Programme Learning outcomes (PLOs) M.Sc.Ed : Physics.

After the completion of the program, prospective teachers will be able to

1. Acquire analytic analyses thinking, critical thinking, logical reasoning, communication and problem-solving skills through acquired knowledge in major branches of physics.
2. Sustain intellectual curiosity and know how to continue to learn not only areas that are relevant to Physics, but also that are important to society.
3. Perform basic, applied and collaborative research in physics/education.
4. Enhance pedagogical and scientific writing skills through modern methods in physics.
5. Build the experimental and computational skill sets that are applicable to a wide range of courses, topics, and career paths in STEM.
6. Examine how technology has improved through the increased understanding of physics and physical systems and use several technological applications complementarily.

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CORE COURSE 1A: PHYSICS

MSE 1: MECHANICS

After the completion of the course, prospective teachers will be able to

1. Demonstrate their understanding of vector calculus and differential equations by solving problems related to gradient, div, curl and theorems such as Gauss-divergence, Stoke…
2. Extend their mathematical understanding to the study of Newton's laws of motion, principle of conservation and oscillatory motion.
3. Apply the principle of conservation of momentum to motion of rockets.
4. Appreciate the role of the central force in our solar system.
5. To theoretically analyze the motion of planets.
6. To determine the nature of orbit of any cosmic object.
7. Distinguish between damped,undamped, critically damped oscillations.
8. Construct geometric figures to analyze superposition of oscillations along different directions with different frequencies.
9. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
10. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
11. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

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Core Course I B Physics

MSEII.1 : ELASTICITY, WAVES, HEAT, AND THERMODYNAMICS

After the completion of the course, prospective teachers will be able to

1. Understand the concepts of elasticity and different types of elastic moduli.
2. Concept of waves and different types of waves.
3. Concept of heat and laws of thermodynamics.
4. Entropy of reversible and irreversible processes and apply their principles to explain natural physical phenomena.
5. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
6. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
7. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

Core Course 1 C : Physics

MSEIII.1 : ELECTRICITY AND ELECTROMAGNETISM

After the completion of the course, prospective teachers will be able to

1. Apply the previous knowledge on vector calculus to learn concepts on electrostatics and magnetism.
2. Apply the Gauss law to study various charge distributions.
3. Understand and apply Kirchhoff's laws to analyze electrical circuits.
4. To understand the working principle of capacitors.
5. Connect (unify) electricity and magnetism.
6. Study the properties of different magnetic materials.
7. Learn and apply Ampere's circuital law to analyze magnetic fields around various coils.
8. Further enhance knowledge on AC circuits.
9. Lay a strong foundation to appreciate Maxwell's laws of electromagnetism.
10. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
11. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
12. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

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Skill Enhancement Course- 1 Physics

MSEIII.6A : BASIC INSTRUMENTATION SKILLS

After the completion of the course, prospective teachers will be able to

1. Understand accuracy, precision, resolution, range and errors/uncertainty in measurements.
2. Understand various aspects of instruments like voltmeter, ammeter, digital multimeter, Cathode ray oscilloscope, signal generators frequency counter and their usage through hands-on mode.
3. Design and troubleshoot the electrical circuits, networks through hands-on mode.
4. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
5. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
6. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

Core Course 1D :Physics

MSEIV.1 :OPTICS

After the completion of the course, prospective teachers will be able to

1. Understand the nature of light, its wave phenomenon and its scattering properties like Raman scattering.
2. Define the principle of superposition of waves and interference phenomenon through wave properties of light.
3. Explain the interference in thin films and explain the formation of colour patterns in any natural physical phenomena.
4. Diffraction principle and the diffraction of light waves by different types of obstacles.
5. Concepts of polarization of light by reflection, refraction and generation of different kind of polarized light and their detection.
6. Application of polarization phenomena such as the functioning of polaroid and optical devices using it.
7. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
8. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
9. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

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Skill Enhancement Course- SEC 2 Physics
MSE IV.6 A: Computational Physics

After the completion of the course, prospective teachers will be able to

1. Learn the importance of computers and C programming language as a tool to solve complex physical problems in physics and other fields.

2. Drawing of flowchart and algorithms and applying them to various physics problems systems.

3. Identify the different types of variables and understand their role in C programming.

4. Use various operators in C (Arithmetic, Relational, Logical…), and appreciate the functional code hierarchy and employ them to solve problems in Physics.

5. Work with characters, strings and arrays.

6. Prepare scientific documents using LaTeX software such as formatting, working with different document classes, typesetting, writing mathematical equations and equation arrays, including graphic files and creating tables.

7. Use GnuPlot as an analysis tool to visualize the data taken from experiments and simulations.

Core Course 1 E : Physics

MSE V.1 : ATOMIC AND MOLECULAR PHYSICS

After the completion of the course, prospective teachers (students) will be able to

1. Know as well as experimental determination of the properties of an electron
2. Various atomic models and determination of the atomic spectra of one and two valence electron atoms. Behaviour of atoms in external electric (Stark)s and magnetic (Zeeman) fields.
3. Explain various molecular spectra such as rotational, vibrational, electronic and Raman spectra of diatomic molecules.
4. Describe working principles of electron spin and nuclear magnetic resonance spectroscopy and their applications.
5. Explain the production of X-rays, different types of X-ray spectra and applications of X-rays.
6. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
7. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
8. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

Core Course 1F : Physics

MSE VI.1 : CLASSICAL & QUANTUM MECHANICS AND SPECIAL THEORY OF RELATIVITY

After the completion of the course, prospective teachers will be able to

1. Distinguish between Lagrangian, Hamiltonian and Newtonian mechanics .
2. Appreciate the importance of solving problems using the Kinetic and Potential energy of a system instead of Force.
3. Apply conservation laws to correlate it to symmeterics of Nature.
4. Understand the postulates of STR of particles.
5. Analyze motion in 4-D when the speed of particles approaches the speed of light.
6. Realize the need to develop alternate theories at different domains.
7. Gain profound understanding of the origin of quantum theory.
8. Apply linear algebra concepts to develop quantum mechanics.
9. Apply Hamillton formalism to construct Schrodinger equation of motion.
10. Solve Schrödinger equation of motion for systems with different Potential energy.
11. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
12. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
13. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

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DSE 1 A : Physics

MSE VII.1 : NUCLEAR AND PARTICLE PHYSICS

After the completion of the course, prospective teachers will be able to

1. Understand the nuclear structure and its properties like charge, spin, radii, mass and magnetic moment and nuclear forces.
2. Understand the concepts of packing fraction and binding energy, binding energy per nucleon vs. mass number graph, and describe nuclear fusion and fission from the nature of the binding energy graph and different nuclear models and their roles in explaining the ground state properties of the nucleus.
3. Summarize the radioactive decay law, the emission of alpha, beta and gamma rays, the properties of the constituents of these rays and the mechanisms of the emissions of these rays.
4. Calculate the decay rates and lifetime of radioactive decays like alpha, beta, gamma decay.
5. Understand fission and fusion well as nuclear processes to produce nuclear energy in nuclear reactors and stellar energy in stars and the principles and basic constructions of particle accelerators such as the Cockcroft– Walton voltage multiplier, cyclotron, betatron and LINAAC.
6. Interpret the basic aspects of particle physics – the fundamental interactions, elementary and composite particles, the classifications of particles.
7. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
8. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
9. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

DISCIPLINE SPECIFIC ELECTIVE

PHYSICS

MSE VIII.1 : SOLID STATE PHYSICS

After the completion of the course, prospective teachers will be able to

1. Understand the crystalline nature of solids, atomic arrangements, and Diffraction of x-rays crystals.
2. Understand the atomic vibrations in solids and the concept of phonons.
3. Understand the theory of specific heat of solids.
4. Understand the metals and their electrical properties.
5. Understand the formation of energy bands and the classification of solids on the basis of energy bands.
6. Understand the superconducting phenomena and their applications.
7. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
8. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
9. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

NINTH SEMESTER

MSE(P) IX.1 : CLASSICAL MECHANICS

After the completion of the course, prospective teachers will be able to

1. Develop in-depth understanding of Lagrangian and Hamiltonian Formulation.
2. Develop problem solving skills to use Euler-Lagrange equations of motion to different physical systems.
3. Extend the problems to different coordinate systems and choose the appropriate generalized coordinate system.
4. Appreciate the importance of variational principle in the development of Lagrange and Hamiltonian equations of motion.
5. Solve the Harmonic oscillator equations of motion by Hamilton-Jacobi method, Canonical transformation method and Hamiltonian formulation.
6. Correlate Poisson brackets with the Canonical transformation equations.
7. Extend the Knowledge on Tensors to Moment of Inertia.
8. Explore the dynamics of rigid bodies and small oscillations as applications of Lagrangian formulation.

MSE(P) IX.2 : MATHEMATICAL PHYSICS – I

After the completion of the course, prospective teachers will be able to

1. Learn about curvilinear coordinates and understand the Tensor analysis.
2. Extend the Knowledge of vector analysis to arbitrary curvilinear coordinates.
3. Solve the partial differential equations by separation of variables in different coordinates.
4. Understand the Frobenius power series method.
5. Apply Frobenius power series method to solve Hermite, Laguerre and Associated Laguerre differential equations.
6. To derive the generating function, recurrence relation, orthogonality relation for the solutions of the aforementioned differential equations.
7. Develop knowledge on the axiomatic description of an abstract space.

8. Enhance understanding on linear transformations to find the properties of the matrix representation of the Linear transformation.
9. Develop the skill to solve eigenvalue and eigenvector of any given matrix.

MSE(P) IX.3 : ELECTRODYNAMICS

After the completion of the course, prospective teachers will be able to

1. Apply the techniques of vector calculus to solve problems related to the Electric and Magnetic field.
2. Deepen the understanding of the Electric and Magnetic field.
3. Unify the fundamental laws of electrodynamics (Gauss law, Ampere's law, Gauss law for magnetism, Faraday's law…) to develop Maxwell equations.
4. Construct the wave equation to analyze and interpret the various properties of the monochromatic plane wave.
5. Appreciate the electromagnetic wave theory approach to concepts of optics like reflection, refraction and polarization.
6. Develop the theory for the fields of the moving charges and radiating systems.
7. Apply the concepts of special relativity to charges and fields observed in different frames and to further formulate covariance of Maxwell's field equations.
8. Apply the knowledge of Tensor to construct and infer electromagnetic field tensors.

MSE(P) IX.4 : NUMERICAL TECHNIQUES AND COMPUTER PROGRAMMING

After the completion of the course, prospective teachers will be able to

1. Find the roots of transcendental equations using numerical methods like bisection, Newton-Raphson etc.
2. Learn and apply interpolation methods such as Newton's forward, backward interpolation formulas and Lagrange's interpolation formula.
3. Numerically solve ordinary differential equations using Euler's method, Milne's method and Runge-Kutta method.

4. perform numerical integration employing Trapezoidal methods and Simpson's method
5. Successfully employ several matrix methods such as Gaussian elimination, inversion of matrices…to solve polynomial equations.
6. Solving eigenvalue problems by applying the Householder and QR method.
7. Use the C programming language as a tool to solve physical problems.

MSE(P) IX.5 : CORE LAB – I

After the completion of the course, prospective teachers will be able to

1. Understand the properties and various phenomena related to optics.
2. Describe features of real optical systems in terms of optical experiments.
3. Operate a data acquisition system, collecting a number of data points.
4. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
5. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

MSE(P) IX.6 : COMPUTER LAB – I

After the completion of the course, prospective teachers will be able to

1. Use various crucial commands required to operate the Linux operating system.
2. Prepare and compile a document using LaTeX.
3. Appreciate the ease of typing, formatting, working with different document classes, typesetting and writing mathematical expressions and equation arrays, including graphic files and creating tables.
4. Analysis and visualization of experimental results using GnuPlot software.
5. Use the mathematics package octave as a tool to compute matrix operations, eigenvalue problems etc.

TENTH SEMESTER

MSE(P) X.1 : QUANTUM MECHANICS -I

After the completion of the course, prospective teachers will be able to

1. Understand the fundamental concepts of quantum mechanics.
2. Solve the problems of a particle moving in different kinds of potentials, example potential well, spherical symmetric potentials etc.
3. Solve exactly solvable problems like harmonic oscillator, hydrogen atom, angular momentum of a particle using Schrödinger wave mechanics.
4. Understand the symmetry & conservation laws of fundamental particles like Bosons and Fermions.
5. Understand the scattering of a subatomic particle by different potential types using quantum theory.

MSE(P) X.2 : MATHEMATICAL PHYSICS – II

After the completion of the course, prospective teachers will be able to

1. Verify whether the given complex function is analytic or non-analytic.
2. Identify the different types of singularities.
3. Solve problems using Cauchy's integral formula, and residue theorem.
4. Evaluate definite integrals using Jordan's lemma.
5. Learn group theory and linear representation of a group extensively.
6. Classify the subgroups of a general linear group GL(n,K) based on their properties.
7. Distinguish between reducible and irreducible representations.
8. Understand the use of Schur's lemma.
9. Solve Bessel, Legendre and Associated Legendre differential equations using Frobenius or power series method.
10. To derive the generating function, recurrence relation, orthogonality relation for the solutions of the aforementioned differential equations.
11. Express any differential equation as the Sturm Liouville differential equation.

12. Demonstrate their understanding of the Fourier integral theorems, Inversion theorem and Convolution theorem by applying them to appropriate examples.
13. Approach more advanced aspects of transform methods.

MSE(P) X.3 : STATISTICAL PHYSICS

After the completion of the course, prospective teachers will be able to

1. Understand the basic concepts of statistical mechanics, different kinds of ensembles and parameters
2. Use the different types of partition function to obtain parameters like energy, pressure and temperature of the system(s).
3. Understand the fundamentals of quantum statistics- Fermions and Bosons. Use this knowledge to solve the problems like black body radiation, condensation of Boson gas and thermionic emission etc.
4. Understand the thermodynamic fluctuations in non-ideal systems.

MSE(P) X.4 : ELECTRONICS

After the completion of the course, prospective teachers will be able to

1. Understand the basics of intrinsic and extrinsic semiconductor materials, properties like carrier concentration, fermi level, donor and acceptor levels, etc.
2. Design, construction and understand the principles of rectifier circuits using diodes and filters.
3. Understand the construction and working principle of a BJT, different transistor configuration and different types of amplifiers,
4. State and prove the network theorems like Superposition theorem, Thevenin's Theorem, and Norton's Theorem and their applications to networks.
5. Principles of feedback and applications of negative and positive feedback in amplifiers and oscillator circuits.
6. Explain construction and working of OP-AMPs and their applications as waveform generators, comparators and multivibrators etc.

MSE(P) X.5 : CORE LAB – II

After the completion of the course, prospective teachers will be able to

1. Design and construct active filters.
2. Design and construct amplifiers and oscillators
3. Design and construct astable multivibrator/monostable multivibrator/bistable multivibrator using transistor and IC 555.
4. Design and construct adder, scaler, differentiator, integrator, amplifier and filters using Op amp.
5. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
6. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

MSE(P) X.6 : COMPUTER LAB – II

After the completion of the course, prospective teachers will be able to

1. Whether a given number is odd or even, prime or composite…
2. Roots of a quadratic equation
3. The Fibonnaci sequence
4. The addition of two matrices.
5. Find the trajectory of a projectile shot with an initial velocity at an angle and other similar problems in physics.

ELEVENTH SEMESTER

MSE(P) XI.1 : QUANTUM MECHANICS - II

After Completion of this course, the student, should be able to,

1. Use the approximation methods to solve the time independent problems like harmonic oscillator, Stark and Zeeman effects in an atom, etc.
2. Calculate the ground state energy of hydrogen and helium atoms using a variational method.

3. Use the approximation methods for time dependent problems such as the interaction of a particle with electromagnetic (EM) radiation. Elevate the knowledge of emission and absorption of EM radiation by an atom.
4. Understand the quantum mechanics of relativistic particles, their spin and the outcomes of Dirac theory of an electron and negative energy states.
5. Understand the concept of quantization of an electromagnetic field.

MSE(P) XI.2 : SPECTROSCOPY

After the completion of the course, prospective teachers will be able to

1. Understand atomic spectroscopy and effect of external fields to spectra like, Normal and anomalous Zeeman effect,
2. Understand the basic idea of molecular spectra and molecular types.
3. Understand rotational spectra of diatomic molecules: rigid rotator model, energy levels, Eigen functions, spectrum, comparison with observed spectrum and non-rigid rotator model, Intensities of spectral lines, microwave spectrometer, Raman spectrum; classical and quantum theory of Raman Effect, pure rotational Raman spectrum.
4. Understand rotational, vibrational, electronic and Raman spectra of molecules and their applications.
5. Describe vibrational spectra of diatomic molecules and their applications.
6. Understand spin resonance spectroscopy, spectrometers and their applications.

MSE(P) XI.3 : SOLID STATE PHYSICS – I

After the completion of the course, prospective teachers will be able to

1. Explain the concept of polarization when solid is exposed to an external static or AC electric field.
2. Understand Ferroelectric phenomena and the classification of ferroelectric materials.
3. Understand the 1st and 2nd order ferroelectric phase transitions by Landau theory.
4. Know about periodic potentials in solid and their application to calculate the energy band gap of nearly free electrons.
5. Understand the theory of superconductivity.
6. Understand the elastic properties of cubic crystals and isotropic solids.

MSE(P) XI.4 : DIGITAL AND COMMUNICATION ELECTRONICS (SYSTEMS)

After the completion of the course, prospective teachers will be able to

1. . Design and verify various logic gates.
2. Understand communication systems, Amplitude modulation, frequency modulations and their detection.
3. Evaluate modulation index, bandwidth and power requirements for various analog modulation schemes including AM, FM and PM.
4. Understand the influence of noise over Analog Modulation and applications of Analog communication techniques.
5. Understand and analyze pulse modulation and digital communication.
6. Understand the basics of satellite communication
7. Understand and analyze the usage of system for the benefit of society
8. Understand the usage of the different applications of satellite communication.

MSE(P) XI.5 : CORE LAB – III

After the completion of the course, prospective teachers will be able to

1. Develop the experimental skills such as conducting experiments, collection, recording and analysis of the data.
2. Calculate and extract information of the required parameters. Estimation of errors and estimate the accuracy. Comparison of the results with standard values available from the literature.
3. Understand the working principle(s) of the apparatus and its usage.
4. Develop the skills of measuring the spectra, for example, optical spectra using different optical sources and analyzing them Spectra.
5. Measure different magnetic Parameters (of what) by various techniques (like what).
6. Experimentally determine the band gap of a semiconductor by different techniques and comparison of the results.
7. Determination of important parameters of metals like Fermi Energy and work function.
8. Validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.

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9. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
10. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

MSE(P) XI.6 : SOLID STATE PHYSICS LAB

After the completion of the course, prospective teachers will be able to

1. Study experimentally, the dispersion relation of monatomic lattice waves.
2. Perform various kinds of experiments using photovoltaic and photoconductive cells.
3. Study the phase transitions in ferroelectric and ferromagnetic materials experimentally.
4. Determining the Fermi energy of copper
5. validate the theoretical basis of the experiments through investigatory type and open-ended laboratory exercises.
6. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
7. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

TWELFTH SEMESTER

MSE(P) XII.1 : LASER PHYSICS

After the completion of the course, prospective teachers will be able to

1. Understand the principle of interaction of an atom with EM radiation and Einstein's A and B coefficients.
2. Explain amplification and condition for lasing in three and four level systems.
3. Acquire knowledge about the different laser cavity modes.
4. describe the generation of giant laser pulses as well as short laser pulses like pico and femtosecond optical pulses.
5. Describe the working principle of various kinds of lasers and their applications.

MSE(P) XII.2: MATERIAL PHYSICS

After the completion of the course, prospective teachers will be able to

1. Understand the background on Nanoscience - concept of nano size, nanoparticle its structure and properties and connect the concepts of physics, chemistry and engineering principles in the study the nanoscale nature of the particles
2. Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment
3. Apply their learned knowledge to develop Nanomaterials.
4. Describe the structures, symmetries, order, and phase transitions of the most important liquid crystal phases.
5. Explain the remarkable features of liquid crystals and their applications.
6. Understand the elastic properties of liquid crystal materials.

MSE(P) XII.3 : NUCLEAR PHYSICS

After the completion of the course, prospective teachers will be able to

1. Understand Nuclear properties-mass, size, spin, magnetic moment and its determination.
2. Analyze the semi empirical mass formula and its applications using liquid drop model
3. Understand the shell model and apply to understand the stability of magic nuclei.
4. Understand the concept of nuclear decay processes -alpha, beta and gamma decay.
5. Apply the knowledge of quantum mechanics and classical mechanics to understand the theories of nuclear decay processes.
6. Understand nuclear fission process, nuclear fusion process, and theory and construction of nuclear reactors.
7. Apply appropriate mathematical techniques to solve nuclear physics problems.
8. Apply appropriate laboratory techniques for the detection of nuclear radiations.
9. Outline the importance of nuclear physics in modern society.

MSE(P) XII.4 : SOLID STATE PHYSICS II

After the completion of the course, prospective teachers will be able to

1. . Understand the scattering of X-rays by an atom and a unit cell.
2. Know about the different X-ray diffraction techniques to study the structure of crystals.
3. Analyze the crystal structure and refinement of structure by different techniques.
4. Know different kinds of imperfections and the energy of formation.
5. Study the role of defects in ionic conductivity.
6. Understand about dislocations in crystals.
7. Calculate magnetic moment of an atom using Hund's rule.
8. Understand the difference in paramagnetism of salts of "d" block and "f" block elements.
9. Know the working principle and conditions for NMR.

MSE(P) XII.5 : CORE LAB – IV

After the completion of the course, prospective teachers will be able to

1. Design and plan a measurement involving nuclear and choose the type of detector to the intended measurement process.
2. Tune parameters of a nuclear electronic equipment.
3. Measure and subtract noise and natural background.
4. Operate a data acquisition system, collecting a number of data points.
5. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
6. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

MSE(P) XII.6 : NUCLEAR PHYSICS LAB

After the completion of the course, prospective teachers will be able to

1. Design and plan a measurement involving nuclear and choose the type of detector to the intended measurement process.
2. Tune parameters of a nuclear electronic equipment.
3. Calibrate a radiation detector.
4. Measure and subtract noise and natural background.
5. Operate a data acquisition system, collecting a number of data points.
6. Analyze the experimental data, to produce graphics showing both statistical and systematic errors, and fits to theoretical models.
7. Interpret the experimental outcome, make a critical assessment and draw valid conclusions by comparing the measured values with previous measurements.

Skill Enhance Course – SEC 2 Botany
MSE IV 6B: UTILIZATION OF PLANTS
AND HERBAL TECHNOLOGY.

Course learning outcomes (CLO's):

On completion of the course, prospective student Teachers will be able to demonstrate the following skills.

Course content:

Unit 1: Utilization of plants

(a) Students will be able to identify and write brief account cereals, pulses, millets, Bengal gram, green gram, black gram, their name, family and their economic importance.
(b) Able to identify & clarify the fibres and observe fibres and the types, express their tenacity and strength of fibre. Cotton, Jute, linen and coir.
(c) Students will be able to explain and understand the procedure to extract oils. Vegetable oils:Groundnut, coconut, sunflower, safflower, castor.
(d) Students will be able to explain and understand the Timber and Bamboos:Rosewood, teakwood, Genne, canes and bamboos.
(e) Students will be able to understand Beverages and types of beverages: Coffee, Tea and cocoa.
(f) Spices and condiments:Students will able to understand the general account of cardamom, clove, pepper, ginger, cinnamon, saffron, turmeric and mustard.
(g) Pharmalonory: Uses of Rauw olfia phyllanthus, catharanthus, ocimum, tylophera, zingiber, trigonella and other locally available medicinal plant they study in detail.

Unit II: Student will able to understand the history and scope-definition of medical terms – role of medicinal plants in siddha systems of medicine cultivation, harvesting – processing- store marketing and utilization of medical plants.

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Unit III: They will be able to understand active principles and methods of photochemistry of same medicinal herbs like:

a. Catharanthus ..... – cardio tonic properties
b. Withania semnifera – drugs action nervous system.
c. Clerodendrom phlomidis – anti rheumatic
d. Centella asictica – memory booster

Unit IV: Students will be able to analyze the active principles, biological testing and photochemical screening test for secondary metabolites like

a. Alkaloids
b. Flavonoids
c. Steroids
d. Triterpenoids
e. Phenqics

* Micro propagation important species and their phanmocognory
* Student Teachers will also study and identify the economic importance of plant and their history.
* Preparation herbarium sheets of medicinal plants
* Visit to a medicinal plant garden.
* Submission of a Technical report on local medicinal plants collected.
* Familiarization of photochemical screening methods and micro propagation methods.
* Cultivation and drug analysis of medicinal herbs.

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मैसुरु - ५७०००६ / Mysuru - 570006

B.Ed

B.Ed - PC-5: CREATING AN INCLUSIVE SCHOOL

BA.B.Ed - BAE VII. 4: Creating an Inclusive School

BSc.B.Ed- BSE VII.4 :CREATING AN INCLUSIVE SCHOOL

M.Sc.Ed:CREATING AN INCLUSIVE SCHOOL

On completion of the course, prospective teachers will be able to :

1. Analyse the meaning and concept of Special Education, Integration and Inclusion.
2. Appreciate the special needs of Individuals with diverse needs.
3. Realize the importance of inclusive education and inclusive education programmes
4. Examine the role of various agencies towards inclusion.
5. Appreciate the concept of exceptional children.
6. Identify the exceptional learners in a classroom.
7. Explore the nature and needs of different categories of children with special needs.
8. Implement the different considerations and provisions for facilitating inclusion.
9. Exercise various educational intervention programmes for meeting the needs of exceptional learners.
10. Employ the skills of adapting curriculum to meet the need of the students with diverse needs.

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Yoga Education, Self-Understanding and Development

Course Learning Outcome.

On the Completions of the Course, prospective teachers will be able to demonstrate

1. Some Important Asanas and Pranayamas
2. He/She will have a clear Idea about the Concepts like Self-esteem & Self-Concept & its importance.
3. Ability to State the Different types of yoga (Astana Yoga, Hatha Yoga etc.,)
4. The Process of Meditation and Stress management
5. The Process of Personality Development through Yogic Practice.

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UNIVERSITY OF MYSORE

REGIONAL INSTITUTE OF EDUCATION
[National Council of Educational Research and Training, New Delhi]

Regulations governing the Programme

1.0 Programme and Duration :

Integrated Programme of Teacher Education titled **'Master of Science Education' (Physics)** leading to the post-graduate degree**, M.Sc.Ed. (Physics).** The programme will be of six year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of 16 weeks of instruction excluding examination.

1.1 **Equivalence:**

The course content in the subjects, Physics, Chemistry and Mathematics in the first four years are equivalent to course content in the relevant subjects in the B.Sc. (PCM) Programme of the University of Mysore. The course contents of the fifth and sixth years are equivalent to the M.Sc. Programme in Physics offered by the University of Mysore.

The course content related to Professional education is equivalent to the B.Ed. of University of Mysore and are as per the NCTE Regulations (2014).

In addition, in the last two years of the Programme, Professional Education components required for teaching of Physics at senior secondary level are also included. The composite degree, M.Sc.Ed., is thereby equivalent to B.Sc., B.Ed. and M.Sc. degrees of University of Mysore.

2.0 Eligibility for admission to M.Sc.Ed.

2.1 Candidates seeking admission to the programme should have passed CBSE Senior Secondary examination/ Pre-University examination of Karnataka or an equivalent examination of any state or UT of the Republic of India with 45% marks in the aggregate. Relaxation up to 5% of marks is given to the SC/ST candidates.

2.2 Candidates should have passed the qualifying examination with the following combinations of subjects: Physics, Chemistry, Mathematics/Statistics.

2.3 Admission shall be made by selection on the basis of marks in the qualifying examination and performance in a specially designed national level test (Common Entrance Examination) conducted by the NCERT. It shall be governed by the admission policies of NCERT and the guidelines of the University of Mysore.

It will also be governed by the reservation policies of Govt. of India as prevalent at the time of admission.

3.0 Scheme of Instruction :

Details of courses, scheme of study, credit distribution pattern and method of evaluation, etc. are provided in Table 1.

From semesters I to VIII Courses of Study are organized under the following categories:

a) Core Courses
b) Ability Enhancement Courses
c) Discipline Specific Electives
d) Skill Enhancement Courses
e) Generic Courses
f) Professional Education Courses.

From semesters IX to XII, courses of study are classified under the following categories:

a) Core Courses
b) Professional Education Courses

3.1 Core Courses:

The Programme offers three majors, Physics, Chemistry and Mathematics in the first six semesters. Each Major comprises of 6 core courses. The titles of courses in each major and their positions are given in Tables 2 & 3.

From semesters IX to XII the core courses comprise of Physics theory and core labs of the Masterôs level.

3.2 **Ability Enhancement Courses :**

This is mandatory for all students. Comprises of 8 courses offered during I to IV Semesters , four each in a language of studentôs choice and four in English

a) Language: Any one of the following: Hindi/ Kannada/ Malayalam/ Tamil / Telugu
b) English

3.3 **Discipline Specific Elective:**

Total of six advanced courses, two in each Major Subject are offered in the VII and VIII semesters of the Programme.

3.4 Skill Enhancement Course:

Two courses are offered in the third and fourth semesters of the Programme. Students can choose any two courses of their choice, cutting across disciplines, from a pool of courses that are being offered in each subject area.

3.5. Generic Course:

Two courses of inter-disciplinary nature are offered in the first and eighth semesters of the programme.

3.6 Professional Education Courses:

In accordance with the NCTE regulations ï 2014, the programme includes 23 courses which are positioned in the first 8 semesters. The requirements of the 20-week internship proposed by the NCTE, are met through five rigorous phases of School Attachment Programmes. The first three Phases are of 2-week duration each, which will be organized in the Demonstration School and selected schools in and around Mysuru. The fourth phase is of 3 weeks duration, i.e. 1 week exclusively for working with community. The final fifth phase is of longer duration of 11 weeks internship and it will be organized in selected schools of NVS of Hyderabad Region or other schools.

An additional School attachment Programme is organized in the XI semester for a duration of 4 weeks. This will be organized in selected higher secondary schools where the student trainees will have a specialized internship in teaching experience at the higher secondary level.

4.0 Attendance

Each student has to attend a minimum of 7**5%** classes out of the classes conducted in each course. Failure to meet the minimum requirement renders disqualification from terminal examination and makes him/her ineligible for NCERT scholarship/ free ship. Such a student is deemed to have dropped the course and is not allowed to write the semester end examination (C_3) of that course. He/She has to re-register for the course/s as and when they are offered by the institute.

5.0 Medium of Instruction:

The medium of instruction and examination is English.

6.0 Course Structure

TABLE 1: Credit Break-Up into B.Sc., M.Sc. and B.Ed. and P.E. Components and Mode of Evaluation

Semesters	Total Credits		Programme	Credits (Theory) (L)	Teaching hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)	Periodic Assessment (C_1+C_2)	Terminal Assessment (C_3)
I	24	18	B.Sc.	13	13	5	10	23	50	50
		6	B.Ed.	4	4	2	4	8	50	50
II	24	18	B.Sc.	13	13	5	10	23	50	50
		6	B.Ed.	4	4	2	4	8	50	50
III	29	21	B.Sc.	15	15	6	12	27	50	50
		8	B.Ed.	4	4	4	8 + 2 Wks	12	50	50
IV	29	21	B.Sc.	15	15	6	12	27	50	50
		8	B.Ed.	4	4	4	8 + 2 Wks	12	50	50
V	26	12	B.Sc.	9	9	3	6	15	50	50
		14	B.Ed.	7	7	7	10 + 2 Wks	17	50	50
VI	27	12	B.Sc.	9	9	3	6	15	50	50
		15	B.Ed.	6	6	9	12 + 3 Wks	18	50	50
VII	29	09	B.Sc.	3	3	6	12	15	50	50
		20	B.Ed.	4	4	12*+4	8+11 Wks	12	50	50
VIII	21	11	B.Sc.	5	5	6	12	17	50	50
		10	B.Ed.	6	6	4	8	14	50	50
IX	23	20	M.Sc	16	16	4	8	24	50	50
		3	PE	2	2	1	2	4	50	50
X	23	20	M.Sc.	16	16	4	8	24	50	50
		3	PE	2	2	1	2	4	50	50
XI	20 4*	20	M.Sc.	16	16	4	8	24	50	50
		4	PE			4**	4 Wks		50	50
XII	23	20	M.Sc.	16	16	4	8	24	50	50
		3	PE	2	2	1	2	4	50	50
Total	302			191	191	111	180	371		

*internship ** includes internship credits

L : Lectures: 1 credit =1hr/week x 16 weeks T :Tutorial/ 1 credit = 2 hr/week x 16 weeks

P : Practicum/practical = 2 hr/week x 16 weeks V: Credit value of a course is L+T+P

TABLE 2: Panorama of Courses with Credit Break-up from Semester I to VIII

Sl.No.	COURSE	CREDITS BREAK-UP SEMESTERWISE (L+T+P)								Credits (L+T+P)	Total Credits In Prog.
		I	II	III	IV	V	VI	VII	VIII		
	CORE COURSES:										
1	Physics	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24
2	Chemistry	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	--	--	18+0+6	24
3	Maths	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	3+1+0	--	--	18+0+6	24
	ABILITY ENHANCEMENT COURSES										
1	Language H/K/M/Tam/Tel	2+1+0	2+1+0	2+1+0	2+1+0	--	--	--	--	8+4+0	12
2	English	2+1+0	2+1+0	2+1+0	2+1+0					8+4+0	12
	SKILL ENHANCEMENT COURSES										
1	Courses 1 & 2	--	--	2+0+1	2+0+1	--	--	--	--	4+0+2	6
	DISCIPLINE SPECIFIC ELECTIVE										
1	Physics							1+1+1	1+1+1	2+2+2	6
2	Chemistry							1+1+1	1+1+1	2+2+2	6
3	Maths							1+1+1	1+1+1	**2+2+2**	**6**
	GENERIC ELECTIVE										
1	Environmental Education	1+1+0								1+1+0	2
2.	Indian Constitution & Human Rights								1+1+0	1+1+0	2
	PROFESSIONAL EDUCATION COURSES										
1	Language Across Curriculum	3+1+0								3+1+0	4
2	Contemporary Indian Education		3+1+0							3+1+0	4
3	Yoga Edu., self-understanding & development		1+0+1							1+0+1	2
4	Understanding the Learner			3+1+0						3+1+0	4
5	Gender School & Society.			1+1+0						1+1+0	2
6*	School Attachment Programme 1to 4			0+0+2	0+0+2	0+0+2	0+0+3			0+0+9	9
7	Learning & Teaching				3+1+0					3+1+0	4
8	Drama & Art Education				1+1+0					1+1+0	2
9	Assessment for Learning					3+1+0				3+1+0	4
10	Pedagogy of Physical Science					2+2+0				2+2+0	4
11	Pedagogy of Maths					2+2+0				2+2+0	4
12	Critical Under-standing of ICT						2+2+0			2+2+0	4
13	Pedagogy of Physical Science						2+2+0			2+2+0	4

14	*Pedagogy of Maths.*						*2+2+0*			*2+2+0*	*4*
15	*Creating an inclusive school*							*2+2+0*		*2+2+0*	*4*
16	Health & Physical *Education*							*1+0+1*		*1+0+1*	*2*
17	*Reading & reflection on text*							*1+1+0*		*1+1+0*	*2*
*18**	Internship - School Subject 1: Physical Science							*0+0+6*		*0+0+6*	*12*
*19**	Internship - School Subject 2: Mathematics							*0+0+6*		*0+0+6*	
20	Knowledge & Curriculum								*2+2+0*	*2+2+0*	*4*
21	Guidance & Counselling								*3+1+0*	*3+1+0*	*4*
22	Value & Peace Education								*1+1+0*	*1+1+0*	*2*

***=** courses which do not have C3 Theory examination

TABLE 3: Panorama of the Courses with Credit break-up from Semesters IX to XII

SL. NO.	***COURSE***	*CREDITS* (L+T+P)				**TOTAL CREDITS**
		IX *L+T+P*	*X* *L+T+P*	*XI* *L+T+P*	*XII* *L+T+P*	
	Core papers					
1	Classical Mechanics	4+0+0				*4*
2	Mathematical Physics ï I	4+0+0				*4*
3	Electrodynamics	4+0+0				*4*
4	Numerical Techniques and Computer Programming	4+0+0				*4*
5	Core Lab ï I	0+0+2				2
6	Computer Lab ï I	0+0+2				2
7	Quantum Mechanics -I		4+0+0			*4*
8	Mathematical Physics ï II		4+0+0			*4*
9	Statistical Physics		4+0+0			*4*
10	Electronics		4+0+0			*4*
11	Core Lab ï II		0+0+2			2
12	Computer Lab ï II		0+0+2			2
13	Quantum Mechanics - II			4+0+0		*4*
14	Spectroscopy			4+0+0		*4*
15	Solid State Physics ï I			4+0+0		*4*
16	Digital And Communication Electronics Systems			4+0+0		*4*
17	Core Lab ï III			0+0+2		*2*

18	Solid State Physics Lab			0+0+2		*2*
19	Laser Physics				4+0+0	*4*
20	Materials Physics				4+0+0	*4*
21	Nuclear Physics				4+0+0	*4*
22	Solid State Physics II				4+0+0	*4*
23	Core Lab ï IV				0+0+2	*2*
24	Nuclear Physics Lab				0+0+2	*2*
	Sub-total					**80**
	PROFESSIONAL EDUCATION					
25	Foundations of higher secondary education	2+1+0				*3*
26	Teaching of Physics		2+1+0			*3*
27	Internship Programme 2 (senior secondary level)			0+0+4		*4*
28	Research in Physics Education				2+1+0	*3*
	Sub-Total					***13***
	GRAND TOTAL					***93***

L : Lectures: 1 credit = 1hr/week x 16 weeks
T :Tutorial: 1 credit = 2 hr/week x 16 weeks
P : Practicum/practical : 1 credit = 2 hr/week x 16 weeks
V: Credit value of a course is L+T+P

Note : VII Semester consists of 25 weeks out of which 11 weeks of School Attachment Programme-internship in Teaching will be organized in schools outside Mysore. 14 weeks are available for classroom instruction.

Tables 4 to 15: Detailed Course Structure for M.Sc.Ed.(Physics)

Total Credits = 302
B.Sc. Component = 122; M.Sc. 80; B.Ed. + P.E.Component = 87+13

TABLE 2: Semester I (Credits: B.Sc.12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Course1A Physics	3	3	1	2	5
2	4	Core Course 2A Chemistry	3	3	1	2	5
3	4	Core Course 3A Mathematics	3	3	1	2	5
4	3	AEC 1A Language H/K/M/Tam/Tel	2	2	1	2	4
5	3	AEC 2A English	2	2	1	2	4
6	4	Language across the curriculum	3	3	1	2	5
7	2	Environmental Education	1	1	1	2	3
Total	**24**		**17**	**17**	**7**	**14**	**31**

Note: Core Courses 1A, 2A & 3A ï refer to the major subjects; A refers to the First course in each major; from Sem II to VI, papers in core courses are designated B, C, D, E & F.
AEC ï Ability Enhancement Course; GE- Generic Elective

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 5: Semester II (Credits: B.Sc. 12; AEC 6; B.Ed. 6; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Course 1B Physics	3	3	1	2	5
2	4	Core Course 2B Chemistry	3	3	1	2	5
3	4	Core Course 3B Mathematics	3	3	1	2	5
4	3	AEC 1B Language H/K/M/Tam/Tel	2	2	1	2	4
5	3	AEC 2 B English	2	2	1	2	4
6	4	Contemporary Indian Education	3	3	1	2	5
7	2	Yoga Edu., self-understanding & development	1	1	1	2	3
Total	24		17	17	7	14	31

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 8 : Semester III (Credits: B.Sc.12; AEC 6; SEC 3; B.Ed. 8; Total 29)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Course 1C Physics	3	3	1	2	5
2	4	Core Course 2C Chemistry	3	3	1	2	5
3	4	Core Course 3C Mathematics	3	3	1	2	5
4	3	AEC 1C Language H/K/M/Tam/Tel	2	2	1	2	4
5	3	AEC 2C English	2	2	1	2	4
6	3	Skill Enhancement Course 1	2	2	1	2	4
7	4	Understanding the Learner	3	3	1	2	5
8	2	Gender School & Society	1	1	1	2	3
9	2	School Attachment Programme 1	0	0	2		2 weeks
Total	29		19	19	10	16	35

SEC 1 - Skill Enhancement Course 1 – Each student will select any one of the 5 courses offered.

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 7: Semester IV (Credits: B.Sc.12; AEC 6; SEC 3; B.Ed. 8; Total 29)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Course 1D Physics	3	3	1	2	5
2	4	Core Course 2D Chemistry	3	3	1	2	5
3	4	Core Course 3D Mathematics	3	3	1	2	5
4	3	AEC 1D Language H/K/M/Tam/Tel	2	2	1	2	4
5	3	AEC 2D English	2	2	1	2	4
6	3	*Skill Enhancement Course 2	2	2	1	2	4
7	4	Learning & Teaching	3	3	1	2	5
8	2	Drama & Art Education	1	1	1	2	3
9	2	School Attachment Programme 2	0	0	2		2 Weeks
Total	29		19	19	10	16	35

* SEC 2 – Skill Enhancement Course 2 – Each student will select any one of the 5 courses offered.

