduction to Inclusive Education
1.1 Historical perspective.
1.2 Concepts of Inclusion- Special Education, Integrated Education and Inclusive Education.
a. Inclusive Education-need, objectives and scope.

Unit II:
Inclusive school
2.1 Inclusive School – concept, need and planning -barriers free school.
2.2 Factors responsible for successful inclusion in the mainstream – future vision.
2.3 Issues and challenges in creating an inclusive environment in schools.

Unit III:
Differently abled children in Inclusive system
3.1 Concept, Identification, classification, causes and characteristics of children with orthopaedical, visual, auditory, speech, mental, learning challenges, and social disadvantages.
3.2 Educational provisions for children with orthopaedical, visual, auditory, speech, mental, learning challenges, and social disadvantages.

Unit IV:
Policies and Provisions for Inclusion
4.2 Constitutional provisions and RTE Act.

Unit V:
Management of Inclusive School
5.1 Role of functionaries -Parents, Peers, Teachers, Administrators, Community, Government and Private Organizations.
5.1 Class room management -Teacher skills and competencies.

Suggested Activities / Practicals / Tutorials
• Identification of children with orthopaedical, visual, auditory, speech, mental, learning challenges, and social disadvantages.
• International Policies of Inclusive Education
• Case studies-individual/families/institution.
• Visit to special schools.
• Visit to inclusive schools.
• Sociometry of a small group.
• Visit to National institutes, Government organizations and NGO’s.
• Interview – Parents, Peers and Teachers.
• Diagnosis and remedial measures – Procedures to be undertaken.
• Clinical and Psychological tests required.
• Designing evaluation tools- Preparing an Anecdote of an inclusive child.

References:

18EDU280 READING AND REFLECTING ON TEXTS 0 1 2 2

Objectives:
On completion of the course, the student teacher will

• reflect on the objectives of reading.
• analyse the process of reading.
• develop the skills of reading
• explore the problems of reading
• develop the skills of reading
• explore the problems of reading different texts
• develop the skill of documentation, note taking
• develop the habit of reading various texts
• differentiate the styles of reading various texts
• identify different skills and sub-skills of reading
Unit I:

The Reading Process

1.1 Objectives of Reading
1.2 The reading process - Reading variety of Texts
1.3 Types of Reading and Texts - Exploratory reading, Conceptual reading, Historical reading, Policy Documents, Narrative Texts, Expository Texts (Predictive), Autobiographical Texts, Field Experiences, Ethnographies

Unit II:

Reading Comprehension

2.1 Reading Skills – Skimming and Scanning.
2.2 Development - Critical reading, skill reading and writing
2.3 Responding to a text, Own opinion, Writing with in Context

Unit III:

Reading: Pedagogical Aspects

3.1 Role of Language and Pedagogical aspects in Reading.
3.2 Impact of types of reading on students
3.3 Reading of different texts – Science, Mathematics, Language, Social Science, Various Class-room activities to develop reading skills

Unit IV:

Reflections of Reading

4.1 Documentation, Note taking, Reflective Journals, Note making
4.2 Analysis of various text structures
4.3 Difference between reading for comprehension/meaning and reading for pleasure, oral, silent reading, aural-oral-visual

Unit V:

Reading and Evaluation

5.1 Uses of Reading - Check the Prediction, Answers to Question, Summarises the texts Influence on Writing
5.2 Evaluation of loud reading – check pronunciation, use of punctuations, pause, stress.
Suggested Activities / Practicals / Tutorials
- Identifying various reading materials, texts etc.,
- Differentiating various texts
- Analyse various text structures
- Activities to enhance comprehensive skills.
- Opportunities to be provided to prepare policy documents, reports about school functioning, documenting once own experiences in the school.
- Developing recording skills, reflecting on existing available documents of field notes

References:

18EDU281 DRAMA AND ART IN EDUCATION 0 0 2 1

Objectives:
On completion of the course, the student teacher will
- get familiarized with the concept of Art education
- identify the varieties in art education
- accept challenges of art in education
- analyse the benefits of art education
- identify the Current trends of Art in Education
- bring out the role of art in the student’s academic achievement
- describe various teaching techniques of art in education
- use technology in art in education
- practice art supporting teaching strategies
- get practical experience in using art in education

Unit I:
Introduction to Drama and Art in Education
  1.1 Historical concept, need and importance
  1.2 Nature and interpretation of Drama and Art in Education

Unit II:
Role of Drama and Art in Education
  2.1 Role of Arts- Visual, fine, performing and digital
  2.2 Arts in Education for all-round development of an individual

Unit III:
Add on effects of Arts and its various forms in Pedagogy
  3.1 Capacity Building programme-self-expression and exploration of
Creativity.

3.2 Current trends - Interpersonal, Intercultural sensitization and Instructional mode of classroom teaching.

3.3 Employs maxims of teaching - Known to Unknown, Particular to General Achievement and performance.

3.4 Role of Art Education in inclusive schools and specially abled children

Unit IV:

Performing Art Forms and Artists

4.1 Identification of different performing art forms and artists: Dance, Music and Musical Instrument, theater, Puppetry etc.

4.2 Drama, Arts & Music - Critically analyze and Review - prepare questionnaire-opinion air Dance and other Arts

Unit V:

Mode of Evaluation - Follow up

5.2 Organization and evaluation of various school programmes and reporting/criteria to be followed in arranging stage

5.2. Indian festivals and its contribution to the arts

Suggested Activities / Practical / Tutorials

- Select the appropriate mode of art to transact textual information in the class and prepare a lesson plan.
- Prepare scripts for drama, dance drama, and art supporting programme for school curriculum
- Attend and observe various cultural activities conducted by various organizations and write a synopsis
- Visiting art galleries and preparing a report
- Conducting interviews with great artists and performers: video recording
- Undertake Survey to assess the importance and application of art in education
- Conduct competitions during important days - music, drawing, dance, collage making, role play and skits etc.
- Conduct school level exhibitions of drawing, paintings, charts, artifacts, greeting cards, placards and games etc.
- Watching various cultural programme and videos on television and internet List out the educational benefits
Objectives:

On completion of the course, the student teacher will.

- develop skills to work on the application programs in MS Office Suite.
- become aware of the on-line services.
- applies the knowledge of computers across the school curriculum.
- prepare and present materials for day-to-day teaching-learning process.
- evaluates digital lesson plan/project/presentation
- uses computers as research, communication and publishing device.
- be aware of the meaning, nature and scope of ICT in Education.
- get acquainted with structure, hardware and software of computer.
- identify the changes that occur due to ICT in Education.
- prepare students to select the appropriate communication facilities through Internet.
- will have the awareness of legal and Ethical issues related to internet and student safety.
- would adopt the knowledge of ICT in teaching learning strategies.
- get acquainted with e-learning and its development in ICT.

Unit I:

Word Processor-MS Word and Spread Sheets-MS Excel

1.1 Document-creation of a new or opening of an existing file and saving
1.2 Entering text-editing and formatting-using insert options
1.3 Working with tables and drawing tools
1.4 Page setting and printing a document
1.5 Worksheet-creation of a new/opening of an existing /saving
1.6 Entering data-inserting and deleting rows, columns and worksheets- formatting
1.7 Use- sort- filter options and formulae functions
1.8 Inserting charts

Unit II:

Presentations- MS Power Point

2.1 Slide-creation of a new presentation or opening of an existing presentation -editing and saving
2.2 Enhancing the knowledge -slides using colors, backgrounds & templates
2.3 Inserting clipart, audio/video clips and Animating slides
2.4 Presentation of slides.
Unit III:

Uses of ICT in teaching and learning process & On-line services

3.1 Worldwide web-browsing, search engines, downloading, printing
3.2 Facilities available for Communication e-mail - creating, sending mails, and Attachments, checking, chat, online conferencing,
3.3 e-Library, websites, Blog, Internet forum, News Groups;
3.4 E-Learning, Virtual Classroom
3.5 Legal and copyright
   a. Issues regarding downloading materials from Internet

Suggested Activities / Practicals / Tutorials

- Development self-instruction / Program instruction / computer assisted instruction material for any unit of any school subject of your choice.
- Discussion on legal and ethical issues regarding internet
- Policies on Cyber crimes
- Impact of ICT on socio-cultural, political and economic spheres.
- Prepare any programme pertaining to ICT

References:

- Assessment and Evaluations - P.G. Pnog
- Instructional system Design - Instructional Technology V.K. Rao
- Computer fundamentals - Arora Bansal
- Information and communication - Kishore, Chavan
- Information Technology - Dyne, Nandkishore
- Crumlish Christian - ABC o internet
- Fun of computer - Singh and Sukhvir
- ICT strategies of for school - Mohenty Laxman
- Intel Teach to the Future pre-Service Version 2.0 manual

18EDU301 PEDAGOGY OF PHYSICS 2023

OBJECTIVES

On completion of the course, the student teacher will

- acquire the knowledge of nature and Scope of Physics.
• Analyse the importance of Physics in life, objectives and values of teaching Physics, content categories of Physics, approaches and methods of teaching Physics.
• Develop the skill of analysing Physics in terms of content and learning experiences.
• Stating objectives in behavioural terms.
• Appreciate the role of Physics in daily life.
• List out the different resources for teaching Physics.
• Develop the skill of selecting and using appropriate media and materials while teaching lessons in Physics.
• Preparing learning aids, conducting experiments and demonstrations in Physics.

COURSE CONTENT

Unit I: Introduction
1.1 Meaning, nature, scope and values.
1.2 Components of scientific knowledge - process and product.
1.3 Importance of Physics in daily life and growth of knowledge.