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 8: Semester V (Credits: B.Sc. 12; B.Ed. 14; Total 26)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Course 1E Physics	3	3	1	2	5
2	4	Core Course 2E Chemistry	3	3	1	2	5
3	4	Core Course 3E Mathematics	3	3	1	2	5
4	4	Assessment For Learning	3	3	1	2	5
5	4	Pedagogy of Physical Sciences	2	2	2	4	6
6	4	Pedagogy of Maths.	2	2	2	4	6
7	2	School Attachment Programme 3	0	0	2		2 Weeks
Total	26		16	16	10	16	32

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 9 : Semester VI (Credits: B.Sc. 12; B.Ed. 15; Total 27)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Course 1F Physics	3	3	1	2	5
2	4	Core Course 2F Chemistry	3	3	1	2	5
3	4	Core Course 3F Mathematics	3	3	1	2	5
4	4	Critical Under-standing of ICT	2	2	2	4	6
5	4	Pedagogy of Physical Sciences	2	2	2	4	6
6	4	Pedagogy of Maths	2	2	2	4	6
7	3	School Attachment Programme 4 and Community Living	0	0	3		3 weeks
Total	**27**		**15**	**15**	**12**	**18**	**33**

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 10 : Semester VII*(Credits: DSE 9; B.Ed. 20; Total 29**)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	3	DSE 1 A Physics	1	1	1+1	2+2	5
2	3	DSE 2 A Chemistry	1	1	1+1	2+2	5
3	3	DSE 3 A Mathematics	1	1	2	4	5
4	4	Creating an Inclusive School	2	2	2	4	6
5	2	Health & Physical Education	1	1	1	2	3
6	2	Reading & Reflections On Text	1	1	1	2	3
7*	6	Internship in School Subject 1 : Physical Sciences	0	0	6		
8	6	Internship in School Subject 2 : Mathematics	0	0	6		11 weeks
Total	**29**		**7**	**7**	**22**	**20**	**27**

*Semester duration 25 weeks; Instructional duration -14 weeks; Engagement in field -11 weeks:

**includes Internship 12 credits; DSE ï Discipline Specific Elective

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 11 : Semester VIII (Credits: DSE 9; GE 2; B.Ed. 10; Total 21)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	3	DSE 1 B Physics	1	1	1+1	2+2	5
2	3	DSE 2 B Chemistry	1	1	1+1	2+2	5
3	3	DSE 3 B Mathematics	1	1	2	4	5
4	2	GE 2 Indian Const. & Human Rights	2	2	0	0	2
5	4	Knowledge & Curriculum	2	2	2	4	6
6	4	Guidance & Counseling	3	3	1	2	5
7	2	Value & Peace Education	1	1	1	2	3
Total	**21**		**11**	**11**	**10**	**20**	**31**

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 12: Semester IX (Credits: M.Sc. 20: Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Physics 1	4	4	0	0	4
2	4	Core Physics 2	4	4	0	0	4
3	4	Core Physics 3	4	4	0	0	4
4	4	Core Physics 4	4	4	0	0	4
5	2	Lab.I	0	0	2	4	4
6	2	Lab.II	0	0	2	4	4
7	3	Professional Education	2	2	1	2	4
Total	**23**		**18**	**18**	**5**	**10**	**28**

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 13 : Semester X (Credits: M.Sc. 20 Prof. Edu. 3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Physics 5	4	4	0	0	4
2	4	Core Physics 6	4	4	0	0	4
3	4	Core Physics 7	4	4	0	0	4
4	4	Core Physics 8	4	4	0	0	4
5	2	Lab.III	0	0	2	4	4
6	2	Lab.1V	0	0	2	4	4
7	3	PE	2	2	1	2	4
Total	**23**		**18**	**18**	**5**	**10**	**28**

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 14: Semester XI (Credits: M.Sc. 20 ; Prof. Edu. 4; Total 24)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Physics 9	4	4	0	0	4
2	4	Core Physics 10	4	4	0	0	4
3	4	Core Physics 11	4	4	0	0	4
4	4	Core Physics 12	4	4	0	0	4
5	2	Lab.V	0	0	2	4	4
6	2	Lab .VI	0	0	2	4	4
7	4	PE - Internship	0	0	4	-	4 weeks
Total	**24**		**16**	**16**	**8**	**8**	**24**

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 15 : Semester XII (Credits: M.Sc. 20 ; Prof. Edu.3; Total 23)

Course No.	Total Credits	Courses	Credits Theory (L)	Teaching Hours per week (L)	Credits: Practicum/al (Lab/Field) (T/P)	Practicum/al Hours per week (T/P)	Total Hours per week (L+T+P)
1	4	Core Physics 13	4	4	0	0	4
2	4	Core Physics 14	4	4	0	0	4
3	4	Core Physics 15	4	4	0	0	4
4	4	Core Physics 16	4	4	0	0	4
5	2	Lab.VII	0	0	2	4	4
6	2	Lab. VIII	0	0	2	4	4
7	3	Professional Education	2	2	1	2	4
Total	**23**		**18**	**18**	**5**	**10**	**28**

Evaluation : $C_1 + C_2 = 50\%$; $C_3 = 50\%$

TABLE 16 : SUBJECTS AND TITLES OF COURSES IN THE PROGRAMME

SEMESTER	COURSE	CODE	SUBJECT	TITLE
SEMESTERS I TO VIII				
FIRST	**Core course 1A**	MSE I.1	Physics	Mechanics
	Core Course 2A	MSE I.2	Chemistry	Atomic Structure and Bonding
	Core Course 3A	MSE I.3	Mathematics	Calculus ï I and Matrices
	AEC 1A	MSE I.4A MSE I.4B MSE I.4C MSE I.4D MSE I.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2A	MSE I.5	English	
	GE 1	MSE I.6		Environmental Education
	Professional Education	MSE I.7		Language Across Curriculum
SECOND	**Core course 1B**	MSE II.1	Physics	Elasticity, Waves, Heat and Thermodynamics
	Core Course 2B	MSE II.2	Chemistry	States of Matter and Nuclear Chemistry
	Core Course 3B	MSE II.3	Mathematics	Calculus ï II , Analytical Geometry and Number Theory
	AEC 1B	MSE II.4A MSE II.4B MSE II.4C MSE II.4D MSE II.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2B	MSE II.5	English	
	Professional Education	MSE II.6		Contemporary Indian Education
		MSE II.7		Yoga Edu., self-understanding & development
THIRD	**Core course 1C**	MSE III.1	Physics	Electricity and Electromagnetism
	Core Course 2C	MSE III.2	Chemistry	Organic Chemistry ï I
	Core Course 3C	MSE III.3	Mathematics	Real Analysis
	AEC 1C	MSE III.4A MSE III.4B MSE III.4C MSE III.4D MSE III.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2C	MSE III.5	English	
	SEC 1	MSE III.6A MSE III.6B MSE III.6C MSE III.6D MSE III.6E	Physics Botany Chemistry Mathematics Zoology	Basic Instrumentation Skills Plant Propagation, Nursery & Gardening Industrial Chemicals and Environment Combinatorics, Statistics & Basic Probability Apiculture
	Professional Education	MSE III.7		Understanding the Learner
		MSE III.8		Gender School & Society
		MSE III.9		School Attachment Programme 1

FOURTH	**Core course 1D**	MSE IV.1A	Physics	Optics
	Core Course 2D	MSE IV.2	Chemistry	Thermodynamics, Equilibrium and Solutions
	Core Course 3D	MSE IV.3	Mathematics	Differential Equations
	AEC 1D	MSE IV.4A MSE IV.4B MSE IV.4C MSE IV.4D MSE IV.4E	Language	Hindi/ Kannada/ Malayalam / Tamil/ Telugu
	AEC 2D	MSE IV.5	English	
	SEC 2	MSE IV.6A MSE IV.6B MSE IV.6C MSE IV.6D MSEIV.6E	Physics Botany Chemistry Mathematics Zoology	Computational Physics Utilisation of Plants & Herbal Technology Industrial Inorganic Materials Data Handling Sericulture
	Professional Education	MSE IV.7		Learning&Teaching
		MSE IV.8		Drama & Art Education
		MSE IV.9		School Attachment Programme 2
FIFTH	**Core course 1E**	MSE V.1	Physics	Atomic and Molecular Physics
	Core Course 2E	MSE V.2	Chemistry	Transition Elements, Coordination Compounds and Chemical Kinetics
	Core Course 3E	MSE V.3	Mathematics	Multivariate Calculus and Vector Calculus
	Professional Education	MSE V.4		Assessment For Learning
		MSE V.5		Pedagogy Of Physical Sciences 1
		MSE V.6		Pedagogy of Mathematics 1
		MSE V.7		School Attachment Programme 3
SIXTH	**Core course 1F**	MSE VI.1	Physics	Classical and Quantum Mechanics and Special Theory of Relativity
	Core Course 2F	MSE VI.2	Chemistry	Organic Chemistry II
	Core Course 3F	MSE VI.3	Mathematics	Groups and Rings
	Professional Education	MSE VI.4		Critical Understanding of ICT
		MSE VI.5		Pedagogy of Physical Science 2
		MSE VI.6		Pedagogy of Mathematics 2
		MSE VI.7		School Attachment Programme 4
SEVENTH	**Discipline Specific Elective 1**	MSE VII.1	Physics	Nuclear and Particle Physics
		MSE VII.2	Chemistry	Electrochemistry and Photochemistry
		MSE VII.3	Mathematics	Linear Algebra
	Professional Education	MSE VII.4		Creating an Inclusive School
		MSE VII.5		Health & Physical Education
		MSE VII.6		Reading & reflection on text
		MSE VII.7A	Internship 1	School Subject 1 : Physical Science
		MSE VII.7B		School Subject 2: Mathematics

EIGHTH	**Discipline Specific Elective 2**	MSE VIII.1	Physics	Solid State Physics
		MSE VIII.2	Chemistry	Spectroscopy, Natural Products and Heterocyclics
		MSE VIII.3	Mathematics	Complex Analysis and Numerical Analysis
	Generic Elective 2	MSE VIII.4		Indian Constitution and Human Rights
	Professional Education	MSE VIII.5		Knowledge &Curriculum
		MSE VIII.6		Guidance & Counselling
		MSE VIII.7		Value & Peace Education

Semesters : IX to XII

NINTH	**Core Physics**	MSE(P)-IX.1	Classical Mechanics
		MSE(P)-IX.2	Mathematical Physics ï I
		MSE(P)-IX.3	Electrodynamics
		MSE(P)-IX.4	Numerical Techniques and Computer Programming
		MSE(P)-IX.5	Core Lab ï I
		MSE(P)-IX.6	Computer Lab ï I
	Professional Education	MSE(P)-IX.7	Foundations of Higher Secondary Education
TENTH	**Core Physics**	MSE(P)-X.1	Quantum Mechanics ï I
		MSE(P)-X.2	Mathematical Physics ï II
		MSE(P)-X.3	Statistical Physics
		MSE(P)-X.4	Electronics
		MSE(P)-X.5	Core Lab ï II
		MSE(P)-X.6	Computer Lab ï II
	Professional Education	MSE(P)-X.7	Teaching Physics
ELEVENTH	**Core Physics**	MSE(P)-XI.1	Quantum Mechanics ï II
		MSE(P)-XI.2	Spectroscopy
		MSE(P)-XI.3	Solid State Physics ï I
		MSE(P)-XI.4	Digital And Communication Electronics Systems
		MSE(P)-XI.5	Core Lab ï III
		MSE(P)-XI.6	Solid State Physics Lab
	Professional Education	MSE(P)-XI.7	Internship 2 (Senior Secondary Level)
TWELFTH	**Core Physics**	MSE(P)-XII.1	Laser Physics
		MSE(P)-XII.2	Material Physics
		MSE(P)-XII.3	Nuclear Physics
		MSE(P)-XII.4	Solid State Physics II
		MSE(P)-XII.5	Core Lab ï IV
		MSE(P)-XII.6	Nuclear Physics Lab
	Professional Education	MSC(P)-XII.7	Research in Physics Education

7.0 Change to another programme

Candidates admitted to M.Sc.Ed.(Physics) programme have the option of changing to M.Sc.Ed. Chemistry or Mathematics programme in the beginning of IX semester, after successful completion of first eight semesters without dropping any course, and subject to conditions laid down by the Academic Committee constituted for the purpose.

8.0 Continuous Assessment, Earning of Credits and Award of Grades

The evaluation of the candidate shall be based on continuous assessment. The structure for evaluation is as follows:

8.1 Assessment and evaluation processes happen in a continuous mode. However, for reporting purposes, a semester is divided into 3 discrete components identified as C_1, C_2, and C_3.

8.2 The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.

8.2.1 The first component (C_1), of assessment is for 25 marks. This will be based on Test/ assignment / seminar. During the first half of the semester, the first 50% of the syllabus will be completed. This shall be consolidated during the 8th week of the semester. Beyond 8th week, making changes in C_1 is not permitted.

8.2.2 The second component (C_2), of assessment is for 25 marks. This will be based on test/ assignment/ seminar. The continuous assessment and scores of second half of the semester will be consolidated during the 16th week of the semester. During the second half of the semester the remaining units in the course will be completed.

8.2.2.1 The outline for continuous assessment activities for Component-I (C_1) and Component-II (C_2) will be proposed by the teacher(s) concerned before the commencement of the semester and will be discussed and decided in the respective Section/Department. The students should be informed about the modalities well in advance. The evaluated courses/assignments during component I (C_1) and component II (C_2) of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained for this purpose by the concerned teacher.

8.2.3 During the 18th-20th week of the semester, a semester-end examination of 2 hours duration shall be conducted for each course. This forms the third/final component of assessment (C_3) and the maximum marks for the final component will be 50.

Setting questions papers and evaluation of answer scripts.

I. Questions papers in three sets shall be set by the internal examiner for a course. Whenever there are no sufficient internal examiners, the chairman of BoE shall get the questions papers set by external examiners.

II. The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation. There shall be separate BoE for UG and PG papers.

III. (i) **For semesters I to VIII**, t**here shall be single valuation for all theory papers by internal examiners. In case, the number of internal examiners falls short, external examiners may be invited.**

(ii) The examination for Practical work/ Field work/Project work will be conducted jointly by two internal examiners. However the BoE on its discretion can also invite external examiners if required.

IV. **For semesters IX to XII, a separate PG board of Examiners approved by the University will be constituted. All question papers will be set by internal examiners but valuation shall be done by external examiners.**

V. Each theory paper comprises of 9 questions of 10 marks each. Each unit will have two questions with internal choice. Question 9 will have questions drawn from all the 4 units.

VI. Challenge valuation

A student who desires to apply for challenge valuation shall obtain a Xerox copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 15 days after the announcement of the results. This challenge valuation is only for C_3 component. The answer scripts for which challenge valuation is sought for shall be sent to another external examiner. The marks awarded will be the higher of the marks obtained in the challenge valuation and in maiden valuation.

8.2.4 In case of a course with only practical component a practical examination will be conducted with two examiners (ref: 8.2.3 III (ii)). A candidate will be assessed on the basis of a) knowledge of relevant processes b) Skills and operations involved c) Results / products including calculation and reporting. If external examiner does not turn up then both the examiners will be internal examiners. The duration for semester-end practical examination shall be decided by the departmental council.

8.2.5 If X is the marks scored by the candidate out of 50 in C_3 in theory examination, if Y is the marks scored by the candidate out of 50 in C_3 in Practical examination, and if Z is the marks scored by the candidate out of 50 in C_3 for a course of (L=0):T:(P=0)type that is entirely tutorial based course, then the final marks M in C3 is decided as per the following table.

L.T.P. distribution	**Calculation of M in C_3**
L:T:P	$\frac{[(L+T)*X]+[(T+P)*Y]}{L+2T+P}$
L : (T = 0) :òP	$\frac{(L*X)+(P*Y)}{L+P}$
L:T : (P=0)	X
L : (T=0) : (P = 0)	X
(L=0) : T : P	Y
(L=0) : (T = 0) : P	Y
(L=0) : T : (P = 0)	Z

8.2.6 The details of continuous assessment are summarized in the following Table.

Compo-nent	**Syllabus in a Course**	**Weightage**	**Period of Continuous Assessment**
C_1	First 50% (2 units of total units)	25%	First half of the semester. To be consolidated by 8th week.
C_2	Remaining 50% (Remaining units of the course)	25%	Second half of the semester. To be consolidated by 16th week.
C_3	Semester-end examination (All units of the course)	50%	To be completed during 18th ï 20th Week
Final Grades to be announced latest by 24th week			

8.2.7 A candidateôs performance from all 3 components will be in terms of scores, and the sum of all three scores will be for a maximum of 100 marks (25 + 25 + 50).

8.2.8 Finally, awarding the grades should be completed latest by 24th week of the semester.

8.3 In case a candidate secures less than 30% in $C_1$and C_2 put together in a course, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C_3 in that course.
In case a candidateôs class attendance in a course is less than 75% or as stipulated by the University, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C_3 in that course.
Teachers offering the courses will place the above details in the Departmental meeting during the last week of the semester, before the commencement of C_3, and subsequently a notification pertaining to the above will be brought out by the Principal before the commencement of C_3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

8.4 In case a candidate secures less than 30% in C_3, he/she may choose DROP/MAKEUP option.
In case a candidate secures more than or equal to 30% in C_3, but his/her grade (G) = 4, as per section 8.12 below, then he/she may be declared to have been conditionally successful in this course, provided that such a benefit of conditional clearance based on G=4 shall not be availed for more than 24 credits for the entire programme..
In case a candidate secures less than 30% in C_3, he/she may choose DROP/MAKE-UP option.
The candidate has to exercise his/her option to DROP immediately within 10 days from the date of notification of results.
A MAKE UP examination for odd semester courses will be conducted along with next regular odd semester examinations and for even semester courses along with a next regular even semester examinations. If a candidate is still unsuccessful, he/she may opt for DROP or again take up MAKE UP examination; however, not exceeding double the duration norm in one stretch from the date of joining the course.

8.5 A candidate has to re-register for the DROPPED course when the course is offered again by the Institute if it is a hard core course. **The details of any dropped course will not appear in the grade card.**

8.6 Each student can go with a normal pace of credits prescribed for each per semester. However, he/she has provision to go with a slow pace of 20 credits per semester or an accelerated pace of +4 credits per semester.

8.7 The tuition fee and the examination fee of a semester will be in accordance with the number of credits registered by each student in that semester.

8.8 The student may avail a maximum of two blank semesters in one stretch. However, he has to pay a nominal fee for maintaining a semester blank to the institution.

8.9 The Institute shall follow the CBCS guidelines of the University and its amendments thereof provided they are beneficial to the system.

8.10 The tentative / provisional grade card will be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. This statement will not contain the list of DROPPED courses.

8.11 Upon successful completion of M.Sc.Ed., a final grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Registrar (Evaluation).

8.12 The grade and the grade point earned by the candidate in the subject will be as given below.

Marks	**Grade**	**Grade Point (GP = V x G)**
30-39	4	V*4
40-49	5	V*5
50-59	6	V*6
60-64	6.5	V*6.5
65-69	7	V*7
70-74	7.5	V*7.5
75-79	8	V*8
80-84	8.5	V*8.5
85-89	9	V*9
90-94	9.5	V*9.5
95-100	10	V*10

Here, P is the percentage of marks (P=[(C1+C2)+M] secured by a candidate in a course which is rounded to nearest integer. V is the credit value of course. G is the grade and GP is the grade point.

8.13 A candidate can withdraw any course within in ten days from the date of notification of final results. Whenever a candidate withdraws a paper, he/she has to register for the same course in case it is hard core course, the same course or an alternate course if it is soft core/open elective.
A DROPPED course is automatically considered as a course withdrawn.

8.14 Overall cumulative grade point average (CGPA) of a candidate after successful completion the required number of credits (302) is given by CGPA = ΣGP / Total number of credits

$$CGPA = \Sigma GP / \text{Total number of credits}$$

9. Classification of results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

CGPA	FGP	
	Numerical Index	Qualitative Index
4 <= CGPA < 5	5	SECOND CLASS
5 <= CGPA < 6	6	
6 <= CGPA < 7	7	FIRST CLASS
7 <= CGPA < 8	8	
8 <= CGPA < 9	9	DISTINCTION
9 <= CGPA < =10	10	

Overall percentage=10*CGPA or is said to be 50% in case CGPA<5

10.0 Provision for Appeal

A candidate, if dissatisfied with the grades that he/she has got with a feeling that he/she is unnecessarily penalized can approach the grievance cell with the written submission together with all facts and all the assignments, test papers etc. which were evaluated. He/She can do so before the semester-end examination (based on 2 continuous assessment components already completed) or after the semester-end examination. The grievance cell is empowered to review the grades if the case is genuine and is also empowered to penalize the candidate if his/her submission is found to be baseless and unduly motivated. This Cell may recommend to take disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the Grievance Cell is final.

The Registrar (Evaluation) will be the Chairman and Convener of the Grievance Cell. The composition of the Grievance Cell is as follows:

1. The Principal
2. The Dean of instruction
3. Heads of DESM, DESSH and I/c Sections. An external expert from the University of Mysore in the concerned subject.
4. The Registrar (Evaluation) ex-officio Chairman/Convener.

The appropriate fee as fixed by the University shall be collected from the candidate who goes for an appeal to the Grievance Cell.

11.0 Barring of Simultaneous Study

11.1 No student admitted to a degree course in a college under the jurisdiction of this university, shall be permitted to study simultaneously in any other course leading to a degree (regular, evening, morning) offered by this/any other university.

11.2 If a candidate gets admitted to more than one course leading to a degree, the university shall without giving prior notice cancel his/her admission to all such courses to which he/she has joined.

12.0 Miscellaneous:

13.1 These revised regulations will apply to the candidates admitted for the academic year 2016-17 and onwards for the course mentioned in Regulation No.1.0 above.

13.2 Other regulations not specifically mentioned above are as per the Regulations of the University as applicable from time to time.

13.3 Any other issue not envisaged above, shall be resolved by the Vice-Chancellor in consultation with the appropriate Bodies of the University, which shall be final and binding.

SYLLABUS

FIRST SEMESTER

Core course 1A: Physics

MSEI.1 :MECHANICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- The students will be able to understand Newtonian mechanics and apply its principles to explain natural physical phenomena.
- The teacher will be able to enable the students to identify and modify alternative conceptions in the domains of Newtonian Mechanics.

COURSE CONTENT:

Unit I

Vectors: Vector and scalar products. Scalar triple product and Vector triple product. Differentiation of a vector with respect to scalars (such as time). Gradient, Divergence, Curl-definitions, physical meaning, and operations, Laplacian, Line, Surface, and Volume integrals. Gaussô, Stokes, and Greens theorem.
Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II

Laws of Motion: Newtonôs Laws of motion. Frames of reference, inertial and non inertial, pseudo forces, Galilean transformations; Galilean invariance, Dynamics of a system of particles. Centre of Mass.
Momentum and Energy: Principle of conservation of momentum for a system of particle, Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Conservation of energy. Momentum of variable-mass system: motion of rocket.

Unit III

Rotational Motion: Angular velocity and angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum.
Gravitation: Newtonôs Law of Gravitation. Central force and motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). two-body central force problem and reduction to the equivalent one body problem, inverse square law potential and different forms of orbit, Keplerôs laws of planetary motion. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness.

Unit IV

Oscillations: Simple Harmonic Motion (Basic idea), Differential equation of SHM and its solutions (simple pendulum, compound pendulum, loaded spring), Kinetic and Potential Energy, Total Energy and their time averages. Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats), Lissajous figures with equal an unequal frequency and their uses. Damped vibrations. Forced vibrations.

Reference Books:

1. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons Inc.
2. Harris Benson, University Physics, Revised Edition, John Wiley and Sons, Inc.
3. FW Sears, MW Zemansky and HD Young, University Physics, 1986. Addison-Wesley.
4. K. R. Symon, Mechanics, Addison Wesley, 1971.
5. Basudeb Bhattacharya, Engineering Mechanics, 2nd Edn., 2015, Oxford University Press
6. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole
7. Y. R. G. Takwale and P. S. Puranik, Introduction to classical mechanics, Tata McGraw Hill.
8. Charles Kittel et. al., Mechanics Berkeley Physics course, 2007, Tata McGraw-Hill.
9. H C Verma, Concepts of Physics, Bharati Bhawan; Revised Reprint 2015 edition

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments out of the following)

1. Study of the motion of an air bubble.
2. Study of the motion of a freely falling body.
3. Study of the acceleration of a body subjected to different unbalanced forces.
4. Study of accelerations of different masses under a constant unbalanced force.
5. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
6. Study of conservation of momentum and energy of a collision in a plane.
7. Conservation of momentum in a mechanical explosion.
8. To study the relation between length and time period of a simple pendulum.
9. To study the relation between force and extension produced in a stretched spring.

10. Study of the variation of the time period of a bar pendulum with different length and determination of ógôat the given place.
11. Study of the dependence of the period of oscillation of a spring-mass system on mass
12. The Spiral spring: Determination of the acceleration due to gravity by the graphical method.
13. Determination of moment of Inertia, mass and density of the flywheel.
14. Moment of inertia of a disc supported on strings.
15. The moment of inertia of a wheel and axle.
16. The Bifilar Suspension

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-Hall Physics Laboratory Experiments7thEdition, Cengage Learning, 2009.

Core Course 2A- Chemistry

MSEI.2 :ATOMIC STRUCTURE AND BONDING

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives :

- To understand and appreciate the development of various atomic theories
- To develop an understanding of principles of Atomic structure
- To justify the need for quantum mechanical structure of atoms
- To develop an understanding of the periodic trends, preparation and uses of s- and p-block
- elements and their compounds in terms of structure and bonding
- To understand the nature of bonding and to predict the shapes of molecules
- To construct MO energy level diagrams and predict the properties of molecules

COURSE CONTENT:

Unit I: Atomic Structure

History of an atom. List the Characteristics of Black-body radiation- Planckôs radiation law, photoelectric effect, Compton effect and their explanation using quantum theory. Bohr's

model of hydrogen atom and its limitations. Summarise the evidence for the wave nature of matter. State de Broglie hypothesis and Heisenberg uncertainty principle.

Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of ψ and ψ^2, postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals , Multi-electron atoms, Aufbau and Pauli exclusion principles and Hundôs multiplicity rule- Electronic configurations of the elements(s,p,d blocks), effective nuclear charge. Explanation for the stability of completely filled and half filled shells with examples. Screening effect: Slatersô rule, Energy level diagram for multi ï electron atoms.

Unit II: Periodic Properties and s -and p-Block Elements

Atomic radii, Covalent radii, ionic radii and Vander waal's radii- definition with explanation with examples in a group and period Explanation of observed trends. Comparision of the ionic size of atoms with the corresponding anion and cation. Variation of ionic radii in isoelectronic ions. Additive nature of covalent radii.
Ionization energy: Definition, the factors influencing ionization energy, variation in a group and period. Effect of the size and electronic configuration on successive ionization energies.

Electron affinity :Definition, variation in a group and in a period (observed trends in the values to be accounted for).
Electronegativity: Definition, variation in a group and in a period (observed trends in the values to be accounted for), calculation of electronegativity by Pauling and Mulliken methods.
s- and p-block elements: Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls ï salient features of hydrides, Action of Liquid Ammonia , Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium.
To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Unit III: Chemical Bonding - I
Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids ï Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajanôs rule, Metallic bond-free electron, valence bond and band theories. Weak interactions ï Hydrogen bonding, van der Waals forces. Covalent Bond ï Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICl_2, and H_2O.

Unit IV: Molecular Orbital theory, boranes and Xenon compounds
Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas ï criteria for forming M.O. from A.O., construction of M.Oôs by LCAO ï H_2^+ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ^*, π,

π* orbitals and their characteristics. Hybrid orbitals ï sp, sp^2, sp^3; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. Models.
Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and NO) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference.
Hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, silicates (structural principle), - Chemistry of xenon: structure and bonding in xenon compounds.

References :

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee , fifth Edition,Wiley Publishers
3. An Introduction to Inorganic chemistry Mackay and Mackay
4. Advanced Inorganic Chemistry Satya Prakash, G.D.Tuli, S.K.Basu, R.D.Madan
5. S.Chand & Company Pvt. Ltd. Principles of Physical Chemistry Puri, Sharma, Pathania 47th Edition,Vishal Publishing Co.
6. Text book of Inorganic Chemistry P.L. Soni Sultan Chand & sons.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To develop the concept of good lab practices including safety, glasswares handling,
- chemicals handling, chemical/glassware waste management, error analysis, note
- book maintenance
- To strengthen the concepts of mole and stoichiometry
- To develop analytical skills of volumetric technique

COURSE CONTENT :

1. Calibration and handling of balances, pipette, burette, and standard flask. Basic principles underlying the preparation of solutions, knowledge of primary and standard substances, Indicators used in titrations, their working principles range and their uses. Concept of Molarity, Normality, Molality, Equivalent weight and related calculations.
2. Stoichiometry of neutralization reactions of Sulphuric, Hydrochloric and Nitric acid using sodium hydroxide solution.
3. Preparation of standard Sodium Carbonate solution, Standardisation of Hydrochloric acid and estimation of Sodium hydroxide present in the given solution.
4. Estimation of carbonate and hydroxide present in a mixture.
5. Estimation of Carbonate and Bicarbonate in a given mixture by double indicator method.
6. Estimation of ammonium chloride in a given solution by back titration
7. Estimation of oxalic acid present in the given solution using sodium hydroxide solution and pure crystals of potassium hydrogen phthalate.
8. Estimation of Ferrous ammonium sulphate present in the given solution using potassium

permanganate solution and pure crystals of oxalic acid.

9. Estimation of iron(II) using Potassium dichromate with internal and external indicators.
10. Estimation of ferrous and ferric ions in a given mixture using potassium dichromate solution.
11. Standardisation of Sodium thiosulphate using potassium dichromate and estimation of copper by Iodometry.
12. Estimation of Copper in the given Copper salt by Iodimetry.
13. Estimation of total hardness of water using EDTA solution and pure crystals of Zinc sulphate.

References :

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Systematic Experiments in Chemistry Arun Sethi New Age International (p) Ltd. Cochin.

Core Course 3A Mathematics

MSEI.3 :CALCULUS - I AND MATRICES

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

At the end of the course students will be able to understand and to apply the concepts, principles and techniques of calculus and matrix theory in problem solving.

COURSE CONTENT:

Unit I: Differential calculus:

Limits revisited, Continuous functions, Discontinuous functions and types. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitzôs theorem. Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection. Angle of intersection between two curves.

Differentiability theorems, Rolleôs theorem, Mean Value theorems, Taylorôs theorem, Maclaurinôs theorem, Taylorôs and Maclaurinôs infinite series, Indeterminate forms.

Unit II: Integral Calculus:

The integral of a function, Techniques of integration, Integration of Rational Functions, Rationalizable Integrals.

Definite Integral, Properties, Definite integral as the limit of a sum, The fundamental theorem of Calculus, Reduction formulae, Area, Volume and Length.

Unit III: Matrices – I

Matrices of order mXn, Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants, Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column

operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

Unit IV : Matrices - II
System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems and their uniqueness.
Characteristic equation of a square matrix, Eigen values and Eigen vectors, Finding them for a real symmetric matrix, Diagonalization of a real symmetric matrix, Cayley ï Hamilton theorem and its applications.

References :

1. Calculus by Anton, Addison-Wiley.
2. First Course in Calculus, Serge Lang, Addison-Wiley
3. Calculus by Lipman Bers, Vols. 1 and 2, IBH.
4. Advanced Calculus, Frank Ayres, Schaum Publishing Co.
5. Higher Algebra by Bamard and Child, MacMillan India Ltd.
6. Integral Calculus by Shanthinarayan, S.Chand and Co.Ltd.
7. Differential Calculus by Gorakhprasad, Pothishala Ltd.
8. Calculus and Analytical Geometry by Thomas ï Finney, Narosa Publishing House.
9. Algebra by Natarajan, Manicavachagon Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
10. Matrices by Frank Ayres, Schaum Publishing Co.
11. Textbook of Matrix Algebra by Suddhendu Biswas.

Ability Enhancement Course 1 A : Language

MSEI.4A :HINDI

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction Mode :
Lecture cum discussion, group discussion, panel discussion, seminar group work, library work.

COURSE CONTENT :

Unit I: History of Language and Literature-1
Hindi Bhasha aur Sahitya ka Itihas [Aarmbha se Lekar 1857 Tak]

Unit II: Short Story-1 [Pre-Independence Literature]
Swatantratapurva Hindi Kahani Ka Vikas

1. **Chandradhar Sharma Guleri-** Usne Kaha Tha
2. **Jayshankar Prasad**- Puraskar
3. **Premchand-** Panch Parmeshwar
4. **Jainendra-** Ek Raat

Unit III: Short Story-2 [Post-Independence Literature]
Swatantrayottar Hindi Kahani Ka Vikas

1. **Mohan Rakesh-** Uski Roti
2. **Kamleshwar-** Dilli Mein ek Maut
3. **Phanishwar Nath Renu-** Teesari Kasam
4. **Bhism Sahani**- Cheef ki Dawat

Unit IV: Communication skill:
Group Discussion [Samooh Charcha]
Introduction ï Definition ï Characteristics ï Types of Discussion ï Round table, Symposium, Lecture forum etc. ï Relevance of Group Discussion ï Exercises.

Reference:

1. Hindi Sahitya Ka Itihas: Ramchandra Shukla Rajkamal Prakashan, Delhi
2. Hindi Sahitya Ka Itihas: Dr Nagendra, Mayoor Paperbacks, Delhi
3. Hindi Sahitya Ki Bhoomika: Hajari Prasad Divedi Rajkamal Prakashan, Delhi
4. Hindi Sahitya Ka Adikaal: Hajari Prasad Divedi Rajkamal Prakashan, Delhi
5. Hindi Sahitya Ka Udbhav Aur Vikas: Hajari Prasad Divedi Rajkamal Prakashan, Delhi
6. Hindi Sahitya Ka Ateet: Viswanath Prasad Mishra, Rajkamal Prakashan, Delhi
7. Bhakti Aandolan Aur Bhaktikavya: Shivkumar Mishra, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Maneger Panday, Vani Prakashan, Delhi
9. Bhakti Ke Aayam: Dr P Jayraaman, Vani Prakashan, Delhi
10. Bhartiya Bhakti Sahitya: Dr Rajmal Bora, Vani Prakashan, Delhi
11. Bhaktikavya ka Samajdarshan: Dr Premshankar, Vani Prakashan, Delhi
12. Hindi Sahitya Ka Sanchhipt Itihas: Nanddulare Bajpayee, Swaraj Prakashan, Delhi
13. Hindi Sahitya ka Sanchhipt Itivritt: Shivkumar Mishra, Vani Prakashan, Delhi
14. Hindi Kahani- Antarang Pahchan: Dr Ramdars Mishra, Vani Prakashan, Delhi
15. Hindi Kahani-Sanrachana aur Samvedana: Dr Rachna Saah, Vani Prakashan, Delhi
16. Galp Ka Yatharth-Kathaloochan ke Aayam: Suvas Kumar, Vani Prakashan, Delhi
17. Hindi Ka Gadyaparva: Namvar Singh, Rajkamal Prakashan, Delhi
18. Sahitya ki Pahchan: Namvar Singh, Rajkamal Prakashan, Delhi
19. Katha Vivechan aur Gadyashilp: Ramvilas Sharma, Vani Prakashan, Delhi
20. Kahani Anubhav aur Abhivyakti: Rajendra Yadav, Vani Prakashan, Delhi
21. Kahani- Swaroop aur Samvedana: Rajendra Yadav, Vani Prakashan, Delhi
22. Kahani-Sankramansheel Kala: Khagendra Thakur, Vani Prakashan, Delhi
23. Aadhoonik Hindi Kahani: Laxminarayan Laal, Vani Prakashan, Delhi

24. Hindi Kahani-Vakt Ki Shinakht aur Srijan ka Raag: Rohini Agarwaal, Vani Prakashan, Delhi
25. Kahani Samkaleen Chunautiyan: Dr Sambhoo Gupt, Vani Prakashan, Delhi
26. Effective Group Discussion: Theory and Practice, Gloria J.Galanes, McGraw Hill Company
27. http://www.hindisamay.com

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects), tests & assignments.
C1-10 (test) + (seminars, projects, assignments etc) =15
C2-10 (test) + (seminars, projects, assignments etc) =15
Total =50

MSE I.4B KANNADA

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT :

Unit I : Descriptive Grammar

Sandhi (Agama, Adesa, Dwitva, etc) A suitable grammar book on Sandhi will be followed in the classroom.

Reference: Kannada Kaipidi, Prasaranga Publication, University of Mysore.

Unit II: Functional Language

a. **Group Discussion** : Introduction ï Definition ï characteristics ï types of discussions ï round-table symposium ï panel ï lecture forum etc. ï relevance of Group Discussion ï exercises.

b. **Conversation** : Definition ï styles of conversation ï formats of conversation ï telephonic conversation, etc. ï Exercises

Reference: Effective Group Discussion ï Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

Unit III: Modern Poetry

i. Kalki ï Kuvempu
ii. Sabhyata Devate ï Kuvempu
iii. Balegaarana Haadu ï K S Narashimha Swamy
iv. Patitha Pavana ï Pu Thi Na
v. Nanna avathara ï M Gopalakrishna Adiga
vi) Hakki Haruthide Nodidraé ï DA. RA.Bendre

Selected from Aunika Kannada Kavya Part I, University of Mysore.

Unit IV: Prose : Collection of short stories

Collection of Short Stories

i. Mochi ï Bharteepriya
ii. Kallina Kolalu ï Chaturanga
iii. Radheya Kshame ï Ananda
iv. Cappaligalu ï Sara Abubakkar

Selected from Sanna Kathegalu, Mysore University, Mysore

Suggested Activities:

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials,(seminars, projects etc.), tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

MSE I.4C MALAYALAM

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Unit I : **Descriptive Grammar - Sandhi**

Ref : Kerala Panineeyam By A R Rajaraja Varma, NBS, Kottayam

Unit II: Functional Language

Group Discussion- Introduction ï Definition ï characteristics ï types of discussions ï round-table symposium ï panel ï lecture forum etc. ï relevance of Group Discussion ï exercises

Conversation - Definition ï styles of conversation ï formats of conversation ï telephonic conversation, etc. ï Exercises

Reference: Effective Group Discussion ï Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

Unit III: Modern Poetry

Lessons from ñ Kavya Mala, University of Kerala Publications, Kerala

1. Mazhuvinte Katha
2. Sabhalamee yaatra
3. Shanta
4. Kochiyile Vrikshangal
5. Bharatheeyam

Unit IV: Literature

Collection of Short Stories:

From Katha malika, University of Kerala publications

1. Kadal theerathu
2. Shavadaham
3. Ammayum makanum
4. Perumazhayude pittennu
5. Chaya

Suggested Activities:

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc,) tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

ABILITY ENHANCEMENT COURSE - AEC 1 A: LANGUAGE

MSE I. 4D Tamil

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C3:50**

Objectives:

(i) To develop the students to acquire basic skills in functional language
(ii) To develop independent reading skills and reading for appreciation the literary works
(iii) To internalize grammar rules so as to facilitate fluency in speech and writing

(iv) To develop functional and creative skills in language
(v) To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region

Mode of Interaction:
Theoretical aspects will be discussed through lecture and discussion mode. Activities like enacting a drama scene, etc. will be conducted in the class room as a practice to conversation skills. Students will be given activities to prepare different types of letters (Official, Demy official, personal letters etc.). Group discussion will be conducted in the classroom on various topics. With the help of newspapers, the NEWS Reporting abilities will be enhanced among the students in class room. Appreciation of literary works will be practiced through group work and seminars.

COURSE CONTENT:

Unit I: Descriptive Grammar:
Sandhi (Ezhuthu Elakkanam) Muthal Ezhuthugal, Sarpezhuthugal, Punarchi

Unit II: Functional Language:
Group Discussion: Introduction-Definition-Characteristics-Types of Discussion-Round Table-Symposium-Panel-Lecture forum etc., - Relevance of Group Discussion - Exercises
Conversation: Definition - Styles of conversations - Formats of conversations - Telephonic conversations, etc., - Exercises

Unit III: Poetry: Modern Poetry:
Ikkala Kavithaikal,
Kannan En Sevagan,
Thiru Arutpa

Unit IV: Prose: Collection of Short Stories:
Naatru - (Collection of Short Stories)

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials, seminars, projects, Tests and assignments.
C1-10(Test)+ 15(seminars, projects, assignments etc.) =25
C2-10(Test)+ 15(seminars, projects, assignments etc.) =25,
Total=50.

References:

1. *Tamil Neengalum Thavarillamal Ezhuthalam* - Dr. Porko.
2. *Effective Group Discussion- Theory and Practice*, Gloria J. GALANES, Mc Graw Hill Company (Publishers)
3. *Nannul-Ezhuthathikaram*, Prof. Soma Elavarasu, Manivasar Pathippagam, Parish, Chennai ï 600 108
4. *Natru*, Vaanathi Pathippagam, 13 Deenadayalu Street, T. Nagar, Chennai- 600 017.
5. *An Anthology of Tamil Poetry* (For First Year Degree Classes), University of Mysore, Mysore.

ABILITY ENHANCEMENT COURSE - AEC 1 A: LANGUAGE

MSE I. 4E Telugu

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C3:50**

Objectives:

(i) To enable the students to acquire basic skills in functional language.
(ii) To develop independent reading skills and reading for appreciating the literary works
(iii) To internalize grammar rules so as to facilitate fluency in speech and writing
(iv) To develop functional and creative skills in language.
(v) To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Mode of Interaction:

Theoretical aspects will be discussed through lecture and discussion mode. Activities like enacting a drama scene, etc. will be conducted in the class room as a practice to conversation skills. Students will be given activities to prepare different types of letters (Official, Demy official, personal letters etc.). Group discussion will be conducted in the classroom on various topics. With the help of newspapers, the NEWS Reporting abilities will be enhanced among the students in class room. Appreciation of literary works will be practiced through group work and seminars.

COURSE CONTENT:

Unit I: Functional language:

Letter writing: Characteristics ï Definition ï Types of Letters ï E-mails ï Language of Letters ï Exercises

News Reporting: Characteristics ï Definition ï Language of NEWS Reporting - Models ï Role of Median NEWS Reporting ï Exercises.

Unit II: Communication skills in language:

Group discussion: Introduction ï Definition ï Characteristics ï Types of Discussion ï Round table, Symposium, Lecture forum etc. ï Relevance of Group Discussion ï Exercises.

Interview: Characteristics ï Definition ï Types of Interviews ï Preparation for Interview ï Models ï Exercises.

Unit III: Modern Poetry and Folk literature:

Desha Charitralu ï Sree Sree (From Maha Prasthanam, Visalandhra Publications, Hyderabad).

Folk Songs from óRayalaseema Raagaluô & óTriveniô Published by Telugu Academy, Hyderabad,

Unit IV: Genre of literature: (Piece of a Drama/Portion of Autobiography)

Selected scenes from drama ó**Kanyashulkam'** by Gurazada Apparao (available at Visalandhra Publication, Hyderabad.

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc.), tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc.) =25
C2-10 (test) +15 (seminars, projects, assignments etc.) =25
Total =50

References:

1. *A Hand book of writing activities*, Prasaranga, University of Bangalore.
2. *Effective Group Discussion – Theory and Practice,* by Gloria J. Galanes, McGraw Hill Company.
3. *Effective Communication Skills,* by Omkar N Kour

Ability Enhancement Course 1B : English

MSEI.5 : PROFICIENCY IN ENGLISH

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3: 50**

Objectives:
Students develop proficiency in English which equips them to:
- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: Descriptive Grammar
1. Tenses:

a) Simple Present: Habitual action, General truths, Future time, Verbs of state, Verbs of perception, Verbs of sensation, Narration, Use of simple present for demonstration and commentaries, Present perfect, present perfect continuous, Present continuous also indicative of future action.

b) Simple past: Past time reference, Present time reference, Future time reference, Past continuous, Past perfect, past, perfect continuous

Unit II: Skills in Communication

1. Negotiating a point of view ï learning to talk persuasively so as to get across oneôs perspective.
2. Debating on an issue ï agreeing / disagreeing.

Unit III: Study and Reference Skills

Note making; Note- taking; Summary writing.
Comprehension Skills
Extracts from literary, scientific and educational journals.

Unit IV: Skills of Communication

Advanced Writing Skills, writing advertisement copy; Writing a project proposal and Writing Resume, sending an application.
Listening effectively; Talking about one self (likes, dislikes, interests, beliefs, personality traits, ambitions); Expressing an opinion about personal belief on a current issue. (Ability to speak fluently for 3-4 minutes. Focus would be on organized, logical, sequential presentation of thought through spontaneous speech).

Suggested Activities:

- Politeness competitions- students with partners take turns in using a given number of utterances for negotiation / requests/complaints/small talk.
- Students introduce themselves though using symbols/ metaphors.
- Students collect newspaper/magazine cuttings on topical and/ or cultural issues of interest-write and share their opinion with peers.

References:

1. Block, C.C. (1997). Teaching the Language Arts, 2nd Ed. Allyn and Bacon
2. Mckay. et al. (1995). The Communication Skills Book, 2nd Ed. New Harbinger Publications.
3. Hornby, A.S.(2001).Oxford Advanced Learnerôs Dictionary, OUP
4. Thomsan,A.J. & Martinet.(2002).A Practical English Grammar.OUP

GENERIC ELECTIVE 1

MSEI.6 : ENVIRONMENTAL EDUCATION

Credits: 2 (1L+ 1T +0P)	**Marks: 100**
Contact hrs per week: 3	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives

The student-teacher will be able to:

- Develop awareness and concern for environmental issues and sustainable development.
- Acquaint with the concept, objectives and importance of Environmental Education (EE).

- Introduce multi-disciplinary approach to environmental problems.
- Acquaint how to design, develop and implement strategies for Environmental Education (EE).
- Acquaint with the different methods and techniques of teaching Environmental Education (EE).
- Undertake practical activities for school cleanliness, neighbourhood cleanliness drive, and healthy personal hygiene in relation to Swachh Bharat and healthy living. (These activities would have been observed and practiced during the 16-week Internship in schools)
- Inculcate environment friendly values through EE.

COURSE CONTENT :

Unit I :Meaning and Concepts

Meaning as evident from Indian literature and contemporary texts, Definition, Objectives, Importance of EE with special reference to Indian view of life and sustainable development Sustainable Development Goals.

Unit II: Basic Environmental Concepts

Ecosystem, Biotic and Abiotic factors, Inter-relationship, Factors affecting environment, population, air, water, soil, noise; Acid rain, Greenhouse effect, Extinction of species, Soil erosion, Energy crisis, Environment and sustainable development; Role of specially designed strategies for cleanliness, Role of mass media and technology in developing awareness about environmental problems and its prevention, Role of NGO and governmental organizations in developing EE.

Unit III: Curriculum, Methods and Techniques of EE

Designing, developing strategies for EE, Evaluation of EE resources materials; Field trips, Role play, Poster presentation, Quiz, Debate, Projects, Swachh Bharat Bahaman sustainability

Unit IV: Value Development through EE as in Indian View of Life

Practical work in relation to school cleanliness and neighbourhood watch, Text book evaluation for contents on environment and cleanliness, Field trip on environmental degradation, and school and neighbourhood cleanliness, Visit to nature park, industry polluted areas.

Practicum

- Study sustainable development initiative in the country.
- Visits to polluted sites and preparation of report.
- Interviewing people and reporting the inconveniences due to any of the environmental problems.
- To study innovations done by to improve the environment of that area.
- To study the implementation of Environmental Education Programmes in schools/stated country.
- To prepare models and exhibits for general awareness of public regarding environmental hazards.
- To prepare a programme for environmental awareness and school cleanliness, and to

conduct the same with school children.

- To visit industries and study alternative strategies of Environmental pollution management.
- To prepare a resource material on any of the environmental problems along with a suitable evaluation strategy. To prepare quizzes and games on environmental issues.
- Organise Swacch Bharat Abhiyan as sustainable activity.
- To study the contribution of NGOs in improving the environment of the city. Classroom. Prepare posters/chart on Sustainable Development Goals.

* In addition, school and community based activities may be organised.

Evaluation Strategies

1. Assignments/sessional work.
2. Unit tests.
3. Portfolio assessment of exhibits, model of charts prepared by student teachers.
4. Seminar presentations followed by group discussion.

References:

1. Trivedi, M.M. and Pathak, Y.P. (1994). *Manav ane Paryavaran: Bhaugolic Paripekshma, University granth Nirman.* Board Publication, Ahmedabad, Gujarat.
2. Garg, B. and Tiwana (1995). *Environmental Pollution and Protection*. New Delhi: Deep & Deep Publication.
3. Sharma, R.C. (1981). *Environmental Education.* New Delhi: Metropolitan Publication.
4. UNESCO, Environmental Education in the light of the Tbilisi Conference, UNESCO.
5. NCERT (2009), *Project Book in Environmental Education from Class I-X*. New Delhi: NCERT.
6. NCERT (2004), *Environmental Education in Schools.* New Delhi: NCERT.
7. **Web Resources** Towards a Green School on Education for Sustainable Development for Elementary Schools, 2015, NCERT
8. http://www.ncert.nic.in/departments/nie/dee/publication/pdf/Towards%20A%20green%20School.pdf
9. Swachh Bharat Swachh Vidyalaya: A National Mission, Clean India: Clean Schools A Handbook, MHRD, http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/Eng_Swachch-Bharat-Swachch-Vidhalaya.pdf

PROFESSIONAL EDUCATION COURSES

MSEI.7 :Language Across Curriculum

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
The student teacher will be able to:

- Understand nature, function and role of different kinds of languages in curriculum transaction
- Acquaint with obstacles in language usage while using the language and ways to overcome them.
- Understand importance and use of first and second language, multilingualism and impact of culture.
- Acquire knowledge about the communication process and verbal and nonverbal communication skills.
- Familiarize the students with of barriers to (Listening, Speaking, Reading, Writing) LSRW skills and activities for developing these skills.

COURSE CONTENT :

Unit I : Nature and Functions of Language

Language ï Meaning and Concept, Functions of Language, Role of Language in Curriculum Transaction, Theories of Language Learning, Barriers in Using a Language & Strategies to Overcome them, Verbal and Non-verbal communication

Unit II: Language across Curriculum in the Indian Context

Language as a determinant of Access, Language proficiency and studentsô attitude towards Learning and Schooling/ dropouts, Language/oral proficiency and critical thinking

Unit III: Strategies for Multilingual Classrooms

Role Plays and Discussions as tools for learning, óQuestioningô to stimulate thought and to encourage and motivate to respond, Preparing Subject/content based exercises in reading, comprehension and usage, Sensitizing, Reflecting and Facilitating, Understanding the learner and his/her language background, Creating sensitivity to the language diversity, Using oral & written language in the classroom for optimal learning

Unit IV: Developing Receptive Skills and Productive Skills

Barriers to Listening Skills, Activities for Developing Listening Skills, Barriers to Reading Skills, Activities for Developing Reading Skills, Barriers to Writing Skills, Activities for Developing Writing Skills, Need and Importance of Classroom Discourse. Barriers to Speaking Skills, Activities for Developing Speaking Skills

Practicum

1. School Visit to Find out Communication Problem/Apprehension in Students
2. Designing Games and Exercises for Developing Listening, Speaking, Reading and Writing Skills
3. Assignments on Developing Writing Skills- Summary, Letter, Paragraph, Essays, Speech
4. Assignments on Developing Speaking Skills ï Oral Presentations, Debate, Elocution, Discussion, Brain-storming

Assignments on Developing Listening Skills ï Listening to speech, directions

***** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.

References:

1. Akmajian, A. et al. (2010). *Linguistics: Introduction to Language and Communication.* (6thed.). Cambridge: MIT Press.
2. Fasold, R. & Connor-Linton, J. (2013). *An Introduction to Language and Linguistics*. (6thed.). Cambridge: Cambridge University Press.
3. Floyd, K. (2009). *Interpersonal Communication*. New York: McGraw Hill Companies Inc.
4. Fromkin, V., Rodman, R. & Hyms, N. (2011). *Introduction to Language.* (9thed.). Canada: Cengage Learning.
5. Pearson, J.C. et al (2011). *Human Communication.* (4th ed.). New York: McGraw Hill Companies Inc.

Web Resources

6. First and Second Language Acquisition ï A Brief Comparison. Retrieved from https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf
7. Similarities and Differences between First and Second Language Acquisition Retrieved from http://multilingualism.pbworks.com/w/page/21913433/Similarities%20and%20Differences%20between%20First%20and%20Second%20Language%20Acquisition
8. Activities for Developing Speaking Skill Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm
9. http://www.educ.ualberta.ca/staff/olenka.Bilash/best%20of%20bilash/speaking.html
10. Activities for Developing Listening Skill Retrieved from http://www.educ.ualberta.ca/staff/olenka.bilash/best%20of%20bilash/listening.html
11. https://blog.udemy.com/listening-skills-exercises/
12. Learning curves: Language Education (2009), by Azim Premji Foundation http://azimpremjifoundation.org/pdf/LCIssue13.pdf
13. Courses on Communication Skills, http://nptel.ac.in/courses/109104030/

SECOND SEMESTER

Core Course I B Physics

MSEII.1 : ELASTICITY, WAVES, HEAT, AND THERMODYNAMICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- The students will be able to understand principles of elasticity, waves, heat, thermodynamics and classical statistical mechanics and apply its principles to explain natural physical phenomena.
- The teacher will enable the students to identify and modify alternative conceptions in the domains of elasticity, waves, heat, thermodynamics and classical statistical mechanics.

COURSE CONTENT:

Unit I: Elasticity

Elasticity: Hookeôs law - Stress-strain diagram - Elastic moduli- Dependence of Youngôs modulus on temperature and its applications, Relation between elastic constants - Poissonôs Ratio-Expression for Poissonôs ratio in terms of elastic constants - Elastic potential Energy, Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, ɖ and ů by Searleôs method.

Unit II: Waves

Review of Mechanical waves, types of waves, travelling waves, the superposition principle, wave speed, power and intensity in wave motion. Transverse waves on a string- travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, interference of waves, standing waves, resonance, Doppler effect. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave.

Unit III: Thermodynamics-I

Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P& C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient. Reversible & irreversible processes, Second law & Entropy, Carnotôs cycle & theorem.

Unit IV: Thermodynamics-II

Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams. Third law of thermodynamics, Unattainability of absolute zero. Thermodynamic potentials. Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwellôs relations& applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (C_P ï C_V), C_P/C_V, TdS equations.

References:

1. David Halliday, Robert Resnick and Jay Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons, Inc.
2. Harris Benson, University Physics, Revised Edition, John Wiley and Sons Inc.
3. Zeemansky and R. Dittman, Heat and Thermodynamics, McGraw Hill, 7th edition, 1996.
4. H J Pain, Physics of Vibration and Waves, Wiley; Sixth edition, 2006.
5. Brijlal and Subramaniam, Heat and Thermodynamics, S Chand, 2008.
6. Matveev, Thermal Physics, MIR Publications
7. D S Mathur, Elements of Properties of Matter, S.Chand (G/L) & Company Ltd., 2010.
8. A. B. Gupta and H. Ray, Heat and Thermodynamics, New central publications.
9. D. S. Mathur, Heat and Thermodynamics, Sultan Chand.
10. M. N. Saha and B. N. Srivastava, Treatise on Heat, The Indian Press.
11. A. Kumar and S.P. Taneja, Thermal Physics, R. Chand Publications, 2014.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

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

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 0^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. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method.
5. Study of Newtonôs law of cooling.
6. Determination of solar constant.
7. J by Joules Calorimeter.
8. Study of the rate of flow of water through a capillary tube under different pressure heads.
9. Study of the relation between pressure and volume of a gas at constant temperature
10. Study of variation of pressure and temperature of a gas at constant volume.

11. To study the variation of thermo emf across two junctions of a thermocouple with temperature
12. Surface Tension-capillary rise method-radius by vernier microscope
13. Study of the motion of a steel sphere in a viscous liquid and determination of the coefficient of viscosity of the liquid.
14. Meldeôs experiment ï determination of frequency.
15. Lees and Charlton disc ï Thermal conductivity of a bad conductor.
16. Specific heat of a solid by the method of mixtures.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House,1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-Hall Physics Laboratory Experiments7thEdition, Cengage Learning, 2009.
7. D.P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication, 1985.

Core Course 2 B :Chemistry

MSEII.2 : STATES OF MATTER AND NUCLEAR CHEMISTRY

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives :

- Illustrate how a scientific model can be constructed based on the experimental observations of the behaviour of gases and to explain the properties in terms of microscopic organization.
- To develop an understanding of properties of Gases, Liquids, colloids and Solutions.
- To understand the shapes of molecules in terms of symmetries and to relate the properties of matter in solid state to the structure.
- To develop an understanding of the concept of acids and bases, characteristics of non-aqueous solvents.
- To familiarize radioactivity as a nuclear phenomenon in understanding the nuclear reactions

COURSE CONTENT

Unit I : Gaseous and Solid State

Review of kinetic theory of gases and van der walls equation. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases based on Joule-Thomson effect.

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

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

X-ray diffraction by crystals. Derivation of Bragg equation. Predicting crystal structure . Defects in solids , Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of state. Critical Phenomena : P-V isotherms of real gases, continuity of states, the isotherms of van der Waals equation, Derive a relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwellôs distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).

Unit II : Liquids and Colloids

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

Structural differences between solids, liquids and gases.

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

Definition of colloids, classification of colloids.

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

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

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

Unit III : Acids and bases

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

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

Non-aqueous Solvents- Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Unit IV : Nuclear Chemistry

Fundamental particles of nucleus, Concept of Nuclides, isotopes, isobars and isotones (with specific examples), nuclear forces, qualitative idea of stability of the nucleus (n/p ratio), binding energy, packing fraction, Natural and artificial radioactivity, Radioactive Disintegration series, half life, average life, nuclear reactions, artificial transmutation, nuclear fusion and fission. Nuclear fusion as a

future source of energy ,Nuclear reactors, Application of Radioactivity and Radio isotopes as tracers in chemistry, , biology, medicine, agriculture and industry. Isotope dilution analysis, Neutron activation analysis.

References :

1. Essentials of Physical Chemistry Arun Bahl B.S.Bahl, G.D.Tuli, S.Chand & Company Ltd.
2. Principles of Physical Chemistry : Marron and Prutton
3. Elements of Physical Chemistry : Samuel Glasstone and Lewis
4. Physical Chemistry : P W Atkins
5. Nuclear Chemistry V.N.Darls Sultan Chand & sons.
6. Essentials of Nuclear Chemistry Arnikar, Hari jeevan, 4th edition, New age international.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To evolve a scheme of qualitatively analyzing an inorganic mixture classification of anions and cations.
- Quantitative inorganic analysis of mixtures containing four radicals.
- To develop skills of synthesizing coordination compound

COURSE CONTENT:

1. To arrive at a scheme of analysis of anions and cations based on solubility products and common ion effect: Systematic qualitative analysis by micro-scale methods of a mixture containing two acidic and two basis radicals from the following list(not more than one interfering radical):
   Cations: lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, sodium potassium, ammonium.
   Anions: carbonate, bicarbonate, acetate, fluoride, chloride, bromide, iodide, nitrate, sulphate,
   borate, oxalate, phosphate.
2. Preparation of the complexes:
   Tris(thiourea)copper(I)sulphate monohydrate, Mercury tetra thiocyanato cobaltate(II), simple cobalt and chromium complexes and their analysis.

References:

1. A Text Book of Quantitative Inorganic Analysis, A .I . Vogel
2. Advanced Practical Inorganic Chemistry, Gurudeep

Core Course 3 B Mathematics

MSEII.3 :CALCULUS – II, ANALYTICAL GEOMETRY AND NUMBER THEORY

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
At the end of the course students will be able to understand the concepts of number system and analytical geometry and principles and techniques of calculus of several variables in problem solving.

COURSE CONTENT:

Unit I: Partial Derivatives – I
Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Linear approximation theorem. Homogeneous functions, Eulerôs Theorem, Chain Rule, Change of Variable, Directional Derivative, Partial Derivatives of higher order, Taylorôs Theorem, Derivative of Implicit functions, Jacobians.

Unit II: Analytical Geometry – I
Cartesian coordinates in three dimensional spaces, Relation between Cartesian coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations of straight lines (Cartesian and Vector form).

Unit III: Analytical Geometry – II
Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Shortest distance between two skew lines.
Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Classification theorem on second degree equation.

Unit IV: Theory of Numbers
Division Algorithm ï Prime and Composite Numbers ï proving the existence and uniqueness of GCD and the Euclidean Algorithm ï fundamental theorem of Arithmetic - the least common multiple ï congruences ï linear congruences ï Wilsonôs theorem ï Simultaneous congruences ï Theorem of Euler ï Fermat and Lagrange.

References :

1. Calculus by Anton,Wiley.
2. Calculus with Analytic Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.
4. First Course in Calculus by Serge Lang, Addison-Wiley.
5. Calculus, Vols. 1 and 2 by Lipman Bers, IBH.

6. Introduction to Calculus and Analytical Geometry by Courant and John, Narosa Publishing House.
7. Advanced Calculus by Frank Ayres, Schaum Publishing Co.
8. Higher Algebra by Bamard and Child, Macmillan India Ltd.
9. Integral Calculus by Shanthinarayan, S.Chand and Co. Ltd.
10. Differential Calculus by Gorakhprasad, Pothishala Ltd.
11. A Course in calculus and Real Analysis-Iby Ghorpade S R and Limaye B V (2006), Springer Verlag
12. Elementary Number Theory by David M. Burton.
13. Elementary Number Theory with applications (2nd edition) by Thomas Koshy, Academic Press.

ABILITY ENHANCEMENT COURSE AEC 1B : LANGUAGE

MSE II.4A: HINDI

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction mode :
Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

COURSE CONTENT:

Unit I: History of Language and Literature-2
Aadhunik Hindi Sahitya ka Itihas [1857 Se Lekar Ab Tak]

Unit II : **Modern Poetry-1 [Pre-Independence Literature]**
Swatantratapurva Hindi Kavita Ka Vikas

1. **Maithilisaran Gupt-** Nar Ho Na Nirash Karo Man ko
2. **Jayshankar Prasad**- Himadri Tung Sring Se Prabudh Sudhha Bharti
3. **Suryakant Tripathi Nirala**- Joohi ki Kali
4. **Sumitranandan Pant-** Drut Jharo Jagat Ke Jirn Patra
5. **Mahadevi Verma-**MaiNeer Bhari Dhukh Ki Badli,

Unit III : Modern Poetry-2 [Post-Independence Literature]
Swatantrayottar Hindi Kavita Ka Vikas

1. **Gajanan Madhav Muktibodh**- Bhool Galti,
2. **Kedarnath Agrawal**- Chandra Gahna Se Lautati Ber
3. **Raghveer Sahay-** Aapki Hansi
4. **Nagarjun-** Aakal Aur Uske Bad
5. **Kedarnath Singh**- Aakal Me Saras

Unit IV : Communication skills
Conversation [Varta]:
Characteristics ï Definition ï Styles of conversation ï Higher order skills-Telephonic conversation, Role Play, ï Models, etc. ï Exercises.

References:

1. Hindi Sahitya Ka Itihas: Ramchandra Sukla, Vani Prakashan, Delhi
2. Hindi Sahitya ka Aadikal: Hajari Prasad Divedi, Vani Prakashan, Delhi
3. Hindi Sahitya Ka Itihas: Dr Nagendra , Mayoor Paperbacks, Delhi
4. Hindi Sahitya Ka Sanchhipt Itihas: Nanddulare Bajpayee, Swaraj Prakashan, Delhi
5. Hindi Sahitya Ka Dusara Itihas: Bacchan Singh, Vani Prakashan, Delhi
6. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
7. Hindi Sahitya ka Sanchhipt Itivritt: Shivkumar Mishra, Vani Prakashan, Delhi
8. Hindi Sahitya ka Sanchhipt Itihas:Viswanath Tirpathi, Orient Longman, Delhi
9. Sawtantrayotar Hindi Sahitya Ka Itihas: Dr Laxmisagar Vasney, Delhi
10. Hindi Sahitya Aur Samvedana Ka Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan
11. Bhasha, Yugbodh aur Kavita: Dr Ramvilas Sharma, Vani Prakashan, Delhi
12. Kavita ka Vartmaan: Dr P Ravi, Vani Prakashan, Delhi
13. Hindi Kvaya ka Itihas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
14. Kavita ki Zameen aur Zameen ki Kavita: Namvar Singh, Rajkamal Prakashan, Delhi
15. Nayee Kavita aur Astitvawad: Ramvilas Sharma, Rajkamal Prakashan, Delhi
16. Chhayavad: Namvar Singh, Rajkamal Prakashan, Delhi
17. Kavita ke Naye Pratiman: Namvar Singh Raajkamal Prakashan, Delhi
18. Hindi Kavita ka Atit aur Vartmaan: Maneger Panday, Vani Prakashan, Delhi
19. Hindi Kavita Ki Tisari Dhara: Mukesh Manas, Swaraj Prakashan, Delhi
20. Effective Communication Skills, by Omkar N Kour
21. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
22. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
23. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
24. http://www.hindisamay.com

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc.), tests & assignments.
C1-10 (test) + (seminars, projects, assignments etc) =15
C2-10 (test) + (seminars, projects, assignments etc) =15
Total =50

MSE II.4B : KANNADA

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives*:*

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT :

Unit I : Descriptive Grammar

Samasa and Alankara
Reference: Kannada Kaipidi, Prasaranga Publication, University of Mysore

Unit II : Functional Language

a. **News reporting** : Characteristics ï definition ï language of news reporting ï model of news report ï patterns ï role of media in news reporting ï exercises.

b. **Interview** : Characteristics ï definitions ï preparation for interview ï various types of interviews (business ï employment ï literary etc) ï exercises.

References: a) Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.
b) The Perfect Interview by Max Eggert, Random House, UK.

Unit III: Medieval Poetry

i) Enna Devange Jagavella Hennu Noada - Akkamahadevi
ii) Kaayuttirdanirulu Hagalennade-Raghavanka
iii) Parahimseyam Madi Manavam Baldapane - Laksheesha
(Kaavya Sanchaya – 3- Mysore University, Mysore).

Unit IV : Collection of Essays

i. Chatavannu kurithu ï B G L Swamy
ii. Samakalina Prajneï G S Shivarudrappa
iii. Namma Praachiinara Jiivana Moulyagalu ï T V Venkatachala Shasthri

iv. Janapada Geethe ï C P K
(Selected from Gadya Vihara Part III) Mysore University, Mysore

Suggested Activities
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc), tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

MSE II.4C : MALAYALAM

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Unit I. **Descriptive Grammar**
Samasa and Alamkara
(Ref : Bhashaa bhushanam and Kerala Paanineeyam , NBS , Kottayam)

Unit II : **Functional Language**

1. News reporting- Characteristics ï definition ï language of news reporting ï model of news report ï patterns ï role of media in news reporting ï exercises

2. Interview- Characteristics ï definitions ï preparation for interview ï various types of interviews (business ï employment ï literary etc) ï exercises.

References: a) Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.

1. The Perfect Interview by Max Eggert, Random House, UK.

Unit III:Poetry - Medieval
VEENA POOVU By Kumaaran ashan, Published by Devi Book Stall, Kodungalloor

Unit IV: Collection of Essays
Lessons from ñ Bharatha Paryatanam By Kutti Krishna Maraar, Published by Maraar Sahitya Prakasha , Kozhikode

1. Yudhathinte parinaamam
2. Amba
3. Karnante arangettram
4. Markandeyante chiri

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc), tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

ABILITY ENHANCEMENT COURSE AEC 1B: LANGUAGE

MSE II. 4D: Tamil

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:

(i) To develop the students to acquire basic skills in functional language
(ii) To develop independent reading skills and reading for appreciation the literary works
(iii) To internalize grammar rules so as to facilitate fluency in speech and writing
(iv) To develop functional and creative skills in language
(v) To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region

Transaction mode:
Lecture cum discussion, group discussion; panel discussion, seminar group work, library work.

COURSE CONTENT:

Unit I: Aspects of Style:
Styles of writing, Idioms, Phrases and Proverbs

Unit II: Functional Languages:
News Reporting: Characteristics-Definition-Language of news reporting- model of news reporting-patterns-role of media in news reporting- exercises**.**
Interview: Characteristics-Definition-preparation for interview-various types of interviews(business-employment-literary-etc)-exercises

Unit III: Medieval Poetry:
Periya Puranam -Selection of poems
Naladiyar-Selection of poems

Unit IV: Collection of Essays:
Ariviyal Tamilzhakkam-SV Shanmugam (First three Essays)- Tamil Nenjam-Dr Mu.

Varatharajan (First three essays)

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the Teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials, seminars, projects, Tests and assignments.
C1-10(Test)+ 15(seminars, projects, assignments etc.,) =25
C2-10(Test)+ 15(seminars, projects, assignments etc.,) =25
Total=50.

References:

1. An Anthology of Tamil Poetry (For first year degree classes), University of Mysore, Mysuru.
2. *Tamil Neengalum Thavarillamal Ezhuthalam* - Dr. Porko.
3. Ariviyal Tamilzhakkam- S.V. Shanmugam, New Century Book House(P) Ltd,41- B SIDCO Industrial Estate, Chennai-600 017.
4. Tamil Nenjam- Dr Mu.Varatharajan,) Pari Nilayam, 184, Broadway ,Chennai-108.
5. Fundamentals of journalism, Report writing and editing by R. Thomas Berner, Maruette Books LLC, Washington.
6. The perfect interview by Max Eggert, Random house, UK.

ABILITY ENHANCEMENT COURSE AEC 1B: LANGUAGE

MSE II. 4E Telugu

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3:50**

Objectives:

(i) To enable the students to acquire basic skills in functional language.
(ii) To develop independent reading skills and reading for appreciating the literary works
(iii) To internalize grammar rules so as to facilitate fluency in speech and writing
(iv) To develop functional and creative skills in language.
(v) To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction mode:
Lecture cum discussion, group discussion; panel discussion, seminar group work, library work.

COURSE CONTENT:

Unit I: Functional language:
Essay Writing: Characteristics ï Definition ï Format of Essays ï Types of Essays (Literary, Scientific, etc.) ï Models ï Exercises.

Translation: Characteristics ï Definition ï Need of Translation ï Translation Models ï Exercises (From English to Regional Languages).

Unit II: Communication skills in language:
Conversation: Characteristics ï Definition ï Styles of conversation ï Higher order Skills-Telephonic conversation, Role Play, ï Models, etc., ï Exercises.
Debate: Characteristics ï Definition ï Need of Debate ï Technique to conduct Debates, etc. ï Exercise.

Unit III: **Ancient poetry and Medieval poetry:**
Damayanthee Swayamvaram by Nannaya (First 18 Poems)
Sathyabhama Santhwanam by Nandi Timmana (Poems 82 to 104)
(From Telugu Sahithya Sravanthi, by Prsaranga, University of Mysore, Mysore).

Unit IV: Genre of literature: (Prose: Literary Work)
Andhrula Sanghika Acharamulu by Khandavalli Lakshmi Ranjanam.
Telugu Samethalu by Nayani Krishna Kumari
(From Telugu Sahithya Sravanthi, by Prasaranga, University of Mysore, Mysore).

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc.), tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc.) =25
C2-10 (test) +15 (seminars, projects, assignments etc.) =25
Total =50

References:

1. Government of Karnataka, *A Hand book of writing activities,* Prasaranga, University of Bangalore.
2. Government of India, *the Art of Translation (A Symposium)*, Ministry of Scientific Research and Cultural Affairs, New Delhi.
3. Gloria J. Galanes, *Effective Group Discussion – Theory and Practice*, Mc Graw Hill Company.
4. Rachamallu Ramachandra Reddy, *Anuvada Samsyalu*, Published by Visalandhra Books, Hyderabad.
5. Narasimha Rao, K V V L, *Aspects of Translation*, CIIL Publication, Mysore

Ability Enhancement Course AEC 2B : English

MSEII.5 : PROFICIENCY IN ENGLISH-1I

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives :

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non-literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

COURSE CONTENT:

Unit I: **Descriptive Grammar**
Function of Auxiliaries; Modals; Question form
Clauses: Noun Clause; Reported Speech and Change of Voice.

Unit II: Development of Language Competence
To be based on the use of multiple texts which address issues of multiculturalism, gender, racism and texts which relate with current issues and contemporary trends. Short stories, comic strips, cartoons and animations (both print and non-print media) to be used. Speeches of famous persons, diaries, travelogues can also be used.

Unit III: Writing for Functional Purposes
Letter-writing (Professional / Personal)

Unit III: Creative Skills in Writing
Writing dialogues, poems and essays

Unit IV: Basic Phonetics
Sounds of English language, intonation and transcription using IPA.

References:

1. Chan. et al. (1997) Professional Writing Skills, San Anselma, CA
2. Fiderer, A. (1994) Teaching Writing: A Workshop Approach. Scholastic.
3. Block, C.C. (1997). Teaching the Language Arts, 2nd Ed. Allyn and Bacon
4. Mckay. et al. (1995). The Communication Skills Book, 2nd Ed. New Harbinger

Publications.
5. Merrriam, E. (1964). It Doesnôt Always Have to Rhyme. Atheneum.
6. Hyland, Ken (2004) Second Language Writing. University of Michigan Press.
7. Graves, D (1992). Explore Poetry: The reading /writing teacherôs companion. Heinemann
8. Stone Douglas (1999). Difficult conversations: How to discuss what Matters Most, New York.:Penguin Books.
9. Gabor Don (2001). How to start a Conversation and Make Friends, New York: Fireside.

PROFESSIONAL EDUCATION COURSES

MSE II.6: CONTEMPORARY INDIAN EDUCATION

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
The course enables the student teachers to:
- Understand different perspectives of Education.
- Analyse the concept of Education and its related terms
- Analyse the Aims of Education and their determinants
- Reflect on the educational ideas and systems of various thinkers and develop the ability to theorize educational practices;
- Collect evidences for the influence of socio-cultural aspects on Education
- Analyse the role of Education on society by gathering various evidences and illustrations
- Understand and appreciate the need of autonomy to teacher and learners
- See the relationship between autonomy, accountability, and commitment
- Arrive at a list of qualities of a committed teacher through discussions.

COURSE CONTENT:

Unit I: Education: Concept, Nature, and Purpose

Education as concept and its distinct nature; Classical, Liberalists and Progressivists view on Education; Analytical concept of education - education as a normative concept; Education as a family of Processes; Education as worthwhile activity; Cognitive and normative dimensions of education; Education and Educated person;
Education as System; Modes of education- formal, informal, non-formal;
Education and its related concepts- Training, Instruction and teaching
Education: Purpose(s) and Determinants - Determinants of Purpose-individual, Community, Religion, State and Market; Brief historical inquiry into purposes and determinants of education (from ancient India to contemporary India); social context of purposes of education
Education as a Discipline and Interdisciplinary in nature
Aims of Education from ancient to contemporary Indian society

Education as value development
Determinants of Aims of Education in emerging India

Unit II: Education and Socio-cultural context

Education as an instrument of social change; Influence of education on society and family; Socio-cultural influences on the aims of education; Emerging trends in societies and their influence on education
Education and Development
Globalization and Internationalization of education

Unit III: Educational thoughts and practices

Critical reflection on the educational thoughts of Indian and Western thinkers and on their relevance to the present education system
Indian: Mahatma Gandhi, Rabindranath Tagore, Aurobindo, Swami Vivekananada, Jiddu Krishnamurthy, Gijju Bhai Badheka; B R Ambedkar.
Western: Plato, Rousseau, John Dewey, Froebel, Montessori, Ivan Iliach, Paulo Frieri

Unit IV: Autonomy of Teacher and Learner

Autonomy: Meaning and extent
Teacher autonomy: Meaning, extent and nature; Teacher as autonomous professional; Areas of teacher autonomy: Their limit-situations - Curriculum making; Learning resources and material selection and use; Pedagogical practices; Assessment modalities; Limit-situations: Structures- Structured curriculum, and examination system; Time-tables;
Learner Autonomy: Meaning, extent and nature; Learning as an autonomous act; Meaning making and learnersôautonomy-opportunities and constraints
Autonomy and Accountability: Teacher Accountability; Teacher commitment

Sessional Activities:

- Presentations on Educational thoughts of Various thinkers
- Preparation of an Album or posters on different thoughts of great thinkers
- Analysis of aims of education from ancient Vedic times to modern times
- Collection of examples/evidences to show the influence of Education on social change and the socio-cultural influences on Educational aims
- Comparative study of National curriculum frameworks of NCERT on aims of education
- Readings on Position paper on ñAims of Educationò-NCF 2005
- Comparative study of Aims of Education of few countries
- Collection of case studies that exemplifies teacher accountability and commitment

References:

1. Alfred North Whitehead (1967), ôThe Aims of Education and Other Essaysõ, The McMillan Company, New York. .
2. Debra Hayes, Martin Hills, Pam Christie & Bob Lingard (2007) Teachers & Schooling: Making a Difference, Allen and Unwin, Australia.
3. Dewey, John (1938) Experience and Education Kappa Delta Pi, Indianapolis, USA
4. Diane Tellman (2000), Living Values: An Educational Program, Sterling Publishing Private Limited, USA.
5. Freiri, Paulo (1968). Pedagogy of the Oppressed, Sea burry Press, New York, USA
6. Hirst,Paul(1970). The Logic of Education, Taylor & Francis, London
7. JJ Rousseau, (1956) Emile
8. John S Brubacher, (1969) Modern Philosophies of Education. Tata McGraw Hill Pub., Co.Pvt.,

Ltd, New Delhi.
9. Krishna Murthy, J. (1947) On Education, Orient Longman, New Delhi.
10. Mani, R.S. (1964). Educational Ideas and Ideals of Gandhi and Tagore, New Book Society, New Delhi.
11. Manoj Das (1999). Sri Aurobindo on Education, National Council for Teacher Education, New Delhi.
12. Margaret (1999). The Open Classroom: A Journey through Education, Orient Longman, New Delhi.
13. Mathur S.S. (1988). A Sociological Approach to Indian Education, Vinod Prakashan, Agra.
14. NCERT (2013). Basics in Education, National Council of Educational Research and Training, New Delhi.
15. NCERT, (2005). National Curriculum Framework-2005. National Council of Educational Research and Training, New Delhi.
16. O'Connor,J (1958) Philosophy of Education, pub by Duke university Press on behalf of philosophical review.
17. Peters, R.S. (1967), The Concept of Education, Routledge, United Kingdom.
18. Peters, RS (1968). Ethics and education.(5th edn), George Allen & Unwin Ltd, London
19. Prema Clarke (2001). Teaching & Learning: The Culture of pedagogy, Sage Publication, New Delhi.
20. Scheffler, Israel (1966).Philosophy and Education: Modern Readings, Allyn and Bacon, Boston, US
21. Stella Van Petten Henderson (1960) Introduction to Philosophy, The University of Chicago press, Chicago.
22. Steven H. Cahn (1970). The Philosophical Foundation of Education, Harper & Row Publishers, New York.

MSEII.7: YOGA EDUCATION, SELF UNDERSTANDING AND DEVELOPMENT

Credits: 2 (1L+ 0T +1P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives :

The student teacher will be able to:

- Understand the meaning and importance of self-concept and self-esteem.
- Be aware of different factors related to self-concepts and self-esteem. Record a brief history of development of yoga through the ages. Discuss how yoga and yoga practices are important for healthy living.
- Explain some important principles of yoga.
- Explain the different limbs of *Astañga* yoga.
- State the different types of yoga.
- Derive how Hatha yoga and *Astañga* yoga are complementary to each other.
- Enable the student to have good health.
- Practice mental hygiene.
- Possess emotional stability.
- Integrate moral values.

- Attain higher level of consciousness.
- Demonstrate some important *asanas* and *pranayama*.

COURSE CONTENT :

Unit I : Introduction to Yoga and Yogic Practices

Yoga: meaning and initiation, What is Yoga? Conceptions of Yoga, History of development of yoga, The streams of Yoga: Astanga yoga Raja yoga, Yogic practices for healthy living

Unit II Introduction to Yogic Texts

Historicity of yoga as a discipline, Classification of yoga and yogic texts, Hatha yogic practices, Meditational processes

Unit III: Yoga and Health

Need of yoga for positive health, Role of mind in positive health as per ancient yogic literature, Concept of health, healing and disease: yogic perspectives, Potential cause of ill health, Yogic principles of healthy living

Unit IV: Personality Development and Stress Management through Yoga

Yogic Practices for Personality Development : Surya Namaskar, Asanas : Tadasana, Simhasana, Kukkutasana, Akarna Dhanurasana, Matsyasana, Pranayama, Anuloma-Viloma Pranayama, Bhastrika Pranayama, Banda, Uddiyana Bandha, Dhyana (Meditation) , What is Stress, Yoga as a Way of Life for Stress Management: Ahara, Vihara, Achara, Vichara, Vyavahara, Yogic Practices for Stress Management ; Asanas, Hastottanasana, Padahastasana, Trikonasana, Shashankasana, Ushtrasana, Ardhamatsyendrasana , Bhujangasana, Makarasana, Sarvangasana, Matsyasana, Shavasana; Pranayama, Bhramari Pranayama, Sheetali Pranayama; Yoga for Healthy Living, Shirshasana, Bakasana, Hamsasana, Mayurasana

PRACTICALS

Exam Duration: 3 hrs **C_3 : 50 marks**

Practicum

- General guidelines for performance of the practice of yoga for the beginners

1. Guidelines for the practice of *āsanas*
2. Guidelines for the practice of *prānāyāma*
3. Guidelines for the practice of *meditation*

- Select yoga practices for persons of average health for practical yoga sessions

1. Supine position
2. Prone position
3. Sitting position
4. Standing position
5. Mudras
6. PrUhUyUmas

*** In addition, school and community based activities may be organised.**

Evaluation Strategies

The evaluation will be done through practicals/ assessment of ability to develop and design softwares for selected contents.

References:

1. Adair, J. and Allen, M. (1999). *Time Management and Personal Development.* London: Hawksmere.
2. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi (Also available in Hindi)
3. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi. (Also available in Hindi)
4. Rohrer, J. (2002). *ABC of Awareness.* Oberurnen: UTD Media.
5. Simanowitz, V. and Pearce, P. (2003). *Personality Development.* Beckshire: Open University Press.
6. Stevens, N. (2008). *Learning to Coach.* United Kingdom: How to books.

THIRD SEMESTER

Core Course 1 C : Physics

MSEIII.1 :ELECTRICITY AND ELECTROMAGNETISM

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

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

COURSE CONTENT:

Unit I: Electrostatics

Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gaussôs theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere and continuous charge distributions (charged rod, ring, disk). Calculation of electric field from potential.

Unit II: Electric Fields in Matter and DC circuits

Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Combination of capacitors, energy stored in a capacitor, Energy per unit volume in electrostatic field. Atomic view of dielectrics, Polarization, Displacement vector. Gauss's theorem in dielectrics. Dielectric constant, Parallel plate capacitor completely filled with dielectric. Polarizability and susceptibility, Clausius-Mossotti equation.
DC Circuits: Kirchhoffôs laws, Voltage and Current dividers, Mesh analysis and Loop analysis, RC circuits, Maximum power transfer theorem.

Unit III: Magnetism

Magnetostatics: Biot-Savartôs law and its applications- straight conductor, circular coil, solenoid carrying current. Magnetic force between two parallel current carrying conductors. The Divergence and Curl of **B**, Magnetic vector potential. Ampere's circuital law. Magnetic field due to a very long solenoid and a toroidal coil.
Magnetism in matter: Magnetic intensity, magnetic induction,, Magnetic susceptibility, permeability. Classification of magnetic substances- a brief introduction of dia-, para- and ferro-magnetic materials.

Unit IV: Electromagnetic Induction and AC Circuits

Electromagnetic Induction: Review of Faradayôs law of induction, Lenzôs law, Motional EMF. Inductance:Self inductance, energy in a magnetic field, magnetic energy density.

AC circuits: The *j* operator.sinusoidal voltage, current voltage relation in resistance, capacitance and inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance. Mutual inductance and transformers.

Reference Books:

1. David J. Griffiths, Introduction To Electrodynamics, 4th Edition, Pearson
2. D C Tayal, Electricity and Magnetism, 1988, Himalaya Publishing House.
3. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 6th Edition, John Wiley, Inc.
4. A N Matveev, Electricity and Magnetism, Mir Publishers, Moscow.
5. F.W.Sears, Electricity and Magnetism, Addison Wesley Co.
6. A F Kipp, Fundamentals of Electricity and Magnetism, McGraw Hill.
7. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill Education, 1986.
8. J.H. Fewkes & J. Yarwood, Electricity and Magnetism, Vol. I, Oxford Univ. Press, 1991.
9. Ronald Lane Reese, University Physics, 2003, Thomson Brooks/Cole.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To study the variation of Magnetic field along the axis of a circular coil.
2. To determine M & H using deflection magnetometer & vibration magnetometer.
3. To determine horizontal component of Earthôs magnetic field using a Tangent galvanometer.
4. To calibrate an ammeter using a potentiometer and Daniel cell.
5. Mapping of magnetic field due to a current carrying straight conductor.
6. Determination of resistance & resistivity using Meter Bridge.
7. Charging & Discharging of a Capacitor.
8. Deflection magnetometer-Tan A, Tan B positions.
9. Deflection magnetometer -Tan C Position-moment of moments.

10. Mapping of magnetic field lines for a current carrying solenoid.
11. Searleôs vibration magnetometer-moment & ratio of moments.
12. Box type vibration magnetometer- M &B_h.
13. Caparison of emf and determination of internal resistance of a cell using a potentiometer.
14. Determination of resistance & resistivity using PO Box.
15. Comparison of capacitance by Desautyôs bridge using BG.
16. Determination of frequency of AC mains using Sonometer & electromagnet.
17. Variation of phase angle with capacitance for a RC circuit.
18. Conversion of Galvanometer to Voltmeter.
19. Unknown resistance by Carey Foster bridge.
20. Induced emf.
21. Maximum power transfer theorem.
22. To verify the Thevenin's and Norton's theorem

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-Hall Physics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 Chemistry

MSEIII.2 :ORGANIC CHEMISTRY – I

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- To review the concept of isomerism and its types
- To develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.

COURSE CONTENT:

Unit I: Stereochemistry of Organic Compounds
Review of Concept of Isomerism and Types of isomerism with examples.

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 ï trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

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

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

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

Alkenes: Accounting for Reactions due to unsaturation in compounds. Nomenclature of alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism. Regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes ï mechanism of hydrogenation, electrophilic and free radical additions, Markownikoffôs rule, hydroboration followed by oxidation, oxymercuration ï reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$. Polymerization of Alkenes. Substitution at the allylic and vinylic positions of alkenes.

Cycloalkenes: Methods of formation and chemical reactions of cycloalkenes.

Alkadienes: Nomenclature and classification of dienes: Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions ï 1,2 and 1,4 additions. Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding in alkynes. Methods of formation (alkylation of acetylene and by elimination reactions). Acidity of alkynes. Chemical reactions of alkynes: Mechanism of electrophilic and nucleophilic addition reactions, hydroboration, oxidation, metal-ammonia reductions, oxidation and polymerization.

Unit III: Aromatic Hydrocarbons

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

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

Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.

Unit IV: Alkyl and Aryl Halides

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

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

Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

References :

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

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop basic skills in organic synthesis and purification of organic compounds

COURSE CONTENT:

1. Calibration of Thermometer using naphthalene / acetanilide / urea
2. Determination of melting point of Benzoic acid / cinnamic acid / m ï dinitro benzene / p-dichlorobenzene

3. Determination of boiling point of aniline / nitrobenzene / chlorobenzene
4. Distillation of water ï alcohol mixture using water condenser; Distillation of chlorobenzene ï nitrobenzene mixture using air-condenser
5. Cystallization: Benzoic acid from hot water, naphthalene from ethanol
6. Sublimation of camphor / phthalic acid / succinic acid

Organic synthesis:

1. Preparation of Iodoform from ethanol / acetone using sodium hypochlorite and KI
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration
3. Preparation of *p*-bromoacetanilide from acetanilide by bromination
4. Preparation of 2,4,6-tribromo phenol from phenol / 2,4,6-tribromoaniline from aniline
5. Preparation of Acetanilide from aniline by acetylation
6. preparation of benzoic acid from benzamide by base hydrolysis
7. preparation of aspirin from salicylic acid by acetylation
8. preparation of p-bromoaniline from acetanilide
9. preparation of 0-iodobenzoic acid from anthranilic acid
10. preparation of p-nitroacetanilide from acetanilide by nitration

References :
A Text Book of Qualitative organic Analysis, A .I . Vogel

Core Course 3 C :Mathematics

MSEIII.3 :REAL ANALYSIS

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
At the end of the course students will be able to understand the concepts of real number system, real sequences, infinite series and the convergence tests. Also understand the concept of Riemann integration and its properties.

COURSE CONTENT:

Unit I:
The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important subsets, Intervals, Countable and Uncountable sets. Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness.

Unit II:
Introduction to sequences, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, Sum Sequences.

Unit III:
Introduction to Infinite Series, Sequence of partial sums of a series, Convergent series, Cauchyôs general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchyôs nth root test, DôAlembertôs Ratio test, Raabeôs test, Maclaurinôs integral test.