Unit II: Planning and Approaches
2.1 General aims and objectives of teaching Physics.
2.2 Writing instructional objectives in behavioural terms (Bloom's/Anderson's revised taxonomy).
2.3 Anderson's constructivist base for lesson planning.

Unit III: Methods of Teaching Physics
3.1 Approaches, methods and models of teaching.
3.2 Concept of correlation - incidental and systematic correlation of Physics - Interdisciplinary and intra-disciplinary.

Unit IV: Teaching and Learning Resources in Physics
4.1 Library resources: Textbooks, Reference Materials.
4.2 Laboratory, importance and uses of laboratory manuals.

Unit V: Technological and Community Resources in Physics
5.1 Technological resources: Audio-visuals materials, Virtual labs, Smart Class, Multimedia and E-learning resources.
5.2 Community resources and improvised aids.

Suggested Activities / Practicals / Tutorials / Practicum

• Contribution of Scientists in the field of Physics.
• Physics as an integral part of science.
Importance, Steps/features, Merits and limitations of Inductive and Deductive methods, Lecture cum Demonstration method, Problem solving method

- Identifying different components of scientific knowledge in the given context
- Development of scientific attitude among students
- Critical analysis of formulation of instructional objectives in behavioural Terms
- Construction of self-instructional materials
- Preparation of Power point presentation – Slides
- Planning and designing for Laboratory work
- Preparing the list of experiments to be conducted in the laboratory.
- Preparing lesson plan for different methods and models of teaching.

References:

Objectives:
On completion of the course, the student teacher will

- acquire the knowledge of
  - nature and scope of mathematics.
  - history of mathematics.
- develop an understanding about
  - values and objectives of teaching mathematics.
  - content categories of mathematics.
  - approaches and methods of teaching of mathematics
- develop skill of
  - preparing lesson plan and unit lesson plan and year plan
  - critically analyze current mathematics text books
- appreciate
  - the role of mathematics in daily life.
  - contribution of Indians, Greeks and Arabs to mathematics.
  - structure of mathematics.

Unit I: Introduction
1.1 Numbersystem, Set, Progression of numbers, Profit and Loss, Banking, Statistics
1.2 Introduction to Algebra, Exponents, Factorisation, HCF and LCM, Simultaneous, Linear Equations, Variations
1.3 Introduction to Geometry, Triangles, Polygons, Quadrilaterals, Circles, Basic concepts of Trigonometry

Unit II: Introduction to Teaching of Mathematics
2.1 Nature of Mathematics
2.2 Mathematics as a language
2.3 Use of Mathematics in daily life and other branches of study
2.4 Contribution of Indians, Greeks and Arabs to Mathematics
2.5 Value of History of Mathematics to a mathematics Teacher
2.6 Values of Teaching Mathematics

Unit III: Planning for Teaching Mathematics
3.1 General Objectives of Teaching Mathematics at the Secondary School Level.
3.2 Writing Instructional Objectives in Mathematics
3.3 Preparation of Year Plan, Unit Plan and Lesson Plan (Constructivist Approach).
3.4 Content categories in Mathematics: Concept and Facts.
3.5 Content analysis of secondary school mathematics curriculum.

Unit IV: Approaches for Teaching Mathematics
4.1 Teaching of Concepts: Concept Attainment Model
4.2 Teaching of Generalizations- Inductive and deductive approaches
4.3 Problem Solving Approach

Unit V: Resources for Teaching Mathematics
5.1 Printed Resources: Text books, Work books and Resource unit
5.2 Audio – Visual Resources & Computers.
5.3 Websites related to Mathematics Education.

Suggested Activities / Practicals / Tutorials / Practicum

- Contribution to Indians and others to Mathematics
- Values of Teaching Mathematics
- Content categories in Mathematics
- Methods of teaching- steps and importance
- Resources for teaching mathematics
- Logical thinking in mathematics
- Formulating instructional objectives
- Preparation of unit plan and lesson plan
- Content analysis of the topics from state mathematics 8th and 9th text books
- Text book analysis- comparative study
- Developing workbooks
- Developing learning aids/transparencies

References:

- Polya, G. (1985), How to Solve it, New Delhi, Prentice Hall, Private Ltd.
Objectives

On completion of the course, the student teacher will

- acquire the knowledge of nature and scope of Chemistry.
- analyse the importance of Chemistry in life, objectives and values of teaching chemistry, approaches and methods of teaching of Chemistry.
- develop the skill of analysing Chemistry in terms of content and learning experiences
- stating objectives in behavioural terms
- appreciate the role of Chemistry in daily life.
- list out the different resources for Teaching Chemistry.
- develop the Skill of selecting and using appropriate media and materials while Teaching lessons in Chemistry
- preparing Learning Aids, conducting experiments and demonstrations in Chemistry

Unit I: Introduction
1.2 Components of Scientific Knowledge- Process and Product.
1.3 Importance of Chemistry in daily life and growth of knowledge.

Unit II: Planning and Approaches
2.1 General aims and objectives of teaching Chemistry.
2.2 Writing instructional objectives in behavioural terms (Blooms/Anderson’s revised taxonomy)
2.3 5E base for lesson planning.

Unit III: Methods of Teaching Chemistry
3.1 Approaches, methods and models of teaching.
3.2 Concept of correlation- incidental and systematic correlation of physical sciences- Interdisciplinary and intra disciplinary.

Unit IV: Teaching and learning resources in Chemistry
4.1 Library Resources: Text books, Reference Materials
4.2 Laboratory, Importance and uses of Laboratory Manuals.

Unit V: Technological and Community resources in Chemistry
5.1 Technological resources: Audio-Visuals Materials, Virtual labs, Smart Class, Multimedia and E-learning resources.
5.2 Community resources and improvised aids.

Suggested Activities / Practicals / Tutorials/Practicum
- Contribution of Scientists in the field of Chemistry.
- Physical science as an integral part of science.
- Importance, Steps/features, Merits and limitations of Inductive and Deductive methods, Lecture cum Demonstration method, Problem solving method
- Identifying different components of scientific knowledge in the given context
• Development of scientific attitude among students
• Critical analysis of formulation of instructional objectives in behavioural Terms
• Construction of self-instructional materials
• Preparation of Power point presentation – Slides
• Planning and designing for Laboratory work
• Preparing the list of experiments to be conducted in the laboratory.
• Preparing lesson plan for different methods and models of teaching.

References:


18EDU311 ADVANCED PEDAGOGY OF PHYSICS 2023

OBJECTIVES

On completion of the course, the student teacher will

• Develop the skill of analyzing the Physics content in terms of content and learning experiences
• State objectives in behavioural terms, prepare Year Plan, Unit Plan and Lesson Plan.
• Acquire the knowledge of professional Competencies of a Physics Teacher.
• Conduct experiments and does demonstrations in Physics
• Construct Achievement and Diagnostic Tests, organise Co-Curricular Activities.

COURSE CONTENT
Unit I:
Co-Curricular Activities in Physics
1.1 Meaning, Importance and organization of Science Club.
1.2 Organization of activities of Science Club - Field Visits, Science fair, exhibition, 
Museum, celebrating ‘Days of Scientific Significance’.

Unit II:
Tools of Assessment in Physics
2.1 Construction of an achievement test, Portfolios, Checklists and rubrics
2.2 Different types of test items – merits and demerits.

Unit III:
Testing and Evaluation in Physics
3.1 Diagnostic test and remedial teaching in Physics.
3.2 Evaluation through projects, seminars and assignments.

Unit IV:
Role of Teacher
4.1 Qualities of a Physics Teacher
4.2 Competencies of a Physics Teacher

Unit V:
Professional Qualities of Teacher
5.1 Professional growth of a Physics Teacher.
5.2 Professional ethics of a Physics Teacher.

Suggested Activities / Practicals / Tutorials
Tutorials:
- Preparation of blue print
- Preparation of Test Items.
- Preparation of a well-balanced question paper for 8<sup>th</sup> and 9<sup>th</sup> std
- Preparation of work book for existing 8<sup>th</sup> and 9<sup>th</sup> Physics text book
- Preparation of self-evaluation tool
- Preparation of different types of questions for different levels of learning and analysis
- Procedure to be followed for item analysis and its interpretation

Practicum
- Organization of a science club
- Organization of science fair, science competitions, field trips and exhibition with 
  reference to Physics.
• Expected and existing competencies of a Physics teacher
• Preparation of model question paper with blue print

Textbooks:
• Monika Davar (2012). Teaching of Science, New Delhi: PHI learning private Ltd.

References:
• Chikkara and Sharma (2000). Teaching of Biological Science (Life Sciences), Ludhiana: Tandon Publications.
• Promila Sharama (2009). Teaching of life science, New Delhi: A P H Corporation Ansari Road, Darya Ganj
Objectives:
- On completion of the course, the student teacher will
- acquire the knowledge of Professional Competencies of a Mathematics Teacher.
- develop an Understanding about extended curricular activities for Teaching Mathematics.
- develop Skill of
  - Constructing Achievement and Diagnostic Tests.
  - Organizing Co-Curricular Activity.

Unit I: Curricular Activities
1.1. Mathematics Projects.
1.2. Developing Mathematics Laboratory
1.3. Mathematics club

Unit II: Recent trends in Mathematics
2.1. Co-operative Learning
2.2. Mathematics Olympiad
2.3. Use of Calculators, m-learning

Unit III: Assessment in Mathematics
3.1. Construction of Unit Test
3.2. Preparation of Balanced question paper
3.3. Evaluation of Projects and Assignments
3.4. Diagnosis and Remediation – Diagnostic Test Construction.
3.5. National Talent Search Scheme.