Unit IV:
Riemann Integration: Upper and lower sums, Criterion for inerrability, Inerrability of continuous functions and monotone functions, Fundamental theorem of Calculus, Change of variables, Integration by parts, First and Second Mean Value Theorems of Integral Calculus.

References:

1. Real Analysis by J.M.Howie, Springer 2007.
2. Real Analysis by Malik, Wiley Eastern.
3. Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.
4. Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
5. Real Analysis by Royden, Prentice Hall of India Pvt. Ltd.
6. Mathematical Analysis by T M Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition.
7. Introduction to Real Analysis by Bartle R G & Sherbert , Wiley India
8. Kumar Ajit & Kumaresan S, *Real Analysis,* CRC Press
9. Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.
10. Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006.
11. Elementary Analysis ï The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.
12. Real Functions by G. Goffman.
13. Principles of Real Analysis by Malik, New Age International Ltd.
14. Textbook of Mathematical Analysis by Leadership Project, Bombay University, Tata McGraw Hill Publishing Media Pvt. Ltd.

Ability Enhancement Course – AEC 1 C : Language
MSE III.4A : HINDI

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.

- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction mode :
Lecture cum discussion, group discussion; panel discussion, seminar group work , library work.

COURSE CONTENT:

Unit I: Modern Literary Genres:
Naveen Gadya Vidhavon Ka Janm Aur Hindi Gadya Ka Vikas

(i) **Nibandh-**Sardar PurnSingh- Aacharan Ki Sabhyata
(ii) **Yatra-Vritant-**Bhartendu Harishchandra-Saryu Par ki Yatra
(iii)**Sansmarn-**Mahadevi Verma- Gungiya
(iv)**Riportaj- Phaniswar Nath 'Renu' -** Rinjal-Dhanjal
(v) **Aatmkatha- Bharatendu Harishchandra -** Kuchh AapBeeti Aur Jag Beeti

Unit II: Criticism:
Hindi Aalochna Ka Aarambh Aur Vikas

Unit III: Novel:
Karmbhoomi by Premchand, Swaraj Prakashan, Delhi.

Unit IV: Communication skill:
Interview [Sachchatkar]
Characteristics ï Definition ï Types of Interviews ï Preparation for Interviewï Models ï Exercises.

References:

1. Hindi Nibandh Sahitya ka Sanskritik Addhyan: Dr Baburam,Vani Prakashan, Delhi
2. Hindi Gadhya-Vinayas aur Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
3. Hindi Sahitya Ka Itihas: Ramchandra Sukla, Vani Prakashan, Delhi
4. Hindi Sahitya ka Aadikal: Hajari Prasad Divedi, Vani Prakashan, Delhi
5. Hindi Sahitya Ka Itihas: Dr Nagendra , Mayoor Paperbacks, Delhi
6. Hindi Sahitya Ka Sanchhipt Itihas: Nanddulare Bajpayee, Swaraj Prakashan, Delhi
7. Hindi Sahitya Ka Dusara Itihas: Bacchan Singh, Vani Prakashan, Delhi
8. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
9. Hindi Sahitya ka Sanchhipt Itivritt: Shivkumar Mishra, Vani Prakashan, Delhi
10. Hindi Sahitya ka Sanchhipt Itihas:Viswanath Tirpathi, Orient Longman, Delhi
11. Sawtantrayotar Hindi Sahitya Ka Itihas: Dr Laxmisagar Vasney, Delhi
12. Aadhunik Hindi Ka Gadhya Sahitya: Ramchandra Tivari, Lokbharti Prakashan, Delhi
13. Hindi Aalochana Ka Vikas: Nandkishor Naval, Vani Prakashan, Delhi
14. Hindi Aalochana: Viswanath Tripathi, Vani Prakashan, Delhi
15. Upanyas aur Lokjeevan: Railph Fox, Vani Prakashan, Delhi
16. Upanyas ka Uadai: Aayan Waat, Hariyana Grantha Academy, Haryana
17. Upanyas ki Mahan Parampara: Khagendra Thakur, Swaraj Prakashan, Delhi
18. Hindi Up nays ka Vikas: Madhuresh,Vani Prakashan,
19. Premchand aur Unka Yug: Ramvilas Sharma, Rajkamal Prakashan, Delhi

20. Pemchand-Virashat ka Sawaal: Shivkumar Mishra,Vani Prakashan, Delhi
21. Premchand aur Bhartiya Samaj: Namvar Singh, Rajkamal Prakashan, Delhi
22. Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
23. Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
24. Prayojanmoolak Hindi: Sidhant aur Prayog- Dangal Jhalte, Vani Prakashan, Delhi
25. http://www.hindisamay.com

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given.

Continuous Assessment (C_1+C_2)
Assessment will be based on tutorials, (seminars, projects, etc), tests & assignments.
C1-10 (test) + (seminars, projects, assignments etc) =15
C2-10 (test) + (seminars, projects, assignments etc) =15
Total =50

MSE III.4B : KANNADA

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT:

Unit I : Functional Language :

a) Letter drafting

Characteristics ï types of letters ï Emails - language of letters ï letters of famous people ï exercises.

b) **Essay writing** ï Characteristics ï Definition ï format of essay ï types of essays (literary, scientific etc) ï models, exercises

Reference: A Handbook of Writing Activities, Prasaranga, University of Bangalore.

Unit II : Translation from English to Regional Language.
Reference: a) About Translation by Peter Newmark, MultiLingual Motters, Clavedon, UK. b) Aspect of Translation by K V V L Narasimha Rao, CIIL, Mysore.c0 Bhashanthara kale by Dr.Pradhana gurudatt, B M Sri Memorial foundations , 54, 3rd cross, gavipuram extention , Bangalore

Unit III : Medieval and Folk Literature

i. Halatorege Bellada kesaru - Basavanna
ii. Chintayemuppu santhoshave javvana ï Rathnakaravarne
iii. Adava nama jola Ulidava Nama hadu ï Folk
(Selections from Kavya Sanchaya Part III), Mysore University, Mysore

Unit IV : Novel

Odalaala ï Devanuuru Mahadeva

Suggested Activities :
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc.,), tests & assignments.
C1-10 (Test) +15 (seminars, projects, assignments etc) =25
C2-10 (Test) +15 (seminars, projects, assignments etc) =25
Total =50

MSE III.4C MALAYALAM

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Unit I:Functional Language

1. Letter drafting- Characteristics ï types of letters ï language of letters ï letters of famous people ï exercises
2. Essay writing- Characteristics ï Definition ï format of essay ï types of essays (literary, scientific etc) ï models, exercises

Reference: A Handbook of Writing Activities, Prasaranga, University of Bangalore.

Unit II: Translation (English to Malayalam)
(Ref: Tharjama-Siddhanthavum Prayogavum Malayathil , Currrent Books, Trichur.)

Unit III: Poetry and Folk literature
Text : 1. Sishyanum makanum By Vallathol narayana menon, NBS , Kottayam
Text 2: Othenanum ponniyam pada nilatha angavum, Shantha Book stall, Kodungalloor

Unit IV: Novel
BALYA KALA SAKHI by Vaikkam Muhammed Basheer, DC Books, Kottayam

Suggested Activities
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:

Assessment will be based on tutorials,(seminars, projects etc.,), tests & assignments.
C1-10 (Test) +15 (seminars, projects, assignments etc) =25
C2-10 (Test) +15 (seminars, projects, assignments etc) =25
Total =50

ABILITY ENHANCEMENT COURSE – AEC 1 C: LANGUAGE

BAE III. 4D: Tamil

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3:50**

Objectives:

(i) To develop the students to acquire basic skills in functional language
(ii) To develop independent reading skills and reading for appreciation the literary works
(iii)To internalize grammar rules so as to facilitate fluency in speech and writing
(iv)To develop functional and creative skills in language
(v) To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region

Transaction mode:
Lecture cum discussion, group discussion, panel discussion, seminar group work, library work.

COURSE CONTENT:

Unit I: Medieval Poetry:
i) Thirukkural ii) Silappathikaram

Unit II: Novel:
Onpadhu Rupaai Nottu

Unit III: Communication skills (Effective speaking and effective writing) in language:
Precise writing- concept - importance - techniques - types - etc.-exercises
Book review – concept - importance of review - techniques-significance-types - etc.-exercises

Unit IV: Grammar:
Sol Elakkanam- Sol-Peyar Sol-Vinai sol-Edai Sol-Uri Sol

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the Teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials, seminars, projects, Tests and assignments.
C1-10(Test)+ 15(seminars, projects, assignments etc.) =25
C2-10(Test)+ 15(seminars, projects, assignments etc.) =25
Total=50.

References:

1. An Anthology of Tamil Poetry (For second year degree classes) University of Mysore, Mysore
2. *A handbook of writing activities,* Government of Karnataka, Prasaranga, University of Bangalore, Bangalore.
3. *Nannul-Ezhuthathikaram*, Prof. Soma Elavarasu, Manivasar Pathippagam, Parish, Cheennai ï 600 108
4. Porko, *Tamil Neengalum Thavarillamal Ezhuthalam*.
5. *Nannul-Sollathikaram*, Prof. Soma Elavarasu.
6. *Onpadhu Rupaai Nottu*, Thankar Pachan, Ekkattu Thangal, Chennai- 600 017.

ABILITY ENHANCEMENT COURSE – AEC 1 C: LANGUAGE

BAE III. 4E: Telugu

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3:50**

Objectives:

(i) To enable the students to acquire basic skills in functional language.
(ii) To develop independent reading skills and reading for appreciating the literary works
(iii) To internalize grammar rules so as to facilitate fluency in speech and writing
(iv) To develop functional and creative skills in language.
(v) To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction mode:
Lecture cum discussion, group discussion, panel discussion, seminar group work, library work.

COURSE CONTENT:

Unit I: Functional Language:
Book Review: definition-features of review-techniques of reviewing-reviewing different genres-examples-exercises.

Unit II: Selected Translated Stories: (From English to Telugu)
Selections from Shakspeare Kathalu

Unit III: Poetry:
Vamana Charitra
Subhadra Parinayamu
(Lessons from ñTelugu Sahitya Sravanthi)

Unit IV: Novel:
Kalaatheetha Vyakthulu (by Dr P Sridevi)

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials, (seminars, projects etc.), tests & assignments.
C1-10 (Test) +15 (seminars, projects, assignments etc.) =25
C2-10 (Test) +15 (seminars, projects, assignments etc.) =25
Total =50

References:

1. Government of Karnataka, *A Handbook of Writing Activities,* Prasaranga, University of Bangalore.
2. Government of Karnataka, *Telugu Sahitya Sravanthi,* Published by Prasaranga, University of Mysore, Mysore
3. Sreedevi P, *Kalaatheetha Vyakthulu,* Vishalandhra Publishing House, Hyderabad

Ability Enhancement Course AEC 2C : English

MSE III.5 ENGLISH

Credits : 3 (2L + 1T)	**Marks: 100**
Contact hrs per week: 4	**C1 + C2 : 50**
Exam Duration : 2 hrs	**C3 : 50**

Objectives :

Students develop proficiency in English which equips them to:
- understand the demands of audience, subject, situation and purpose and the use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.

- plan, draft, edit and present a piece of writing.

Transaction Mode:
Lecture-cum-discussion, interactive session, group dynamics, role-play, peer-assessment, self-valuation.

COURSE CONTENT :
Unit I : PROSE
Walter Benjamin: Experience, Art In the Age of Mechanical Reproduction
Sylvia Townsend Warner: ôThe Phoenixô

Unit II : POETRY
1. P.B.Shelley - Ode to a Skylark
2. Alfred Lord Tennyson - Lotus Eatersï
3. E.D.Browning - How Do I Love Thee (from Sonnets from the Portugese)
4. Walter De La Mare ï The Ghost
5. Hopkins - Thou Art Indeed Just My Lord
6. Wilfred Owen - Anthem for Doomed Youth
7. William Shakespeare ï (Sonnet- 18)- Shall I Compare Thee to a Summer's Day?
8. Robert Browning ï Porphyriaôs Lover
9. R.S.Thomas - Song for Gwydion
10. Auden - Refugee Blues

Unit III : DRAMA

Anton Chekov : *The Bear*
Shakespeare : *Othello*

Unit IV : FICTION
Somerset Maugham *: The Razor's Edge*

Emile Bronte- *Wuthering Heights*

Continuous Assessment:
Assessment will be based on tutorials(seminars, projects Etc) tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

Suggested Readings:
Merriam, E. (1964). It Doesnôt Always Have to Rhyme. Atheneum.
Hyland, Ken (2004) Second Language Writing. University of Michigan Press.
Graves,D (1992). Explore Poetry: The reading /writing teacherôs companion. Heinemann
Stone Douglas (1999). Difficult conversations : How to discuss what Matters Most, New York.: Penguin Books.
Gabor Don (2001). How to start a Conversation and Make Friends, New York: Fireside.

Skill Enhancement Course- 1 Physics

MSEIII.6A : BASIC INSTRUMENTATION SKILLS

Credits: 3 (2L+ 0T +1P) **Max. Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

Unit I: Basic of Measurement

Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.
Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

Unit II: Cathode Ray Oscilloscope and its uses

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation onlyï no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Unit III:

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.
Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Unit IV:

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.
Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

References :

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers & Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

To get exposure with various aspects of instruments and their usage through hands- on mode.

COURSE CONTENT:

(A minimum of EIGHT experiments to be selected from the following)

1. Circuit tracing of a given laboratory electronic equipment.
2. Use of Digital multimeter/VTVM for measuring voltages.
3. Winding a coil / transformer.
4. Study the layout of receiver circuit.
5. Trouble shooting a circuit.
6. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
7. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
8. To measure Q of a coil and its dependence on frequency, using a Q- meter.
9. Measurement of voltage, frequency, time period and phase angle using CRO.
10. Measurement of time period, frequency, average period using universal counter/ frequency counter.
11. Measurement of rise, fall and delay times using a CRO.
12. Measurement of distortion of a RF signal generator using distortion factor meter.
13. Measurement of R, L and C using a LCR bridge/ universal bridge.

References:

1. B L Theraja, A text book in Electrical Technology, S Chand and Co.
2. M.G. Say, Performance and design of AC machines, ELBS Edn. CBS Publishers &

Distributors,2005.
3. Venugopal, Digital Circuits and systems, Tata McGraw Hill, 2011.
4. Shimon P. Vingron, Logic circuit design, Springer, 2012.
5. Subrata Ghoshal, Digital Electronics, Cengage Learning, 2012.
6. S. Salivahanan & N. S.Kumar, Electronic Devices and circuits, 3rd Ed., Tata Mc-Graw Hill, 2012.
7. U.Tietze, Ch.Schenk, Electronic circuits: Handbook of design and applications, Springer, 2008.
8. Thomas L. Floyd, Electronic Devices, Pearson India, 2008.

Skill Enhancement Course 1 - Botany

MSE III.6B : PLANT PROPAGATION, NURSERY AND GARDENING

Credits: 3 (2L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
After completing the course students will be able to:
- Plan and manage a garden
- Cultivate vegetables in kitchen gardens
- Multiply plants through appropriate techniques
- Identify seeds and garden plants

COURSE CONTENT:

Unit I
Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - green house - mist chamber, shed root, shade house and glass house.

Unit II
Nursery: Definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

Unit III
Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology - seed testing and certification.

Unit IV
Gardening: Definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, ladyôs finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

COURSE CONTENT:

- Identification of common agricultural tools and implements.
- Demonstration and practice of different methods of plant propagation
- Raising a floral nursery, soil bed preparation, transplantation and maintenance of garden
- Identification of seeds of common garden plants, crop plants and vegetables.
- Steps in the Preparation of pots for planting, maintenance of pots
- Methods of breaking seed dormancy
- Visit to Brindavan garden, Zoo garden and parks in Mysore for study and preparation of report.

References:

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

Skill Enhancement Course 1 :Chemistry

MSEIII.6C : INDUSTRIAL CHEMICALS AND ENVIRONMENT

Credits: 3 (2L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- To understand the basic techniques of chemical industry
- To gain idea about the energy sources
- To understand the properties and application of lubricants
- To study the effects of green house phenomena
- To study the water quality parameter and waste water management
- To acquire the basic knowledge about commom pesticides

COURSE CONTENT:

Unit I:

Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology.

Unit II:

Fuel Chemistry: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and non fuel) in various industries, its composition, carbonization of coal.Coal gas, producer gas and water gasð composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro Gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Unit III:

Air Pollution: Pollutants and their sources, pollution by SO2, CO2, CO, NOx, H2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Green House effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluent from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

Unit IV:

Pesticides General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil) , Anilides (Alachlor and Butachlor).

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To monitor the water quality parameters
- To prepare simple indusrial products
- To analyse food adultrants

COURSE CONTENT:

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method.
   ($AgNO_3$ and potassium chromate)
6. Estimation of total alkalinity of water samples (CO_3, HCO_3) using double titration method.
7. Preparation of borax/ boric acid.
8. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
9. Preparation of simple organophosphates, phosphonates and thiophosphates
10. Preparation of Magnesium bisilicate (Antacid).
11. Preparation of soap.
12. Testing of mercuric powder, milk powders, mustard oil for adultrants.

References:

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
3. B.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut.
4. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
5. R. Cremlyn: Pesticides, John Wiley. 7. William O. Foye, Thomas L., Lemke , David A. William:
6. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
7. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
8. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
9. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi. 10. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.

Skill Enhancement Course 1 : Mathematics

MSEIII.6D : COMBINATORICS, STATISTICS AND BASIC PROBABILITY

Credits :3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration : 2 hrs **C3 : 50**

Objectives:
To enable the students to understand the basic concepts of combinatorics, statistics and probability, to obtain the skills and apply them in problem-solving and teaching.

COURSE CONTENT:
Unit I:
Partially ordered sets, Lattices, Complete lattices, Distributive lattices, Complements, Boolean Algebra, Boolean expressions, Application to switching circuits.

Unit II:
Permutations and Combinations, Pigeon-hole principle, Principle of inclusion and exclusion. Solving real life problems based on them.

Unit-III:
Introduction to statistics, Mean, Mode and Median of grouped and ungrouped data, Graphical representations; Pie Charts, Line Graphs, Bar Graphs, Histographs, frequency polygon. Measures of dispersion; Range, Mean deviation, Variance and Standard deviation, Analysis of frequency distribution.

Unit-IV: Random experiment, Concept of probability, Sample space, Events- different kinds Probability definitions ï Mathematical or Classical or Statistical, Conditional probability, Independent events, Bayeôs theorem.
Random variable, Discrete and continuous random variables, Probability function, Probability density function, Distribution function. Mean Variance and standard deviation of a random variable.

References:

1. Elements of Discrete Mathematics by C. L. Liu , McGraw-Hill, 1986.
2. Discrete Mathematics and its Applications by Kenneth H. Rosen, McGraw-Hill, 2002.
3. Introduction to the Theory of Statisticsby Alexander M. Mood and Others (1988), New York, McGraw Hill.
4. Introduction to Probabilityby Charles M. Grinstead and Laurie Snell J. (1991), Rhode Island, American Mathematical Society.
5. Fundamentals of Mathematical Statistics by Gupta S.C and Kapur (2011), New Delhi, Sultan Chand and Co.
6. Basic Probability Problemsby Richard Serfozo (2003), London, Springer.
7. Introduction to Mathematical Statisticsby Robert V. Hogg and Allen T. Craig (1978), McMillan Publishing Co.

Skill Enhancement Course 1: Zoology

MSE III.6E :APICULTURE

Credits: 3 (2L + 0T + 1P) **Max. Marks: 100**
Contact Hrs per Week:2 hrs **C1+C2: 50**
Exam. Duration: 2 hrs **C3: 50**

Objectives:

- Impart education about techniques in beekeeping,
- to inculcate and sharpen the observation skill to enjoy the wonders of nature
- to understand the social life of honey bees, management and their importance to man
- to learn the uses of hive products and biopesticides
- to learn the technique of processing and preserving of honey, its economic and medicinal value
- to understand the diseases of honeybees and propylatic measures.
- to develop enterpreneural skills in beekeeping

UNIT I :
Introduction to Apiculture, history, importance of bee keeping, b) Types of bee hives, floral calander, bee biology and behavior, c) Role of bees in Pollination.

UNIT II:
Study of morphology of honey bees (workers drones and queen bees), b) Reproduction in honey bees, Bee hives, types of beehive boxes, selection of bee hive equipment, Populating and management of bee colony.

UNIT III:
Composition and types of honey, Different methods of collecting honey. Harvesting quality honey, Hive products.

UNIT IV:
Bee pests, predators and diseases and propylatic methods, Economics of bee keeping, Medicinal importance of honey.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:
- To provide the hands-on experience in Bee Keeping practices
- To understand the importance of Honey Bees in environment
- To appreciate the modern technology employed in Bee Keeping

COURSE CONTENT:

1. Collect different species of honey bees
2. Study the morphology of worker drone and queen bees.
3. Study different types of hive boxes
4. Study the life cycle of honey bees
5. Extraction of honey ï different methods
6. Study on predators on Honey bees
7. Dealing with robber bees

Visit to Apiaries at Mysore and agriculture universities to study the new techniques in bee keeping

References:

1. The complete book on BEE keeping and honey Processing (2nd revised edition) NPCS Board , Published by: NIIR project consultancy services
2. A practical manual of beekeeping by David Cramp (spring Hill)
3. Beekeeping in India; Ghosh G K; APH Publishing 1994
4. Beekeeping in India; Sardar Singh; ICAR 1982
5. Bees for Development (2010). Beekeeping Training modules. Honey bee colony management. Monmouth- UK.
6. Dadant and Sons. (1992**)**. The Hive and the Honeybee. Extensively rivised. Dadant and Sons. Hamilton,Illinois.
7 ABC of Beekeeping problems and problem Beekeepers By William Dullas.
8. Fundamentals of Beekeeping by Clarence H Collison ;Pennsylvania State University
9. The biology of stingless Bees by Hayo H. W. Vethuis
10. Mugume, A.(2009). Beekeeping Training Notes. Kabarole DLG. Fortportal - Uganda.
11. Beescape of maliponines: Conservation of Indo- Malayan stingless bees By Abu Hassan Jalil, Ibrahim huib M B; B S (Malaya)
12 Diseases and hygienic Behavior in Honey bees and stingless bees by University of Sheffield.
- National Bee keeping training and extension manual, 2012.

PROFESSIONAL EDUCATION COURSES

MSE III.7: UNDERSTANDING THE LEARNER

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the salient features and problems of growth and development during childhood to adolescence.
- Understand the dynamics of personality development in order to facilitate student traineesô and their studentsôpersonal growth.
- Develop the ability to apply the knowledge provided by Educational Psychology to classroom problems of various kinds.
- Understand the intra and inter individual differences in the learners and their Implications for organizing educational programmes.
- Acquire the skills of understanding the needs of all the learners in the classroom and meeting their needs.
- Appreciate the contribution of psychology in realizing the objectives of education.

COURSE CONTENT

Unit I : Nature of Human Development and Educational Implications

Concept and Branches of Psychology; Importance of Study of Psychology by Classroom Teachers, Meaning of Growth and Development. Differences between growth and development, importance of growth and development for the teachers. Principles of Development, Factors Influencing Growth and Development; Role of Heredity and Environment in determining individual Differences in Development. Developmental Stages and Tasks, Development during Early Childhood, Late Childhood and Adolescence-Characteristics, Factors Influencing and Educational Implications:(a) Physical (b) Psychomotor (c) Intellectual (d) Language (e)Emotional (f) Social and (g) Moral and ValueDevelopment

Unit II : Management of Issues and Concerns of Adolescent Students

Factors Affecting Adolescent development; Issues and Concerns during Adolescence - Physical and Health concerns,Emotional Issues, Social Issues, Socio-cultural diversity, Adverse Life experiences, Identity Vs Role Confusion; Adolescent Cognition and its effect on Adjustment, Need and Importance of Adolescence Education, Significance of Life Skill Education for Adolescence, Role of Schools for the Balanced Personality

Unit III: Individual Differences in Learners

Individual Differences in - Psycho-Motor skills, Intelligence, Aptitude, Personality, Learning styles and Cognitive Preferences, Self concept and Self esteem, Social-Emotional Development, Aptitude, Interest,Attitude and Values and Study Habits.

Unit IV : Assessment of Individual and Intra Individual Differences in Learners

Tools and Techniques: Psychological Tests, observation Schedules, Inventories, Checklists, Anecdotal Records, Cumulative Records, Sociometry, Interview Techniques, Achievement and Diagnostic Tests.

Meeting the Individual Differences in the Classroom- General Approaches; Remedial Instruction, Guidance and Counseling, Whole School Approach.

Practicum

Administering Group Tests
Conducting Case Studies
Diagnosing the deviations
Studying School Record and preparing Reports.
Getting Famililiarised with Individual Psychological Tests.

References:

1. Bigge, M.L. (1982). *Learning Theories for Teachers,* (4th edition). New York, Harper and Row Publishers, pp. 89-90.
2. Bolles, R.C. (1975). *Learning Theory*. New York, Holt, Rinehart and Winston, pp. 18-19.
3. Chauhan, S.S. (1978). *Advanced Educational Psychology*, Vikas Publishing House Pvt. Ltd., New Delhi.
4. Dandapani, S. (2001). *A textbook of Advanced Educational Psychology*. New Delhi: Anmol Publications.
5. Dunn, R. (1983). *Can students identify their own Learning Styles?* Educational Leadership, 40, pp. 60-62.
6. Dash, M. (1988). *Educational Psychology*. Delhi: Deep and Deep Publication.
7. Duric, L. (1975). *Performance of Pupils in the Process of Instruction*. Bratislava, SPN, pp. 54-90.
8. Duric, L. (1990). *Educational Sciences: Essentials of Educational Psychology*. International Bureau of Education, UNESCO, New Delhi, Sterling Publishers, p. 81.
9. Fontana, D. (1995). *Psychology for Teachers* (3rd edition). The British Psychological Society, London: McMillan in association with BPS Books.
10. Kumar, S. (2014). Child Development and Pedagogy, Pearson.
11. Kundu C.L. and Tutoo, D.N. (1993). *Educational Psychology*, Sterling Publishers Pvt. Ltd.
12. Lindgren, H.C. (1967). *Educational Psychology in Classroom* (3rd edition). New York: John Wiley and sons.
13. Mohan J. and Vasudeva P.N. (1993). *Learning Theories and Teaching, In Mohan Jitendra (ed.) Educational Psychology*, New Delhi, Wiley Eastern Limited, P. 146.
14. Murthy, CGV and Rao, AVG. (2005). *Life skills Education: Training Package*, Mysore: Regional Institute of Education.
15. NCERT (2013) *Training and Resource materials in Adolescence Education*, New Delhi

16. Oza, D.J. and Ronak, R.P. (2011). *Management of behavioral problems of children with mental retardation*. Germany: VDM publication.
17. Papalia D.E., and Sally, W.O. (1978). *Human Development*. McGraw Hill Publishing Company.
18. Phens, J.M., and Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational Psychology*. New York: Holt Rinehart and Winston Inc.
19. Tessmer, M., and Jonassen, D. (1988). *Learning Strategies: A New Instructional Technology*. In Harris Duncun (1988) Education for the New Technologies, World Year Book of Education. London: Kogan page Inc.
20. Skinner, E.C. (1984). *Educational Psychology*-4th Edition. New Delhi: Prentice Hall of India Pvt. Ltd.
21. Spinthall, N., and Spinthall, R.C. (1990). *Educational Psychology* 5th Edition. McGraw Hill Publishing Company.

Web Resources

- Animated Videos from Study.com, http://study.com/academy/course/educational-psychology-course.html
- Seifert, K. and Sutton, R. 2011). Educational Psychology Third Edition http://www.oercommons.org/courses/educational-psychology/view
- Introduction to Psychology, Open Textbook, http://open.lib.umn.edu/intropsyc/
- Generic Issues, NCERT, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/PDF/generic.pdf
- www.aeparc.org

MSEIII.8 : Gender, School and Society

Credits: 2 (1L+ 1T +0P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
This course enables the student teachers to

- Understand and contextualize ideals of the Constitution of India;
- Appreciate humanistic agenda of the Constitution of India;
- Value and recognize the role of education in realizing the ideals of the Constitution;
- Analyse various educational contexts to see whether the childôs rights are ensured
- Understand and develop positive attitudes towards various forms of exclusions;
- Appreciate the measures taken at the national level to universalize elementary and secondary education;
- Analyse the contextual examples to understand the gender issues and concerns;
- Develop positive attitude and values towards promoting gender equality;
- Evolves strategies and mechanisms as a teacher to ensure equality in school and learning contexts

COURSE CONTENT:

Unit I: Education as Fundamental Right

Constitution of India: Fundamental rights; Education as Fundamental right; Human Rights: Meaning, Nature, and classification; Rights of Children: International covenants and Indian Constitution; Education as Fundamental Right of Children: 2009, Rights of girl child

Unit II: Policy framework for public Education in India and its implementation

Education in Post-Independent India: Significant recommendations of commissions and committees, National Policy on Education-1986,Revised 1992, Delors Report: learning the treasure within, Universalization of elementary education: Need and significance; Government schemes and efforts with special focus on Sarva Shiksha Abhiyan, Issues in implementing RTE-2009: A critical understanding.Issues that affect and negate the childrenôs right to education(Child labour: Street children, abandoned and orphans; Differently abled children; Attitude towards the girl child and her participation in schooling; Punishment, abuse and violence in schools). alternative schooling, Secondary education: Universalization of secondary education; universal access, universal enrollment, universal retention, universal success; interventions of RMSA, Initiatives and measures taken at national level to improve teacher education at secondary level: Role of NCTE and NCERT

Unit III: Contemporary Indian Schooling: Concern and Issues

Equality of Educational Opportunity: Meaning and nature; Forms of inequality: Caste, Gender, Transgender, regional, religious and other marginalized groups;

Inequality in Schooling: Public- private schools, Rural-urban schools, Mass-elite schools, single teachersô schools and many other forms of in equal school systems. Positive discrimination: concept and issues and policy intervention;

Understanding Exclusion in schooling: Exclusion: Meaning, and nature; Forms of Exclusion:

Physical/physiological Exclusion; Different kinds/types of differently abled children: Measures to address the issues of leaning of differently abled children and professional preparedness of institutions;

Socio-cultural and economic exclusion

Understanding different forms of socio-cultural and economic exclusion in schoolingð Caste, Class, Gender, Minority, and other Marginalized sections of the society;

Critical understanding of óscribed identitiesôon educational opportunities;

Unit IV: Gender: Issues and concerns

Basic Gender concepts: Difference between Gender and Sex; Social construction of Gender; Gender roles as viewed in Indian context; Concept of Transgender

Gender roles in society through various institutions such as family, caste, religion, culture, media and popular culture (films, advertisements, songs etc), law and State; stereotype in gender roles

Issues related to women/girl child: female infanticide and feticide, sex ratio, honour killing, dowry, child marriage, property rights, divorce, widowhood.

Gender bias in school enrolments, household responsibilities, societal attitude towards girlôs education

Issues related to gender in school: sexual abuse, sexual harassment, perception of safety at

school, home and beyond

Representation of gendered roles, relationships and ideas in textbooks and curricula.

Role of schools, peers, teachers, curriculum and textbooks in challenging gender inequalities or reinforcing gender parity

The Indian constitution and provisions accorded to women; womenôs rights; legal aspects related to women, indecent representation of women (Prohibition act), cybercrime:

Educational and Employment provisions for Transgender: Legal aspects; social recognition

Sessional activities

- A critical study, with the help of survey and oMSErvational study, of alternative schools- child labour schools, night schools, mobile schools and boat schools.
- Critical analysis of different committees and commissions on Education
- Readings on National Policy on Education, RTE Act 2009, Delors Report
- Survey of schools to see the implementation of various incentives of government to equalize educational opportunities
- Textbook analysis for identifying integration of gender issues.
- Prepare presentation on laws related to women harassment, early marriage, property inheritance, trafficking etc.
- Prepare presentations on constitutional provisions and other government measures to promote girl childôs education
- Presentation of Case study reports on girl childôs problems in schools and at home.

Suggested Readings

- Anand, C.L. et.al. (1983). Teacher and Education in Emerging in Indian Society, NCERT, New Delhi.
- Govt. of India (1986). National Policy on Education, Min. of HRD, New Delhi.
- Govt. of India (1992). Programme of Action (NPE). Min of HRD.
- Mistry, S.P. (1986). Non-formal Education-An Approach to Education for All, Publication, New Delhi.
- Mohanty, J., (1986). School Education in Emerging Society, sterling Publishers.
- Mukherjee, S.N. (1963). Secondary School Administration, Acharya Book Depot, Baroda.
- Mukherji, S.M., (1966). History of Education in India, Acharya Book Depot, Baroda.
- Naik, J.P. & Syed, N., (1974). A Studentôs History of Education in India, MacMillan, New Delhi.
- NCERT (1986). School Education in India ï Present Status and Future Needs, New Delhi.
- Salamatullah, (1979). Education in Social context, NCERT, New Delhi.
- Sykes, Marjorie (1988): The Story of Nai Talim, Naitalim Samiti: Wardha.
- UNESCO; (1997). Learning the Treasure Within.
- Dr. Veda Mitra. Education in Ancient India, Arya book Depot, New Delhi ï 1967
- Reports of SSA and RMSA
- NCTE (2009) National curriculum framework for teacher education
- Agarwal, N (2002). Women and Law in India. New Delhi: New century Pub
- Sen,S.(2013). Womenôs rights and empowerment. New Delhi: Astha Pub.
- Siddiqi, F.E.& Ranganathan,S.(2001). Handbook on women and human rights, New

Delhi: Kanishka Pub

Web Resources: Video on improving Gender Equality- EFA Crowdsourcing Challenge, 2012, UNESCO, Pub by The Pearson Foundation, 3 minutes.

MSEIII.9 : School Attachment Programme 1

Credits : 2 **Marks: 100**
Duration: 2 Weeks **C1+C2 : 50**
C3 : 50

Objectives

- To familiarize the student teachers to school environment, its structure, functions and processes.
- To provide field experience of assessment practices including record maintenance and report cards followed in schools at elementary and secondary levels.

COURSE CONTENT:

- The student teachers will visit the neighbourhood schools for two weeks to get acquainted with the school environment and its functions and processes and submit the report.
- The student teachers will familiarize themselves with school structure and administration.
- The student teachers will visit schools and interact with teachers to know about the assessment practices like CCE, grading patterns and reporting the performance of students and submit the report
- Students will analyse the assessment records and the report cards to study the models of assessment and procedures followed in reporting studentsôperformance. The students will attend the PTA meetings where feedback about studentsôperformance is given by the teachers and submit the report.

Evaluation: All assessments are internal

C1 ï Report 1
C2 ï Report 2
C3 ï Presentation through PPT.

FOURTH SEMESTER

Core Course 1D :Physics

MSEIV.1 :OPTICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable students to

- understand that light is a wave phenomenon.
- apply the understanding of wave phenomenon to light.

COURSE CONTENT:

Unit I: Nature of Light and Scattering
Brief discussion on theories of light. Dual nature of electromagnetic radiation, electromagnetic spectrum, energy and monmentum of em wave. Electromagnetic nature of light. Definition and Properties of wave front. Huygenôs Principle.
A brief discussion on Tyndall, Rayleigh and Raman scattering of light. A qualitative account of fluorescence and phosphorescence, the Raman Effect experiment and its explanation, intensity and polarisation of Raman lines, some applications of Raman Effect.

Unit II: Interference
Definition of Coherence, Methods of production of Coherent sources by division of wavefront and division of amplitude. Theory of interference (condition for constructive and destructive interference). Youngôs double slit experiment, Lloydôs Mirror and Fresnelôs Biprism. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newtonôs Rings: measurement of wavelength and refractive index.
Michelson and Fabry-Perot interferometers: determination of wavelength of light. Wavelength difference, Refractive index and Visibility of fringes

Unit III: Diffraction
Fraunhoffer Diffraction, Diffraction at a single slit, double slit, multiple slits, Diffraction grating, Resolving power ï Rayleighôs 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, a slit and a wire using half-period zone analysis.

Unit IV: Polarisation

Polarization by reflection, Brewsterôs 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, Fresnelôs theory, Rotatory polarization, use of biquartz.

Reference Books:

1. F A Jenkins and H E White, Fundamentals of Optics, McGraw-Hill, 1976.
2. B.K. Mathur, Principles of Optics, Gopal Printing, 1995.
3. H.R. Gulati and D.R. Khanna, Fundamentals of Optics, R. Chand, 1991.
4. Eugene Hecht,Optics, Pearson Education India, 2012.
5. N. Subramaniam, Brijlal, and M. N. Avadhanulu Textbook of Optics, S. Chand Limited, 2004.
6. A K Ghatak, Optics, Tata McGraw-Hill Education, 2009.
7. Ariel Lipson,Stephen G. Lipson,Henry Lipson, Optical Physics, Cambridge University Press, 2010.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To determine the refractive index (n) of a liquid by Liquid Lens.
2. Determination of ôRôof a Lens using the Newtonôs ring arrangement.
3. Determination of thickness of a paper foil using Air wedge setup.
4. Refractive index (n) of the material of Prism by Spectrometer- measuring angle of minimum deviation.
5. To determine the refractive index (n) of glass & water by apparent depth method.
6. Specific rotation of sugar solution using Polarimeter.
7. Spectrometer- i_1- i_2 curve.
8. Refractive index of glass prism (i-d curve).
9. Spectrometer-solid prism- Dispersive power.
10. Wavelength of sodium D1 & D2 lines using Diffraction grating.
11. Newtonôs rings-wavelength of sodium light.
12. Cauchyôs constants A & B using spectrometer.
13. pï n junction diode characteristics.
14. Half wave Rectifier
15. Construction of full wave, Centre tapped and Bridge rectifiers

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2 D :Chemistry

MSEIV.2 :THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS

Credits: 4 (3L+ 0T +1P)	**Marks: 100**
Contact hrs per week: 5	**C1 + C2: 50**
Exam Duration: 2 hrs	**C3: 50**

Objectives:

- To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermochemical equations.
- Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts.
- Apply the concept of equilibrium to construct and interpret the phase diagrams.
- To understand the colligative properties of solutions and the behaviour of immiscible liquids.

COURSE CONTENT:

Unit I: Thermodynamics – I

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

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

Thermochemistry: Standard state, standard enthalpy of formation. Hessôs Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoffôs equation.

Unit II : Thermodynamics – II

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

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

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

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

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

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

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

Statement and meaning of the termsï phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component systemï water, CO_2 and Sulphur systems. Phase equilibria of two component systemï solid-liquid equilibriaï simple eutecticï Biï Cd. Pb-Ag Systems, desilverisation of lead. Simple eutectics, systems forming compounds with congruent melting points.

Unit IV: Solutions

To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henryôs 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 ï compound formation with congruent melting point (Mg ï Zn) and incongruent melting point (NaClï H_2O), ($FeCl_3$ï H_2O) and ($CuSO_4$ï H_2O) system. Freezing mixtures, acetone dry ice.

Liquid ï liquid mixtures: Ideal liquid mixtures, Raoultôs and Henryôs law. Non-ideal system ï Azeotropesï HCï H_2O and ethanolï water systems.

Partially miscible liquidsï Phenol-water, trimethylamineï water, nicotineï water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.

Immiscible liquids, steam distillation. Nernst distribution law ï thermodynamic derivation, applications.

References :

1. Principles of physical chemistry : Puri,Sharma and Pathania, 47th edition
2. Physical Chemistry : Atkins
3. Phase rule: Gurdeep Raj, Goel Publishing House.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the energetics of chemical reactions
- To find out the equilibirium constants of selected systems
- To study the behaviour of immiscible liquid systems
- To appreciate the physical properties of liquids and liquid mixtures

COURSE CONTENT:

1. Determination of heat of neutralization of acids and bases .Verification of Hessôs law of constant heat summation.
2. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
3. pH titration of acid versus base (oMSErvation of change in pH
4. Determination of equilibrium constant of hydrolysis of an ester(ethyl acetate/methyl acetate)
5. Determination of dissociation constant of a weak acid.
6. Determination of solubility product constant (K_{sp}) of a sparingly soluble salt
7. Determination of dissociation constant of phenolphthalein/methyl orange by colorimetric method.
8. Determination of molecular weight of a given liquid by steam distillation.
9. Determination of percentage composition of the given NaCl solution by miscibility temperature method (phenol-water system).
10. Determination of distribution coefficient of benzoic acid between water and toulene or acetic acid between water and 1-butanol.
11. Determination of transition temperature of a given salt hydrate by thermometric method.
12. Determination of molecular weight of a given substance by Rastôs method.
13. Determination of density, coefficient of viscosity and surface tension of the given liquid.
14. Determination of refractive index of pure liquids and liquid mixtures.

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References :

Systematic Experiments in Chemistry by Arun Sethi.

Core Course 3D :Mathematics

MSEIV.3 : DIFFERENTIAL EQUATIONS

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
By the end of the semester the students will be able to understand the concept of ordinary and partial differential equations, and their uses in solving real life problems.

COURSE CONTENT:

Unit I:
Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form ï Reducible to homogeneous form, Linear equations, Bernoulliôs equation, Exact equations, Equations reducible to exact equations.

Unit II:
Equations of the first order and higher degree, Clairautôs equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendreôs differential equations, Simultaneous differential equations.

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

Unit IV:
Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrangeôs linear equations Pp + Qq = R, Standard types of first order non-linear partial differential equations, Charpitôs method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

References :

1. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
4. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
7. Differential Equations by Ayres, Schaum Publishing Company.

8. Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co.
9. Differential Equations by Vasishta and Sharma, Krishna Prakashan Mandir.
10. A Textbook of Differential Equations by Mittal, Har Anand Publications

REGIONAL LANGUAGES

MSE IV.4A : HINDI

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction mode :
Lecture cum discussion, group discussion; panel discussion, seminar group work , library work.