Unit IV: Mathematics Teacher
4.1. Qualities,
4.2. Professional Competencies

Unit V: Professional Development
5.1. Professional Development: in-service Programes, Continuing Education, Research Activities – Action Research,
5.2. Seminars, Workshops and Conferences
5.3. Teacher Associations – NCTM, AMTI, AISMTA

Suggested Activities / Practicals / Tutorials/Practicum
- Achievement test - concept and importance
- Diagnostic test
- Mathematics club activities
- Teacher associations-functions
- Review of articles related to mathematics teaching
- Interaction with students of other colleges of education.
• Conducting Action Research (Practice-in-teaching)
• Organizing mathematics quiz (Practice-in-teaching).

References:
• Polya, G, (1985), How to Solve it, New Delhi, Prentice Hall, Private Ltd.

18EDU313 ADVANCED PEDAGOGY OF CHEMISTRY 2023

Objectives:

On completion of the course, the student teacher will
• Develop the skill of analyzing the Chemistry content in terms of content and learning experiences
• State objectives in behavioural terms, prepare Year Plan, Unit Plan and Lesson Plan.
• Acquire the knowledge of professional Competencies of a Chemistry Teacher.
• Conduct experiments and does demonstrations in Chemistry
• Construct Achievement and Diagnostic Tests, organise Co-Curricular Activities.

Unit I: Co-Curricular Activities in Chemistry
  1.1 Meaning, Importance and organization of Science Club.
  1.2 Organization of activities of Science Club - Field Visits, Science fair, exhibition, Museum, celebrating ‘Days of Scientific Significance’.

Unit II: Tools of Assessment in Chemistry
  2.1 Construction of an achievement test, Portfolios, Checklists and rubrics
  2.2 Different types of test items – merits and demerits.

Unit III: Testing and Evaluation in Chemistry
  3.1 Diagnostic test and remedial teaching in Chemistry.
  3.2 Evaluation through projects, seminars and assignments.

Unit IV: Role of Teacher
4.1 Qualities of a Science Teacher
4.2 Competencies of a Science Teacher

Unit V: Professional Qualities of Teacher
5.1 Professional growth of a science Teacher.
5.2 Professional ethics of a Science teacher.

Suggested Activities / Practicals / Tutorials/Practicum
- Preparation of blue print
- Preparation of Test Items.
- Preparation of a well-balanced question paper for 8th and 9th std
- Preparation of work book for existing 8th and 9th Physical science text book
- Preparation of self-evaluation tool
- Preparation of different types of questions for different levels of learning and analysis
- Procedure to be followed for item analysis and its interpretation
- Organization of a science club
- Organization of science fair, science competitions, field trips and exhibition with reference to Physical science.
- Expected and existing competencies of a Physical science teacher
- Preparation of model question paper with blue print

References:


18EDU381 SKILL DEVELOPMENT

1. Microteaching –

a. Core teaching skills:
   • Skill of introducing a lesson
   • Skill of explaining
   • Skill of illustrating with examples
   • Skill of fluency in questioning

b. Subject Specific Skills:
   • Skill of drawing diagrams
   • Skill of drawing mathematical constructions
   • Skill of reading aloud
   • Skill of stimulus variation

2. Practice of Communicative Skills

18EDU390 INTERNSHIP - I

During the first phase of internship the student teachers have to spend 4 weeks by visiting various government offices like DIET, BRC, BEO and to various residential and special schools. It includes the observation and recording of various functions happening in the offices, observing senior teachers classes, teaching learning process, methodologies used in special schools and to familiarize with the existing educational scenario of the respective states. It shall provide for sustained engagement with learners and the school (including engaging in continuous and comprehensive assessment for learning), thereby creating a synergy with schools in the neighborhood throughout the course.

ASSESSMENT INDICATORS OF SCHOOL INTERNSHIP I

Internship Programme I
1. Visiting and recording information on various government offices and schools.
2. Reports on senior class teachers observation, facilities of the school, activities in the school (both curricular and co-curricular)
3. Development of a tool to evaluate the classroom performance of teachers
4. Report writing
5. Presentation

18EDU501 ASSESSMENT FOR LEARNING 2103

Objectives:
On completion of the course, the student teacher will
- gain a critical understanding of issues in assessment and evaluation
- become cognizant of key concepts, such as formative and summative assessment, evaluation and measurement, test, examination
- be exposed to different kinds and forms of assessment that aid student learning
- be acquainted with the use of a wide range of assessment tools and learn to select and construct these appropriately
- Evolve realistic, comprehensive and dynamic assessment procedures that are able to keep the whole student in view.

Unit I:
Assessment and Evaluation
1.1. Modality - assessment - measurement - test - examination - evaluation - marking scheme - ranking - grading and on-line examination
1.2. Purposes of assessment - assessment in a constructivist paradigm.
1.3. Classification of assessment - formative and summative, CRT (Criterion-Referenced Test) and NRT (Norm-Referenced Test); Peer assessment and Self-assessment.
1.5. Distinction between 'Assessment of Learning' and 'Assessment for Learning'

Unit II:
Assessment of Formal Learning
2.1. Taxonomy of educational objectives – Blooms and Anderson’s revised classification of objectives.
2.2. Assessment of cognitive learning-
2.3. Assessment of affective learning – attitudes, aptitude and interest; items and procedure for assessment.
2.5. Construction of a Unit test – three dimensional Blueprint.

Unit III:
Assessment for Learning
3.1. Assessment for information as an input of learning.
3.2. Assessment devices - Assignments, projects, seminars, practical works, and performance based activities and reports.
3.3. Using assessment feedback for further learning (both teacher and student)
3.4. Developing performance test (rubrics for portfolio assessment)
3.5. Organising and planning for student portfolios.
Unit IV: Evaluation Mechanism and Examination System

4.1. Examination - Need and types, objectives and uses of objective test, achievement test, entrance test, paper pencil test, on-line examination, open book examination and question bank.

4.2. Critical analysis of prevailing examination system on student learners and stakeholders

4.3. Purpose of Examination grade placement.

4.4. Directions for Examination Reform: Introducing flexibility, improving quality of questions papers, Examination management, Scheme of valuation.

4.5. Analysis of test results - Alternative modes of certification, School-based credits, CBCS and Role of ICT in examination.

Unit V: Data Analysis, Interpretation and Follow-up

5.1. Data Analysis – significance and uses - Presentation of data – tabulation and graphical representation-frequency polygon.

5.2. Analysis of data - Measures of central tendency, variability, relationship types and uses.


5.4. Follow-up; Diagnosis and remediation

Suggested Activities / Practicals / Tutorials

- School visits followed by presentation on evaluation practices in schools.
- Data processing and interpretation of achievement test performance of school students.
- Presentation of papers on issues and concerns / trends in assessment and evaluation.
- Presentation of papers on examination and evaluation policies.
- One sessional test.
- Construction and administration of an achievement test - Classification, tabulation and graphical representation of data as well as interpretation of data.
- Construction and administration of a diagnostic test and suggesting appropriate remedial measures.
- Construction of observation schedule, rating scale, check lists, attitude scale, interest inventories.
- Development of a question bank.
- Critical analysis of question papers.
- Planning of other assessment tools.

References:


- Ram Bahia Patel – Evaluation Theory and Practice...

18EDU511 KNOWLEDGE AND CURRICULUM 2002

Objectives:
On completion of the course, the student teacher will

- reflect on the nature and role of disciplinary knowledge
- facilitate learner to construct knowledge through various disciplines.
- analyze the nature of each discipline connected with the curriculum
- identify different disciplines connected with school education
- investigate the emergence of each existing discipline in the school education
- reflect on the nature and role of curriculum
- explore the present status of disciplines in the school curriculum
- analyze the modern societal demand for various disciplines
- create interdisciplinary curriculum
- analyse the different approaches to curriculum development
- explain the learner, constructivist, activity based centered approaches
- analyse modern concerns of curriculum
- distinguish between knowledge and skill, teaching and skill - knowledge and information
- identify various dimensions of the curriculum and their relationship with the aims of education
Unit I:
Knowledge and Disciplines
1.1 Knowledge – concept, nature, importance.
1.2 Distinction between – Knowledge and Wisdom, Knowledge and Skill, Knowledge and Information, Teaching and Training, Reason and Belief.
1.3 Discipline- concept, role, need.

Unit II:
Knowledge resources accumulation
1.1 Knowledge generation- Modes - Activity ,Discussion – Dialogue
1.2 Impact of Modernization and democracy.
1.4 Concept of Nationalism, Universalism and Secularism and their relationship with education

Unit III:
Nature importance and development of School Curriculum
1.1 Nature-Meaning and importance of Curriculum – Syllabus and distinction
1.2 Types of curriculum.
1.3 Approaches to curriculum development. -Subject centered, teacher centered, Learner centered, Dialogue centered, Activity based approaches.

Unit IV:
Curriculum Construction
1.1 Principles and Components
1.2 Impact of policies in curriculum construction
1.3 Preparation of text books-children’s literature-teachers’ handbooks .

Unit V:
Agencies of curriculum
5.1 Role of agencies in curriculum development- State and National level - DSERT, NCERT, CBSE, NCTE, UGC, NIEPA, and Universities.
5.2 Role of School formal agency.

Suggested Activities / Practicals / Tutorials
• Critical analysis of existing curriculum at primary and secondary levels and their assessment.
• Revising curriculum based on global market needs.
• Teachers handbook its need and content.
• Different modes of knowledge generation
• Subject-centered, learner- centered, activity centered
• Constructivist approach to teaching.
• Hidden curriculum and its role
• Case studies of schools. (Curriculum)
• Observation in schools and other field visits.
• Panel or group discussion on issues in education.
• Recording of observations and experiences of various culture groups.