COURSE CONTENT:

Unit I : Media Studies:
Television, Cinema Aur New Media

Unit II: New Literary Discourses
Stri Vimarsh Aur Dalit Vimarsh

Unit III: Drama:
Hanoosh by Bhishm Sahani Published by Rajkamal Prakashan, Delhi

Unit IV: Communication skill:
Debate [Vaad-Vivad]
Characteristics ï Definition ï Need of Debate ï Technique to conduct Debates, etc. Exercise

Reference:

1. Fundamentals of Journalism, Report Writing and Editing by R. Thomas Berner, Marquette Books, LLC, Washington.
2. Media Samgra- Jagdishwar Chaturvedi, Swaraj Prakashan, Delhi
3. Media Vimarsh- Sudhish Pachauri, Vani Prakashan, Delhi
4. Hindi Cinema Ka Sapharnama- Bhaskar Rao, Delhi
5. Yatharthvad Aur Hindi Dalit Sahitya: Dr Sarvesh Mourya, Swaraj Prakashan, Delhi

6. Dalit Vimarsh Ki Bhoomika: Kaval Bharti, Sahitya Upkram, Allahabad
7. Dalit Sahitya Ki Awdharna: Kaval Bharti, Sahitya Upkram, Allahabad
8. Dalit Sahitya Ki Bhoomika: Harpal Singh Arush, Vagdevi Prakashan, Delhi
9. Dalit Strivad Ka Svar: Vimal Thorat, Anamika Prakashan, Delhi
10. Samkaleen Dalit Strivad: Rajni Tilak, Swaraj Prakashan, Delhi
11. Aurat Hone Ki Saja: Arvind Jain,Vani Prakashan, Delhi
12. Ek Aurat Ki Notebook: Sudha Arora, Vani Prakashan, Delhi
13. Stri Sangharsh Ka Itiha: Radha Kumar, Vani Prakashan, Delhi
14. Stritva Ka Maanchitra: Anamika, Vani Prakashan, Delhi
15. Hindi Natak-Udbhav aur Vikas: Dasrath Ojha, Rajpal and sons, Delhi
16. Bhishm Shahnai ki Katha Bhasha: Kiran Kishra, Swaraj Prakashan, Delhi
17. Natyashastra ki Bhartiya Parmpara aur Dasroopak: Hajari Prasad Divedi, Rajkamal Prakashan, Delhi
18. Rangmanch ke Sidhhant: Mahesh Aanand, Devendraraj Ankur, Rajkamal Prakashan, Delhi
19. Rangmanch ka Saundryashastra: Devendraraj Ankur, Rajkamal Prakashan, Delhi
20. Antrang Bahirang: Devendraraj Ankur, Rajkamal Prakashan, Delhi
21. Darshan Pradarshan: Devendraraj Ankur, Rajkamal Prakashan, Delhi
22. Aaj Ki Kala: Prayag Shukla, Rajkamal Prakashan, Delhi
23. Rangmanch ka Jantantra: Hrishikesh Sulabh, Rajkamal Prakashan, Delhi
24. Rang Arang: Hrishikesh Sulabh, Rajkamal Prakashan, Delhi
25. Natya Darpan: Mohan Rakesh, Rajkamal Prakashan, Delhi
26. Aadhunik Bhartiya Natya-Vimarsh: Jaydev Taneja, Rajkamal Prakashan, Delhi
27. Rang-Darshan: Nemichand Jain, Rajkamal Prakashan, Delhi
28. http://www.hindisamay.com

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials (seminars, projects etc) tests & assignments.
C1-10 (test) + (seminars, projects, assignments etc) =15
C2-10 (test) + (seminars, projects, assignments etc) =15
Total =50

MSE IV.4B : KANNADA

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

COURSE CONTENT :

Unit I : Functional Language

a. **Book Review** : Characteristics ï definition ï format ï models ï exercises.

b. **Precis-writing**: Characteristics ï definitions ï steps to précis writing ï models ï exercises.

Reference: A Handbook of Writing Activities, Prasaranga, University of Bangalore.

Unit II : Technical Writing

a. Definition ï characteristics ï format ï models ï Language used in the writing ï Terminology ï Process of writing ï Planning of document ï Styles of writing ï Techniques of writing ï exercises.
b. Creative Writing: Poem Writing, Essay Writing

Reference: (a) Technical Writing by Richard W.Smith, Barnes and Noble Inc., New York**, (b)** Technical Report Writing Today ï Danel G.Riordan, 19-A, Ansari Road, New Delhi 110 002.

Unit III : Ancient Poetry

1. Melpu balpanaligum- Pampa
2.Paligum paapakkamanjadavar eegeyyar- Nagachandra
3.Muktiyanolisuven-Janna
(Kaavya Sanchaya-3 ï Mysore University, Mysore)

Unit IV : Drama

Sankraanthi-Lankesha

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:

Assessment will be based on tutorials(seminars, projects etc) tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

MSE IV.4C: MALAYALAM

Credits 4 (2L+1T) **Max. Marks: 100**
Contact Hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs **C 3:50**

Unit I: Functional Language

1.Book Review- Characteristics ï definition ï format ï models ï exercises.

2. Precis-writing: Characteristics ï definitions ï steps to précis writing ï models ï exercises.

Unit II:Technical Writing
Definition-characteristics-format-models-Language used in the writing-Terminology-Process of writing planning of document-Styles of writing-Technologies of writing-exercises.

Unit III: Ancient Poetry
Text : Karna Parvam (Krishna Darshanam) By Ezhuthachan, NBS , Kottayam

Unit IV: Drama
SAKETHAM by C. N. Sreekantan Nair, Current Books , Trichur

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

Continuous Assessment:
Assessment will be based on tutorials (seminars, projects etc) tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

ABILITY ENHANCEMENT COURSE - AEC 1D: LANGUAGE

MSE IV. 4D: Tamil

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3:50**

Objectives:

- To develop the students to acquire basic skills in functional language
- To develop independent reading skills and reading for appreciation the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region

Transaction mode:
Lecture cum discussion, group discussion, panel discussion, seminar group work, library work.

COURSE CONTENT:

Unit I: New Genres & Media Studies:
a) Travellogue: Nadanthai Vaazhi Kaveri- Janakiraman
b) Cinema, TV, Newspaper and New Media: significance of media-role of media in society- values-etc.

Unit II: Drama
Tanneer Tanneer

Unit III: Poetry: Ancient Poetry
1. Nedunalvaadai
2. Kalithogai

Unit IV: Grammar: Porul, Yappu, Ani- Agam, Puram- Venpa, Aasiriyappa-Uvamai, Uruvagam, Vettumai, Vettuporul, Tharkurippettam.

Suggested Activities:
In the internal class during the different activities the performance of the student will be assessed by the Teacher. Test, assignments and small projects works may be given.

Continuous Assessment:
Assessment will be based on tutorials, seminars, projects, Tests and assignments.
C1-10(Test)+ 15(seminars, projects, assignments etc.) =25
C2-10(Test)+ 15(seminars, projects, assignments etc.) =25
Total=50.

References:

1. An anthology of Tamil poetry (for second year Degree class), University of Mysore, Mysore.
2. Thandiyalangaaram, Thirunelveli Saiva Chithaantha Noorpathippu Kazhagam, 522, DDK Road, Chennai-18.

3. Purapporul venpa maalai, Thirunelveli Saiva Chithaantha Noorpathippu Kazhagam, 522, DDK Road, Chennai-18.
4. Udagangalin ethirkalam, Dr. Neelakanda pillai, no 17, Tagur street, Sidlapakkam, Chennai-64.
5. Nadanthai vaazhi Kaveri- Janakiraman. Kaiachuvadu pathippagam, 669, K.P. Road, Nagercoil-629001.
6. Tanneer Tanner. Komal Swaminathan, Vanathi pathippagam, 13 Deenadayalu street, T. Nagar, Chennai-600 017.

ABILITY ENHANCEMENT COURSE - AEC 1D: LANGUAGE

MSE IV. 4E TELUGU

Credits 3 (2L+1T+0P) **Max. Marks: 100**
Contact hours per week: 4 **C1+C2:50**
Exam duration: 2 Hrs. **C 3:50**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

Transaction mode:
Lecture cum discussion, group discussion; panel discussion, seminar group work, library work.

COURSE CONTENT:

Unit I: Functional Language
1.Analytical writing: Definition-how to analyze a poem-a story- a novel and an essay-different approaches to observe-examples-exercises
2. Precise-writing: Characteristics ï definitions ï steps to précis writing ï models ï exercises.

Unit II: Technical Writing
Definition-characteristics-format-models-language used in the writing-terminology-process of writing-planning of document-styles of writing-technologies of writing-exercises.

Unit III: Ancient Poetry
Padmavyuha bhedanam-Tikkana (Sree Madaandhra Mahabharatham)
Ruthu varnanalu ï Srikrishna devaraya (Amuktha Malyada)
Lessons from ñTelugu Sahitya Sravanthiò.

Unit IV: Short stories:

(i) *Nannu gurinchi katha vrayavoo*-Buchchibabu

(ii) *Lakshmi* - Rachakonda viswanatha sasthry

(Selections from Telugu Katha, by Central Sahithya Academy, New Delhi.)

Suggested Activities:

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given.

Continuous Assessment:

Assessment will be based on tutorials (seminars, projects etc.) tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc.) =25
C2-10 (test) +15 (seminars, projects, assignments etc.) =25
Total =50

References:

1. Government of Karnataka, *A Handbook of Writing Activities,* Prasaranga, University of Bangalore.
2. Kodavati Ganti Kutumba Rao, *Science Vyasalu,* Published by Vishalandhra Publications, Abids, Hyderabad.
3. Government of Karnataka*, Telugu Sahitya Sravanthi,* Published by Prasaranga, University of Mysore, Mysore
4. *Amuktha Malyada,* Sanjeevani Vyakhya, Emesco Publishers, Hyderabad.

Ability Enhancement Course 2D

MSE IV.5 ENGLISH

Credits 4 (2L+1T) **Max. Marks: 100**

Contact Hours per week: 6 **C1+C2:30**

Exam duration: 3 Hrs C 3:70

Objectives :

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the
- use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary,
- spelling, punctuation and speech.
- examine authentic literary and non literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

Transaction Mode :

Lecture-cum-discussion, interactive session, group dynamics, role-play, peer-assessment, self-valuation.

COURSE CONTENT :

Unit I : PROSE

1. J.B.Priestley : Travel by Train.
2. Bertrand Russell :Knowledge and Wisdom

Unit II : POETRY

T.S.Eliot : Hollow Men
Wordsworth : The Solitary Reaper
Pablo Neruda : The Portrait in the Rock
William Shakespeare : True Love.
William Blake : A Poison Tree.
William Wordsworth : Lucy Gray.
Robert Frost : The Road Not Taken
Emily Dickinson : There is a certain slant of light

Unit III : DRAMA

Ionesco : *Rhinoceros*
Harold Pinter : *The Dumb Waiter*

Unit IV : FICTION

D.H.Lawrence : *Sons and Lovers*
Gabriel Garcia Marquez : *One Hundred Years of Solitude*

Continuous Assessment:

Assessment will be based on tutorials(seminars, projects Etc) tests & assignments.
C1-10 (test) +15 (seminars, projects, assignments etc) =25
C2-10 (test) +15 (seminars, projects, assignments etc) =25
Total =50

Suggested Readings:

Cambridge Companion to British Romanticism
Pelican Guide to English Literature ï Dickens to Hardy to Lyrical Ballads
Nortonôs Anthology, Volume.2 1-7, 139
Mathew Arnold- Culture and Anarchy
Dickens- Novel óChanging Face of Cityô
Meenakshi Mukherjee - Jane Austen
William Congrev- Excerpts from London Gazette
Brown, John Russel, and Harris, Bernard(ed.)- Restoration Theatre (London, 1965)
Richetti, John, The Cambridge Companion to Eighteenth Century Novel (Cambridge, 1996)
Addison and Steele - Spectators Papers
Cambridge Companion to English Poetry- Donne to Marvel
Restoration Theatre - ed. Brown, John Russel
Background Prose Reading - papers 6,7 & 8: Worldview, an Imprint of Book Land Publishing co.

Skill Enhancement Course - SEC 2 Physics

MSE IV.6A : COMPUTATIONAL PHYSICS

Credits: 3 (2L + 0T +1P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics.

- To use of computational methods to solve physical problems.
- To use computer language as a tool in solving physics problems (applications).

COURSE CONTENT:

Unit I: Introduction

Importance of computers in Physics, paradigm for solving physics problems for solution. Algorithms and Flowcharts, Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples (Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal).

Unit II: Scientific Programming

Concept of high level language, steps involved in the development of a Program, Compilers and Interpreters. Development of C, Basic elements of C. Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Data types, Type declaration of variables, Symbolic constants, Arithmetic operators, Increment and decrement operators, Conditional operator, Bitwise operators, Hierarchy, Arithmetic expressions, Logical operators and expressions, Assignment operators, Arithmetical and assignment statements, Mathematical functions, Input/output statements (unformatted/ formatted), Relational operators, Decision making and branching, Go to, if, ifé else, switch statements, Looping, While, do and for, Arrays (Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Handling characters and strings, Functions and voids, structures, Pointers (elementary ideas only), File operations(defining and opening, reading, writing, updating and closing of files, Enough examples from physics problems.

Unit III:Scientific word processing

Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. Equation representation: Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors.

Unit IV:Visualization

Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot.

References:

1) S.S. Sastry, Introduction to Numerical Analysis, 5th Edn., 2012, PHI Learning Pvt. Ltd.
2) V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3) Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4) J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5) J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6) F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7) Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8) Leslie Lamport, LaTeXï A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9) Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10) R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11) U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12) K.E. Atkinson, Elementary Numerical Analysis, , 3rd edition, 2 007, Wiley India.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

The course aims to emphasize the role of computer programming and numerical analysis in solving problems in Physics and to provide hands on training on the Problem solving on Computers.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. To print out all natural even/ odd numbers between given limits.
2. To find maximum, minimum and range of a given set of numbers.
3. Calculating Euler number using exp(x) series evaluated at x=1
4. To compile a frequency distribution and evaluate mean, standard deviation etc.
5. To evaluate sum of finite series and the area under a curve.
6. To find the product of two matrices
7. To find a set of prime numbers and Fibonacci series.
8. To write program to open a file and generate data for plotting using Gnuplot.
9. Plotting trajectory of a projectile projected horizontally.
10. Plotting trajectory of a projectile projected making an angle with the horizontally.
11. Creating an input Gnuplot file for plotting a data and saving the output for seeing on

the screen. Saving it as an eps file and as a pdf file.

12. To find the roots of a quadratic equation.
13. Motion of a projectile using simulation and plot the output for visualization.
14. Numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
15. Motion of particle in a central force field and plot the output for visualization.

References:

1. S.S. Sastry, Introduction to Numerical Analysis, 5th Edn, 2012, PHI Learning Pvt. Ltd.
2. V.Rajaraman, Programming in C, PHI Learning Pvt. Ltd., 1994.
3. Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
4. J.H.Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
5. J.B.Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, 2010.
6. F. B. Hildebrand, Numerical analysis, 2nd edition, Courier Corporation, 2013.
7. Brian P. Flannery, Saul Teukolsky, William H. Press, and William T. Vetterling, Numerical Recipes in C, The art of scientific computing, Cambridge University Press
8. Leslie Lamport, LaTeXï A Document Preparation System, 2nd edition, Addison-Wesley, 1994.
9. Philip K Janert, Gnuplot in action: understanding data with graphs, Manning Publications, 2010.
10. R. C. Verma, et al., Computational Physics: An Introduction, New Age International Publishers, New Delhi, 1999.
11. U.M. Ascher and C. Greif, A first course in Numerical Methods, 2012, PHI Learning.
12. K.E. Atkinson, Elementary Numerical Analysis, 3rd edition, 2 007, Wiley India.

Skill Enhancement Course - SEC 2 Botany

MSE IV.6B :UTILIZATION OF PLANTS AND HERBAL TECHNOLOGY

Credits: 2(1L+0T+1P) **Max Marks: 100**
Contact Hours per week: 3 **C1+C2 = 50**
Exam duration: 2 hrs. **C3 = 50**

Objectives:

After completion of the course students will be able to:

1. Appreciate the wealth and potential of medicinal plants in our country
- Identify important plants that are useful to us
- Familiarise with phytochemical and micropropagation techniques

COURSE CONTENT:

Unit I: Utilization of plants

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

a) Cereals and Pulses : Rice, wheat, maize, millets, pigeon, pea, Bengal gram, green gram, black gram.

b) Fibres : Cotton, jute, linen, coir.

c) Vegetable oils : Groundnut, coconut, sunflower, safflower, castor.
d) Timber and bamboos : Rosewood, teakwood, honne, canes and bamboos.
• Beverages : General account, coffee, tea, cocoa.
Spices and condiments : General account, cardamom, clove, pepper, ginger, cinnamon, saffron, turmeric, mustard.
A. Rubber : General account, *Hevea, Ficus*.
B. Pharmacognosy:Uses of *Rauwolfia, Phyllanthes, Catharanthus, Ocimum, Tylophora, Zingiber,* Trigonella, and other locally available medicinal plants.

Unit: II
Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

Unit III:
Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; Catharanthus roseus (cardiotonic), Withania somnifera (drugs acting on nervous system), Clerodendron phlomoides (anti-rheumatic) and Centella asiatica (memory booster).

Unit IV:
a) Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)
b) Medicinal plant banks micro propagation of important species (Withania somnifera, neem and tulsi- Herbal foods-future of pharmacognosy)

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

COURSE CONTENT:
- Identification and study of plants of economic importance included in theory.
- Methods of cultivation and micropropagation of medicinal plants
- Familiarisation with basic phytochemical techniques
- Submission of a report on local medicinal plants
- Preparation of 2 herbarium sheets of medicinal plants
- Visit to medicinal plants garden and herbal extraction companies

References:
1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994.

Oxford IBH publishing Co.
5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
6. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
7. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

Skill Enhancement Course - SEC2 Chemistry

MSE IV.6C : INDUSTRIAL INORGANIC MATERIALS

Credits : 3 (1L + 0T +1P) **Marks: 100**
Contact hrs per week: 3 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 50**

Objectives :

- To understand the production, handling and storage of indusrial gases
- To gain knowledge about the manufacture, application and hazardous in handling the inorganic chemicals
- To know the composition, properties and application of silicate minerals in indusry
- To acquire the knowledge of simple fertilizers, surface coatings, alloys, and chemical explosives

COURSE CONTENT

UNIT I : Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate. Industrial Metallurgy - Preparation of metals (ferrous and nonferrous) and ultra pure metals for semiconductor technology.

UNIT II : Silicate Industries

Glass: Glassy state and its properties, classification (silicate and non silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, super conducting and semi conducting oxides,

fullerenes carbon nanotubes and carbon fiber.

Cements : Classification of cement, ingredients and their role, Manufacture of cement and the settingprocess, quick setting cements.

UNIT III :

Fertilizers: Fertilizers: Different types of fertilizers. Manufacture of the following fertilizers: Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphates; Polyphosphate, Super phosphate, Compound and mixed fertilizers Potassium Chloride, Potassium sulphate.

Surface Coatings: Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electroless), metal spraying and anodizing

UNIT IV:

Alloys: Classification of alloys, Ferrous and Non-Ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, Page 39 of 80 demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.

Chemical Explosive: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction of rocket propellant.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To analyse the chemical composition, properties of simple fertilizer and alloys
- To familiarise with the preparation of inorganic salts, dyes and pigments

COURSE CONTENT:

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Estimation of Cu-Zn in brass
5. Determination of composition of dolomite (by complexometric titration).
6. Analysis of Cu-Ni or (Cu, Zn) in alloy or synthetic samples.
7. Analysis of Cement.
8. Preparation of pigment (zinc oxide).
9. Estimation of Available Oxygen in Hydrogen Peroxide.
10. Determination of phosphoric acid in commercial sample of phosphoric acid.

11. Preparation of chrome alum.
12. Preparation of potash alum from alluminium scarp
13. Preparation of mthyl orange.

References:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, NewDelhi.
3. J. A. Kent: Riegelôs Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
5. A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
6. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New

Skill Enhancement Course –SEC 2 : Mathematics

MSE IV.6D : DATA HANDLING

Credits : 2 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration : 2 hrs **C3 : 50**

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

- understand the types of educational data, procedures of data validation and its analysis.
- appreciate the analysis of educational data by using statistical tests.
- Develop skill of using the application software for data analysis and computation of various statistical measures.
- Compute the different statistical measures by using computerized application software.
- Drawing meaningful conclusions based on the interpretation of analysed data.

Unit I: Data Collection- Nature and types of data
Data collection- primary sources and secondary sources; Scales of measurement (NOIR)
Coding: Variable names; Coding responses; Coding open-ended questions
Tabulation, Constructing frequency distribution table, Graphical representation of data ï Pie diagram, Histogram, frequency curve.

Unit II : Descriptive Analysis of Data-1
Measures of dispersion ï Range; Quartile deviation; Standard deviation; Coefficient of dispersion; Skewness and Kurtosis.

Unit III: Descriptive Analysis of Data-2
Normal Probability Curve ï Meaning, Purpose and Applications, Derived Scores (Z & T Scores).
Measures of Reltionships: Meaning of Correlation and Methods of computing correlation -

Product Moment Correlation; Rank Difference Method of Correlation

Unit IV: Inferential Statistics
Sampling Procedures ï Random sampling, Systematic Random sampling, (with and without repetitions), Stratified random sampling, Cluster sampling, Snow ball sampling.
Hypothesis ï Meaning and types; testing of hypothesis ï one sample t-test, independent samples t-test, paired samples t-test, Chi-square test.

Practicum:
1. Collect data live ï class test scores/ survey data and generate frequency distribution table and represent it graphically.
2. Collect test scores of any school subject of any class and compute Mean, Quartile Deviation and Standard Deviation.
3. Compute coefficient of correlation among language subject papers and core subject papers like ï English and History, Mathematics and Science, etc.
4. Study the sampling procedures adopted by taking various school contexts like selecting a team for school reports, team for debate competition, etc.

Skill Enhancement Course SEC 2: Zoology

MSE IV.6E : SERICULTURE

Credits: 3 (1L + 0T + 1P) **Max. Marks: 100**
Contact Hrs per Week: 3 hrs **C1+C2: 50**
Exam. Duration: 2 hrs **C3: 50**

Objectives
1. To understand the importance of sericulture
1. To provide the hands-on experience in sericulture practices
2. To enhance the skill of practicing silk production
3. To appreciate the modern technology employed in sericulture practices

COURSE CONTENT:

Unit I: Introduction to Silkworm Practices
Sericulture: Definition, history and present status
Silkworms: Types of silkworms, their food plants and distribution
Non-Mulberry Silkworm: Tasar *(Antherea*: Distribution, life cycle, food plant and marketing
Muga silkworm: Distribution, Food plants and Life cycle, marketing
Eri Silkworm: Distribution, life cycle and food plants, marketing.
Prospectus of Sericulture in India : Sericulture industry in different states, employment
Central Silk Board (CSB): Role of Central Silk Board and Directorate of Sericulture in extension and development.
Moriculture: Salient features and economic importance of the genus *Morus*; Anatomy of mulberry leaf, stem and root
Soil: Physical and chemical properties; Soil nature; Soil moisture; Climatic conditions: Temperature, photoperiod, humidity and rainfall

Unit II: Silkworm Taxonomy And Distribution

Classification and Taxonomic characters: Phylum, class, order, family, genus and species;
Moultinism and voltinism: Univoltine, bivoltine and multivoltine races; Distribution and Races; Geographical distribution in the world and India;
Life cycle: Egg, larvae, pupa and adult, life span

Unit III: Silkworm Morphology

Egg: External and internal morphology and colour change;
Larvae: Mouth parts, legs, prolegs, spiracles, eyes, claspers and integumentary hair and sexual markings;
Pupa: Male and Female Morphology and sexual dimorphism;
Adult: Mouth parts, antenna, wings, external genitalia.
Silk glands: Structure, development and mechanism of silk synthesis
Endocrine glands: Endocrine glands in lava and pupa; Hormonal control on metamorphosis, diapause, silk synthesis. Pheromone: sex attractants and their role in mating.

Unit IV: Silkworm Rearing Technology and Diseases

Rearing: Rearing appliances, Rearing trays, ant-wells, rearing stands and racks, paraffin papers, rubber foam pads, net, chopsticks and feathers; Mountages
Disinfectants appliances: Disinfect ants - Formalin, bleaching powder, RKO, Disinfectant appliances: Sprayers and dusters
Seed: Collection of disease-free layings (DFLs), cards, loose eggs, incubation; Hatching and Brushing: Uniform hatching and Brushing methods for I instar larvae
Basic concepts of silkworm diseases: Viral and Protozoan diseases (Nuclear polyhydrosis virus (NPV); *Nosema bombycis* (Pebrine disease) and Preventive measures
Bacterial diseases: Bacterial septicemia (*Bacillus sp*.); Fungal Diseases (white muscardine (*Beauveria bassiana*),
Silkworm pestsð Tachinid Fly (Uzifly), Dermistid beetles; Vertebrate and other silkworm pests and their control.

References

1. Narasingabba, M. N. (1988) Manual of silkworm and its production by Central Silk Board, Bangalore.
1. Tasar culture. Dr. M. S. Jolly et. al., CSB, 1974.
2. Silkworm Rearing Techniques in the Tropics, Dr. S. Omura, Japan International Cooperation Agency, 1980.
3. Muga Silk Industry by S. N. Choudhary, Directorate of Sericulture and weaving, Govt. of Assam, 1982.
4. Studies on soils of India, S. V. Govind Rajan and H. G. Gopala Rao (1970), Vikas Publ. House Pvt. Ltd., New Delhi.
5. Boraiah, G. (1986) Mulberry Cultivation. Lectures on Sericulture.
6. Manual on Sericulture; Food and Agriculture Organisation Rome 1976.
7. Appropriate Sericultural Techniques Ed, by M. S. Jolly Director, CSR & TI, Mysore.
8. Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan1972.
9. A Guide for Bivoltine Sericulture: K. Sengupta, Director, CSR & TI, Mysore 1989.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives

i) To provide the hands-on experience in sericulture practices
- To enhance the skill of practicing silk production
- To appreciate the modern technology employed in sericulture

COURSE CONTENT:

1. Preparation of a map showing extension of sericulture in the world.
1. Preparation of a map showing extension of sericulture in India.
2. Graphical representation of cocoon and silk production by various silkworms in India.
3. Moriculture: a) Soil sampling and analysis of pH and moisture content. b) External morphology of root, stem and leaf. c) Methods of propagation by cutting.
4. Morphology ï Egg, last instar larva, pupa, adult, sexual dimorphism, mouthparts, antennae, legs, prolegs, wings.
5. Anatomy ï Dissection of silk gland of larva and adult.
6. Study of appliancesð Types of trays and racks, types of mountage, Cellule, humidity and temperature devices, dusters and sprayers.
7. Life cycle of Silkworm
8. Silk productsð Silk wastes, spun yarn and other byproducts.
9. Single cocoon reelingð determination of average filament length and denier
10. Visit to various sericulture department/centres.
11. Collection of mulberry disease sample and preservation.
12. Study of mulberry fungi, viruses and bacteria causing diseases.

PROFESSIONAL EDUCATION COURSES

MSE IV.7: LEARNING AND TEACHING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

The student teacher will be able to:

- Gain an understanding of the process of learning.
- Understands the Conditions Essential for Facilitating Learning and Retention.
- Apply the Principles and Strategies of Major Approaches to Learning in Classroom Environment.
- Understands the Process of Effective Teaching and Qualities of Effective Teachers.
- Understands various Approaches to Teaching and will be able to apply them in the

relevant situations.

- Understands the Principles and Strategies for Creating Conducive Classroom Environment.
- Appreciates the role of a teacher as leader, organizer, a facilitator & a humane reflective practitioner.
- Realize the difficulties in learning and teaching.

COURSE CONTENT

Unit I : Concept and Nature of Learning

Factors Associated with Learning
Maxims of Learning and their Educational Implications
Approaches to Learning(Concept, Associated Concepts Basic Principles and Educational Implications)-Habitual Learning, Associative Learning (Classical and Instrumental Conditioning), Spatial Learning/Cognitive Maps, oMSErvational Learning, Learning by Insight, Information Processing Approach, Humanistic Approach, Constructivist Learning Approach
Types of Learning-Concept Learning, Skill Learning, Verbal Learning, Learning of Principles and Problem Solving (Meaning, Nature, Stages, Principles and Approaches/Strategies)

Unit II: Understanding Components of Learning

Attention-Meaning, Factors Influencing Attention, Strategies for Enhancing Attention;
Perception-Meaning, Laws of Perceptual Organization (Gestalt PsychologistsôView) and Educational Implications.
Process of Memory- Sensory Registration, Retention(Storing), Recognition, Recall; Factors Influencing Retention; Strategies for Enhancing Memory.
Transfer of Learning- Concept, Types, Theories; Strategies for Enhancing Positive Transfer of Learning
Achievement Motivation- Concept, Intrinsic and Extrinsic Motivation; Strategies for enhancing Achievement Motivation in Students.

Unit III: Understanding the process of Teaching-Learning

Teaching as a Profession
Teaching as an Art and Science.
Understanding the Process of Teaching as a Profession
Identifying the need and importance of classroom teaching-learning
Reflective teaching/practice
Skillful teaching
Applying the knowledge of Maxims of Teaching
Role of teacher in identifying classroom related problems

Unit IV: Teacher and Teaching as a profession

Various Approaches to Teaching: Behaviourist, Cognitivist, Constructivist, Connectionist, Participatory, Cooperative, Collaborative, Personalized, and Holistic
Teacher as a Facilitator and Guide/Philosopher/Friend
Teachers commitment towards fulfilling Felt Need of Learners

Professional Characteristics of Teacher in Classroom Management.
Skills & Competencies of a TeacherCommunication:Meaning,' mode::input/process/output
Basic Model of Communication: Sender, Message, Medium, Receiver & Reach; Factors facilitating communication
Effective Classroom Management-Principles and Strategies
Leadership Qualities in Teachers

Practicum

Conducts Projects on ï
Identifying the Learning Difficulties of Students in Different School Subjects and the Possible Reason for them;
Providing Remedial Instruction to the Students with Learning Difficulties;
Study the Qualities of Effective Teachers through observation, interview, case study etc.,
Visiting Model Schools and Prepare Reports

References:

- Benjamin S., Bloom et al. (1964). *Taxonomy of educational objectives*. Longman Group.
- Bruce Joyce (1985) *Models of teaching* (2nd ed.) Prentice Hall**.**
- Encyclopaedia of Modern Methods of Teaching and Learning (Vol. 1-5).
- Gage N.L. Scientific Basis of art of Teaching
- Gavriel Salomon (1981) *Communication and education* Sage.
- Lieberman, M. (1956) *Education as a profession*. Prentice Hall, Inc.
- Karthikeyan, C. (2004). *A Text book on instructional technology,* RBSA.
- Kumar, S. (2014). Child Development and Pedagogy, Pearson.
- Ohles, J.F. (1970). *Introduction to Teaching*. New York: Random House, INC.
- Siddiqui, Mujibul Hasan (2005). *Techniques of classroom teaching* A.P.H
- Skinner, E.C.(1984). *Educational Psychology. 4th Edition***.** New Delhi: Prentice Hall of India Pvt. Ltd.
- Snowman & Baihler (2006). *Psychology Applied to teaching*. Boston: Houghton Mifflin Company.
- Stephens, L.M. & Evans, E.D. (1973). *Development and Classroom Learning: An Introduction to Educational psychology*. New York: Holt, Rinehart and Winston, Inc.
- Tanner, L.N. & Lindgren, H.C. (1971). *Classroom Teaching and Learning*. New York: Holt, Rinehart and Winston, Inc.

Web Resources

- Courses on Communication Skills, http://nptel.ac.in/courses/109104030/
- Jane Ciumwari Gatumu, Reflective Teaching, http://oer.avu.org/bitstream/handle/123456789/155/REFLECTIVE-TEACHING.pdf?sequence=1
- School leadership (2011), http://azimpremjifoundation.org/pdf/learning-curve-16.pdf

MSE IV.8 : DRAMA AND ART EDUCATION

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the efficacy of different art forms in education
- Understand the use of ódramaôas a strategy
- Use órole playôtechnique in the teaching learning process.
- Understand the importance of dramatic way of presentation.
- Integrate singing method in teaching learning process.
- Understand various ódance formsôand their integration in educational practices.
- Use art of drawing and painting in teaching learning process.
- Develop creativity through different creative art forms.

COURSE CONTENT

Unit I : Drama and its Fundamentals

Creative writing ï Drama writing, Drama as a tool of learning, Different Forms of Drama Role play and Simulation, Use of Drama for Educational and social change (Street play, Dramatization of a lesson), Use of Drama Techniques in the Classroom: voice and speech, mime and movements, improvisation, skills of observation, imitation and presentation

Unit II: Folklore Music (Vocal & Instrumental)

Sur, *Taal and Laya (Sargam),* Vocal - Folk songs, Poems, Prayers, Singing along with ñ*Karaoke*ò, Composition of Songs, Poems, Prayers, Integration of *Vocal & Instrumental* in Educational practices

Unit III: The Art of Dance

Various Dance Forms - Bharat Natyam, Kathakali, Kuchipudi, Yakshagana- Folk dance and various other dances; integrate movement and rhythm.
Integration of Dance in educational practices
(Action songs, *Nritya Natika*)

Unit IV: Drawing and Painting

Colours, Strokes and Sketching- understanding of various means and perspectives, Different forms of painting- Worli art, Madhubani art, Glass painting, Fabric painting and various forms of painting, Use of Drawing and Painting in Education -Chart making, Poster making, match-stick drawing and other forms, Model making ï Clay modeling, Origami, Puppet making, Decorative ï Rangoli, Ekebana, Wall painting (Mural), Kalameshuthu or any other local art

Transactional Strategies

Lecture cum Discussion for each Unit (Unit 1 to 4) followed by simulated/ authentic practices, Workshop schedule, Slide / Film show, Project work, Demonstration, Simulation, Group work and field trips involving meetings with folk singers and other skilled practitioners will especially form part of the transaction scheme. In addition to the above any one or more of the following:

Practicum

Suggestive List:

1. Developing a script of any lesson in any subject of your choice to perform a Play / Drama.
2. Developing a script for the street play focusing on ñGirlôs education and Women empowermentò.
3. Preparing a pictorial monograph on ñVarious folk dance of South India.
4. Preparing a pictorial monograph on ñVarious Classical Dance forms in Indiaò.
5. Preparing a calendar chart on ñVarious Musical Instruments in Indiaò.
6. Develop an Audio CD based on newly composed Poems of any Indian language.
7. Preparing some useful, productive and decorative models out of the waste materials.
8. Visit the Faculty of Performing Arts in your city and prepare a detailed report on its multifarious functioning.
9. Development a Review of a theatre programme if possible
10. Organize a competition on some Decorative / Performing Art forms in the school during your School Internship programme and prepare a report on it.
11. Organizing a workshop on some selected Creative Art forms in the school during your School Internship programme and prepare a report on it.

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc.Action research based on teaching learning and school and community could be conducted.**

Evaluation Strategies

Sessional, practicum, unit test project work related presentations.

Suggested Readings

1. Natyashastra by Bharathamuni
2. Deva, B.C. (1981). An Introduction to Indian Music. Publication Division, Ministry of Information and Broadcasting, Government of India.
3. NCERT (2006). Position Paper by National Focus Group on Arts, Music, Dance and Theatre
4. Theory of Drama by A. Nicoll
5. Folklore and School Education. Regional Institute of English Publication, 2007.

Web Resources

Position Paper National Focus Group on Arts, Music & Dance, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/art_education.pdf
Arts in school education, (2012), http://azimpremjifoundation.org/pdf/LCXVIII.pdf
Online courses on Arts, http://www.dsource.in/course/index.php
Learning Indicators and Learning Outcomes at the Elementary Stage, (2014), NCERT
http://www.ncert.nic.in/departments/nie/dee/publication/pdf/LI_Final_Copy_Revised_29.12.14.pdf

MSE IV.9 : School Attachment Programme 2

Credits : 2 **Marks: *100**
Duration : 2 weeks **C1 + C2:50**
C3: 50

Objectives:

- To familiarize student teachers with classroom processes and skills employed in teaching-learning process
- To familiarize the student teachers with different types of schools existing in the community**.**

COURSE CONTENT:

- The student teachers will observe minimum 3 classes of regular teachers for understanding the skills and strategies used in teaching by them.
- The student teachers will visit different types of schools such as Government, Government aided and private schools to study their governing norms, regulations and participation in the community.
- The student teachers will visit the schools run by community/NGO or other organizations like minority run schools, schools in SC/ST dominated areas, schools in slum areas, special and inclusive schools and submit the report.

Evaluation:* All assessments are internal

C1 ï Report 1
C2 ï Report 2
C3 ï PPT

FIFTH SEMESTER

Core Course 1 E : Physics

MSE V.1 : ATOMIC AND MOLECULAR PHYSICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Physics-I

The Electron: Determination of e/m of an electron by Thomson method, Determination of charge of an electron by Millikanôs oil drop method.
Atomic Spectra: Inadequacy of Bohr atomic model, correction due to finite mass of the nucleus, Rydberg constant in terms of reduced mass, Excitation and Ionization potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, relativistic mass correction, vector model of an atom, Electron spin, space quantisation, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

Unit II: Atomic Physics-II

Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules. Pauliôs exclusion principle. Electronic configuration of atoms. Valence electron and a brief mention of L-S and J-J coupling for multi electron atoms. Fine structure lines of Sodium Zeeman effect.Explanation of Zeeman effect on the basis of vector model of atom, Expression for Zeeman shift and experimental details. Mention on anomalous Zeeman effect, A qualitative mention of Paschen ï Back and Stark effects.

Unit III : Molecular Spectra

Molecular formation, the molecular ion, H_2 ï 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 Infrared (IR) spectra, simple applications. UV-Visible, Fourier Transform IR, Nuclear Magnetic resonance (NMR) and Laser Raman spectra of organic molecules and their interpretations.

Unit IV: X-Rays

Electromagnetic spectrum, production of X-rays, X-ray spectra, Continuous X-ray spectra Characteristic X-ray. Duanne and Hunt limit. Moseleyôs law and its significance, X-ray energy levels.Braggôs law and Bragg spectrometer. A brief mention of different types of

crystals. Structures of NaCl and KCl crystals. Compton Effect, Expression for Compton Shift.X-ray diagnostics and imaging

Reference Books:

1. H. S. Mani and G. K. Mehta, Introduction to Modern Physics, Affiliated East-West Press,India, 1990.
2. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
3. J.R. Taylor, C.D. Zafiratos,Modern Physics, M.A. Dubson, PHI Learning, 2009.
4. R.A. Serway, C.J. Moses, and C.A.Moyer, Modern Physics, Cengage Learning, 2005.
5. G. Kaur and G.R. Pickrell, Modern Physics, McGraw Hill, 2014.
6. Rich Meyer, Kennard, Coop, Introduction to Modern Physics, Tata McGraw Hill, 2002.
7. R. Murugeshan and K. Sivaprasath Modern Physics, S. Chand Publisher, 1994.
8. J. R. Reitz, F. J. Milford, and R. W. Christy, Foundations of Electromagnetic Theory, Addison-Wesley; 4 edition, 2008.
9. Banwell and E. Mccash, Fundamentals for Molecular Spectroscopy, McGraw Hill Education; 4 edition, 1994.
10. H. E. White, Atomic Spectra ï MacGraw-Hill, 1954.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Franck-Hertz experiment.
2. Study of sodium lines using discharge tubes.
3. Study of hydrogen lines using discharge tubes.
4. Study of helium lines using discharge tubes.
5. Dissociation energy of Iodine.
6. Hartmannôs formula for wavelength.
7. Benzene IR spectrum.
8. Rydberg Constant ï Solar Spectrum
9. Excitation of Brass spectrum using Arc method
10. Rutherford model ï Simulation technique.
11. Zener diode characteristics.
12. Transistor characteristics and transfer characteristics in Common Base configuration-current gain.
13. Transistor characteristics and transfer characteristics in Common Emitter configuration-current gain.
14. CE Transistor Amplifier-Frequency response.

15. Basic operational amplifier.
16. Energy gap of a semiconductor.
17. Bi-prism experiment.
18. Resolving power of grating.
19. Current balance experiment- the effects of a magnetic field on a current carrying conductor.
20. Resolving power of a telescope.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2EChemistry

MSE V.2 : TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- To develop an understanding of Principles of Chemical Kinetics and Surface Chemistry.
- To explain the properties of d and f block elements and their compounds in terms of their electronicconfiguration and bonding.
- To understand the properties of coordination compounds in terms of bonding theories.

COURSE CONTENT:

Unit I: d-block and f-block elements

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

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. Powder metallurgy ï extraction of tungsten. Position of lanthanides and actinides in the periodic table, lanthanide contraction and its consequences, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides. General properties of actinides:
Extraction of Thorium, Uranium and Plutonium from burnt nuclear fuels.

Unit II : Coordination Compounds

To apply theories that explain certain properties and structure of transition metal complexes. Wernerôs 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 behavior and color 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: Chemical Kinetics

Understanding the factors that influence a chemical reaction and rationalising them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction ï concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions ï zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction ï 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 IV :Surface Phenomena

Adsorption: Introduction-Absorption and adsorption(definition, examples and differences) types 0f adsorptions-physical and chemical(definition, examples and differences between them), factors influencing the adsorptionof gases on solids. Adsorption isotherms: definition, Mathematical expression for Freundlich and Langmuir's adsorption isotherms. applications of adsorptions.

Catalysis: Definition, general characteristics, action of catalytic promoters and inhibitors. Homogeneous catalysis (definition and examples),Heterogeneous catalysis(definition and examples) mechanism of hetwerogeneous catalysis(based on adsorption theory) enzyme catalysis (definition and examples) Mechanism of enzyme catalysed reaction(lock and key mechanism)

References :

1. Inorganic Chemistry : James Huhey
2. Essentials of physical chemistry Arun Bahl,B.S. Bahl,G.D. Tuli
3. Concise Inorganic Chemistry J.D.Lee 5th edition,Wiley publishers.
4. Advanced Inorganic Chemistry Satya Prakash G.D. Tuli S.K. Basu, R.D. Madan S.Chand and company pvt. Ltd.
5. Principles of Physical Chemistry Puri,Sharma and Pathania.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To understand the kinetics of chemical reactions
- To familiarise with the analysis of ores
- To prepare and analyse inorganic complexes
- To study the adsorption phenomena

COURSE CONTENT:

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar
8. Colorimetric study of kinetics of oxidation of Indigo carmine by Chloromine-T.
9. To study the adsorption of acetic acid on activated charcoal
10. To determine the relative strength of Hydrochloric acid and sulphuric acid by studying thekinetics of hydrolysis of ethyl acetate.
11. To study kinetically the reaction rate of decomposition of iodine by hydrogen peroxide.
12. Determination of Copper by colorimetric method using ammonia as the complexing agent.
13. Determination of Ferric ion by colorimetric method using potassium thiocyanate as the complexing agent.
14. Estimation of Manganese in pyrolusite by volumetric method
15. Preparation of a complex: potassium trioxalato aluminate(III) trihydrate or potassium trioxalato
    cobaltate(III)
16. To determine the rate constant for the inversion of sucrose using polarimeter.

References :

1. Advanced practical inorganic chemistry by Gurdeep Raj, Goel Publication House, Meerut-India.
2. Systematic Experiements in chemistry by Arun Sethi, New age International Pvt.Ltd, New Delhi.

Core Course 3E : Mathematics

MSE V.3 : MULTIVARIATE CALCULUS & VECTOR CALCULUS

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
To enable the students to understand the concepts of multi-variate calculus and vector clculus, and also to compute the areas of plain regions, surfaces and volume of solids.

COURSE CONTENT:

Unit I:
Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral.

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

Unit III:
Quadratic Curves, surfaces, sphere, cylinder, cone, Ellipsoid, Hyperbloid, Parabloid, Ruled surfaces.

Unit IV:
Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stokeôs Theorem, Greenôs Theorem in plane.

References

1. Calculus by Lipman Bers, Vols 1 and 2.
2. First Course in Calculus by Serge Lang
3. Calculus ï Single and Multivariable by Hughes Hallet
4. Calculus and analytic geometry by Thomas and Finny.
5. Advanced Calculus by David Widder

PROFESSIONAL EDUCATION COURSES

MSE V.4 : ASSESSMENT OF LEARNING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
This course is designed to help student teachers to:

* Understand the nature of assessment and evaluation and their role in teaching- learning process.
* Understand the importance of assessment in continuous and comprehensive manner
* Plan assessment tasks, techniques, strategies and tools to assess learnerôs competence and performance in curricular and co-curricular areas,
* Devise marking, scoring and grading procedures,
* Analyse, manage and interpret assessment data.
* Devise ways of reporting on student performance
* Develop the skills of reflecting-on and self-critiquing to improve performance.