References:
• Von Glasersfeld E (1989), Cognition, Construction of knowledge and teaching synthesis. 80 (1), 121-140.

18EDU512 SCHOOL MANAGEMENT 2103

Objectives:

On completion of the course, the student teacher will
• comprehend the meaning of School Management and highlights the basic principles of School Management.
• justify the need for institutional planning
• infer the need of maintaining different school related records
• reflect critically on supervision of school, staff and activities.
• generate a plan on the institutional functions.
• evaluate the existing infrastructure and functioning of the school
• describe the administrative structure of the State Board of Education
• differentiate the function of a teacher and the Head of the Institution
• prepare and maintain the school records

Unit I:

School Management
1.1 School Management – Concept, meaning, principles, importance, distinction between Administration, Management and Supervision
1.2 Administrative Head – Qualities, Duties and Responsibilities,
1.3 Supervision and Inspection – Meaning, importance, types and procedure - Accountability – meaning and need.
1.4 Physical Infrastructure – Availability, adequacy and utilization, management of space, constraints and suggested strategies to overcome it, Concept of School plant.

Unit II:

Planning of School Management and School Activities

2.1 Institutional planning – Meaning, need, importance, steps and areas
2.2 School records and registers – need, importance and maintenance.
2.3 Calendar of events and School timetable – importance, types, preparation and principles involved in their construction.
2.4 Concept of School complex – meaning, purpose, functions and advantages - Role of SDMC.
2.5 Co-curricular activities – Meaning – importance - planning and principles.
2.6 Parent Teacher Association – Formation - role- importance and school organization functions.

Unit III:

Teacher

3.1 Teacher- Teacher as a facilitator, counselor - community leader - second parent and guardian
3.2 Professional skills and competencies of teachers.
3.3 Class room management – concept, principles, influencing factors and technique of class room management, importance of discipline.

Unit IV:

Action Research

4.1 Action Research – Meaning, scope, importance, identification of problem in school and classroom, steps involved in action research.
4.2 Teacher as a researcher

Unit V:

Role of Voluntary, Government and Non-Government Organisation

5.1 Educational Administration –Role and hierarchy (NCERT, DSERT, DIET)
5.2 Structure of State Educational Administration and Supervision – external and
internal hierarchy

5.3 Role of different boards in monitoring, supervising - supervision report-
educational ladder (DDPI, Block Education Office)

Suggested Activities / Practicals / Tutorials
- A critical study of the working of parent-teacher association in any two secondary schools.
- Preparation of an institutional plan.
- A critical survey of co-curricular activities in a secondary school.
- Preparation of an action plan and its implementation.
- A critical study of school health programmes in a secondary school.
- A critical survey of school records maintained in a secondary school.
- Preparation of school time table
- Preparation of an academic calendar/school calendar
- Analysis of the changed scenario in the inclusive school and prepare a report on it.
- Teacher competencies, Service record
- Head of the Institution
- Teacher Accountability for quality improvement
- Role of CCA.
- Activities facilitating all round development of students.
- Structure of Administration of State and Central (Comparative Study)

References:
Objectives:
On completion of the course, the student teacher will
- develop an understanding of the concept and aims of education.
- acquire an awareness of the development of education in India.
- analyse the divergent philosophies behind education and their implications.
- analyse the diversities, unifying factors, constitutional provisions
- appreciate the role of education in national development.
- comprehend the integral relationship between education and society.
- comprehend the nature of contemporary Indian society-social, economic and political environment-with reference to the educational systems.
- get acquainted with various levels of education in India.
- develop proper attitude towards solving social and academic problems in the school today.
- explore the significant role to be played by teachers as agents of social change in India.

Unit I:
Education as an evolving concept
1.1 Concept and Aims of Education
1.2 Education in India - Ancient, Medieval and Western systems of education in India
   (Macaulay’s Minutes and Wood’s Dispatch), Education Commissions in pre Independence India(Hunter’s Commission, Sargant Report)
1.3 Relationship between Philosophy and Education
1.4 Contributions of Indian Philosophers in Education - Swami Vivekananda, Rabindranath Tagore, Mahatma Gandhiji and Sarvepalli Radha Krishnan

Unit II:
Constitutional provisions related to education
2.1 Directive Principles of State Policy, Fundamental Rights and Duties
2.2 Articles related to education (15, 16, 17, 19, 21, 21a, 24, 28, 29, 30, 45, 350,350a)
2.3 Constitutional values related to education.

Unit III:
Policies and Programmes
3.2 NPE 1986, Revised NPE (1992)
3.3 Sarva Shiksha Abhiyan (SSA) - Akshara Dasoha, Nali – Kali, Chaitanya, Edu sat.
3.4 RMSA, RTE Act (2009), RUSA, Role of DIET’s, NCERT, DSERT and NCTE.
3.5 Higher education system- structure and role of UGC and NUEPA

Unit IV:
Diversities in India
  4.1 National and emotional integration
  4.2 Indian society - Unity in diversity, inequality and marginalization.
  4.3 Languages and media of instruction in schools

Unit V:
Education in the global context
  5.1 Liberalization, Privatization and Globalization in education (L.P.G.)- Implications for quality and expansion
  5.2 Education as investment – Human resource development
  5.3 Education for international understanding

Suggested Activities / Practical’s / Tutorials
- Ongoing programmes of Elementary and Secondary Education introduced by Government of Karnataka and at National Level.
- Indian concept of Education.
- Contribution of Swami Vivekananda, Rabindranath Tagore, Mahatma Gandhiji and Sarvepalli Radha Krishnan to the development of education.
- Role of MHRD.
- Study any one of the State and Centrally Sponsored schemes of education and submit a report on it.
- An analysis of the present educational situation in India in terms of policies of the Government\ reservation\ vocationalisation etc. and present a report on it with suggestive measures to improve the present status.
- A study of hurdles in fulfilling the Constitutional provision in respect of article 15,16,17,18,19,2,21a,28,29,30 and 45,350 and 350a.
- Critical Analysis of the implication of Right to Education Act – 2009
- Collect and interpret the data regarding the output of Sarva Shikshana Abhiyana (SSA)
- Discuss the comments/views on on-going programmes Akshara Dasoha, Nali – Kali, Chaitanya, Edu sat.
- Conduct a seminar on the Aims and objectives of “Rastreeya Madyamika Shikshana Abhiyana (RMSA).

References:
- NCERT (1985). Teacher and Education in Emerging Indian Society, New Delhi, NCERT.
• Yadav and Yadav (1990) *Education in Emerging Indian Society*, New Delhi, Tandon Publications
• NCERT. (2005). National curriculum framework. NCERT.
• pathshala.nic.in/wp-content/doc/NCF/Pdf/teacher_edu_final.pdf

18EDU531 EDUCATIONAL RESEARCH 3 0 0 3

Objectives:

On completion of the course, the student teacher will

• acquire knowledge of research in the field of education
• know the fundamental principles and functions of educational research.
• review the educational research articles
• understand the steps involved in educational research
• develop a research proposal
• equip the students with the required knowledge about the ethical issues related to research
• explain a sampling design appropriate for a research study
• understand the use of different tools and techniques in educational research
• understand the role and use of statistics in educational research
• equip the students to prepare and to evaluate research reports
Unit I:

Introduction to Educational Research
1.1. Research – meaning, definition and its importance.
1.2. Educational research – meaning, definition, significance of educational research, need for scientific approach to research, kinds of educational research.
1.3. Steps of educational research – identification of a research problem, review of literature, formulation of objectives and hypothesis, finalization of research design, collection of data, analysis of data and interpretation and report of results.
1.4. Preparation of research proposal.

Unit II:

Research Ethics
2.1. Research Ethics – meaning and ethical treatment of participants
2.2. Ethical issues in educational research.

Unit III:

Research Designs
3.1. Research Design – meaning and criteria of a good research design
3.2. Quantitative research – historical research, case study and ethnography.
3.3. Qualitative research – survey and experimental research
3.4. Sampling – meaning, steps in sampling design, types of sampling design
3.5. Methods of data collection – types of data – primary data collection methods – observation, experimentation, simulation and interview.
3.6. Tools for collecting data – Questionnaire, observation schedules, rating scales.

Unit IV:

Analysis and Presentation of Data
4.1. Processing of data – Editing, coding, classification, tabulation,
4.2. Graphical representation of data - frequency tables, mean, bar charts, pie charts, histograms, cross tabulation, other table based analysis, Descriptive and inferential statistics
4.4. A brief introduction to hypothesis testing.

Unit V:

Report Writing and Presentation
5.2. Writing a report - Planning report writing, format of a research report, report writing stages,
5.3. Presentation.

**Suggested Activities / Practicals / Tutorials**

- Prepare a Research Proposal.
- Preparation, Try Out and finalization of a tool
- List out the ethical issues related with the research and conduct a discussion on it
- Participate and Present the paper in workshop, Seminar and Conferences.
- Identify a problem and submit an Action Research report.
- Select a topic of your choice and write Literature Review
- Preparation of Research report

**References:**

- Neuman, W.L. (1997), Social Research Methods: Qualitative and Quantitative Approaches, Allyn and Bacon, Boston.
- R.P.Bhatnagar (Ed.) *Readings in Methodology of research in Education* ;Meerut , R Lall Book Depot,2002
18EDU532 GUIDANCE AND COUNSELLING

Objectives:

On completion of the course, the student teacher will
- take up minimum guidance programme at the high school level
- understand the history, principles, scope, needs of guidance and counselling
- acquaint with the knowledge of different techniques of guidance and counselling
- develop the skills of using the tools and techniques to know the abilities, interest of high school pupils
- explore the process of collection and dissemination of occupational information

Unit I:

Guidance

1.1 Guidance – Meaning, nature, principles uses with reference to schools.
1.2 Educational guidance–meaning, objectives, nature, scope, promotion of parental collaboration, role of Schools.
1.3 Vocational guidance- meaning, objectives, need and role of schools, peer and parents influence, societal needs.

Unit II:

Guidance Services

2.2. Types of Guidance Services –orientation, pupil inventory, placement, counseling and follow up.
Unit III:

**Tools and Techniques of Guidance:**

3.2. Tools and techniques for collecting data – observation, rating scales, anecdotal records, sociometry, case study, cumulative records, fact finding interview.
3.3. Self-Report - Personal data blank, autobiography, diary.

Unit IV:

**Counselling**

4.1. Counselling – meaning, nature, distinction between guidance and counselling, important features, steps of counselling process, different approaches of counselling - directive, non-directive, eclectic, Types of Counselling – Individual, Group – Group counselling process – Differentiate Group Guidance and Group Counselling - qualities and qualifications of a counsellor.
4.2. Basic skills in Counselling - observation, communication, making notes and reflections, interview, history, developing case histories of adolescence – physical/mental/emotional/social, documenting information, Analysis working with other professionals, further planning.

Unit V:

**Counseling for Children with Special Needs**

5.1. Ethics in counselling, legal responsibilities
5.2. Guidance and counselling for children with special needs - role of teacher in dealing students with special needs.

**Suggested Activities / Practicals / Tutorials**

- Differences between educational and vocational guidance.
- Discrepancies in Indian and Global counselling.
- Brief history of guidance movement in India
- Highlighting identifying adolescence problems.
- Conduct an action research on a problem that is most prevalent in schools which immediate attention of a guidance worker is needed and prepare a brief report – discipline, time concept, environment pollution and Personal hygiene.
- Construct a questionnaire to students for evaluating the guidance services of their school.
- Identifying learning difficulties in a particular subject.
- Visiting a school and identifying adjustment problems (children having negative attitude, low self-esteem, unable to get self-motivated etc.) and prepare a report.
- Preparation of an anecdotal record.
- Conduct mock counselling interview and prepare a brief report on it.
- Preparing rating scale (to evaluate participation in CCA)
• Visiting and reporting guidance service programmes in a school.
• Prepare a detailed outline of career talk in any institution
• Organizing career exhibition.
• Video presentation on career conference.
• Annual program of work for guidance and counselling activities for the students of Std. VIII, IX and X.
• Talk by a school counsellor.
• Role play representing directive, non-directive and eclectic counselling.
• Video presentation of the counselling session and discussion of the same.
• Prepare and administer a questionnaire on mental health of secondary school students and analyse the findings and submit an individual report.
• Identify children with special needs in any two schools and prepare a report.
• Peer pressure, mobile usage, pocket money, internet usage.

References:
• Asha K Kinra (2009) Guidance and Counselling, Dorling Kindersley (India) Pvt.Ltd

**18EDU533 VOCATIONAL EDUCATION 3 0 0 3**

**Objectives:**

On completion of the course, the student teacher will
• acquire knowledge of the various aspects of vocational education in India.
• trace the development of vocational programme in India.
• appreciate the significant role of vocational education in increasing productivity.
• develop proper attitude towards vocational education.
• analyse the significant changes in the field of vocational education in India.
• analyse the various committees and report related to vocational education.

Unit I:
Introduction
1.1 Vocational education – Meaning, Need and importance.
1.2 National Policy on Education in the programme of action in Vocational Education
1.3 Vocational education at Higher Secondary stage-objectives, course of study – list of vocations – syllabus, scheme of examination, allocation of periods, qualification and training of teachers for vocational education.
1.4 Human Resources Development – skilled manpower – productivity — Work experience-concept – distinction between work experience and vocational education.

Unit II:
Basic Education and S.U.P.W.
2.1 Basic education – concept – merits – criticism, need and importance, scheme of multipurpose schools.

Unit III:
Models of Vocational Education
3.1. Vocational education-Problems measures to improvement
3.2. Models of Vocational Education – School Model, Dual Model, Mixed Model.

Unit IV:
Vocational Education and Training
4.1. Vocational education and training, correspondence and continuing education – need and Importance - in service programme-training for self – employment and small scale industry.
4.2. Training in Entrepreneurship-Government’s Assistants

Unit V:
Role of Center and State Governments
5.1 The role and functions of center and state governments’ vocational education and training DSERT, NCTE, ICAR, CSIR, SBTE and NCERT – funding agencies.
5.2 Vocational and Technical education in INDIA- Skill India - job oriented programs - significance -economic development

Suggested Activities / Practicals / Tutorials
• Secondary Education Commission (1952 – 53)
• Kothari Commission Report (1964 – 66)
• Ishwarbhai Patel Committee Report (1977)
• Malcolm Adiseshiah Committee Report (1978)
• Report of Kulandaisamy Group (1985)
• National Policy on Education in the programme of action in Vocational Education (1986)
• The role of center and state governments regarding vocational education and training. AICTE, DSERT, NCTE, ICAR, CSIR, SBTE and NCERT – their functions.
• Vocational and Technical education in INDIA, U.S.A. Russia and Japan.
• Vocational education and economic development – Vocational education in five year plans.
• Visits to places of any one of the small scale industries.
• Administer an Occupational Preference Inventory and report it.
• Preparation of Socially Useful Productive Work (SUPW) materials.
• Activities related to local visits and other activities.

References:
• Secondary Education Commission (1952 – 53)
• Kothari Commission Report (1964 – 66)
• Tarun Rashtriya, Vocational Education, APH Publishing Corporation, New Delhi, 2005

18EDU534

HEALTH AND PHYSICAL EDUCATION 3 0 0  3

Objectives:
On completion of the course, the student teacher will
• understand the concept of holistic health, its various dimensions and determinants and the importance of sports and yoga for development of holistic health
• develop positive attitude towards health as individual and be collectively responsible to achieve it
• know the health status, identify health problems and be informed for taking remedial measures
• become aware about rules of safety in hazardous situation (illness, accident and injury) and equip them with first aid measures about common sickness and injuries
• develop right habits about exercise, games and sports, sleep, rest and relaxation
• become sensitized, motivated and acquire with the skills for physical fitness, learn
correct postural habits and activities for its development
• practice of yogasanas and meditation through which learns the skills/art of self-control, concentration, peace and relaxation to avoid ill effects of stress, strain and fatigue of routine life
• understands and develops skills to deal with psycho-social issues including those, related to process of growing up during adolescence, HIV/AIDS and substance abuse
• Understands various policies and programs related to health, physical education, yoga and help them to understand the process of assessment of health and physical fitness.

Unit I:

Health Education programme
1.1 Health- Concept, importance, dimensions and determinants of health; physical and mental health
1.2 Health needs - importance of keeping good health children and adolescents, including differently-abled children
1.3 Understanding of the body system—central nervous system, skeleton, muscular, respiratory, circulatory and digestive —coordination and cooperation

Unit II:

Food and Nutrition-
2.1. Food habits-their functions of nutrition
2.2. Diversity and verity foods, preservation of food value during cooking, indigenous and modern ways to persevere food,
2.3. Change in food habit of globalization-changing life style
2.4. Awareness of food hygiene preservation and consumption.
2.5. Choice and consumption of healthy diet- need and importance. Causes of food decay micro-organization

Unit III:

Physical Education
3.1. Physical activity - sports and Games - athletics (general physical fitness exercises), games (lead-up games, relays and major games), rhythmic activities, gymnastics and their impact on health
3.2. Yogic practices — importance of yoga, yogasanas, kriyas and pranayama and meditation, Sthitaprajna
3.3. Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defense activities-relationship between physical fitness and good food

Unit IV:

Health Issues
4.1. Health problems and communicable diseases- causes, prevention and cure
4.2. Role of first aid- safety and security.
Unit V:
Role of Institutions and Health Services

5.1. Role of institutions - school and family. - voluntary organization impact on body and mind (16/02/2016)

5.2. Health services, Health insurance policies and major health and physical education-related programmes,

5.3. Blood banks, role of media.

Suggested Activities / Practicals / Tutorials

1. Giving first aid.
2. Organizing Intramural activities.
4. Flag hoisting and de-hoisting.
5. Making physical aids for propagating health education.
7. Pollution.
8. Advantages of yoga.
   • Effectiveness of exercises.
   • Safety measures in home, school and playground.
   • Drawing fixtures.

References:

• Nanda V.K (2004), Health Education, New Delhi: Anmol Publications Pvt, Ltd.

18EDU581 UNDERSTANDING THE SELF 0 1 2 2

Objectives
On completion of the course, the student teacher will
1. Understand self as a person and as a teacher (Professional identity).
2. Develop sensitivities, dispositions and skills which will help to facilitate personality of students.
3. Develop social relational sensitivity (develop desirable social relationships with students,
colleagues, managers and parents and members of the community.
4. Develop resilience to deal with conflicts at different levels.
5. Learn to organize groups to draw collective strength to handle (solve) academic, personal and social (group) tensions / conflicts.
6. Develop a holistic and integrated understandings of human self and personality.
7. Identify self-identities (gender, relational, social cultural) and analyses one beliefs, stereotypes, prejudice, attitudes and values objectively.