COURSE CONTENT:

Unit I: Introduction to Assessment & Evaluation

(a) Concept of test, measurement, Assessment, examination, appraisal and evaluation in education and their inter relationships.
(b) Purpose and objectives of assessment/ Evaluation- for placement, providing feedbacks, grading promotion, certification, diagnostic of learning difficulties.
(c) Importance of assessment & evaluation for Quality Education ï as a tool in Pedagogic decision making (writing instructional objectives, selection of content, teaching learning resources, methodology, strategies & assessment procedures followed).
(d) Forms of assessment : -
  (i) (Formative, Summative, diagnostic; prognostic, placement; Norm referenced; Criterion referenced based on purpose)
  (ii) (Teacher made tests Standardizedtests: based on nature & scope)
  (iii) (Oral, written, performance: based on mode of response)
  (iv) (Internal, External, self, peer, & teacher, group Vs individual- based on context)
  (v) Based on nature of information gathered (Quantitative, Qualitative)
  (vi) CCE, school based assessment ; Standard Based- based on Approach

(e) Recent trends in assessment and evaluations:
  - Assessment for learning, assessment of learning and assessment as learning; Relationship with formative and summative, Authentic assessment.
  - Achievement surveys- State, National and International; Online assessment; On demand assessment/ evaluation.
  - Focus on Assessment and Evaluation in Various Educational commissions and NCFs

Unit II: Developing Assessment Tools, Techniques and Strategies -1

(a) Concept of Cognitive, Affective, Psychomotor domain of learning

(b) Relationship between educational objectives, learning experiences and evaluation.

(c) Revised taxonomy of objectives (2001) and its implications for assessment and stating the objectives-

- Knowledge dimensions:- factual, conceptual, procedural and meta-cognition.
- Cognitive, Affective, Psychomotor domains ï Classification of objectives

(d) Stating objectives as learning out comes: General, Specific.

(f) Construction of achievement tests- steps, procedure and uses (Teacher made test/Unit Tests)

- Constructing table of specifications & writing different forms of questions ï (VSA, SA, ET & objective type, situation based) with their merits and demerits; assembling the test, preparing instructions, scoring key and marking scheme; and question wise analysis

(g) Construction of diagnostic test ï Steps, uses & limitation; Remedial measures- need types and strategies

(h) Quality assurance in tools ï Reliability: Meaning &Different methods of estimating reliability (Test-retest; equivalent forms, split- half); Validity: Meaning &Different methods of estimating reliability (Face, content, construct), Objectivity and Practicability/ Usability

(i) Inter dependence of validity, reliability and objectivity

Unit III: Developing Assessment Tools, Techniques and Strategies -II

(a) Concept of CCE, need for CCE its importance; relationship with formative assessment and problems reported by teachers and students

(b) Meaning & construction of process-oriented tools- Interview; Inventory; oMSErvation schedule; check-list; rating scale; anecdotal record;

(c) Assessment of group processes-Nature of group dynamics; Socio-metric techniques; steps for formation of groups, criteria for assessing tasks; Criteriaôs for assessment of social skills in collaborative or cooperative learning situations.

(d) Promoting Self assessment and Peer assessment ï concepts and criteriaôs

(e) Portfolio assessment ï meaning, scope & uses; developing & assessing portfolio; development of Rubrics

Unit IV: Analysis, Interpretation, Reporting and Communicating of student's performance

a) Interpreting studentôs performance

(i) Descriptive statistics (measures of central tendency & measures of variability, percentages, rank correlation)

(ii) Graphical representation (Histogram, Frequency Curves)

(b) Grading ï Meaning, types, and its uses

(c) Norms ï Meaning, types, and its uses

(d) Reporting studentôs performance ï Progress reports, cumulative records, profiles and their uses, Portfolios, Using descriptive Indicators in report cards

(e) Role of feedback to stake holders (Students, Parents, Teachers) and to improve teaching ï learning process; Identifying the strengths & weakness of learners.

Sessional Works

1. Discussion on existing assessment practices in schools and submitting the report.
2. Constructing a table of specification on a specific topic (subject specific)
3. Constructing a unit test using table of specifications and administering it to target group and interpreting the result.
4. Construction of any one of the process oriented tools and administering it to group of students & interpreting it.
5. Analysis of question papers:teacher madeandvarious Boards
6. Analysis of report cards-State and Central (CMSE)
7. Analysis of various education commission reports and NCFs for knowing various recommendations on Assessment and Evaluation

References:

1. Ebel, R.L. and Fresbie, D.A. (2009).Essentials of Educational Measurement. New Delhi: PHI Learning PVT. LTD.
2. Garrett, H.E. (2008). Statistics in Psychology and Education. Delhi: Surjeet Publication.
3. Gupta, S.K. (1994). Applied Statistics for Education. Mittal Publications.
4. Mehta, S.J. & Shah, I.K. (1982).Educational Evaluation. Ahmedabad: Anand Prakashan (Gujarati).
5. NCERT (2015) Learning Indicator, New Delhi
6. NCERT (2015) CCE Packages, New Delhi
7. Rani, P. (2004).Educational Measurement and Evaluation. New Delhi: Discovery Publishers.
8. Rawat, D.S. (1970). Measurement, Evaluation and Statistics in Education. New Delhi: New Raj Book Depot.
9. Reynolds, C.R., Livingston, R.B., and Willson, V. (2011).Measurement and Assessment in Education. New Delhi: PHI Learning PVT. LTD.
10. Ten Brink, T.D. (1974). Evaluation ï A Practical Guide for Teachers. New York: McGraw Hill Book Co.
11. Thorndike, R.M. (2010). Measurement and Evaluation in Psychology and Education. New Delhi: PHI Learning Pvt. Ltd.
12. Yadav, M.S. and Govinda, R. (1977). Educational Evaluation, Ahmedabad: SahityaMudranalaya.
13. Linn, Robert and Norman E Gronland (2000); Measurement and Assessment in teaching, 8th edition, by Prentice Hall, Inc, Pearson Education, Printed in USA
14. VedPrakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri AurobindoMarg, New Delhi
15. Tierney, R. J., Carter, M. A., & Desai, L. E. (1991). Portfolio Assessment in the Reading ï Writing Classroom. Norwood, MA: Christopher-Gordon Publishers
16. Glatthorn, A. A. (1998). Performance Assessment and Standards-based Curricula: the Achievement Cycle. Larchmont, NY: Eye no Education
17. Gredler, M. E. (1999). Classroom Assessment and Learning. USA: Longman.
18. Likert, R. (1932). A technique for the Measurement of Attitudes. Archives Psychology, 40.
19. Mehrens, W. A. & Lehmann, I. J. (1991). Measurement and Evaluation in Education and Psychology (8th ed.): Chapter 10: Describing Educational Data.
20. Oosterhof, A. (1994). Classroom Applications of Educational Measurement (Second Edition). New York: Macmillan College Publishing Company Inc.
21. Payne, D.A (2003).Applied Educational Assessment. Australia: Wadsworth: Thomson

Learning.
22. Popham, W.J. (1981). Modern Educational Measurement. New Jersey, Engle Wood Cliffs: Prentice-Hall Inc.
23. Popham, W. J. (2002). Classroom Assessment: What teachers need to know (Third Edition). Boston: Allyn& Bacon.

Web Resources

1. Assessment in school education, (2013) http://azimpremjifoundation.org/sites/default/files/userfiles/files/Issue%20XX%20Section%20C.pdf
2. Compendium of Tools, (2013), CMSE
3 http://cMSE.nic.in/ePub/webcMSE/webcMSE/Revised%20Compendium%20of%20Tools/Revised%20Compendium%20of%20Tools/docs/Revised%20Compendium%20of%20Tools.pdf
4. http://www.cMSE.nic.ib/cce/index.html
5. www.ncert.nic.in
6. http://nroer.in/home/

MSE V.5 : Pedagogy of Physical Science 1

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

Student teachers will be able to

- Explain the nature of science.
- Specify the goals and objectives of science teaching.
- Review the contributions of major scientists.
- Explore several methods of teaching science.
- Apply various theories science learning and analyze the implications for teaching science.
- Review the science curriculum, syllabus, and text books.
- Explore constructivist practices in teaching of science.
- Create unit plans, lesson plans in an artistic and scientific way.
- Explore the inter-relation between science and other subjects.

COURSE CONTENT:

Unit I: Nature of Science

Nature and scope of science -Scientific method, how science works.
Science as a process and product. Science as a way of thinking: inquiry, observation, problem-solving, rational thinking, reasoning, science as an empirical body of knowledge. Structure of knowledge: facts, concepts, principles, generalizations, theories.
Historical development of physical science with illustrations from topics such as structure of

atoms, laws of chemical combinations, stoichiometry, equivalent mass, models of the universe, nature of light, electricity and magnetism etc.

Contributions of Indian and international figures in science to the knowledge domain of physical science.

Basic branches of physical science and applications of physical science to human life. Evolution of Physical Science as a knowledge field; science and technology; science and society;

Correlation between science and other subjects, role of science teacher.

Unit II:

a. Aims and learning objectives of Physical Science

Aims of teaching physical science in the school curriculum.

Development of process skills of science, scientific attitude and temper by learning Physics and Chemistry as experimental sciences.

Nurturing curiosity, creativity and aesthetic sense.

Science and societyï relating physical science with the natural and social environment and technologies relating science to daily life

Values through science teaching-open mindedness, objectivity, truthfulness, critical thinking, logical thinking, development of problem solving skill, social learning.

Ethics of using the knowledge of science and technology.

b. Physical Science Curriculum

Recommendations of major commissions in India and policies on science teaching.

The school science curriculum with regard to NCF 2005: major themes in secondary school science.

Brief study of famous curricular reform projects such as Nuffield, STEM, PSSC, Chemical Bond Approach, CHEMSTUDY etc.

Comparison of international secondary schools science syllabus- Singapore, Oxford, CIE (Cambridge).

Unit III: Pedagogical shift, Approaches and Strategies of learning Physical Science

Role of prior knowledge in constructing new knowledge (Ausubel), Piagetôs theories of learning (schema- disequilibrium).

Development of concepts in Science- Real-life as the basis of conceptions; personal vs. verified knowledge of science. Conceptions, alternate concepts, and misconceptions in science, naïve concepts.

Teaching concepts and generalizations: inductive approaches, using advance organizers, problem solving approach, investigatory approach, project method, cooperative learning method.

Vygotskyôs theories of role of language and context in learning.

Van Glasersfeldôs theory. Development of constructivist practices in science teaching, 5E learning model, 7E model, conceptual change model of teaching, challenges in using constructivism in the classroom.

Approaches in teaching Science : Cooperative and Collaborative learning approach, problem solving approach, concept mapping, experiential learning, cognitive conflict, inquiry

approach, analogy strategy.
Facilitating learning: Teacherôs role as a facilitator, grouping students, multiple learning experiences, discussing and negotiating ideas, scaffolding, consolidating studentsô ideas, questioning-techniques and strategies, higher order and metacognitive questioning.
Maintaining positive learning environment.
Catering to children with varied needs and abilities.
Scope and importance inclusiveness in science class room.
Gender and Science
Role of learner: each learner as unique individual, involving learner in learning process, role of learner in negotiating and mediating learning, encouraging learner to raise and ask questions.

Unit IV: Planning for Physical science Teaching-learning

Importance of planning, unit plan and lesson plan.

Anderson and Krathwohlôs revised Bloomôs taxonomy: knowledge domains and cognitive processes, action words. Types of knowledge- factual, conceptual, procedural and metacognitive knowledge.
Identification and organization of concepts.
Elements of physical science lesson plan: learning Objectives, introduction, development, assessment, extended learning, assignment.
Designing learning experiences, pre-existing knowledge, selecting approach/strategy, arrangement of teaching learning materials, group learning, formation of groups, organizing activities.
Planning the lesson by using ICT applications and laboratory materials.
Reflective planning; unit plan; developing lesson plans on different topics and through various approaches taking examples form upper primary, secondary and higher secondary stage (physical and chemical changes, redox reaction, light, magnetic effect of electric current, etc.).
Important skills required to teach in Constructive mode.

Sessional Activities:

9. Presentation on historical development of science concepts with a view to understand the nature of science.
1) Pedagogical analysis (units for pedagogic analysis: any unit from VIII, IX or X physical science textbook).
2) Drawing concept-maps for secondary level concepts.
3) Presentation on the contributions of Physicists and Chemists to physical science.
4) Readings on curriculum initiatives in secondary science with a special reference to NCF 2005.
5) Comparison of different science curricula.
14. Lab demonstration/exploration of science experiments.

- Exploring common mis-concepts in Physical Science by observing science classes or interviewing science teachers or using VIII and IX textbooks.
- Stating learning objectives for teaching a topic in science.
- Demonstration of different methods of teaching of Physical Science.
- Experimentation of different methods of teaching of Physical Science.

Practicum on teaching skills in integrated and Constructivist form to be carried out in the Block hours allotted.

References :

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSE V.6 : Pedagogy of Mathematics 1

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

On completion of the course the students will have

* understanding of nature of mathematics and its branches
* ability to analyse the relationship of mathematics within itself and with other subjects
* ability to categories mathematical knowledge into factual, conceptual, procedural and meta cognitive knowledge
* Appreciates the contributions made by Indian and other country mathematicians contribution

* ability to apply logical reasoning and problem solving ability in solving various mathematical problems

UnitI: Knowledge about Mathematics

Nature of mathematics- abstractness, preciseness, brevity, language and symbolism; Nature of mathematical propositions; Quantifiers- necessary and sufficient conditions(one and two way); structure of mathematics- undefined terms, defined terms, definitions, axioms, postulates and theorem; mathematical theorem and its variants- converse, inverse and contra positive; Pure and Applied mathematics; branches of mathematics- Arithmetic, algebra, geometry and their diversities; mathematization through- oMSErvation, conjecturing, hypothesing, testing and verifying; creation of conceptual knowledge and its importance; creation of procedural knowledge- derivation of laws/ theorems/ generalizations in mathematics; relationship of mathematics among different branches of science; relationship within and among branches of mathematics; Contribution of Indian and other Mathematician- Aryabhatta, Bhaskara, Ramanujuam, Guass, Euclid, Descarte, Cantor, Pythagarous;

Organization of Mathematical content- horizontal and vertical linkage (within and between classes IX and X); linkage between upper primary, secondary and senior secondary mathematics.

Unit II: Aims and objectives of teaching Mathematics

Aims of mathematics- Cultural, disciplinary, moral, social and utilitarian aims; General objectives of teaching mathematics Vis-a-Vis the objectives of secondary education; Major shifts in classroom teaching (societal and technological influence); characteristics of a good instructional objectives; Writing specific objectives of different content categories in mathematics; Unit plan and Lesson plan-its importance and writing unit plan and lesson plan for mathematics lessons using the format.

Unit III: Strategies for learning mathematical concepts

Nature of concepts, types of concept, process of concept formation; Moves in teaching concepts- a) Exemplar moves- giving examples and non-examples (with or without reasoning); comparing and contrasting ; giving counter example b) Characterization move- definition, stating necessary and/or sufficient condition; concept Attainment Model (Bruner); Advance Organizer Model (Ausubel); Planning and implementation of strategies for teaching various mathematical concepts(secondary level maths)

Important skills required to teach in Constructivist mode.

Unit IV: Teaching of Generalization

Teaching by exposition- Moves in teaching generalization:- Introductory move, focus move, objective move, motivation move, assertion move, application move, interpretation move, justification move; Planning for expository strategies of teaching generalization.

Teaching by guided discovery- nature and purpose of learning by- discovery, inductive, deductive, guided discovery strategies; maxims for planning and conducting discovery strategies; planning strategies involving either induction or deduction or both.

Sessional work:

Analysis of secondary level mathematics text books to identify various categories of mathematical knowledge presented and its horizontal and vertical linkage among 8, 9 and 10 standard text books.

Analysing the structure of mathematics present in selected chapter/unit.
Writing a unit plan for selected unit
Writing of specific instructional objectives for selected unit
Writing a lesson plan on selected content area
Writing a plan for teaching a concept of a generalization using the appropriate moves to teach them.

Practicum on teaching skills in integrated and constructivist form to be carried out in block hours allotted.

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc
6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi
8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education,Syndey, Croom Helm Australia Pty Ltd
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal publications Pvt Ltd

MSE V.7 : School Attachment Programme - 3

Credits : 2 **Marks: *100**
Duration : 2 weeks **C1 + C2:50**
C3: 50

Objectives:

The student teachers will

- Understand learners coming from diverse backgrounds
- Analyze the availability of physical and learning facilities which function as the curriculum resources at secondary level.
- Analyze the relevance of principles of curriculum organization and transaction to actual implementation process of curriculum in schools

Course Content

The student teachers will perform the activities listed below and prepare reflective diary and the reports on the tasks performed separately level wise. They will present their reports in the seminar organized after the completion of school attachment programme.

During this phase student teachers are expected to begin developing their own understanding about facilities available in school, learners and their learning context, curriculum transactions in school. Student teachers gain understanding being into actual school environment by observation, gathering information and interaction with students, teachers and school Head.

The following tasks centered on school, learner contexts and teacher context are suggested to be carried out by student teachers in this phase.

- Analyze how the curriculum proposed at the national /state levels are translated into class room practices by observing teacherôs classes of any one subject
- Identity the resources and facilities used by the teacher for teaching a lesson and interact with teacher to identify the resource mobilization.
- Study of the availability of facilities and resources catering to curriculum transaction at upper primary and secondary levels - labs, library, activity rooms, learning resources, art and craft resources and resources for physical education and yoga
- Study of the facilities and scope for inclusiveness in school environment
- Observation of classes to understand the learning processes ; Study the learners coming from diverse back grounds and their interaction in classrooms - social context of learners; Individual differences; learning facilities for Inclusive children
- Observation of learners in various contexts (participation in school activities, play ground, lunch time, participatory role in school functioning, maintenance of class room and school surroundings, responsibilities taken in various club activities etc.)

Records to be submitted for assessment

- Report on the analysis of school and the class room practices in realizing the curricular expectations evolved at national/state level.
- Report on availability and utility of resources in school.
- Report on learners diversities.

Evaluation:* All assessments are internal

- C1 ï Report 1
- C2 ï Report 2
- C3 ï PPT

SIXTH SEMESTER

Core Course 1F : Physics

MSE VI.1 : CLASSICAL & QUANTUM MECHANICS AND SPECIAL THEORY OF RELATIVITY

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives: To enable students to understand the essentials of classical mechanics, quantum mechanics, quantum statistics and relativity.

COURSE CONTENT:

Unit I: Lagrangian formulations of Classical Mechanics
Constraints- sclerenomic and rheonomic constraints, holonomic and non holonomic constraints, Generalized co-ordinates and velocities, Principle of virtual work, DôAlembertôs principle, Euler- Lagrange equations, Cyclic co-ordinates, Conservation laws and symmetry properties, applications of Lagrangian formulation (simple pendulum). Canonical momenta & Hamiltonian of a system. Hamilton's equations of motion. Hamiltonian for a harmonic oscillator.

Unit II: Special Theory of Relativity
Galilean transformation, Earth as an inertial frame of reference, Constancy of speed of light, Ether hypothesis, Michelson-Morley experiment, Postulates of Special Theory of Relativity, Lorentz transformations. Simultaneity and order of events. Length contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.

Unit III: Origin of Quantum Theory
Qualitative discussions on inadequacies of Classical Physicsï black body radiation and photoelectric effect, Planckôs hypothesis and explanation of black body radiation, Einsteinôs explanation of photoelectric effect with derivation, Wave-particle duality, de Broglieôs hypothesis of matter waves, concept of group velocity and phase velocity and their relationship, experimental evidence for matter wavesï Davisson and Germer experiment, electron diffraction experiment. Uncertainty Principle.

Unit IV: Development and application of Schrodinger Equation
Wave function, interpretation of wave function, postulates of quantum mechanics, probability density, Eigen functions and eigen values, expectation values, Normalization of wave functions, development of time dependent and time independent Schrodinger wave equation, operator method of deriving Schrodinger equation. Applications of Schrodinger wave

equationï one dimensional infinite potential well, finite potential well, phenomenon of tunneling, one dimensional harmonic oscillator, hydrogen atom (only qualitative discussion).

Reference Books:

1. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
2. H.Goldstein, C.P. Poole, J.L. Safko, Classical Mechanics 3rd Edn., Pearson Education, 2002.
3. L. D. Landau and E. M. Lifshitz, Mechanics, Pergamon, 1976.
4. P.S. Joag, N.C. Rana, Classical Mechanics 1st Edn., McGraw Hall.
5. R. D. Gregory, Classical Mechanics, Cambridge University Press, 2015.
6. L. I. Schiff, Quantum Mechanics, 3rd Edn., Tata McGraw Hill, 2010.
7. R. Shankar, Principles of Quantum Mechanics 2nd edition, Springer, 2014.
8. David J Grifith, Introduction to Quantum Mechanics, Addison Wesley; 2 edition, 2004.
9. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
10. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
11. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
12. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Stefanôs constant.
2. Planckôs constant using LEDôs (3no.s).
3. Absorption spectra.
4. Photoelectric effect.
5. Variation of resistance with temperature of copper wire (10 mts).
6. Laser Diffraction.
7. Laser-wavelength using transmission grating.
8. Photo conductivity using LDR.
9. Photovoltaic cells.
10. Numerical aperture of an optical fibre by semiconductor laser.
11. BG Absolute Capacity.
12. BG-High resistance by leakage method
13. BG Mutual inductance
14. e/m of electron.
15. Verification of inverse square law for light using photodiode.

16. Diffraction of light. Determination of wavelength λ.
17. Characterization of photo diode.

Reference Books:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

Core Course 2FChemistry

MSE VI.2 :ORGANIC CHEMISTRY – II

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
To develop an understanding of the chemistry of Functional groups and mechanism of Organic Reactions.

COURSE CONTENT:

Unit I: Alcohols and Phenols
Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).
Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols-oxidative cleavage [$Pb(OA_c)_4$ and HIO_4] and Pinacol-pinacolone rearrangement.
Trihydric alcohols: Nomenclature and methods of formation(from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI).
Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2- naphthols (one method each). Physical properties and acidic character of phenol.

Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit II: Carbonyl Compounds

Aldehydes and Ketones

Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic addition to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketones. An introduction to σ, β unsaturated aldehydes and ketones.

Carboxylic Acids and their Derivatives

Nomenclature, structure and bonding. Preparation of carboxylic acids ï by oxidation, using Grignard reagents and hydrolysis of nitriles. Physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Reactions of carboxylic acids: HVZ reaction, synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions hydroxy acids ï malic, tartaric and citric acids.

Unsaturated monocarboxylic acids: Methods of formation and chemical reactions
Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.
Carboxylic acid derivatives: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acid, base conditions).

Unit III: Organic synthesis via Carbanions

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of Ŭï hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids ï succinic acid and adipic acid; Ŭ,ɓ ï unsaturated acids ï crotonic acid and cinnamic acid; barbituric acid.
Synthetic applications of acetoacetic ester: dicarboxylic acids ï succinic acid and adipic acid; Ŭ, ɓ ï unsaturated acids ï crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes, Alkylation and acylation of enamines.

Unit IV: Organic Compounds of Nitrogen

Nitro Compounds: Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.
Aliphatic and Aromatic amines: Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsbergôs method). Structural features effecting

basicity of amines. Amine salts as phase ï transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts and azo coupling.

References :

1. Advanced organic chemistry Arun Bahl and B.S. Bhal
2. Organic Chemistry:Reagents and Reactions Agrawal, Goel Publishing House 53rd edition 2015
3. Organic Chemistry John Macmumy 9th Edition 2016.
4. Organic Chemistry J.Clayden,N.Greeves and S.Warren 2nd Edition 2012 Oxford University Press.

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

- To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification
- To develop skills of separation techniques

COURSE CONTENT:

1. Qualitative organic analysis

1. Separation of organic mixtures containing two solid components using water , $NaHCO_3$, NaOH

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

2. Chromatographic Techniques

(i) Thin Layer Chromatography

(a) Determination of R_f values and identification of organic compounds:
(b) Identification of plant pigments by thin layer chromatography
(c) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone using toluene : light petroleum (2:3 ratio)
(d) Separation of mixture of dyes

(ii) Paper Chromatography

Determination of R_f values and identification of organic compounds:
(a) Separation of mixture of amino acids
(b) Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water 4:5:1) ; Spray reagent: anilinehydrogenphthalate

(iii) Column Chromatography

Separation and identification of ortho and para nitro anilines

References :

1. A Text Book of Qualitative Organic Analysis, A I Vogel
2. A Text Book of Quantitative Organic Analysis, A I Vogel
3. Systematic experiments in Chemistry Arun Sethi, New Age International(P) Ltd.

Core Course 3F Mathematics

MSE VI.3 : GROUPS AND RINGS

Credits: 4 (3L+ 1T +0P) **Marks: 100**

Contact hrs per week: 5 **C1 + C2: 50**

Exam Duration: 2 hrs **C3: 50**

Objectives:

By the end of the semester the students will be able to develop understanding of the abstract concepts of groups and rings, and special classes of rings and to appreciate modern mathematical concepts.

COURSE CONTENT:

Unit I:

Groups, Examples, Properties and types, Sub-groups. Cyclic groups and properties, Cosets, Lagrangeôs theorem and its Consequences, Dihedral groups, Normal subgroups, Quotient groups.

Unit II:

Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, , Fundamental theorem of Homomorphism, Cauchyôs theorem for abelian groups, Permutation group, Alternating Group, Cayleyôs Theorem.

Unit III:

Rings, Integral Domains, Division Rings, Fields, Properties, Field of quotients. Ideals, Quotient rings Maximal, Prime and Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

Unit IV:

Homomorphism of a ring, Kernel, Isomorphism, Fundamental theorem of Homomorphism, Polynomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorisation Theorem, Eisensteinôs Criterion of irreducibility.

References :

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

5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
6. Basic Abstract Algebra, 2nd Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.
7. Modern Algebra ï An Introduction by Durban, 5th Edition, Wiley.
8. Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
9. A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

PROFESSIONAL EDUCATION COURSES

MSE VI.4 : CRITICAL UNDERSTANDING OF ICT

Credits: 4 (3L+ 0T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives
On completion of the course the students will be able to:

- Appreciate the historical, current and future trends in ICT and its implications to education
- Explain the meaning of ICT and its application in Education
- Demonstrate an understanding of the computer hardware and software fundamentals
- Use various digital hardware and software for creating resources and providing learning experiences
- Use a word processor, spread sheet, drawing and presentation software skillfully and intelligently to produce various teaching learning resources for educational use
- Use internet technologies efficiently to access remote information, communicate and collaborate with others
- Model collaborative knowledge construction using various web 2.0 tools and technologies
- Design and develop technology integrated learning experiences using ICT tools
- Develop skills in using various e-learning and e-content tools and technologies
- Plan, develop, and use multimedia based learning content using open source authoring software
- Use ICT for designing learning experiences using innovative pedagogical approaches
- Explain the role of ICT in authentic and alternative assessment
- Understand the social, economic, security and ethical issues associated with the use of ICT
- Appreciate the scope of ICT for improving the personal productivity and professional competencies
- Appreciate the use ICT in improving educational administration
- Explain the emerging trends in information and communication technology

COURSE CONTENT:

Unit I: ICT and Education

Information and Communication Technology: meaning and nature. Learning theories and its implications for ICT integration in education. National ICT policy, curriculum and schemes

Historical account of the development of various educational media (audio, print, video, storage, display, projection)

Role of technology in emerging pedagogical practices. Visual literacy, media literacy, and new media literacy

Computer hardware fundamentals, computer network-LAN, WANand Internet. Software ï meaning and types: proprietary software and open source software, System software and application software

Emerging Trends in ICT and its educational applications: Augmented reality, e-books and rhizomatic learning, learning analytics, ubiquitous computing and mobile learning, Game based learning, cloud computing and software as service, 3D printing, and marker space

Unit II: E-content and e-resources

Educational applications of word processing, spreadsheet, presentation, and drawing tools ï diagrams, concept maps, timelines, flow charts.

Reusable Learning Objects (RLO), e-content standards, authoring tools- open source and proprietary alternatives

Multimedia: meaning and types, multimedia tools-audio editing, video editing, screen casting, graphic editing, basics of animation, and creating interactive media. Evaluation of multimedia resources.

Open Educational Resources ï Meaning and importance, various OER initiatives, creative common licensing

Locating internet resources ï browsing, navigating, searching, selecting, evaluating, saving and bookmarking

Use of digital still and video camera, digital sound recorder, scanner, printer, interactive white board, visualizer, and multimedia projector for creating and using multimedia resources

Unit III: ICT and Pedagogy

Techno pedagogical content knowledge (TPCK). Approaches to integrating ICT in teaching and learning

Web 2.0 tools for creating, sharing, collaborating, and networking: Social networking, social book marking, blog, wiki, instant messaging, online forums/discussion groups and chats, and media streaming.

E-learning: concept, types, characteristics, e-learning tools and technologies, Learning Management Systems (LMS)

Subject specific ICT tools for creating and facilitating learning. Designing technology integrated authentic learning designs and experiences

ICI integrated Unit plan ï Web 2.0 for creating constructivist learning environment

Technology for pedagogical innovations: web quest, PBL, virtual tours, MOOC, flipped classroom

Assistive technology for special needs and inclusion: tools and processes, ICT and Universal design for Learning (UDL)

Unit IV: ICT for Assessment,Management, and professional development

ICT and Assessment**:** e-portfolio, electronic rubrics, online and offline assessment tools ï rubrics, survey tools, puzzle makers, test generators, reflective journal, and question bank.

Use of web 2.0 tools for assessment,

ICT for professional development - tools and opportunities: electronic teaching portfolio, web 2.0 technologies, technology and design based research, ICT for self-directed professional development, web conferencing, role of OER and MOOCs
ICT for personal management: email, task, events, diary, networking. ICT for educational administration: scheduling, record keeping, student information, electronic grade book, connecting with parents and community, school management systems.
Managing the ICT infrastructure: software installation, troubleshooting of hardware, seeking and providing help, storage and backup, updating and upgrading software

Computer security: privacy, hacking, virus, spy ware, misuse, abuse, antivirus, firewall, and safe practices, fare use and piracy

Sessional Work

1. Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices
2. Using word processor, spread sheet, drawing and presentation software to produce various teaching learning resources and sharing it online
3. Locating internet resources ï navigating, searching, selecting, saving, evaluating(use standard internet evaluation criteria), and bookmarking using social bookmarking
4. Creating digital concept maps, flow charts, timelines, and other graphics for a particular content
5. Creating screen cast video and podcast of a lesson
6. Shooting, editing, and sharing of videos segment on any educational topic
7. Creating account in YouTube/slide share and sharing the video/presentation. View and comment on others contributions
8. Creating account in wikispace/wikipedia/mediawiki and adding/editing content
9. Developing an educational blog in www.blogger.com, www.wordpress.com, or www.edublog.com
10. LMS experience- hands on various features of LMS ï the ICT course may be provided through LMS
11. Enrolling and completing some MOOC courses of interest
12. Creating resources for flipped classroom and Practicing flipped learning in school during internship
13. Evaluating OER resources. Creating and sharing OER materials- may be in NROER
14. Developing technology integrated unit/lesson plan and trying out this in the school during internship
15. Hands on experience on subject specific software tools like Geogebra, PhET
16. Developing a multimedia e-content for a topic using eXe Learning
17. Field visit to the Edusat center and take part in teleconferencing
18. Planning and creating digital rubrics for any topic and create an e-portfolio
19. Organize web conferencing using Skype or any other tools
20. Review of ICT labs (plans and equipments/resources) in school from internet
21. Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
22. Readings on emerging ICT trends in education
23. Review of national ICT policy and curriculum
24. Using FOSS tools for timetabling, grade sheet

References:

1. Andrew A Kling(2010).Web 2.0 (Technology 360). Lucent Books : New Delhi.
2. Andrew M. St. Laurent. (2004). Understanding Open Source and Free Software Licensing. Oreilly:Cambridge
3. Athanassios Jimoyiannis (Editor) (2011). Research on e-Learning and ICT in Education. Springer: USA
4. Barbara B. Levin, Lynne Schrum.(2012). Leading Technology-Rich Schools (Technology & Education, Connections (Tec). Teachers College Press: New York
5. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi
6. Bruce M. Whitehead, Devon Jensen, Floyd A. Boschee.(2013). Planning for Technology: A Guide for School Administrators, Technology Coordinators, and Curriculum Leaders.Corwin:New Delhi
7. Cabmbridge, D.(2010).E-Portfolios for Lifelong Learning and Assessment.John Wiley and Sons
8. Christopher Moersch(2009). Beyond Hardware-Using Existing Technology to promote Higher-Level thinking. Viva Books: New Delhi.
9. Conrad, Keri (2001). Instructional Design for Web based Training. HRD Press
10. Costantino,P.M., DeLorenzo,M.N., Kobrinski,E.J.(2006).Developing a professional teaching portfolio: a guide for success. Pearson
11. Crumlish Christian (1999). The Internet No Experience Required. BPB Publications: New Delhi
12. Curtis J. Bonk (2011).The World Is Open: How Web Technology Is Revolutionizing Education. Jossey- Bass: San Fransisco
13. Imison,T., Taylor,P.H.(2001). Managing ICT in the Secondary Schools. Heinemann:Oxford
14. James,K.L. (2003). The Internet: A Userôs Guide. Prentice Hall of India Pvt.Ltd: New Delhi
15. Jane Hunter (2015).Technology Integration and High Possibility Classrooms: Building from TPACK
16. Jean-Eric Pelet (2014).E-Learning 2.0 Technologies and Web Applications in Higher Education (Advances in Higher Education and Professional Development (Ahepd)).Idea Group: U.S.
17. Liz Arney (2015.)Go Blended!: A Handbook for Blending Technology in Schools
18. Loveless Avril(2001). ICT-pedagogy and the curriculum-Subject to change.RoutledgeFalmer: London.
19. Lynne Schrum, Barbara B. Levin. (2010).Leading 21st-Century Schools: Harnessing Technology for Engagement and Achievement. Corwin: New Delhi
20. ManojkunarDash(2010). ICT in teacher development. Neelkamal Publications: New Delhi.
21. Mary Webband Margaret Cox (2014). Information and Communication Technology-Assessment for Learning in the ICT Classroom (Inside the Black Box).Learning Sciences :US.
22. M. D. Roblyer, Aaron H. Doering (2012). Integrating Educational Technology into Teaching (6th Edition)
23. Michael Thomas (2009). Handbook of Research on Web 2.0 and Second Language Learning. Information Science Reference: US.
24. Rena M. Palloff, Keith Pratt (2011).The Excellent Online Instructor: Strategies for Professional Development. Wiley: San Francisco
25. Ronghuai Huang and Kinshuk(2014). ICT in Education in Global Context: Emerging

Trends Report 2013-2014 (Lecture Notes in Educational Technology). Springer: New York.
26. Rosemary Papa.(2010).Technology Leadership for School Improvement. Sage:New Delhi.
27. Sarkar, S.K. & Gupta, A.K.(1998). Elements of Computer Science. S.Chand& Company: New Delhi
28. Semenov, Alexy (2005). Information and Communication Technologies in Schools. A handbook for Teachers. UNESCO
29. ShalinHai-Jew. (2012). Open-Source Technologies for Maximizing the Creation, Deployment, and Use of Digital Resources and Information. Information Science Reference:USA
30. Theodore Lee(2008). Professional Development of ICT Integration for Teachers.VDM Verlag : Germany.
31. W.J. Pelgrum and N.Law(2003). ICT in Education around the world-Trends ,Problems and Prospects . UNESCO : Paris.
32. Viva Lachs (2000). Making Multimedia in the Classroom-A Teacherôs Guide. Routlegde Farmer :London.

MSE VI.5: PEDAGOGY OF PHYSICAL SCIENCE 2

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

- Enable the students to write the unit plans and lesson plan as per the norms of NCF 2005.
- Applying the different teaching methods based on a constructivist point of view.
- Enable the students to observe the lesson systematically.
- Selecting the learning resource and effective use of the same.
- Using of ICT in physical science teaching and learning.
- Explore various assessment strategies for evaluating learning in Physical science.
- Explore various professional development opportunities.
- Plan and conduct action research in secondary schools.
- Identify various teaching- learning resources.
- Develop skills of facilitation as they teach in simulated situations.
- Reflecting the methods in the class.

Unit I: Learning Resources in Physical Science

Print resources: Textbook as a learning resource, criteria for evaluation of a textbook, handbooks, teacher resource books, laboratory manuals, science journals and magazines, encyclopedia, newspaper.
Daleôs cone of experience and its use in teaching- learning.
Developing and using resources such as charts, models, science kits, posters, science parks.
Science laboratories: designing, management, and safe practices.
Making low-cost equipment from locally available resources, using the immediate

environment and the community resources for teaching of physical science.
Exploring and using digital resources: websites, videos, games, simulations, mobile apps, presentations, OER, interactive multimedia resources, e-books, podcasts, digital concept maps, and digital graphics.
ICT integration in physical science teaching: different forms of ICT and its application in science education.

Unit II: Need and Importance of Assessment for Learning Physical Science
Learning standards in science, process and product assessment in Physical Sciences, importance of metacognition and reflection in assessment, importance feedback in facilitating learning.
Meaning of the terms test, examination, measurement, assessment and evaluation in proper context, Continuous and Comprehensive Evaluation (CCE) and its features.
Assessment and evaluation as intertwined process of classroom experiences performance based assessment, planning assessment framework, Learning Indicators (Lis) and its types, developing LIs for activity, presentation, group work, assignments etc.
Recording and reporting of learning evidences ï measurement of studentsôachievement ï marks and grading.

Unit III: Tools and Techniques Assessment for Learning Physical Science
Tools and technique of assessment-- assessment of written and oral work, project work, laboratory work, field trips, journal writing, concept map; assessment of learners with special needs.
Use of oMSErvation, questioning, concept mapping, rating scales, worksheets, reflective journals/diary, peer and self-assessment in physical science.
Use of rubrics, and portfolio assessment in Physical Science, diagnosing learning difficulties and misconception in Physical Science.
Use of ICT in assessment.
Constructing different types test items in Physical Science at different levels of taxonomy, preparation of blue print/table of specification and constructing unit test.

Unit IV: Professional development of Physical Science teachers
Professional competencies of a physical science teacher.
Need for updating content and pedagogical competencies, pre-service and in-service courses and initiatives, agencies to nurture the best teachers, NCERT activities for teachers.
Participation in science fairs, exhibitions, and science club activities
Planning contextual activities- celebration of science day, birthdays of great physicists and chemists, seminars, conferences, online sharing, distance learning, membership to organisations- NSTA, IPA, IAPT, Indian Chemical Society, INSC. NCERT publications and journals

Meaning, nature, scope, designing and implementing innovative approaches to teaching science.
Teacher as a Researcher: meaning of research and its importance, action research versus research, selecting the problem for action research, format of research plan, action research in physical sciences, steps in action research, examples of action research from the primary, secondary, and higher secondary levels.

Sessional Activities:

(Any TEN from the following)

- Design and development of unit test.
- Developing rubrics for laboratory work, assignment, field trip, project etc.
- Facilitating the development of digital portfolio by a couple of school students.
- Designing and implementing science lab experiments.
- Text book analysis for content organization/ validness of curriculum mentioned in NCF 2005.
- Analysis of process skills and planning lessons for developing process skills.
- Identifying, selecting, and evaluating various media for chosen unit.
- Case studies of successful teacher leaders.
- Presentation and discussion on sample action research studies.
- Planning and conducting an action research.
- Debates on various ethical issues.
- Visit to a special school, oMSErvation of inclusion strategies in regular classroom.
- Development of teaching portfolio.
- Analysis of teacher competency framework of various organization.
- Study of a science professional organization.
- Review of an action research article/teaching of Physical science related research article.
- Organizing a science exhibition.
- Formation of a science club and conducting various activities.
- School visit to study the CCE practice.
- Conducting field trips to science muesuem, science park, botanical garden.
- Writing unit plan for at least 2 units of secondary science.
- Writing lesson plan for at least 2 topics of secondary science.
- Classroom Experience 2: Classroom observation for studying teacherôs facilitation skills and how student work is distributed (with emphasis on pedagogical aspects-strategies/materials used).
- Preparing and demonstrating low cost/improvised teaching aids based on Class VII, VIII and IX class Physical Science.
- Simulated teaching of class VII-X topics.
- Developing and analysing a Physical Science achievement test.
- Develop an assessment rubric in Physical Science.
- Visit to a Science museum / Science park /Science teacher resource centres.
- Organize a seminar related to Science day. Developing an action research plan for teaching-learning Physical Science.

References:

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The

Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
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14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
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17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

MSE VI.6 : PEDAGOGY OF MATHEMATICS 2

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

On completion of the course the students will have
* understanding of nature of teaching proof and problem solving in mathematics
* ability to analyse the purposes of teaching algebra and geometry
* ability to select suitable tools for mathematical construction and measurements
* Appreciates the usefulness of mathematics in day today activity in various fields
* adopt different strategies to meet the diversified needs of learners and appreciates the availability of various learning resources in mathematics
* Decision making ability to use appropriate assessment tools for mathematical assessment

COURSE CONTENT:

Unit I : Teaching of Proof and Teaching of Problem-solving

Meaning and nature of Proof; kinds of proof- direct, proof by mathematical induction, proof by contradiction, proof by contrapositive, proof by cases, proof by counter examples ; planning and teaching of various theorems in mathematics (secondary level)

Problem-solving

Definition of problem, problem solving; Meaning and nature of PrOblem solving, strategies of problem solving- Means-ends analysis, backtracking, backward movement, heuristics; Polya's Problem solving steps; solving various mathematical problems

Unit II: Teaching of Algebra and Geometry

Introduction of basic ideas of algebra- variable, constant, coefficient, expression, equation; nature and purpose of teaching algebra; Contextualization of practical situation into algebraic expressions or equations(mathematization); solving various algebraic relations problems of secondary level.

Nature of geometry; purpose of teaching geometry; construction of different geometrical figures; Role of geometry in comprehending mathematics as whole; developing skills in selecting, drawing, using appropriate geometrical instruments and its utility in real life situation; scale drawing; topology and its application in mathematics.

Unit III: Meeting diverse needs of learners (Gifted and Slow learners) and Learning resources in mathematics

Gifted child in mathematics- their characteristics, identification and enrichment programmes slow learners in mathematics- their characteristics, identification and remedial measures; overcoming dyscalculia and dysgraphia problems in mathematics and their remediation.

Creation of **visual aids**-charts, models, graphs; usage of **graphical tools**- calculator, logo, cabri, geogebra, sketch pad, ready reckoners; selection and integration of tools in relation to content and learning environment; **Audio-visual aids**- animations, film shows; mathematics lab; mathematics club; e-resources and open and free software; **community resources**- library, museum, theatre, knowledgeable person or experts

Unit IV: Assessment of learning in mathematics

Selection of appropriate tools for formative and summative assessment; diagnosing the learning difficulties of learners (Error analysis- procedural errors, conceptual errors, computational errors) and providing remedial measures (Peer tutoring, direct instruction, mentoring); creation of rubric, portfolios, Criterion reference test, Norm referenced test based on set criteria; construction, administration, scoring, interpretation of a unit test and providing feedback to learners.

For all the Pedagogical transactions the following content knowledge (8^{th}, 9^{th} , 10^{th}, 11^{th}, and 12^{th} standard syllabus) to be made use of, and these can be revised as per the change in curriculum of respective state or changes in CMSE syllabus or in NCERT text books.

Arithmetic: Number system, Ratio and Proportion, Fractions, Commercial mathematics and Data handling, sets, Matrices

Algebra: Polynomials, Graphical representations of various equations, trigonometry,

Geometry: Lines and angles; Triangles and its related theorems; polygons; analytical geometry, Differential calculus; Integration, Trigonometry; graph theory; computing using ICT.