Workshop session 1:-

**Developing relational sensitivity (objective)**

**Subject Content:**

Meaning of social relational sensitivity, impact of community on individuals, social relationships with students, colleagues, administrators peers, parents and community, interaction between school/teachers and community role of emotional reaction in social relationships. Conflict resolution at different levels (colleagues, students, parent, community) is using group efforts to resolve conflicts, creativity and group dynamics.

**Activities:**
1. Discussion on how to develop positive social relationships among the peer, siblings, neighbors /community teacher and head master in the school context.
2. Analyse the social structure of a class-room using sociometry.
3. Listen to a recitation of a passage or a story building or a narration and record it after listening and evaluate the content listened. Submit it in a report form.
5. Social distance scale.

Workshop Session 2:-

**Understanding the self-personality (objective)**

**Subject Content:**

Concept of self, identities of self as a person, personality development, social cultural influence on self-development, beliefs, attitudes and values.

**Activities:**
1. Write a note on oneself consisting of perception of one’s self (Who I am?); social cultural back-ground, one’s beliefs, attitudes and values.
2. Watching a movie/ documentary about successful persons and analyse the influence of life-event on self-development.
3. Understanding one’s ability to transfer learning using Bilateral Transfer of learning
4. Analyse the personality of individual using Eysenck’s Personality test.
5. Thematic Apperception test (TAT)

Workshop Session 3:-

Understanding the self-adjustment and mental health resolving conflicts.

Subject Content

Concept of adjustment and mental health. Different modes of resolving conflicts and Defense mechanisms.

1. Analyse self-adjustment using Bell’s Adjustment Inventory.
2. Discussion on students’ real life experiences to strengthen their mental health and personal adjustment.
3. Analyse a conflicting situation and reflect on the strategies adopted to solve item. Discuss the types of conflicts.
4. Identify the frustrating and depressed situations Come out with the strategies to resolve them.

Workshop Session 4:-

Intelligence and Creativity

1. Understanding the level of intelligence using Raven’s Progressive matrices.
2. Discussion on different modes of intelligence, Emotional intelligence.
3. Creative work for self expression (writing a poem, story or drama relating to Understanding of self, critical analysis of one –self).
4. Production of creative work –Small group production and display – Example –painting, clay models, greeting cards, imitation jewelry, embroidery.

18EDU590 INTERNSHIP –II
(Any two methodologies)

SCHOOL INTERNSHIP IN PHYSICS

Credit 5

Practice in Teaching in Physics consists of delivery of TWO (2) integrated lessons in simulated situation .Later during internship FIFTEEN (15) regular class-room lessons need to be delivered in the respective Schools selected for internship . Out of which five are based on constructivist
approach, three innovative lessons, (ICT /CAM/ITM) one remedial lesson and later ends in a culminating lesson.

After the completion of all Fifteen (15) lessons a Practical examination is conducted. Thus each student teacher will have to complete FIFTEEN (15) lessons in Physical Science as ‘Term work’. The whole term work is evaluated for 150 marks.

SCHOOL INTERNSHIP IN CHEMISTRY

Credit 5

Practice in Teaching in Chemistry consists of delivery of TWO (2) integrated lessons in simulated situation. Later during internship FIFTEEN (15) regular class-room lessons need to be delivered in the respective Schools selected for internship. Out of which five are based on constructivist approach, three innovative lessons, (ICT /CAM/ITM) one remedial lesson and later ends in a culminating lesson.

After the completion of all Fifteen (15) lessons a Practical examination is conducted. Thus each student teacher will have to complete FIFTEEN (15) lessons in Physical Science as ‘Term work’. The whole term work is evaluated for 150 marks.

SCHOOL INTERNSHIP IN MATHEMATICS

Credit 5

Practice in Teaching in Mathematics consists of delivery of TWO (2) integrated lessons in simulated situation. Later during internship FIFTEEN (15) regular class-room lessons need to be delivered in the respective Schools selected for internship. Out of which five are based on constructivist approach, three innovative lessons, (ICT /CAM/ITM) one remedial lesson and later ends in a culminating lesson.

After the completion of all Fifteen (15) lessons a Practical examination is conducted. Thus each student teacher will have to complete FIFTEEN (15) lessons in Mathematics, as ‘Term work’. The whole term work is evaluated for 150 marks.

18EDU599 Project

18LAW201 INDIAN CONSTITUTION 2002

Objective: The preliminary objective is to ensure that every student has some knowledge about Indian Constitution.
Unit 1
Meaning and Importance of Constitution, Preamble and Salient Features of the Constitution.

Unit 2
Fundamental Rights, Right to Equality, Right to Freedom, Right against exploitation, Right to freedom of religion, Cultural and Educational Rights, Right to Constitutional Remedies and Duties, Directive Principles of State Policy.

Unit 3
Union Government – Lok Sabha and Rajya Sabha Composition, Powers and functions: The President, The Prime Minister and Supreme Court: Role Position and Powers/ functions.

Unit 4
State Government - Legislative Assembly and Legislative Council: Composition, Powers and functions: The Governor, Chief Minister and High Court: Role, Position and Powers/ functions.

Unit 5
Local self Government, Panchayat Raj System in India; Election Commission; Public Service Commissions, Role, powers and function

Skill development Activities:
• Court Visit & Report Presentation
• Group discussion(Fundamental rights and duties)

REFERENCES:
1. Introduction to The constitution of India – M V Pylee, Vikas publishing house Pvt LTD
2. Introduction to The constitution of India – Dr. Durga das Basu, 19th edition Reprint 2007

18MAT101 CALCU LUS 3 1 0 4
Objective: To enable students to understand the meaning of differentiation and integration and apply the techniques of indefinite and definite integration.

Unit I:
Chapter-2 (Sections 2.3-2.7)

Unit II:
Differentiation: The Derivative as a Function – Differentiation Rules – The Derivative as a Rate of Change – Derivatives of Trigonometric Functions – The Chain Rule and Parametric Equations – Implicit Differentiation -n derivatives of the functions: e^ax, (ax + b)^n, log(ax + b), sin(ax + b), cos(ax + b), e^axsin(bx+ c), e^axcos(bx + c) – Problems.
Chapter-3 (Sections 3.1-3.6)

Unit III:
Application of Derivatives: Extreme values of Functions – The Mean Value Theorem – Monotonic Functions and the First Derivative Test – Concavity and Curve Sketching.
Chapter 4 (Sections 4.1-4.4)

Unit IV:
Chapter 5 (Sections 5.1-5.6)

Unit V:
Chapter 8 (Sections 8.1-8.4, 8.8)

Textbooks:

References:

18MAT118 MATRICES AND VECTOR CALCULUS 3 1 0 4

Objectives: To enable students to understand the basic concepts of matrix calculus, vectors and basic vector operations and solve computational problems of vector calculus.

Unit I:
Systems of Linear Equations: Linear System of Equations, Gauss Elimination, Consistency of a linear system of equations, Vectors, Linear independence and dependence of vectors, Rank of a Matrix.
Text Book-1: Chapter-1 and 2

Unit II:
Text Book-1: Chapter-7.

Unit III:
Three dimensional coordinate systems, vectors, dot and cross products. Vector Differentiation: Gradient, divergence and curl, identities, invariant scalar.
Text Book-2: Chapter-12 (Sections 12.1-12.5)

Unit IV:
Line integrals, Vector Fields, Work, Circulation and Flux, Path Independence, Potential Functions, and Conservative Fields, Green’s Theorem in the plane.

Text Book-2: Chapter-16 (Sections 16.1-16.4)

Unit V:
Surface area and surface integrals, Parametrized surfaces, Stokes Theorem, The divergence Theorem and a unified theory
Text Book-2: Chapter-16 (Sections 16.5-16.8)

Textbooks:

References:

18MAT201 DIFFERENTIAL EQUATIONS 3 1 0 4

Objectives: To enable students to develop the knowledge of standard concepts of ordinary differential equations and apply analytical techniques to compute solutions to various differential equations.

Unit I:
Ordinary Differential Equations
Review of differential equations (order, degree, linear, nonlinear, implicit and explicit form of solution, general solutions, particular solution, singular solution). Exactness, nonexact equations reduce to exact form.
Part I: 1.1-1.9, 2.12-2.22

Equations of first order but of higher degree: Equations solvable for \( \frac{dy}{dx} \), y, x, equations in Clairaut’s form, equations reducible to Clairaut’s form.
Part I: 4.1-4.11

Unit II:
Part I: 5.1-5.5, 6.1-6.3, 1.12, 1.13, 5.26-5.27, 7.1-7.5

Unit III:
Systems of first order linear equations: Conversion of nth order differential equation to n first order differential equations, homogeneous linear system with constant coefficients, fundamental matrices, complex eigen values, repeated eigenvalues. simultaneous linear differential equations with constant coefficients, simultaneous linear differential equations with variable coefficients,
PART I: 8.1-8.3, 2.1-2.7

Partial Differential Equations
Review of partial differential equations (order, degree, linear, nonlinear).

Unit IV:
Formation of equations by eliminating arbitrary constants and arbitrary functions.

Solutions of partial differential equations: General, particular and complete integrals. Lagrange’s linear equation, Charpit’s method. Methods to solve the first order partial differential equations of the forms \( f(p,q) = 0 \), \( f(z,p,q) = 0 \), \( f_1(x,p) = f_2(y,q) \) and Clairut’s form \( z = px + qy + f(p,q) \) where \( p = \frac{\partial z}{\partial x} \) and \( q = \frac{\partial z}{\partial y} \).