Sessional work:

Selecting any one of the theorem and teaching it by adopting the strategies of teaching proof
Selecting any one kind of problem in mathematics and demonstrate its procedure of solving
Selecting a topic in algebra or in geometry and teaching it using appropriate learning resources
Construction of unit test (administration, scoring, statistical analysis and reporting) on a selected unit
Analysing the errors committed by learners at secondary level, in regular test (FA1or FA2) and analysing its causes and suggesting various remedial measures for it

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
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6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
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11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal Publications Pvt Ltd

MSE VI.7 :School Attachment Programme 4

Credits : 3 **Marks: *100**
Duration : 3 **C1 +C2 :50**
2 weeks SAP + 1 week Community living **C3:50**

Objectives:

The student teachers will

- Understand the dynamics of class room processes.
- Understand the diversity in learning based on student responses to learning tasks
- Understand the role of planning, preparation and transaction in the teaching learning process.
- Understand the different strategies and approaches used in teaching based on the nature of content and the skills to be developed.
- Analyse the assessment tools and techniques employed with respect to their purpose, learner friendly, and quality.
- Develop lesson plans in the respective subject areas of specialization
- Understand the strategies adopted for developing art and creative sensibilities in learners

Course Content

The student teachers will perform the activities listed below and prepare reflective diary and the reports on the tasks performed separately. They will present their reports in the seminar organized after the completion of school attachment programme.

During this phase student teachers are expected to begin developing their own understanding about classroom dynamics, diversity in learning, role of planning, preparation, execution by adopting various strategies and approaches along relevant assessment strategies. Student teachers gain understanding being into actual classroom transaction by observation, gathering information and interaction with students, teachers and school Head.

The following tasks centered on classroom transactions are suggested to be carried out by student teachers in this phase.

- Understand the dynamics of classroom processes and multiple roles of teacher & learners.
- Understand the Classroom management strategies employed by the teacher.
- Interact with teachers to understand how unit and lesson planning are done in their subjects
- Understand school policies and practices to address student learning difficulties- remediation, extra study hours etc. - at macro level- across subjects and at micro level within the class room.
- Develop 2 lessons (one lesson in each pedagogy) with the use of learning materials/teaching aids and one unit plan.
- Analyze test- question papers in subjects to understand what is assessed; types of questions/items used; and with reference to the objectives of the unit/lesson
- Reflect on the processes employed in CCE and the observed outcomes.

Records to be submitted for assessment

Å Submission of lesson plan in each pedagogy.(one in each pedagogy).
Å Observation records (3 lessons) in each pedagogy.(one in each pedagogy)
Å Report on analysis of test paper/s.
Å Report on class room transactions and learning processes

Community Based Activities:

Objectives

- To develop an awareness and understanding of educational status of the community.
- To create an awareness of the implementation of various progrmmes of the government related to school education through field experiences and community participation.

Activities

- The student teachers will visit the local community to study the drop out/ out of school children and the modes of alternative education received by them.
- Organize awareness programmes in the selected community on literacy, human rights, gender sensitization, environmental conservation etc through street play, role play and dramatization.
- To interact with community members like zilla parishat members, SDM and PTA members to study about their participation in school development programmes

Evaluation:* all the assessment are internal

- C1 ï Report 1
- C2 ï Report 2
- C3 ï PPT

SEVENTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

DSE 1 A : Physics

MSE VII.1 : NUCLEAR AND PARTICLE PHYSICS

Credits: 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:
To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

COURSE CONTENT:

Unit I: Atomic Nucleus
Nuclear structure, Failure of proton-electron hypothesisï neutron, its discovery and properties, Proton-neutron hypothesis, Constituents of nucleus and their Intrinsic properties, Basic properties of nucleusï charge, spin, radii, mass, magnetic moment. Nuclear forces and their characteristics. Yukawaõs Theory (Qualitative), Packing fraction and binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, Nuclear stability, Segre chart.

Unit II: Nuclear Models

Nuclear Modelsï Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Unit III: Radioactivity

Review: Radioactive decay ï Half life, mean life, Activity-decay constant. Radioactive displacement laws. Theory of α decay, Ŭ-emission, Gamow factor. Geiger-Nuttal law. Beta decay, energy kinematics for Beta decay, positron emission Beta spectra. Neutrino hypothesis, K electron capture, internal conversion, Gamma decay, pair production, successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions, nuclear fission and fusion. Energy liberated in nuclear fission, energy production in stars, Nuclear reactors.

Unit IV:

Particle Accelerators and Detectors: Cockroftï Walton voltage multiplier, LINAC, Cyclotron, Betatron.

Nuclear Detectors: GM counter, scintillation detector, bubble chamber, principle of semiconductor detector.
Particle Physics: Particles and anti-particles, Classification of particles, Symmetries and Conservation Laws, Qualitative introduction to quarks, Structure of hadrons.

References:

1. I. Kaplan, Nuclear Physics, Narosa, 2002.
2. Kenneth S. Krane, Introductory nuclear Physics, Wiley India Pvt. Ltd., 2008.
3. Bernard L. Cohen, Concepts of nuclear physics, Tata Mcgraw Hill, 1998.
4. Subramanyam and Brijlal, Atomic and Nuclear Physics, S. Chand & Company Ltd. 2013.
5. R.A. Dunlap, Introduction to the physics of nuclei & particles, Thomson Asia, 2004.
6. Arthur Beiser, Perspectives of Modern Physics, McGraw-Hill Inc.,US; International edition edition.
7. D. Griffith, Introduction to Elementary Particles, John Wiley & Sons, 2008.

PRACTICALS

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. GM Counter characteristics.
2. GM Counterï Absorption coefficient.
3. Determination of Half life of Co-60.
4. Simulation experiment on radioactive decay.
5. Verification of inverse square law for beta rays.
6. Verification of inverse square law for gamma rays.
7. Rutherford modelï Simulation technique.
8. Ionization potential of Xenon.
9. Measurement of Mercury spectrum wavelength.
10. Spectrometer-Quartz prism-Refractive indices of quartz for the ordinary and extra-ordinary rays.
11. LCR Parallel resonance
12. LCR Series resonance.
13. FET characteristics.
14. Hartley oscillator.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2AChemistry

MSE VII.2 : ELECTROCHEMISTRY AND PHOTOCHEMISTRY

Credits: 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

- Explain the nature of Electrolytic conduction involving theories of electrolytes.
- Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.
- To have knowledge about the commercial cells and their applications
- To obtain information about the basic photophysical and photochemical processes

COURSE CONTENT:

Unit I: Electrochemistry – I

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

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

Applications of conductivity measurements : Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit II: Electrochemistry – II

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

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

EMF of a cell and its measurements. Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), Chemical cells with and without transport.

Unit III : Electrochemistry – III

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

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

Unit IV : Photochemistry

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

References :

1. Photochemistry Gurudeep Raj Goel Publishing House
2. Principles of Physical Chemistry Puri, Sharma, Pathania 47th Edition Vishal Publishing Co.
3. Elements of Elecrochemistry by Samuel Glasstone and Lewis
4. Principles of Physical chemistry -Marron and prutton

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objectives:

- To study the elecrical behaviour of weak and strong electrolytes
- Quantitative estimation of electrolytes by conductometric and potentiometric titration

COURSE CONTENT:

1. To determine the equivalent conductance of a strong electrolyte at several concentrations and verify Onsager's equation.
2. Conductometric titration of a strong acid Vs. strong base, strong base Vs. weak acid, strong base Vs mixture of acids (strong and weak) to determine the concentration of acids in a given solution and in mixture.
3. To determine the concentration of the given acid solution and concentration of acids in a mixture by potentiometric titration using sodium hydroxide solution.
4. Determination of Pka value of a weak acid by potentiometry.
5. Determination of the dissociation constant of a weak acid by conductometry
6. To determine the equivalent conductance of a weak electrolyto at different concentrations and verify Ostwald's dilution law.Also to find out the dissociation constant of a weak electrolyte.
7. To determine the solubility and solubility constant of a weak electrolyte conductometrically.
8. To find the composition of the complex formed between iron(III) and salicylic acid by Job's method.
9. To find out the amount of copper sulphate in the given solution by titrating with standard alkali by conductometry.
10. To determine the amount of FAS in the given solution by potentiometric titration with standard potassium dichromate and potassium permanganate solutions.
11. Estimation of Silver nitrate by potentiometric titration with standard potassium chloride solution.

References :

1. Systematic experimentas in chemistry Arun Sethi New Age International (P) Ltd New Delhi.

DSE 3A Mathematics

MSE VII.3 : LINEAR ALGEBRA

Credits: 3 (1L + 2T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable the students to understand and apply the concepts of linear algebra in solving appropriate problems.

COURSE CONTENT:

Unit I:
Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space ï some properties. Quotient spaces, Homomorphisms and Isomorphisms of vector spaces, Direct sums.

Unit II:
Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Cauchy-Schwarz inequality, Orthogonal and orthonormal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

Unit III:
Matrices of Linear maps, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

Unit IV :
Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation, Characteristic polynomial, Cayley - Hamilton Theorem, Minimal Polynomial.

References :

1. Theory and Problems of Linear Algebra, Saymour Lipschitz, Schaum Outline Series.
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
3. Modern Algebra, Vol.II, by Narayanan and Manicavachagam Pillay, S. Vishwanathan and Co.
4. Brief Survey of Modern Algebra, Brikhoff and Maclane, IBH
5. Linear Algebra by Serge Lang, Addison Wesley Publishing company Inc.
6. Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.
7. Linear Algebra by Larry Smith, Spinger Verlag.
8. Elementary Linear Algebra with Applications, Keith Nicholson, PWS ï Kent Publishing Company
9. Linear Algebra, Surjith Sinth, Vikas Publishing House Pvt. Ltd.
10. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.
11. Linear algebra ï a geometric approach by Kumaresan. S

PROFESSIONAL EDUCATION COURSES

MSE VII.4 : CREATING AN INCLUSIVE SCHOOL

Credits: 4 (2L+ 2T +1P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understanding the meaning and significance of inclusive education.
- Appreciate the special needs of Individuals with diverse needs.
- Get Familiarized themselves with the concept of Inclusive Education.
- Understand the nature and needs of different categories of disabled children.
- Understand the concept of Special Education, Integration and Inclusion.
- Understand the different considerations and provisions for facilitating inclusion.
- Understand and Acquire the Skills of Adapting Curriculum to meet the need of the Students with Diverse needs

COURSE CONTENT

Unit I : Basic Concepts and Introduction to Inclusive Education

Meaning of Impairment, Disability and Handicap; Concept of Special Educational Needs and Diverse Needs, Difference between Special Education, Integration and Inclusive Education. Significance of Inclusive Education; Factors Affecting and Promoting Inclusion.

Unit II : Nature and Needs of Diverse Learners-Identification of Diverse Learners in the Classroom

Sensory Impairment: Hearing impairment and Visual impairment
Physical Disabilities: Orthopaedic impairment, Cerebral Palsy, Special Health Problems, Congenital defects; Slow Learners and Under Achievers; Intellectual Disability; Learning disabilities and ADHD; Autism Spectrum Disorders; Multiple disabilities ; Emotional and Behavioural Problems; Gifted and Creative; Socially Disadvantaged, Economically Deprived, Religious and Linguistic Minorities, Inhabitants of Geographically Difficult Areas

Unit III: Preparing Schools for Inclusion-General Considerations and Provisions Concept of Inclusive School, Competenciencies and Characteristics of inclusive Teacher

Physical Consideration, Socio-Emotional Considerations, Curricular Considerations
Provision of Assistive devices, equipmentõs and technological support. Special provisions in Evaluation

Unit IV : Inclusive Practices in Classroom

Making learning more meaningful: Responding to special needs by developing strategies for differentiating content, curriculum adaptation and adjustment, lesion planning and TLM.
Pedagogical strategies to respond to needs of individual students: Cooperative learning

strategies in the classroom, peer tutoring, buddy system, reflective teaching, multisensory teaching. Use of ICT suitable for different disabilities.

Practicum

- Collection of data regarding children with special needs.
- Visit to Inclusive Schools and to observe classroom transaction of any one of such school and make a report of the same.
- Identifying one/two pupils with special needs in the primary schools and preparing a profile of these pupils.
- Preparation of teaching aids, toys, charts, flash cards for children having any one type of disability. (Visit to Resource Room)
- Preparation of Lesson Plan, instruction material for teaching students with disability in inclusive school.
- Developing list of teaching activities of CWSN in the school.

Visits to different institutions dealing with different disabilities and observation of their Classroom.

* In addition, school and community based activities may be organized.

References:

1. Fimian, M.J., Fafard, M., and Howell, K.W.: *A Teacher's guide to Human Resources in Special Education: Para Professionals, Volunteers, and peer tutors.* Boston: Allyn and Bacon, Inc.
2. Furth, H. (1964). *Thinking without Language.* New York: Free Press.
3. Hallahan, D.P. and Kauffman, J.K. (1988). *Exceptional Children: Introduction to special Education.* N.J.: Englewood Cliffs.
4. Jangira, N.K. (1986). *Special Education Scenario in Britain and India*. Gurgaon: The Academic Press.
5. Jangira, N.K. (2013). NCERT: The Mother of Inclusive Education, Regional Institute of Education NCERT, Ajmer. (Also available on Google search Jangira special education).
6. Julba, A. (2014) Teachers creating Inclusive classrooms: Issues and challenges ï A research study
7. Kapoor, S. (2015). Index of Inclusive School Quality, Brotherhood, Delhi.
8. Kothari, R.G. and Mistry, H.S. (2011). *Problems of students and Teachers of the special schools – A study of Gujarat state.* Germany: VDM Publication.
9. Maitra, K. & Saxena, V. (ed)(2008) *Inclusion: Issues and Perspectives,* Kanishka.
10. Meadow, K.P. (1980*). Deafruss and child development.* Berkley, C.A.: University of California Press.
11. Messily,K. (2012). Confronting Marginalisation in Education: A Framework for Promoting inclusion, Routledge, London.
12. Mithu, A. and Michael, B. (2005). *Inclusive Education: From rhetoric to Reality*, New Delhi: Viva Books Pvt. Ltd.
13. NCERT (2006) Position Paper: National Focus Group on Education of Children with Special Needs, NCERT, New Delhi.
14. NCERT (2013) Training and Resuorce Material on Adolescence Education, New Delhi, available on www.aeparc.org
15. Oza, D. and Pandit, R. (2011). *Management of behavioural problems of children with*

mental retardation. Germany: VDM publication.

16. Premavathy, V. and Geetha, T. (2006): Integrated and Inclusive Education DSE(VI) Manual: New Delhi, Krishana Publication.
17. Reed, M. (1984). *Educating Hearing Impaired Children.* Milton Keynes: Open University Press.
18. Sharma, P.L. (1988). *A Teacher's Handbook on Integrated Education of the Disabled*. New Delhi: NCERT.
19. Ramaa S : Website: s-ramaa.net (for various publications)
20. Voluntary Health Association of India. *Disabled 'Village Children' – A Guide for Community Health Workers, Rehabilitation Workers, and Families*.
21. World Bank (2003) Inclusoive Education: Achieving Education for all including those with Disabilities and special Education Needs

Web Resources

- IBE-UNESCO (2016). Training Tools for Curriculum Development - Reaching Out To All Learners: a resource pack for supporting Inclusive Education, Ibe.training@unesco.org, http.//www.ibe.unesco
- Video on A World for Inclusion (2007) by UNESCO, directed by David Atrakchi, 20 minutes,http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=213
- Children with Disabilities (2012), by UNESCO, 23 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2758
- Inclusive Education: Approaches, scope and Content (2008), by UNESCO, produced by International Bureau of education, 11 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3314
- Inclusive Education: Learners and Teachers (2008), by UNESCO, produced by International Bureau of education, 14 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=3316
- Preparing Teachers in Asia-Pacific for Inclusive Education, (2012), by UNESCO, 3 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2030
- Preparing teachers for inclusive education: Part 3 & 4, by UNESCO, produced by Lesotho, Ministry of Education, 21 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=418
- Toward Inclusive schools - Special needs in the classroom, by UNESCO, directed by Mike Fowler, 6 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=488
- Training Video: Special Needs in the Classroom, (1992), by UNESCO, directed by Mel Ainscow, 46 minutes, http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=405
- Including Children with Special Needs Primary Stage (2014), NCERT,http://www.ncert.nic.in/pdf_files/SpecialNeeds.pdf
- Including Children with Special Needs Upper Primary Stage, (2015), NCERT, http://www.ncert.nic.in/gpPDF/pdf/tiicsnups101.pdf
- Julka, A. (2007) Meeting Special Needs in Schools: A Manual, NCERT, http://www.ncert.nic.in/html/pdf/inclusive_education/COVER.pdf
- Position Paper National Focus Group on Education of Children with Special Needs, NCERT, http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/special_ed_final1.pdf
- Learning Curves, Inclusive education (2014), Azim Premji Foundation, http://www.teachersofindia.org/en/periodicals/learning-curve-issue-xxiii

MSEVII.5 : HEALTH AND PHYSICAL EDUCATION

Credits: 2 (1L+ 0T +1P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- to build a scenario of Health Education in India.
- to develop a Knowledge Base of the Most Common and Uncommon Diseases in India; their Diagnosis & Remediation.
- Prospective Teacher Educators to learn the Techniques Related to Health Risks & Learn How to Fix these.
- Prospective Teacher Educators to study the Health Education Vision & Mission of India.
- To acquire the skills for physical fitness, correct postures, habits and activities for development
- Acquire skills to practice yogasanas and meditation and learn the skills of concentration, relaxation, dealing with stress and strain
- Understand and develop psychological abilities as life skills to deal with growing up issues like HIV and AIDS and prevention of substance issues
- Understand the process of assessment

COURSE CONTENT :

Unit I: Health Education Scenario in India

Introduction to the concept of health, significance and importance in the context of ancient and modern Indian perspective
Identity of Educational Institutional Plants: Structure, Infra-Structure and Environment, Time-Space-Personnel-Material Constellation Educational Management System, Emerging Health & Total Quality of the Educational Institutions, Status of Health Education in India from Pre-Natal Education through Higher Education, Yoga & Yog, Health & Hygiene, Clean Toilets, Work & Leisure, Quality of Health ï Role of Education, Administrators, Teachers, Students, Supporters,

Unit II: Tech-related Health Risks

Identification of the technological health hazards ï Smartphone Stress, Acne caused by the Cell Phones, Blackberry Stress Injuries to the Thumb, Radiation from the cell phones, Cell Phone Sickness, Cell Phone & Car Accidents, Allergies & Phones, Crazy Phones, Computers Causing Wrist Pain, Back & Neck Pain, Decreased Sperm Count from the WIFI, Laptop Burns, Laptop Headaches, Sleeping Problems from the Laptops, Decreased attention span from using Face-book, The Internet Causing Anxiety, Headphone Use leading to Accidents, Hearing Loss from Headphones, Visual Impairment, Death from Social Networking, Environmental Degradation, Aggression, Social Crimes--- Evolving Controlling & Regulatory Mechanisms.

Unit III: Approaches to Sound Health

Games, Sports & Athletics.
Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.
Games and sports ï athletics (general physical fitness exercises), games (lead-up games, relays and major games) rhythmic activities, gymnastics and their impact on health.
Fundamental skills of games and sports; Sports for recreation and competition; Rules and regulation of sports; sports ethics; sports awards and scholarships, sportsmenship.
Yoga ï Raja Yoga, Karma Yoga, Bhakti Yoga, Jnana Yoga.
Safety and security ï disasters in and outside schools, ways of prevention, safety from snake and dog bites, animal attacks, prevention and treatment.
Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhabitation. Safety measures to be taken in Libraries, Laboratories, Classrooms, Halls, Play Fields, Water Tanks, Swimming Pools, Community Pools, Roads Human Development Index (HDI), Health: Vision, Goals and Objectives of Government of India, Experiments on Influence of Surroundings & Thought, Science of Laughter & Smiles, Health observation Programs, Impact of TV Serials.
Role of Institutions (schools, family and sports), health services, policies and major health and physical education-related programme, blood banks, role of media.

Unit IV: First Aid – Principles and Uses

Structure and function of human body and the principles of first aid., First aid equipments. Fractures-causes and symptoms and the first aid related to them, Muscular sprains cause, symptoms and remedies, First aid related to hemorrhage, respiratory discomfort, First aid related to Natural and artificial carriage of sick and wounded person, Treatment of unconsciousness, Treatment of heat stroke, General disease affecting in the local area and measures to prevent them.

Practicum

Surfing to know the diseases in India.
Preventive & Ameliorative measures for health hazards.
Playing Games.
Athletics.
Yoga.
Reflective Dialogues on Serials, such as, Satyamev Jayate on Health of the People.
Preparation of inventories on myths on exercises and different type of food.
Make an inventory of energy rich food and nutritious food (locally available) indicating its health value.
Make an inventory of artificial food and provide critical oMSErvations from health point of view.
Home remedies as health care.
Role of biopolymers (DNA) in health of child.
Medicinal plants and child health.
Strategies for positive thinking and motivation.
Preparation of first aid kit.
*** In addition, school and community based activities may be organised.**

References:

1. Arora,P. (2005) Sex Education in schools, Prabhat Prakashan
2. K..Park ñPreventive and Social Medicineò Banarsidas Bhanoth, Publishers Nagpur Road, Jablapur, India.
3. NCERT(2013). Training and Resource materials on Adolescence Education, NCERT, New Delhi (This material is also available on www.aeparc.org.www.ncert.nic.in
4. NCERT(2014). Population Education, Source Material, NCERT, New Delhi.
5. Stephen, J. Williams, Paul R. Torrents, ñIntroduction to Health Serviceò, Delmore Publications.

Physical Education

1. Deboarh, A. Wuest, Charles, A. Bucher: ñFoundation of Physical Education Exercise Science and Sportsò, Tata McGraw Hill Pvt. Ltd., New Delhi.
2. John, E. Mixton, Ann, E. Jewett: ñAn Introduction to Physical Education, W.B. Saunders Company, London.
3. John, Cheffers; Tom, Evaul: ñIntroduction to Physical Education ï Concept of Human Movementò. Prentice Hall Engle Wood: New Jersey.
4. Bette J., Logdson & Others, ñPhysical Education for Childrenò, Lea and Febiger, Philadelphia..
5. Roberts, S. Weinberg & Daniel Gould, ñFoundation of Sports and Exercise Psychologyò, Human Kinetics Publication.
6. A.K. Uppal, Lawrance Gray Kumar, ñBiomechanics in Physical Education and Exercise Science: Friends Publication, New Delhi.
7. Jack, H. Wilmore, David, L.. Costil, W. Larry Kenney, ñPhysiology of Sports and Exercise: Human Kinetics Publication.

Yoga

1. Swami Satyanand Saraswati, ñAsana Pranayama Mudra Bandhò, Bihar School of Yoga, Munger.
2. M.M. Ghore, ñAnotomy and Physiology of Yogic Practicesò. Lonavala Yoga Institute, Lonavala.
3. Gharote, M.L. (2004). Applied Yoga, Kaivalyadhama S.M.Y.M. Samiti, Lonavala.
4. ñYogasanaò Morarji Desai National Institute of Yoga, New Delhi.
5. ñPranayamaò Morarji Desai National Institute of Yoga, New Delhi.
6. MDNIY (2010). ñYoga Teachers Manual for School Teachers, New Delhi.
7. NCERT (2015). Yoga: A Healthy Way of Living Upper Primary Stage, New Delhi.
8. NCERT (2015). Yoga: A Healthy Way of Living Secondary Stage, New Delhi.
9. Agarwal, Satya P. (1998). The social role of the GąŨ how and why, Motilal Banarsidass, ISBN 978-81-208-1524-7, retrieved 17 June 2010.
10. Goel, Devraj & Goel, Chhaya (2013). Universe of Swami Vivekananda & Complete.
11. Wholistic Social Development, CASE Publication under UGC SAP, The M.S. University of Baroda, Vadodara.
12. Jason Liu and Dr. Gwendalle Cooper (2009) *Scientific Analysis of the Effects of Falun Dafa* Presented at International Conference of Psychologists, February 27, 2009 by Catherine Hennessy.
13. Mehroo D. Bengalee (1976).*Child Guidance*. Sheth Publishers, Educational Publishers, 35, Everest, Pedder Road, Bombay.
14. Ministry of Health & Family Welfare, Government of India, *Annual Report to the People on Health*, December 2011.
15. Porter, Noah (2003). *Falun Gong in the United States*: An Ethnographic Study, Master

Thesis, Department of Anthropology, College of Arts and Sciences, University of South Florida.

16. Wu JY, Feng, L, Park , H-T, Havlioglu N, Wen L, Tang H, Bacon KB, Jiang Z, Zhang X, Rao Y. (2001). *Molecule that guides Nerve Calls Directs Immune Cells*, Science Daily, Apr. 20.

Web Resources

Position Paper National Focus Group on Health and Physical Education, NCERT

http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/health_prelims_final.pdf

Learning curves: sports in education, (2013) Azim Premji Foundation
http://azimpremjifoundation.org/pdf/learning-curve-17.pdf
www.FalunDafa.org
www.http://greatist.com/health/*19-worst-tech-related-health-risks*

MSE VII.6 : READING AND REFLECTING ON TEXT

Credits: 2 (1L+ 1T +0P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the meaning, process, importance and characteristics of reading.
- Understand and apply different levels, types, techniques and methods of reading.
- Acquaint with the skills of reading different types of texts.
- Develop different types of reading skills through various activities and met cognition
- Learn the skills of reading comprehension and to enhance vocabulary.
- Acquaint with the problems of reading across curriculum.

COURSE CONTENT

Unit I: Introduction to Reading

Reading ï Meaning and Process, Importance of Reading across Curriculum, Characteristics of Reading, Developing reading skills.Role of libraries in promoting reading habits

Unit II: Techniques and Methodology of Reading

Levels of reading ï literal, interpretative, critical and creative, Types of reading ï intensive and extensive reading, oral & silent reading, Reading techniques ï skimming and scanning. Methodology of reading

Unit III: Reading the Text

Types of Texts ï Narrative, expository, descriptive, suggestive, empirical, conceptual, ethnography, policy documents, field notes; Importance of Different Texts in Curriculum

Unit IV : Developing Reading Skills and Reading Comprehension

Developing Critical Reading Skills, Developing Reflective Skills, Activities for Developing Reading Skills, Developing Metacognition for Reading, Developing Reading Comprehension Developing Vocabulary for Reading, Problems of Reading

Practicum

- Divide the class in small group and provide different kinds of texts and instruct them to read and reflect according to the nature of text.
- Divide the group and provide one text and suggest students to make different interpretations.
- Design vocabulary games to enhance vocabulary.
- Read the text and provide a five words summary to each paragraph.
- Reading and comprehension exercises.
- Skim through the text and give suitable title to the text.
- Complete given text in stipulated time and summarize it in 6/7 lines with a suitable title.
- Making an oral presentation
- Organising a debate, discussion based on their reading
- Preparation of a poster
- Making a collage
- Displaying appropriate texts/graphic on bulletin board
- Addressing morning assembly during their internship in schools
- Making a power point presentation on selected topic
- Submission of written articles/assignments
- Writing maintaining reflective journals

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.**

References:

1. Bright, J.A., and McGregor, G.P. (1970). *Teaching English as a Second Language.* ELBS: Longman.
2. Doff, A. (1988). *Teach English: Training Course for Teachers.* Cambridge: Cambridge University Press.
3. Hill, L.A., and Dobbyn, M.A. (1979). *Training Course, Trainer's Book.* London: Cassell.
4. Hubbard, P., and Hywel, J. et al (1983). *A Training Course for TEFL.* Oxford University Press.
5. Joseph, K.S. (2004). *Self Instruction in English Grammar and Figures of Speech.* Vadodara: Gold Rock Publications.
6. Mukalel, J.C. (1998). *Approaches to English Language Teaching.* New Delhi: Discovery Publishing house.
7. Mukalel, J.C. (1998). *Creative Approaches to Classroom Teaching.* New Delhi: Discovery Publishing house.
8. Mukalel, J.C. (1998). *Psychology of Language Teaching.* New Delhi: Discovery Publishing House.
9. Mukalel, J.C., and Ahmed, S. B. (1984). *Teaching English in India.* New Delhi: Arya Book Depot.
10. Nagaraj, G. (1996). *English Language Teaching Approaches, Methods and*

Techniques. Calcutta: Orient Longman.
11. Richard, J.; Theodore, S. and Rodgers, T.S. (1968). *Approaches and Methods in Language.* Cambridge University Press.
12. Venkateswaran, S. (1995). *Principles of Teaching English.* New Delhi: Vikas Publishing House.
13. Wilkins, D.A. (1982). *Linguistics in Language Teaching.* London: Edward Arnold.
14. Willis, J. (1981). *Teaching English through English ELBS.* England: Longman Ltd.
15. Yule, G. (1985). *The Study of Language.* Cambridge: Cambridge University Press.
16. My experiments with the truth ï *Autobiography of Mahatma Gandhi*
17. The Little Prince ï *Antain de Saint* ï Exupery
18. Cultural Heritage ï Dr. S. Radhakrishnan
19. Periodicals Like ï Outlook, India Today, Economic and Political Weekly, Business Today, Journals of Education, Organiser ï weekly
20. Recognizing Different Types of Text

Web Resources

- http://www.bbc.co.uk/skillswise/factsheet/en03text-l1-f-different-types-of-text

Models of Reading Process

- http://people.ucalgary.ca/~mpeglar/models.html
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001687/
- http://www.tarleton.edu/Faculty/gentry/reading%20models.html

Reflective Skills

- http://www.skillsyouneed.com/ips/reflecting.html
- http://www.skillsyouneed.com/ps/reflective-practice.html

MSE VII.7A Internship in School Subject 1 – Physical Science (SAP-5)
&
MSE VII.7B :Internship in School Subject 2 – Mathematics (SAP-5)
OR
MSE VII.7C : Internship in School Subject 2 – Biological Science (SAP-5)

(Evaluation in each school subject shall be as per the break up shown below and all are internal)*

Credits : 12 (6+6) **Marks: *100**
Duration : 11 Weeks **C1 + C2 : 50**
C3 : 50

The activity is divided into three phases:

- Pre ï internship - 2 weeks
- Internship - 8 weeks
- Post internship- 1 week

- **Pre internship**

Objectives:

- To facilitate student teachers in designing and executing lessons in each pedagogy.
- To develop in student teachers the skills of observation and evaluating teaching of their peers

Activities
The student teachers will
- plan and teach minimum 3 lessons in each pedagogy
- observe minimum 5 lessons of their peers in each pedagogy
- participate in the mentoring sessions to plan lessons under the guidance of mentors.

- **Internship**

Objectives:

To provide the student teachers with the field experience of getting attached to a school for a long duration and develop professional skills of teaching, participate in various day to day functions of schools, and in organizing various activities.

Activities

- The student teachers will teach 20 lessons (excluding lesson givn during pre-internship) at secondary level in each pedagogy.
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records

- **Post Internship**

Activities
- Submission of internship records - evaluation records, activity record, observation records, reflective diary
- PPT Presentation of reflections

Evaluation in each pedagogy is as follows:
C1 ï Pre-internship activities
C2 ï Internship records and post-internship presentation
C3 – Internship in teaching

EIGHTH SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

PHYSICS

MSE VIII.1 : SOLID STATE PHYSICS

Credits: 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To enable students to apply the basic knowledge of classical and quantum mechanics for an understanding of physics of nuclei and of solids.

COURSE CONTENT:

Unit I: Crystal Structure

Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis ï Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices.Brillouin Zones. Coordination number, packing fraction for cubic crystals (sc, bcc and fcc). Diffraction of X-rays by Crystals. Braggôs Law.

Unit II:

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Dulong and Petitôs Law, Einstein and Debye theories of specific heat of solids. T^3 law.

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia ï and Paramagnetic Domains. Curie-Weiss Law, Discussion of B-H Curve. Hysteresis and Energy Loss.

Unit III:

Electrical Properties: Free electron model of a metal, solution of one dimensional Schroedinger equation in constant potential, Density of states. Fermi energy, Energy bands in solids, Distinction between metals, semiconductors and insulators. Kronig- Penney model. P and N type Semiconductors. Conductivity of Semiconductors, mobility. Hall effect-Expression for Hall coefficients. Applications of Hall effect.

Dielectrics: Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation.

Unit IV: Superconductivity

Superconductivity: Qualitative description,. Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, Londonôs

Equation and Penetration Depth. Isotope effect. High temperature superconductors Applications

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, 8th Ed., Wiley India Pvt.Ltd., 2004.
2. A J Dekker, Solid State Physics, Macmillan, 1965.
3. J.P. Srivastava, Elements of Solid State Physics, 2nd Ed., Prentice-Hall of India, 2006.
4. Leonid V. Azaroff, Introduction to Solids, Tata Mc-Graw Hill, 2004.
5. M. A. Wahab, Solid State Physics: Structure and Properties of Materials,Alpha Science International, Ltd., 2005.
6. Neil W. Ashcroft and N. David Mermin, Solid State Physics, Cengage Learning, 1976.
7. S O Pillai, Solid State Physics, NEW AGE, 2009.
8. G. I. Epifanov, Solid State Physics, Central Books Ltd., 1979.
9. M. Ali Omar,Elementary Solid State Physics, Pearson India, 1999.
10. H. Ibach and H Luth, Solid-state Physics, Springer, 2009.

PRACTICALS

Exam Duration: 3 hrs **C3: 50 Marks**

Objectives:

- To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.
- To validate the theoretical basis of the experiments.

COURSE CONTENT:

(A minimum of TEN experiments to be selected from the following)

1. Measurement of susceptibility of a paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. Determination of Hall coefficient in semiconductors.
5. Determination of Curie temperatureï ferromagnet.
6. Determination of work function of a metal using R-D equation.
7. To measure the Dielectric Constant of a dielectric Materials with frequency.
8. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR).
9. To determine the refractive index of a dielectric layer using SPR.
10. To study the PE Hysteresis loop of a Ferroelectric Crystal.
11. To draw the B- H curve of iron using a Solenoid and determine the energy loss from Hysteresis.
12. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150^{o} C) and to determine its band gap. Franck-Hertz experiment.
13. Powder XRD pattern of KCl.

14. Powder XRD pattern of NaCl.
15. Powder XRD pattern of $CaCl_2$.
16. Solar cell experiment.
17. Frequency resonance of LR circuit.
18. Polarisation by reflection-Brewster's law.

References:

1. B.L.Flint & H.T.Worsnop, Advanced Practical Physics for students, Asia Publishing House, 1971.
2. E Armitage, Practical Physics, John Murray.
3. PSSC Physics Laboratory Guide.
4. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015
5. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi, 2011.
6. Jerry D Wilson and Cecilia A. Hernández-HallPhysics Laboratory Experiments7th Edition, Cengage Learning, 2009.
7. S.Panigrahi & B.Mallick, Engineering Practical Physics, Cengage Learning India Pvt. Ltd., 2015.
8. Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers, 1985.

DSE 2BChemistry

MSE VIII.2 : SPECTROSCOPY, NATURAL PRODUCTS AND HETEROCYCLICS

Credits: 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

To develop an understanding of the

- basic principles of Spectroscopy and apply the principles in the structural elucidation of simple organic compounds.
- chemistry of natural products, dyes and drugs, macromolecules and heterocyclic compounds

COURSE CONTENT:

Unit I : Spectroscopy

UV and Visible spectroscopy: Introduction, absorption laws, instrumentation, formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward ï Fieser rules for calculating absorption maximum in dienes and Ŭ,ß-unsaturated carbonyl compounds.

IR spectroscopy: Introduction, theory of molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, finger print region and applications of IR spectroscopy.

NMR spectroscopy: Introduction, instrumentation, number of signals, position of signals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts- inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemical exchange and coupling constant.

Structural determination of simple organic compounds using UV, IR and NMR spectral data.

Unit II: Natural Products

Carbohydrates: Introduction, classification and nomenclature. Configuration of monosaccharides. Erythro and threo diastereomers. Interconversions in carbohydrates ï glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation. Constitution of disaccharides - maltose, sucrose and lactose. Introduction to polysaccharides (starch and cellulose) without involving structure determination.

Alkaloids : Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine

Terepinoids : Introduction, isoprene rule, structural elucidation of Citral and Menthol

Amino acids, Peptides, Proteins and Nucleic acids

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α-amino acids.Classification of proteins. Peptide structure determination - end group analysis, selective hydrolysis of peptides. Solid-phase peptide synthesis. Primary and secondary structures of proteins. Protein denaturation.

Nucleic acids : Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. The double helical structure of DNA. Types of different RNA and their functions in the synthesis of protiens. Genetic code.

Unit III: Dyes, Drugs and Macromolecules

Dyes: Introduction, Classification of dyes, Colour and constitution (electronic concept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.

Drugs: Introduction, classification, structure and synthesis of sulpha drugs- sulphapyridine, sulphathiazole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials ï plasmaquin, mepacrine and chloroquin.

Macromolecules: Introduction, Classification, Types of polymerization ï chain polymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers ï buna S , butyl

rubber and neoprene. Synthetic fibres ï nylon 6, nylon 6,6, terylene. Conducting polymers ï polypropylenes and polyanilines. Bio-degradable polymers.

Unit IV: Heterocyclic Compounds

Introduction, methods of formation of five membered heterocycles ï furan, thiophene and pyrrole. Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and their chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Six membered heterocycles: methods of formation of pyridine, mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles, preparation and reactions of Indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

References :

1. Organic Spectroscopy by P S Kalsi
2. Organic Chemistry : I L Finar Vol II
3. Application of absorption Spectroscopy to Organic Compounds : John R Dyer
4. Organic Spectroscopy : William Kemp
5. Fundamentals of Molecular Spectroscopy : C N Banwell

PRACTICAL

Exam Duration : 3 hrs **C3 : 50**

Objective:

To develop skills of synthesis and Estimation of organic compounds

COURSE CONTENTS:

1. Two step organic synthesis

1. Synthesis of p-bromoaniline from acetanilide
2. Preparation of o-iodobenzoic acid from anthranilic acid
3. Preparation of m-nitrobenzoic acid from methyl benzoate
4. Preparation of Paracetamol
5. Synthesis of Quinoline

2. Quantitative organic analysis

1. Estimation of aniline/ phenol by bromate-bromide method
2. Estimation of glucose by Fehlings method/ Spectrophotometry using 3,5 dinitro salicylic acid
3. Determination of iodine value of an oil by Wijôs method/ Chloramine-T method
4. Determination of saponification value of an ester / oil
5. Estimation of amino acid by formal titration method
6. Estimation of ascorbic acid in Vitamin C tablets by Volumetry

7. Estimation of Paracetamol by titrimetric and spectro photo metric methods.
8. Colorimetric Estimation of proteins by Biuret method

References :

1. Organic synthesis-special techniques V.K. Ahluwalia, 2nd Edition Narosa Publishing House
2. Organic Synthesis A.I. Vogel

DSE 3B Mathematics

MSE VIII.3: COMPLEX ANALYSIS& NUMERICAL ANALYSIS

Credits : 3 (1L + 2T + 0P) **Marks: 100**
Contact hrs per week: 5 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 50**

OBJECTIVES:

To develop the understanding & application of the concepts of complex analysis in problem solving situations. To enable and apply Numerical methods in solving problems related to real life situations with help of computers, which have become indispensable in modern world.

COURSE CONTENT:

Unit I:

Functions of a Complex Variable, Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions, Conformal Mappings.Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations.

Unit II:

Complex Integration: Introduction, Definite Integral, Cauchyôs Theorem, Cauchyôs integral Formula, Higher Derivatives. Power Series**:** Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions.

Unit III:

Numerical Methods: Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Iteration method, Newton-Raphson method.
Finite differences, Forward and Backward differences, Weierstrass theorem, Interpolation, Newton-Gregory forward and backward interpolation formulae, Divided differences, Lagrangeôs interpolation formula.

Unit IV:

Numerical Differentiation: Finding first and second derivatives using interpolation formulae, Difference equations.
Integration: General quadrature formula, Trapezoidal Rule, Simpsonôs 1/3 rule, Simpsonôs 3/8 rule, Weddleôs rule, Newton-Cotes quadrature formula, Gauss quadrature.

References:
1. Complex Analysis by Ahlfors McGraw Hill International Edition.
2. Introduction to the Theory of Functions of a Complex Variable by Palka, Springer Verlag.
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
5. Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, OxfordUniversity Press.
7. Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
8. Functions of One Complex Variable by Conway, Narosa Publishing House.
9. Theory and Problems of Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
10. Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.
11. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
12. Finite Differnece and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
13. Introductory Methods of Numerical Analysis by Shstry, PHI.
14. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
15. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
16. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
17. Numerical Calculus by William Edmund Milne, Princeton University Press.
18. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
19. Numerical Analysis by Schield, Schaumôs Outline Series.
20. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.

GENERIC ELECTIVE 2

MSE VIII.4 : INDIAN CONSTITUTION AND HUMAN RIGHTS

Credits 2 (2L+0T+0P) **Max. Marks: 100**
Contact Hours per week: 2 **C1+ C2: 50**
Exam duration: 2 Hrs **C3: 50**

Objectives:
On completion of this course, the student teacher will be able to
- know the importance, preamble and salient features of Indian Constitution
- appreciate the significance of Fundamental Rights, Duties and Directive Principles of State Policy.
- develop an understanding of the strength of the Union Government.
- understand the functioning of the State Government for the unity and the strength of the Democracy.
- know the importance of local self-Government and Panchayati Raj Institutions in India.
- know the meaning, significance, the growing advocacy of Human Rights.

Transaction Mode:
Through Lectures, Group discussions, Interactive sessions, field activities and use of Education Technology.

COURSE CONTENT:

Unit I: Meaning and Importance of the Constitution
Preamble, Salient features, Constituent Assembly and the Spirit of the Indian Constitution.

Unit II: Fundamental Rights, Duties and Directive Principles
Fundamental Rights, Fundamental Duties, and the Directive Principles of the state policy of the Indian Constitution.

Unit III: Union, State and Local Self Governments
Union Government: Parliament, the President and Prime Minister: State Government: Governor and the Council of Minister: Judiciary: Functions and Powers: Panchayat Raj System.

Unit IV: Human Rights
Origin and Development of Human Rights, Growing Advocacy and Declining Trends of Human Rights, Rights of Scheduled Casts, Scheduled Tribes, Minorities, Children and Women, Human Rights Defenders, Human Rights Violation and Human Rights Organizations.

References:

1. M.V.Pylee, **Indian Constitution**, OUP, New Delhi
2. Granveille Austin, **Indian Constitution**, OUP, New Delhi
3. Rajani Kotari, **Politics in India**, OUP, New Delhi
4. Johari, J C, **Indian Government and Politics**.
5. S R Maheswari, **Local Governments in India (Latest Edition)**
6. R K Arora and Rajani Goyal, **Indian Public Aministration 1995.**
7. C P Bhambri, **Introduction to Indian Constitution**.
8. Subash C Kashyap, **The Working of Indian Constitution,** NBT, New Delhi
9. Subash C Kashyap,**Our Parliament**, NBT, New Delhi
10. Granveille Austin, **Functioning of the Indian Constitution**, NBT, New Delhi.
11. Bipan Chandra**, India after Independence**. Roopa, New Delhi 2000.
12. Arjun Dev, **Source Book on Human Rights**, NCERT, New Delhi.
13. **Human Rights in India: Theory and Practice**, National Book Trust, 2001.

PROFESSIONAL EDUCATION COURSES

MSE VIII.5 : KNOWLEDGE AND CURRICULUM

Credits: 4 (2L+ 2T +0P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives:

This course is designed to help student teachers to

- Understand the concept and the need for curriculum in schools.
- Explore the influences of the knowledge categories, social, cultural, economic and the technological aspects in shaping the present school curriculum and the text books.
- Analyze the principles employed in sequencing the school curriculum and the syllabus at different levels.
- Identify various learning sites and resources operating as curriculum supports in the system.
- Analyze the multiple roles of schools in implementation of curriculum.
- Discuss the roles and responsibilities of curriculum stakeholders.
- Analyse the role of teachers in operational sing the curriculum.
- Examine the processes and criteria commonly used to evaluate curriculum in pursuit of improvement.
- Explore the evaluation approaches adopted to revise the curriculum at the national and state levels.
- Analyze the national curriculum frameworks for necessary reforms proposed and their implications at school level.
- Develop an image of oneself as a curriculum informant, designer, agent, and evaluator.