Part III: 1.1 – 1.5, 2.3-2.12, 3.1-3.2, 3.7-3.8, 3.10-3.18

Unit V:

Part III: 8.1, 4.1-4.12

Textbooks:

References:

Dennis Zill, A First Course in Differential Equations, Cengage Learning, 9th edition

18MAT222 MODERN ALGEBRA 3 1 0 4

Objectives: To enable students to understand fundamental concepts of algebra and apply results from elementary group theory to solve contemporary problems.

Unit I:

Unit II:
Chapters 4-7.

Unit III:
Chapters 11-13.

Unit IV:
Chapters 23-24.

Unit V:
Quotient Rings and Ideals. Homomorphism of rings and rings of polynomials.
Chapters 28-30.

Textbooks:

References:

18MAT301 REAL ANALYSIS 2 1 0 3

Objectives: To enable students to understand the basic properties of the field of real numbers and understand notion of continuous functions and their properties.

Unit I:
Review:-Sets and Functions, Mathematical Induction, Finite and Infinite Sets.
Chapter-2 (Sec.2.1-2.3)

Unit II:
Chapter-3 (Sec.3.1-2.6)
Review of Limits-Limits of Functions, Limit Theorems. (Chapter-4, review only)

Unit III:
Continuous Functions-Continuous Functions, Combinations of Continuous Functions, Continuous Functions on Intervals, Uniform Continuity.
Chapter-5 (Sec.5.1-5.4)

**Unit IV:**
**Differentiation**- The Derivative, The Mean Value Theorem, L'Hospital's Rules, Taylor's Theorem.

Chapter-6 (Sec.6.1-6.4)

**Unit V:**
**The Riemann Integral**- Riemann Integral, Riemann Integrable Functions, The Fundamental Theorem.

Chapter-7 (Sec.7.1-7.4)

**Textbooks:**

**References:**

**18MAT309 DISCRETE MATHEMATICS 1102**

**Objectives:** To enable students to understand the basics of logic, permutations and combinations and use effectively algebraic techniques to analyse basic discrete structures and algorithms.

**Unit I:**
**Logic, Mathematical Reasoning and Counting:** Logic, Prepositional Equivalence, Predicate and Quantifiers, Theorem Proving.

**Unit II:**
Basics of Counting, Pigeonhole Principle, Permutation and Combinations.

**Unit III:**
**Relations and Their Properties:** Representing Relations, Closure of Relations, Partial Ordering, Equivalence Relations and partitions.

**Unit IV:**
**Advanced Counting Techniques and Relations:** Recurrence Relations, Solving Recurrence Relations, Solutions of Homogeneous Recurrence Relations.

**Unit V:**
**Graph Theory:** Introduction to Graphs, Graph Operations, Graph and Matrices, Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest Path Problem

**Textbooks:**
18MAT320                                  PROBABILITY AND STATISTICS                                  1 1 0  2

Objectives: To enable students to understand the properties of probability and probability distributions and apply wide variety of specific statistical methods.

Unit I:
Probability Concepts:
Important definitions- random experiment, trial, sample space, mutually exclusive events, independent events, dependent events, equally likely events, exhaustive events – approaches to measuring probability.

Unit II:
Random Variables.
Discrete and continuous random variables – discrete and continuous distribution functions- mathematical expectation.

Unit III:

Unit IV:
Correlation:
Introduction to simple correlation - scatter plot and correlation coefficient, properties of correlation coefficient, rank correlation coefficient.

Unit V:
Regressions: Introduction to simple regression, regression lines.

Textbooks:

References:
OBJECTIVES: To enable students to obtain knowledge of theory of complex functions of a complex variable and get acquainted with different methods and techniques of series and bilinear transformations.

UNIT I:
Definition, Algebra of complex numbers, polar forms, regions, Limits, continuity, differentiability Analyticity, CR equations, Harmonic Functions.
Chapters 1 & 2

UNIT II:
Conformal mappings, bilinear transformations, Special bilinear transformations, fixed points.
Chapter-9 (Sections: 9.1-9.3)

UNIT III:
Contour integral, Cauchy-Goursat theorem, Cauchy’s integral formula, winding number, Primitives
Chapter-4 (Sections: 4.1-4.4, 4.7)

UNIT IV:
Sequences, series, power series, uniform convergence of power series, Taylor’s series, Laurent’s series, Integration and differentiation of Power series.
Chapters- 5 & 6 (Sections: 5.1-5.2, 6.1, 6.3-6.5)

UNIT V:
Zeros and singularities of analytic functions, types of singularities, poles, residue theorem.
Chapter-7 (Sections: 7.1-7.3)

TEXTBOOKS:

REFERENCES:
**Objectives:** To enable students to understand Newtonian mechanics and apply Newton’s laws to explain natural physical phenomena.

**Unit I:**
**Vector Analysis:** Integrals (line, surface and volume), Physical significance of Gradient, Divergence and curl, statement of Gauss’s and Stroke’s theorems.

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

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

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

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

**Collisions:** Elastic and Inelastic, Collision in one and two dimensions.

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

**Central Force:** Kepler’s laws of planetary motion, the inverse square law, Rutherford’s problem, derivation of Kepler’s Law from Universal law of Gravitation.

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

Unit V:

Dynamics of Rigid bodies
Angular momentum and moment of inertia, Theorem on moment of inertia, moment of inertia for (i) solid cylinder, (ii) rectangular slab, (iii) solid sphere and (iv) circular hoop.

Fluid Mechanism
Ideal fluids, Equation of Continuity, Viscous fluids, critical velocity, Derivation of Poiseuille’s Equation.

Practicals
(A minimum of ten experiments to be done from the list given below)
1. To Determine the Momentum of Inertia and Mass of a Flywheel.
2. Study of the motion of an air bubble.
3. Study of the motion of a freely falling body.
4. Study of the acceleration of a body subjected to different unbalanced forces.
5. Study of accelerations of different masses under a constant unbalanced force.
6. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
8. Determination of Surface tension of liquid by capillary rise method.
9. To study the relation between length and time period of a simple pendulum.
10. Study of the rate of flow of water through a capillary tube under different pressure heads.
11. Momentum of inertia of a rod by torsional oscillation.
12. Determination of Acceleration due to Gravity and radius of gyration by Bar Pendulum.

Textbooks:

References:

18PHY112 WAVES, HEAT AND THERMODYNAMICS 3 0 2 4
Objectives: To enable students to see the relation between linear and rotational motion and understand the production and propagations of waves in elastic media. And also understand the laws of thermodynamics and its applications.

Unit I:

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

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

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

Unit II:

Kinetic Theory of Gases

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

Mean free path, van der Waal’s equations of State, critical constants, application to liquefaction of gases.

Unit III:

Heat and First Law of Thermodynamics

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

Unit IV:

Entropy and Second Law of Thermodynamics

Introduction, reversible and irreversible processes, the Carnot cycle, Carnot engine, Carnot theorem, absolute scale of temperature, second law of thermodynamics, efficiency of engines, the thermodynamic temperature scale, entropy in reversible and irreversible processes, entropy and the
II law, entropy and disorder, consequences of II and III law of thermodynamics, Second law of thermodynamics as a probabilistic statement.
Low temperature Physics – Porous Plug experiment, temperature of inversion, principle of regenerative cooling, liquefaction of air by Linde’s method.

**Unit V:**

**Thermodynamic potentials:** Internal Energy, Enthalpy, Helmholtz function, Gibbs function, relations among these functions, Gibbs-Helmholtz equations

**Maxwell's Thermodynamic Relations:** Derivation of Maxwell's thermodynamic relations, TdS equations, Internal energy equations, Heat capacity equations. Change of temperature during Adiabatic process using Maxwell's relations

**PRACTICALS**
( **A minimum of ten experiments to be done from the list given below**)

1. Study of the oscillations of a column of water as a function of its length and study of damped oscillation
2. To determine the velocity of sound at O° C and the end correction by setting up a resonance column (first resonance length)
3. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire
4. Verification of Stefan’s Boltzmann law using Potentiometer
5. Study of Newton’s law of cooling.
6. Determination of Thermal conductivity of a bad conductor by Lee Charlton method
7. Specific heat of a solid by the method of mixtures
8. Determination of latent heat of fusion of ice by calorimetric method
9. J by Joules Calorimeter
10. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method
11. Melde’s experiment – determination of frequency
12. Frequency of AC by a sonometer.

**Textbooks:**


**References:**

Objective: To enable students to acquire a broad conceptual framework of electromagnetic phenomena.

Unit I:
Electrostatics
Electrical pressure on a charged surface. The path traced by a charged particle in a transverse electric field. The attracted disc electrometer – construction, theory and applications.
Review of concept of electric field and electric field due to point charge. Electric field due to (i) electric dipole, (ii) line of charge and (iii) charged disc
A dipole in an electric field, torque on a dipole in uniform and non-uniform E fields, potential energy of an electrical dipole.

Unit II:
Electric Fields in matter: Capacitance, parallel plate capacitor, calculation of capacity of a spherical and cylindrical capacitor, energy stored in a capacitor, capacitor with dielectric, atomic view of dielectrics, polarization, electric field due to a polarised material, Gauss’s law in dielectrics, Dielectric constant, Energy density of an electrostatic field (with and without dielectric).
Polarisability and susceptibility – Frequency dependence of polarisability, Clausius- Mossotti equation.

Unit III:
Magnetostatics
Review of Ampere’s law, B near a long wire, Magnetic lines of induction, force between two parallel conductors, definition of ampere, B for a solenoid, Biot-savart’s law, and applications of Biot-savart’s law.
The magnetic field, Lorentz force and definition of magnetic field, magnetic induction, magnetic force on a current element, circulating charges, Cyclotron resonance frequency, Cyclotron Magnetisation, magnetisation current density, magnetic field intensity, magnetic susceptibility and permeability.

Unit IV:
Electromagnetic Induction

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

**Unit V:**

**Alternating current and filters**
R M S values, Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the j symbol), Series and parallel resonance, Half-power frequencies, bandwidth and Q-factor, Power in electrical circuits, power factor, Maximum power transfer theorem (with proof).
High-pass and low-pass filters with LR and CR combinations, Cut-off frequency, Band-pass filters

**PRACTICALS**

(A minimum of ten experiments to be done from the list given below)
1. Determination of Q factor by series resonance
2. Determination of Q factor by parallel resonance
3. Determination of self inductance of a coil using Anderson’s Bridge
4. Determination of capacitance by measuring impedance of RC circuit
5. Determination of Inductance by measuring impedance of RL circuit
6. Mutual inductance of a solenoid by Ballistic Galvonometer
7. De Sauty’s Bridge
8. Determination of resistivity of a material using low resistance
9. Determination of the specific charge of a copper(Cu++) ion using Copper Voltameter
10. Study of decay of current in LR and RC circuit
11. Measurement of B by current balance
12. To show that the behavior of an inductance in an AC circuit is analogous to that of a resistor which obeys Ohm’s Law and hence to measure inductance.

**Textbooks:**
1. Electricity and Magnetism, Fewkes and Yarwood.
2. Electricity and Magnetism: A N Matveev, Mir Publishers, Moscow.
3. Electricity and Magnetism, F.W.Sears, Addison Wesley Co.

**References:**
18PHY215OPTICS3 02 4

Objectives:
To enable students to understand that light is a wave phenomenon and apply the understanding of wave phenomenon to light.

Unit I:
Wave Nature of Light and Interference
Light-electromagnetic spectrum, Rotating mirror method of determination of speed of light, Huygen’s principle, explanation of reflection and refraction, Fermat’s Principle, Phase change on reflection, total internal reflection.
Young’s experiment - coherence, intensity distribution and visibility of fringes, Newton’s rings, Fresnel’s Biprism, interference in thin films, colours of thin films, interference at an air wedge, Michelson’s interferometer.

Unit II:
Diffraction
Fraunhofer and Fresnel : Diffraction, Diffraction at a single slit, double slit, Diffraction by multiple slits, Diffraction grating, Resolving power – Rayleigh’s criterion, Resolving power of a grating and telescope.
Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge (qualitative treatment only).

Unit III:
Polarisation
Polarization by reflection, Brewster’s law, Malus law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polariods, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity.

Unit IV:
Scattering of Light
A brief discussion on Tyndall effect, Rayleigh scattering and Raman effect. Blue of the sky and ocean. A qualitative account of fluorescence and phosphorescence. Raman effect: Classical and quantum theory of Raman effect, experimental method for studying Raman spectra, Raman spectrum, study of Raman effect using Lasers, intensity of Raman lines, Polarisation of Raman lines, characteristic properties of Raman lines, applications of Raman effect.
Unit V:

**Introduction to Lasers:** Spontaneous and stimulated emission, density of states, Einstein’s A and B coefficients. Ratio of stimulated to spontaneous transitions in a system in thermal equilibrium, condition for amplification, population inversion, methods of optical pumping, energy level schemes of He-Ne and Ruby Laser. Properties and uses of Lasers. Basic concepts of holography – construction of hologram – Discussion on the use of holograms in daily life - Recording and reproduction of holograms.

**PRACTICALS**
1. Determination of wavelength of mercury spectral lines using Diffraction Grating by normal incidence method
2. Determination of the refractive index of the material of a prism by minimum deviation method
3. Determination of Cauchy’s constants using a prism, grating and spectrometer
4. Determination of the resolving power of a telescope
5. Determination of wave length of monochromatic light source using Bi-Prism
6. Resolving power of a grating
7. Wavelength and wavelength difference using a Michelson’s interferometer
8. Determination of the thickness of paper by interference at a wedge
9. Determination of the radius of curvature of the lens by Newton’s Rings
10. Determination of the refractive index of a liquid by Newton’s rings
11. Verification of Brewster’s Law
12. Refractive index of a prism by i-d curve

**Textbooks:**

**References:**
3. Khanna and Bedi: Sound
Objectives: To enable students to understand the physics of semiconductors and their applications in basic electronic circuits.

Unit I:
Semiconductor Characteristics and Applications

Review: Intrinsic and extrinsic semiconductors, electrons and holes in intrinsic and extrinsic semiconductors, conduction by electrons and holes, conductivity of a semiconductor, Energy bands in semiconductors. Carrier concentrations in intrinsic and extrinsic semiconductors, Fermi level, donor and acceptor levels in extrinsic semiconductors.
P-N junction diode – depletion layer, conduction in PN junction diode, characteristics, diode resistance.
Half wave and full wave rectifiers, power output and efficiency, Ripple factors.
Breakdown in diodes – Zener breakdown, Zener diode characteristics and application in voltage regulation.
LEDs, photo diodes, LDRs and Solar cells.

Unit II:
Transistors and Applications

Bipolar junction transistor (PNP and NPN) transistors, different configurations and characteristics, current components in CE configuration, large signal and small signal dc current gains, transistor biasing – self bias circuit, Load line and operating point.
Transistor as an amplifier: Transistor as a two port device, h-parameters and analysis of CE amplifier using h parameter equivalent circuit, simplified h-parameter circuit, stabilization of voltage gain in CE amplifiers, Two stage amplifiers, RC coupling, frequency response of CE amplifier. Comparison of transistor configurations.
Emitter follower circuit and its use. Transistor as Power amplifier.
FET construction and its characteristics – MOSFET characteristics.
Concept of feedback in amplifiers and advantages of negative feedback

Unit III:
Unit IV:

Digital Electronics
Binary to decimal and decimal to binary conversion, Binary addition and subtraction, Octal number system, Hexadecimal system and conversions.
Construction and working of AND and OR logic gates using diodes. Construction of NOT gate using transistor. Symbols and truth table for AND, OR, NOT, NAND NOR and Ex-OR logic gates. Boolean algebra, Boolean laws, D’morgan’s theorem. NAND and NOR as universal gates.

Unit V:

Communication Electronics
Basic theory of amplitude modulation, Power in modulated carrier, single side band transmission, Basic idea of frequency and phase modulation. Modulated class C amplifier, demodulation, PN diode as demodulator linear and square law detection.

Textbooks:
1. V.K. Mehta: Electronics.

References:
2. Resnick: Special theory of relativity
3. A.P French: Special relativity
5. C. Kittel: Introduction to solid state physics
6. A J. Dekkar: Solid State physics
7. J.B. Blackmore : Introduction to solid state physics
8. S V Subramanyam : Experiments in Electronics
9. R P Jain: Modern Digital Electronics
10. Malvino and Leach : Digital principles and applications
11. Grob B: Basic Electronics
12. Boylestead: Network analysis

18PHY316       ATOMIC AND MOLECULAR PHYSICS       3003
**Objective**: To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

**Unit I:**


**Unit II:**

**Atomic Spectra**:

**The Electron**: Determination of e/m of an electron by Thomson method, Determination of charge of an electron by Millikan’s oil drop method.


**Unit III:**

**Zeeman effect**: Introduction, experimental study of normal Zeeman effect, theory of normal Zeeman effect, expression for Zeeman effect, quantum theory of normal Zeeman effect, anomalous Zeeman effect, Paschen-Back effect and Stark effect.

**Unit IV:**

**Molecular Spectra**: Molecular formation, the Hmolecular ion, H2 – molecule. Salient features of molecular spectra. Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules. Theory of pure rotation and rotation-vibration spectra, Raman and IR spectra, simple applications.

**Unit V:**

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

**Textbooks:**
1. Atomic and nuclear physics - Littlefield and T.V. Thorley
2. Molecular spectra – G Herzberg
3. Fundamental university physics, vol. 3 – Aloson and Finn

References:

1. Perspectives of Modern Physics Beiser.
2. Electromagnetism, Reitz and Milford.
4. Introduction to modern Physics- F.R. Richtmeyer. E.H. Kennard and T. Lauritsen
5. Lasers – A K Gatak
6. Modern Physics - K.S. Krane
7. Introduction to modern Physics – H S Mani and G K Mehta

18PHY381PRACTICAL

(A minimum of ten experiments to be performed from the following list)
2. Junction diode characteristics
3. Zener diode characteristics
4. Junction Transistor characteristics
5. FET characteristics
5. Wien Bridge Oscillator.
6. UJT characteristics.
7. Full adder using AND, OR and XOR gates
8. Study of op-amp characteristics.
9. Measurement of efficiency and output power of LED.
10. Verification of the inverse square law for light intensity using a phototransistor.
13. Amplitude demodulator.
14. Logic gates – AND, OR, NOT, NOR and XOR using IC 7402

18PHY382

PRACTICALS

(A minimum of eight experiments from the following)
1. Determination of Rydberg constant by studying the Fraunhoffer spectrum
2. Analysis of powder X ray photograph
3. Study of the characteristics and spectral response of a photocell (selenium photocell
4. Study of hydrogen spectrum
5. Analysis of band spectrum of PN molecule.
6. Analysis of rotational spectrum of nitrogen.
7. Analysis of rotational vibrational spectrum of a diatomic molecule (HBr).
8. Absorption spectrum of KMnO₄
9. Determination of dipole moment of an organic liquid