COURSE CONTENT:

Unit I: Concept and the nature of curriculum

a) Meanings of curriculum; different perspectives of curriculum; need for curriculum in schools.
b) Educational policy reforms leading to curriculum reforms; Relationship between curriculum framework, curriculum , syllabus and text books- their significance in school education.
c) Meaning and concerns of core curriculum-its need and significance in Indian context; Meaning and concerns of Hidden curriculum and spiral curriculum and their relevance to learning.
d) Types of curriculum: subject-centered, activity-centered, environmental centered, and community-centered and their relevance.

Unit II: Foundations of Curriculum Development

a) **Forms of knowledge & Curriculum:** Forms of knowledgeand structure of a Discipline, and their characterization in different school subjects; Logical grammar of different school subjects
b) **Nature of learner& learning:** Nature of learner - needs and interests, and different

perspectives on learning (behaviourists, cognitivists and social constructivists) and their implications to curriculum development

c) **Socio –cultural**: Importance of society-school relationships ; Societal factors that affect the curriculum ; Multiculturalism, multilingual aspects, and societal aspirations; Social reconstruction, social efficiency, inequality in educational standards, need for common goals and standards;

d) **Technological determinants** : Science and technological advancements, Using the resources of the information society in curriculum development

e) **Some of the critical issues**: environmental concerns, gender concerns .inclusiveness, value concerns, social sensitivity, and globalization.

Unit III: Process of curriculum Development

a) Understanding shifts in emphasis in approach to curriculum; from subject centered and behaviouristic learning to integrated approach involving development of perspectives, activity centered and constructivist orientation;

b) **Behaviouristic orientation**: Formulating aims and objectives ï (general, specific - subject wise and level wise); Selecting content and learning experiences ï Principles involved; Organizing the content and learning experiences- Principles (continuity, sequence and integration: organizing elements- concepts, skills, and values); breadth of coverage and depth of understanding; applicability and relevance to school curriculum planning

c) **Constructivists orientation**: curriculum embedded in real life contexts; authentic learning in real life contexts leading to knowledge construction; applicability and relevance to school curriculum planning

Unit IV Curriculum Implementation and Curriculum evaluation

a) Operationalising curriculum into learning situations; Planning and converting curriculum into syllabus and curriculum engagement activities.

b) Role of teachers in operationalising curriculum in generating dynamic curricular experiences through i) flexible interpretation of curricular aims ii) concept mapping iii) contextualization of learning v) selecting varied experiences and long range and daily planning, choice of resources, planning assessment etc.

c) Planning and use of curricular materials: Text book; teachers hand book, source book, work book, manuals, and other learning materials such as kits, AV and software materials..

d) School culture and climate in implementing the curriculum.

e) Supports to curriculum engagement: available infrastructure and curriculum sites and resources (library, laboratory, playground, neighbourhood etc); Use of community resources in curriculum engagement .

f) Role of external agencies ï National, Regional and State in developing the learning supports (including training of teachers) for curriculum implementation.

g) Meaning of curriculum evaluation; Need for curriculum evaluation

h) Process of curriculum evaluation and renewal: collecting opinions and views on school curriculum and text books from different stakeholders; studentsô attainability of curricular standards as one of the criterion; evaluation of the discrepancies observed between anticipated and observed inputs, transactions and outputs; critical analysis of text books; evaluation of other curricular materials;

i) Role of National, Regional and State bodies in empowering the teachers in evaluating curriculum

Sessional Work:

- Review of national curriculum frame works and write a report for presentation and discussion
- Analysis of teachersô handbooks, text books, workbooks, source books followed by Presentations.
- Readings of certain curriculum reviews and articles bearing significance to the course outlined and reflections on them

References:

1. Olivia, P (2004): Developing the curriculum (6th Ed). Allyn & Bacon, Inc. ISBN: 0205412599.
2. Curriculum planning for better teaching and learning by J.G. Saylor and W Alexander (Holt, Rinehart and Winston).
3. Yashpal Committee (1993): Learning without Burden, MHRD, and India.
4. Position paper: National Focus Group on óCurriculum, Syllabus, Textbooksô, NCERT.
5. Lewy, Arieh (1977): Handbook of Curriculum Evaluation, International Institute for educational Planning, France and Longman Inc.
6. Giroux, Henry et.al (1981): Curriculum and Instruction: Alternatives in Education by MC Cutchan Public Corp, Printed in USA.
7. Dewey, John (1959): The Child and the Curriculum, Chicago, the University of Chicago Press.
8. Hilda T (1962): Curriculum and Development- Theory and Practice; Harcourt, Brace and World, Inc.
9. Howson, Geoffrey (1978): Developing a New Curriculum, London: Heinmann
10. NCERT (1988) National Curriculum for Elementary and Secondary Education: A framework.
11. NCERT (2000) National Curriculum Framework For school Education.
12. NCERT (2005) National Curriculum Framework. NCERT publications
13. Schubert W (1986): Curriculum Perspectives, Paradigms and Possibilities, New York: Macmillan.
14. Zias, R (1976): Curriculum Principles and Foundations; New York; Thomas Crowwell.
15. Hirst, Paul (1975) : Knowledge and curriculum, (International Library of the Education volume 12): A collection of Philosophical papers, International library of Philosophy of Education, Routledge publishers
16. Kumar, Krishna and Malla Reddy : Curriculum Development and Educational Technology.

MSE VIII.6 : GUIDANCE AND COUNSELLING

Credits: 4 (3L+ 1T +0P) **Marks: 100**
Contact hrs per week: 5 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- appreciate the nature, purpose and need for guidance and counselling;
- sensitise the student-teachers with the need and relevance of Guidance and counselling.
- demonstrate an understanding of educational, vocational and personal guidance
- develop an understanding of the process of Guidance and Counselling
- understand the process of organization of guidance services in schools
- develop capacity of applying the techniques and procedures of guidance and counselling
- describe various testing and non- testing techniques
- develop the skill of administration and interpretation of psychological tests
- understand the concept and importance of career development.
- analyse the role of the teacher in the provision of Guidance and Counselling
- know the qualities required for good Counsellor

COURSE CONTENT

Unit I: Meaning and Nature of Guidance

Guidance: Concept, aims, objectives, functions and principles.
Need & Procedure for (Educational, Psychological and Social) guidance.
Purposes and Principles of organization of different guidance Services
Organization of guidance services at Secondary Level: Need and Importance
Group Guidance: Concept, Need, Significance and Principles, Organization of Guidance programs in schools.
Role of Guidance Personnel in organization of guidance services in School : Counsellor, Career Master, Psychologist, Doctor, Teacher Counsellor, Head of the Institution, Teacher, Social Worker

Unit II: Meaning and Nature of Counselling

Counselling: Meaning,and nature; Difference between Guidance &Counselling; Principles and approaches of counselling, Individual and Group Counselling; Skills in Counselling-Skills for Listening, Questioning, Responding, & Communicating, Listening Attentively to the concerns of the counselee, Negotiating Self Discovery, Decision Making, Problem Solving etc and values such as Patience, Empathy etc.; Methods and Process of Counselling
Academic, Personal, Career and Behaviour problems of students with special needs, viz. socio-emotional problems of children with disabilities and deprived groups such as SC, ST and girls, need for Counselling; Professional Ethics and Code of Conduct ; Qualities and Qualifications of an effective Counsellor

Unit III:Tools and Techniques of Guidance

Testing and Non-Testing Techniques for Studying and Appraisal of students : a) Testing Techniques: Intelligence/Mental Ability tests, Aptitude tests, attitude scales, Interest inventories, and Personality Tests, b) Non-testing Techniques: Interview, observation,and Case Study, c) Tools-Questionnaire, anecdotal record, Cumulative Record Cardsetc,
Role of the teacher in Assessment and Testing.

Unit IV: Career Guidance and Counselling

Educational and Career Information in Guidance and Counselling: Meaning, Importance, collection, types, classification of occupational information; Dissemination of Occupational Information: Class talk, career talk, Group discussion, Preparation of Charts and Poster, Career Exhibition, Career conference; Guidance for gifted, slow learner, socio-economically disadvantaged children; Career development: Meaning and Importance; Teacherôs role in Career planning, Vocational training and placement opportunities for CWSN.Broad outline with respect to the emerging courses and career options available in India; Guidelines for Establishment of Guidance Cell or Career Corners in Schools

Suggestive List of Activities:

- Group Guidance-Preparation of Class Talk and One Career Talk
- Visit to different Guidance Centre
- Design a checklist/Questionnaire to collect information on students and classify them under educational, psychological or social problem.
- Preparation of Cumulative Record
- To prepare a Case study and Analysis of Case study
- Administration, Scoring & interpretation of at least two tests: One Mental Ability Test and One Aptitude Test
- Job Analysis of a Counsellor
- Preparation of list of problem behaviours based on oMSErvation. Detailed study of the Guidance and Counselling Services available in a given School
- Prepare a Chart and Poster for dissemination of Career Information
- Familiarise and write a report of any one of the Personality Tests used in Guidance and Counselling

References:

1. Aggarwal, J. C. (2004). Educational Vocational Guidance and Counselling, Delhi: Doaba House.
2. Asch, M. (2000). Principles of Guidance and Counselling, New Delhi: Sarup and Sons.
3. Bhatia, K. K., (2002). Principles of Guidance and Counselling, Ludhiana: Vinod Publications
4. Bhatnagar, R. P.; Rani. S. (2001); Guidance and Counselling in Education and Psychology.
5. Chauhan, S. S. (2008). Principles and Techniques of Guidance. UP: Vikas Publishing House Pvt. Ltd.
6. Coorey,S.M (1953).Action Research to Improve School Practices, New York:Teacherôs ,Columbia University
7. Gibson, R.L. and Mitchell (2008). Introduction to counselling and Guidance. New Delhi:PHI Learning Pvt. Ltd.
8. Granz, R. M. (2005). Foundation and Principle of Guidance, Boston: Allyn& Bacon.
9. Gupta, V. K. (2004). Educational Guidance and Counselling, Ludhiana: Ankur

Publications.
10. Jones, J. A. (1970). Principles of Guidance, Bombay: Tata, New York: McGraw Hill.
11. Joneja G. K. (1997); Occupational Information in Guidance, NCERT publication
12. Kakkar, S.B (2015) Educational Psychology, *PHI Learning: Publications*
13. Kocher, S. K. (2007). Educational Guidance and Counselling, New Delhi: Sterling.
14. Myres, G. E. (2005). Principles and Techniques of Vocational Guidance, New York: McGraw Hill.
15. Nanda, S. K.andSagar, S. (1972). Fundamentals of Guidance. Chandigarh: N.B.S. Educational Publishers.
16. Nayak A.K. (2004); Guidance and Counseling
17. NCERT (2008). Counselling Process and Strategies (Module 2). New Delhi: NCERT.
18. NCERT (2008). Guidance for Human Development and Adjustment (Module3) New Delhi: NCERT.
19. NCERT (2008). Introduction to Guidance (Module 1). New Delhi: NCERT.
20. NCERT (2005). National Curriculum Framework-2005,NCERT,New Delhi

Web resources

- Introduction to Guidance and Counseling African Virtual university http://oer.avu.org/bitstream/handle/123456789/153/GUIDANCE%20AND%20COUNSELING.pdf?sequence=1
- Ethical Principles of Psychologists and Code of Conduct by APA, http://www.apa.org/ethics/code/principles.pdf
- Guidance and Counselling, http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/pdf/guidelines_for_guidance_and_counseling.pdf
- http://www.egyankosh.ac.in/

MSE VIII.7 : VALUE AND PEACE EDUCATION

Credits: 2 (1L+ 1T +0P) **Marks: 100**
Contact hrs per week: 3 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

Objectives

The student teacher will be able to:

- Understand the need and importance of education for peace and values.
- Understand the nature, characteristics and types of human values.
- Understand the five core values of Truth, Righteous conduct, Peace, Love and Non-Violence.
- Appreciate the developments in Peace Education in India and Abroad.
- Understand various methods, techniques and approaches of value development.
- Appreciate the preamble to the constitution and values inherent in it.
- Understand various models of value education.
- Appreciate the importance of living together and imbibe in their attitude and behaviour.

COURSE CONTENT

Unit I: Concept, Meaning and Nature of value

Concept and meaning of value and Peace:
Indian and Western perspectives on value and Peace.
Reflections of great Indian thinkers on values and Peace (Gandhiji, Swami Vivekananda,Sri Aurobindo, Rabindratha Tagore, J. Krishmamurthi)
Understanding Peace in the individual, Social, National and International context
Nature and characteristics of values
Sources and selection of values -culture and human needs

Unit II : Concept, Meaning and Nature of Peace

Historical development of Peace education in India and in the world
Preamble to the Indian Constitution and values inherent in it
Exposition of the five human values of Truth, Righteous Conduct, Peace, Love and Non-Violence with illustrations from life and literature.
Creation of United Nations, UNESCO, UNICEF and their role in promoting value and Peace Education.

Unit III : Concept and need for Value-based Education and Education for Peace

Concept of value based education and Education for Peace with special reference to peace to Indian view of life;
Paradigm shift from Peace education to Education for Peace.
Need for and importance of value based education and Education for Peace in the present scenario.
Recommendations of Sri Prakasha Committee (1959) on value education.
Recommendations of Parliamentary Committee of HRD on Values Education (1996-90) headed by Shri S.B. Chauhan.

National Focus Group Report on Education for Peace (2005).

Curriculum development and Models of Value Education.

Models of value education; Rationale building model, the consideration model, valuing process and clarification model.

Aims and objectives of value based education and Education for Peace in the curriculum.

Integration of human values with all (school) academic subjects.

Unit IV :Pedagogy of Value Education and Education for Peace

- Approaches and Techniques of teaching human values:-
  Direct approach: value based Story-telling, Group activities (dramatization, literary activities, games and sports, service activities), Counselling, organizing value based co-curricular activities.

  Indirect Approach; Incidental Approach with illustrations

  Integrated approach: Integration into curricular, co-curricular activities and subjects (with illustrations of integration from Language, Mathematics, science and social science , art and aesthetics , Yoga and health education,
- Teacher as Role Model.
- Role of school ambience and environment in development of values.

Practicum

- Develop / compile stories with values from different sources and cultures, organize value based co-curricular activities in the classroom and outside the classroom, develop value based lesson plans, integrating values in school subjects.
- Study of any Model of integrated value education ï case study of models expressed by Sri Sathya Sai, J. Krishnamurti, etc.
- Visit to Ramakrishna Institute of Moral and spiritual Education

In addition, school and community based activities may be organised.

Evaluation Strategies

1. Reflective reading based presentations.
2. Unit tests.
3. Quiz based evaluation
4. Seminar presentation
5. Submission of case reports on violation of peace as reported through mass-media.

References:

1. Barash, P. David (2000). Approaches to Peace, Oxford University Press, New York.
2. Bernard, Jessie (1957). The Sociological study of conflict. International Sociological Association, The Nature of Conflict, UNESCO Paris.
3. Galtung, J. (2003). Searching for Peace ï The road to TRANSCEND, Sterling Virginia.
4. Galtung, Johan (1996). Peace by Peaceful Means: Peace and Conflict, Development and Civilization. Sage Publications, New Delhi.
5. Galtung, Johan (1984). The Struggle for Peace Gujarat Vidyapith, Ahmedabad.
6. Gandhi, M.K. (1944). Non-Violence in Peace and War Navajivan Publishing House, Ahmedabad.
7. Govt of India (1983). Report on Education in Human Values in Teacher Training Programmes, New Delhi, Ministry of Human Resource Development.

8. Harris Ian. M. (1998). ñPeace Educationò Mc Farland & Company, Inc Publisher London
9. Howlett, Charles F., John Dewey and Peace Education, Encyclopedia of Peace Education, Teacher College, Columbia University 2008.
10. Kapani, Madhu (2000). Education in Human Values ï concept and practical implications, New Delhi; Sterling Publishers.
11. Krishnamurti, J.: ñTotal Freedomò, Krishnamurti Foundation Chennai.
12. NCERT National Curriculum Framework (2005). Position Paper, National focus Group on Education for Peace, NCERT, New Delhi (2006).
13. National Curriculum Framework (2005) position paper, National Focus group on Education for Peace, NCERT, New Delhi.
14. NCTE (1998). Curriculum Framework for Quality Teacher Education, NCTE, New Delhi.
15. Pandey, S. (2004). Education for Peace, Self Instructional Package for Teacher Education, NCERT, New Delhi.
16. Sri Sathya Sai Bal Vikas Education Trust (1985). Curriculum and Methodology for integrating Human Values Education, Prashanthi Nilayam (International Education).
17. Sri Sathya Sai International Center for Human Values (2009). Education in Human Values: Course Book for Training of Master Trainers, New Delhi.
18. The Curriculum framework for Quality Teacher Education (1998) NCTE, New Delhi
19. UNESCO (2001) Learning the way of Peace, ñA Teacher Guide to Education for Peaceò, UNESCO, New Delhi.

Web resources

Education for values in schools- a framework, NCERT
http://www.ncert.nic.in/pdf_files/Framework_educationCOMPLETEBOOK.pdf

Values Education A Handbook for Teachers (2012), CMSE
http://cMSEacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf

Position Paper National Focus Group on Education for Peace, NCERT
http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/education_for_peace.pdf

NINTH SEMESTER

MSE(P) IX.1 : CLASSICAL MECHANICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Survey of Elementary Principles

Mechanics of a particle and of a system of particles: Center of mass, conservation of linear and angular momentum in the absence of forces and torques. The energy equation and the total potential energy of a system of particles. Constraints and their classifications, Generalized coordinates. Virtual displacement , DôAlembertôs principle and Lagrangean equations of the second kind. Examples of (I) single particle in (a) Cartesian coordinates, (b) spherical polar coordinates and (c) cylindrical polar coordinates, (II) Atwoodôs machine and (III) a bead sliding on a rotating wire in a force-free space. (IV) Simple pendulum. Hamiltonôs principle. Derivation of Lagrange equation from Hamiltonôs principle.

Unit II: Hamilton's Equations

Legendre transformations, Generalized momenta, Hamiltonôs equations of motion, Examples (i) the simple harmonic oscillator. (ii) Hamiltonian for a free particle in different coordinates. Cyclic coordinates and Conservation theorems. Physical significance of the Hamiltonian function. Derivation of Hamiltonôs equations from a variational principle. Some applications of the Hamiltonian formulation: A simple pendulum with a moving support, charged particle in an electromagnetic field.

Unit III: Canonical transformations

The equations of canonical transformations, Generating functions (Four basic types), examples of Canonical transformations, the harmonic oscillator treated by canonical transformations. The symplectic approach to canonical transformations, Examples of Lagrange and Poisson brackets as canonical invariants, properties of Poisson brackets, angular momentum and Pois-son bracket relations the equations of motion in the Poisson-bracket notation. The Hamilton-Jacobi equation, Example of the harmonic oscillator treated by the Hamilton- Jacobi method.

Unit IV: Mechanics of Rigid Bodies

Mechanics of Rigid Bodies: Degrees of freedom of a free rigid body, Angular momentum and kinetic energy of rigid body. Rate of change of a vector in space and body fixed coordinates. Moments and products of inertia, Moment of inertia tensor, principal moments of inertia, products of inertia, the inertia tensor. Eulerôs equations of motion for a rigid body, torque-free motion of a rigid body,Euler angles, Motion of a symmetric top.

Small oscillations of mechanical system: types of equilibria, Quadratic forms of kinetic and potential energies of a system in a equilibrium, General theory of small oscillations, secular equation and Eigen value equation, small oscillations in normal coordinates and normal modes, examples of two coupled oscillators, vibrations of a linear triatomic molecule.

Reference Books:

1. H. Goldstein, C. P. Poole Jr., John L. Safko, Classical Mechanics, 3rd Edition, Pearson Education, India, 2002.
2. V. B. Bhatia, Classical Mechanics, Narosa Publications, 1997.
3. Arnold Sommerfeld, Books for reference: Mechanics- Lectures on Theoretical Physics, Vol. I, Academic Press.
4. N. C. Rana and P. S. Joag, Classical Mechanics, Tata McGraw Hill.
5. R. G. Takwale and P. S. Puranik, Introduction to Classical Mechanics, Tata McGraw Hill.
6. L. D. Landau and E. M. Lifshitz, Classical Mechanics, Pergamon Press, Oxford, 1985.
7. Atam P. Arya, Introduction to Classical Mechanics 2nd Edition, Addison Wesley 1998.
8. R. G. Takwale and P. S. Puranik, Introduction to Classical Mechanics, Tata McGraw, New Delhi 1991.

MSE(P) IX.2 : MATHEMATICAL PHYSICS – I

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Tensor analysis

Curvilinear coordinates, tensors and transformation theory: Tensors of rank r as an r-linear form in base vectors. Transformation rules for base vectors and tensor components. Invariance of tensors under transformation of coordinates. Sum, difference and outer products of tensors, Contraction. Curvilinear coordinates in the Euclidean 3-space. Covariant and contravariant basis vectors. Covariant and contravariant components of the metric tensor. Raising and lowering of indices. Differentials of base vector fields. Christoffel symbols. Covariant differentiation. The contracted Christoffel symbol. Grad, divergence, curl and Laplacian in arbitrary curvilinear coordinates.

Unit II: Special functions- I

Differential equations, Hermite and Lagaurre functions: Partial differential equations, Separation of variables- Helmholtz equation in cartesian, cylindrical and spherical polar coordinates. Differential equations: Regular and irregular singular points of a second order ordinary differential equations. Series solutions- Frobinius method. Examples of Harmonic oscillator and Bessel's equation. Linear dependence.and independence of solutions Wronskian.

Unit III: Special functions- II

Hermite functions: Solution to the Hermite equation, Generating functions, Recurrence relations, Rodrigues representation, Orthogonality. Laguerre functions: Differential equation and its solution,-Laguerre polynomials, Generating function, Recurrence relations, Rodrigues representation, Orthogonality. Associated Laguerre functions: Definition, Generating function, Recurrence relations and orthogonality. The gamma function and beta function; definition and simple properties.

Unit IV: Linear vector space

Definition. Linear dependence and independence of vectors. Dimension. Basis. Change of basis. Subspace. Isomorphism of vector spaces. Linear operators. Matrix representative of a linear operator in a given basis. Effect of change of basis. Invariant subspace. Eigenvalues and eigenvectors. Characteristic equation.The Schur canonical form. Diagonalisation of a normal matrix. Schur's theorem

Reference Books:

1. G. B. Arfken and H. J. Weber, Mathematical methods for physicists, 7th Edn., Academic Press, New York (Prism Books, Bangalore, India), 2012.
2. E. G. Harris, Introduction to modern theoretical physics, Vol. 1, John Wiley, New York, 1975.
3. K. N. Srinivasa Rao, The rotation and Lorentz groups and their representations for physicists, Wiley Eastern, New Delhi, 2003.
4. B. D. Guptha, Mathematical physics, 4th Edn, 2011.
5. J. Mathews and R. L. Walker, Mathematical Methods for Physics, Benjamin, Pearson Addison-Wesley; 2nd edition, 1971.
6. L. I. Pipes and L. R. Harvill , Applied Mathematics for Engineers and Physicists 3rd Edition, McGraw Hill, 2014.
7. E. Kreyzig, Advanced Engineering Mathematics 8th edition, Wiley, 2010
8. M. Greenberg, Advanced Engineering Mathematics 2nd edition, Pearson India, 2002.

MSE(P) IX.3 : ELECTRODYNAMICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I:

Electrostatics, Magnetostatics and Time varying fields: Coulomb's law, Gauss's law, Laplace and Poisson equations, Solutions, Boundary value problems, Green's identities and Green's function, uniqueness theorem, Method of images with simple examples, Multipole expansion of an arbitrary charge distribution, Ponderable media, Dielectrics. Biot-Savart law, Ampere's law, Boundary value problems, Ampere's theorem, Multipoles, Electromagnetic induction.
Time varying fields and Maxwell's equations: Maxwellôs equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Time harmonic fields. Gauge transformations. The Lorentz, Coulomb and radiation gauges.

Unit II:

Electromagnetic waves: Monochromatic plane waves, velocity, phase and polarization. Propagation of plane electromagnetic waves in (a) conducting media and (b) ionized gases. Polarization, Reflection and refraction of electromagnetic wavesð Fresnel formulae for parallel and perpendicular components. Brewster law. Normal and anomalous dispersionð Clausius -Mossotti relation. Superposition of waves, Group velocity, Kramers Kronig relations.

Wave guides and cavity resonators: Penetration of fields into the conductors, Wave guides, Cylindrical, Rectangular, Energy flow and attenuation, Resonance cavities, Power losses, Fields and radiation of localized oscillating source, Electric dipole fields and radiation.

Unit III:
Fields of moving charges and radiation: The retarded potentials. The Lienard- Wiechert potentials. Fields due to an arbitrarily moving point charge. The special case of a charge moving with constant velocity.
Radiating systems: Radiation from an oscillating dipole. Power radiated by a point chargesð Larmor formula. Lienardôs generalisation of Larmor formula. Radiation reactionð Abraham-Lorentz formula.

Unit IV:
Relativistic electrodynamics: Charge and fields as observed in different frames. Magnetism as a relativistic phenomenon, Transformation of the field. Covariant formulation of electrodynamics. Electric field of a point charge moving uniformly, Electromagnetic field tensor, Electrodynamics in tensor notation, Transformation of fields - Field due to a point charge in uniform motion Potential formulation of relativistic electrodynamics. Lagrangian formulation of the motion of charged particle in an electromagnetic field.

Reference Books:

1. J. D. Jackson, Classical Electrodynamics 3rd edition, Wiley, 1999.
2. D. J. Griffiths, Introductory Electrodynamics, Prentice Hall of India, 1989.
3. Paul Lorrain, Dale R. Corson, and Dale Corson , Electromagnetic fields and waves, W.H. Freeman & Company; 3rd edition, 1987.
4. D. K. Cheng, Field and Wave Electromagnetics, Addisson Wesley, 1989.
5. B. B. Laud, Electromagnetics, Wiley Eastern Limited, India, 2000.
6. W. Miah, Fundamentals of Electromagnetics, McGraw-Hill Education, 1982.

MSE(P) IX.4 : NUMERICAL TECHNIQUES AND COMPUTER PROGRAMMING

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT
Unit I:
Roots of transcendental equations: Location theorem, Bisection (half interval) method Method of false position (Regula Falsi), Graphical Method, Newton-Raphson method, Geometric significance, inherent error, convergence of Newton Raphson method, Special procedure for Algebraic equations, Iteration Method, Geometry and convergence of iteration process.

Unit II:
Interpolation and curve fitting: Difference calculus, Detection of error, Forward, backward, Central & divided difference, Newtons forward, backward, general interpolation formula, Lagrangeôs Interpolation formula. Least square fitting (Linear & Non-linear).
Numerical integration and Ordinary differential equations: Trapezoidal and Simpsonôs

methods, Newton-Coteôs method, Gauss quadrature, Solution of ordinary differential equations - Eulerôs method, Milneôs method, Runge-Kutta methods.

Unit III:
Determinants and Matrices: Evaluation of numerical determinants, Cramerôs rule, Successive elimination of unknowns: division by the leading coefficients, Gauss method, Solution by Inversion of Matrices: solution of equation by matrix methods, Systems solvable by iteration and condition for convergence. The Eigen value problem ï Eigen values of a symmetric tridiagonal matrix- Householder's method ï QR method.

Unit IV:
C Programming fundamentals:Constants and variables, Data types, Type declaration of variables, Symbolic constants, Arithmetic operators, Increment and decrement operators, Conditional operator, Bitwise operators, Hierarchy, Arithmetic expressions, Logical operators and expressions, Assignment operators, Arithmetical and assignment statements, Mathematical functions, Input/output statements, Formatted I/O, Relational operators, Decision making and branching, Go to, if, ifé else, switch statements, Looping, While, do and for, Arrays, Handling characters and strings, Functions and voids, structures, Pointers (elementary ideas only), File operations(defining and opening, reading, writing, updating and closing of files.

Reference Books:

1. S. S. Shastry, Introductory methods of numerical analysis, Prentice Hall of India,1983.
2. V. Rajaraman, Computer Programming in C, PHI Learning Pvt. Ltd., 1994.
3. E. Balaguruswamy, Programming in ANSI C, Tata-McGraw Hill, 1992.
4. Yashavant P. Kanetkar, Let Us C, Infinity Science Press, 2008.
5. J. H. Rice, Numerical methods-software and analysis, McGraw Hill, 1983.
6. J. B. Scarborough, Numerical mathematical analysis, Oxford and IBH, 6th edition, John Hopkins University Press, 1966.
7. Hildebrand, Numerical analysis, Dover Publications; 2 edition, 1987.
8. W. H. Press, S. A. Teukolsky, W. T. Vellerling & B. P. Flannery, Numerical Recipes in C, The art of scientific computing, Cambridge University Press, 2007.

MSE(P) IX.5 : CORE LAB – I

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any TEN of the following experiments)

1) Birefringence of mica using a Babinet compensator.
2) Birefringence of mica using a quarter wave plate.
3) Determination of the size of lycopodium spores by the method of diffraction haloes.
4) Determination of wavelengthï by using Fabry Perot Etalon.
5) Dispersion of the birefringence of quartz.
6) Determination of wavelength with laser based Michelson Interferometer.
7) Determination of the pressure dependence of the refractive index of air by an

Interferometer.

8) Determination of the Stokes vector of a partially polarised light beam.
9) Determination of birefringence of mica using quarter wave plate.
10) Analysis of the sodium spectrum by Edser Butler fringes.
11) Cauchy's constants. ï Liquid prism (different concentrations).
12) Michelson's interferometer - (a) wavelength of D1 and D2 lines of sodium light and (b) d thickness of mica sheet.
13) Determination of the refractive index of air by Jamin interferometer.
14) Verification of Brewsterôs law of Polarisation.
15) Verification of Fresnelôs laws of reflection.

Reference books:

1. B. L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methusen & Co. 1950.
2. E. V. Smith, Manual of experiments in applied Physics, Butterworth, 1970.
3. R. A. Dunlap, Experimental Physics, Modern methods, Oxford University Press, 1988.
4. D. Malacara (ed), Methods of experimental Physic- series of volumes, Academic Press Inc., 1988.
5. S. P. Singh, Advanced Practical Physics ï Vol I & II, Pragati Prakasan, Meerut, 2003.

MSE(P) IX.6 : COMPUTER LAB – I

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(A minimum of EIGHT experiments to be selected from the following topics)

Linux operating system basics: Login procedure; creating, deleting directories; copy, delete, renaming files; absolute and relative paths; Permissionsð setting, changing; Using text editor.
Scientific text processing with LATEX: Typeset text using text effects, special symbols, lists, table, mathematics and including figures in documents.
Using the plotting program GNUPLOT: Plotting commands; To plot data from an experiment and applying least-squares fit to the data points. Including a plot in a LATEX file.
Using the mathematics package OCTAVE: To compute functions, matrices, eigen-values, inverse, roots.

MSE(P) IX. 7 :FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Objectives:

- Understand the concept of Education and its Epistemological premises
- Analyses the Discipline categories and their Logical distinctions
- Understands Education as a Discipline and its contribution to curriculum courses
- Analyses the societal problems and the necessity for Peace Education in schools
- Explores the possible sources of value conflicts , crisis among Higher secondary learners and teacherôs role in helping to resolve value conflicts
- Analyses various perspectives and thoughts on Peace and Peace Education
- Analyses the role of Education in a Pluralistic society like India and a need for culture-specific pedagogy in School Education
- Reflects on the social discriminations, inequalities and the oppressed groups ,as a teacher, as well as a member of the society and develops responsible attitude and commitment.
- Understands the school as a sub system of society and its responsibilities in reflecting the cultural and social ethos in its aims and functions
- Examines the concerns and issues of contemporary Indian Society and their bearing upon Education

Transaction Mode:
Lectures followed by Discussions; Group Discussions; Seminars; Collaborative Presentations; Assignments

COURSE CONTENT:
Unit I:
Education as a critical concept and criteria of educative process; Knowledge and disciplines; Logical distinction between Scientific and Mathematical Knowledge; Education as a discipline; Multidisciplinary nature of education; Concept and nature of value and value education; Factors contributing to value development; Value shifts; Need for education for peace; Value crises in adolescent learners; Methods of resolving value conflicts; Human rights; Role of education in promoting peace; Use of curricular and co-curricular areas in promoting peace as a value; Rationality as a value to be developed in learners.

Unit II:
Styles of learning and thinking ï implications for understanding the adolescent learner; Sociocultural factors influencing learning.
The process of adult learning ï cognitive changes (Praget and Elkind); role of feedback and incentives; learnerôs experience in the construction of knowledge.
Personality and development of self; The intra and interpersonal realm ï self perception, self-defeating behaviour, self presentation, impression and management, self-monitoring; search for identity (Erikson), time of turmoil.

Mental health and management ï Issues and concerns; adjustment and adjustment mechanisms; role of teacher in management.

Unit III:

Characteristic of Indian society : Multicultural, Multilinguistic and Multireligion system and role of senior Secondary Teacher

Socialization and acculturation, etc. influence on personality development in education.

Modernisation, its attributes and effect on present system of education.

Democratic values, equality and social justice, its importance in classroom teaching at higher secondary level.

Unit IV: Issues and Concerns of Senior Secondary Education

Gender equality, Inclusive Education for Children with Diverse Needs. Environmental Concerns, Sustainable Education, Quality Teacher Education, Globalization and its Effect over Education System.

References:

1. Dewey,John(1956): The School and the Society, The University of Chicago,ptd in USA,1990.
2. Carnoy, Martin (1974): education as Cultural Imperialism, Longman Inc. London
3. Bruner,S,J(1972): the Relevance of Education,Pub by Redwood press Ltd, ptd in Great Britain.
4. Gross,R,B(1970): Analytical Philosophy- An Historical Introduction, Western Publishing company, Inc. USA
5. OôConnor.D.J(1956): Philosophy Of Education
6. Dewey, J(1916): Democracy and Education: An Introduction to Education, New York
7. Peters, R.S: The concept of Education
8. Peters, R.S: Education and Education of Teachers
9. Pathak, Avijit (2002), Social Implications of Schooling, Rainbow Publishers, Delhi
10. Introduction: Life at School, need for critical enquiry Ch. 2 Sociology of School Knowledge Ch 3. Looking Beyond Texts, culture of school and formation of consciousness
11. Kumar Krishna (2004), What is Worth Teaching? 3rd edition, Orient Longman Ch 3. Implications of a Divisive School System Ch. 6 Growing Up Male
12. Saraswathi, T.S. (1999), Culture, Socialization and Human Development, Sage Publications
13. Bhattacharjee, Nandini, Through the Looking Glass: Gender Socialization in a Primary School (Ch14)
14. Krishnamurti, J., Education and the Significance of Life, KFI Publications (Ch. 6)
15. Readings from ôThe Social Character of Learningô by Krishna Kumar and from ôInner Worldôby Sudhir Kakar could also be considered
16. Krishnamurthi.J (2002): Why are you being educated? Talks at Indian Universities Krishnamurthy Foundations of India, Ptd by Chennai
17. Banks, James A. and C. A. McGee Banks, eds(1989): Multicultural Education: Issues and Perspectives. Needham Heights, Mass.: Allyn & Bacon
18. Boocock, S. S(1980): Sociology of Education: An Introduction. Lanham, MD: University Press of America
19. Chesler, Mark A. and W. M. Cave(1981): A Sociology of Education. New York: Macmillan
20. Dreeben, Robert(1968): On What is Learned in School. Reading, Mass.: Addison-

Wesley
21. Durkheim, Emile(1956): Education and Sociology. Tr. Sherwood D. Fox. New York: Free Press
22. Eggleston, John(1977): The Sociology of the School Curriculum. Boston: Routledge & K. Paul
23. Jackson, P.W.(1968):Life in Classrooms. New York: Holt.
24. Rayner Steve (2007): Managing Special and Inclusive Education. New Delhi : Sage Publications.
25. Woodfolk Anitha (2004) : Educational Psychology. Boston : Pearson.
26. Snowman, S and Bidher, R. (2004): Psychology Applied to Teaching. California : Wadsworth.
27. NCERT (2005) : Education of Children with Special Needs ï Position Paper by National Focus Group. New Delhi: NCERT.
28. NCERT (2005): Education for Peace- Position Paper by National Focus Group. New Delhi : NCERT.
29. Byrne, D. and Baron, R. (2008): Social Psychology. Boston : Allyn and Bacon.
30. Palmer, Joy, A. (2003) : Environmental Education in the 21st Century ï Theory, Practice, Progress and Promise. New York : Routledge.

TENTH SEMESTER

MSE(P) X.1 : QUANTUM MECHANICS -I

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENTS:

Unit I: Fundamental Concepts

The Sternï Gerlach Experiment, Kets, bras, and operators, base kets and matrix representations, postulates of quantum mechanics observables. Measurements, eigen values and expectation values, the uncertainty relations, compatible and incompatible observables, change of basis, position, momentum and translation, Momentum as generator of translations. The canonical commutation relations, wave functions in position and momentum space, momentum operator in position eigen basis, Gaussian wave packets.

Unit II: Quantum Dynamics

Schrodinger wave equation, Heisenbergôs formulation of Quantum mechanics, potential well and barrier problems, reflection, transmission and tunneling, simple harmonic oscillator ï solution by operator method, spherically symmetric potentials, hydrogen atom, two body problem, equations for center of mass and reduced mass, separation of variables, orbital angular momentum, commutation relations, radial and angular parts, energy eigen states and eigen values, degeneracy of energy eigen states.

Theory of Angular Momentum : Angular momentum operators, Matrix representation of angular momentum operators, spin ½, Pauli spin matrices, Eigen values and eigen- states of angular momentum, Addition of angular momenta, Clebsch-Gordon coefficients, simple examples.

Unit III: Symmetry and Conservation laws

Space-time symmetrics, conservation of linear momentum, conservation of energy, conservation of angular momentum, space inversion and time reversal, identical particles, construction of symmetric and antisymmetric wave functions, Slater determinant, Pauliôs exclusion principle, Bosons and Fermions, spin wave functions for two electrons, ground state of the He atom, scattering of identical particles.

Unit IV: Scattering

Classical definition of scattering cross-section, quantum theory of scattering, low energy scattering by a central potential, method of partial waves, phase shifts, scattering by a square well potential, scattering by Coulomb potential, High energy scattering, Born approximation, Validity of Born approximations, Yukawa potential, Rutherford scattering.

Reference Books:

1. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Plenum Press, New York, 1984.
2. L. I. Schiff, Quantum Mechanics, 3rd Edition, McGraw Hill, Koyakusha Ltd., New Delhi, 1968.

3. N. Zettili, Quantum Mechanicsï Concepts and applications, John Wiley & Sons, 2004.
4. V. K. Thankappan, Quantum Mechanics, New Academic Science Ltd, 4th revised edition, 2014.
5. A. K. Ghatak and S. Lokanathan, Quantum Mechanics : Theory and Applications, 3rd Edition, Macmillan India Limited, Madras, 1994.
6. David J Grifith, Introduction to Quantum Mechanics, Addison Wesley; 2nd edition, 2004.
7. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
8. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
9. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
10. B. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.
11. Stephen Gasiorowicz, Quantum Physics, John Wiley & Sons; 3rd edition, 2003.
12. E. Merzhacher, Quantum Mechanics, John Wiley & Sons; 3rd edition, 1998.

MSE(P) X.2 : MATHEMATICAL PHYSICS – II

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Functions of Complex Variables

Function of a complex variable, Analytic functions, Cauchy- Riemann conditions, Contour Integral, Cauchyôs integral theorem, Cauchyôs integral formula. Taylors Expansion, Laurent expansion, Zero of analytic functions, Singularities- regular and singular points, poles of a function, Residues, Cauchy's Residue theorem, Calculus of residues and applications, Evaluation of definite integrals, Jordan's lemma, Cauchy's principal value.

UNIT II: Groups

Linear representations of groups. Groups of regular matrices; the general linear groups GL(n;C) and GL(n;R). The special linear groups SL(n;C) and SL(n;R) .The unitary groups U(n) and SU(n) .The orthogonal groups O(n;C), O(n;R), SO(n;C) and SO(n;R).Rotation group The matrix exponential function. Definition and properties. Rotation matrix in terms of axis and angle. Eigen values of a rotation matrix. Euler resolution.of a rotation. Definition of a representation. Equivalence. Reducible and irreducible representations. Schur's lemma. The groups O(3) and SO(3). Construction of the $D^{1/2}$andD^{1} representation of SO(3)by exponentiation. Mention of the DJ irreps SO(3)

UNIT III: Special functions

Special functions:Sturm Liouville theory, Bessel functions, Legendre functions and Spherical harmonics. Self adjoint ODE's, Hermitian operators, completeness of eigenfunctions, Green's function eigenfunction expansion. Bessel functions: Bessel functions of the first kind J (x). Bessel diffeerential equation, generating function for J (x), integrals for $J_0(x)$ and $J_1(x)$, reccurence formulae for J(x), orthogonal properties of Bessels polynomials. Legendre functions: Legendre differential equation, Legendre polynomials, generating functions, recurrence formulae, Rodrigues representation, orthogonality. Associated Legendre

polynomials. The differential equation, orthogonality relation. Spherical harmonics: Definition and orthogonality.

UNIT IV: Fourier transforms and integral equations

Integral transforms, Development of the Fourier integral. Fourier transforms-inversion theorem. Fourier transform of derivatives. Convolution theorem. Momentum representation, Integral equations: Types of linear integral equations. definitions. Transformation of a differential equation into an integral equation. Abel's equation, Neumann series, separable kernels.

Reference Books:

1. G. B. Arfken and H. J. Weber., Mathematical methods for physicists, 7th Edn., Academic Press, New York (Prism Books, Bangalore, India), 2012.
2. E. G. Harris, Introduction to modern theoretical physics, Vol. 1, John Wiley, New York, 1975.
3. K. N. Srinivasa Rao., The rotation and Lorentz groups and their representations for physicists, Wiley Eastern, New Delhi, 2003.
4. D Guptha., Mathematical physics, Vikas Publishing House, 4th edition, 2009.
5. A.W.Joshi, Elements of Group Theory for Physicists, New Age International (P) Ltd., 1997.
6. J. Mathews and R. L. Walker, Mathematical Methods for Physics, Benjamin, Pearson Addison-Wesley; 2nd edition, 1971.
7. M. Tinkham, Group Theory and Quantum Mechanics, Dover Publications Inc., 2004.
8. L. I. Pipes and L. R. Harvill : ñApplied Mathematics for Engineers and Physicists (3rd Edition)" (McGraw Hill).
9. Wu- Ki Tung, Group theory for Physicists, World Scientific Publishing Co Pte Ltd., 1985.
10. E. Kreyzig, Advanced Engineering Mathematics 8th edition, Wiley, 2010.
11. M. Greenberg, Advanced Engineering Mathematics 2nd edition, Pearson India, 2002.

MSE(P) X.3 : STATISTICAL PHYSICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Basic concepts of classical statistical Mechanics

Specification of states of a system, contact between statistics and Thermodynamics, classical Ideal gas, entropy of mixing and Gibbs paradox. Macroscopic and microscopic description of a system, Kinetic calculation of Pressure and interpretation of Temperature, Maxwell-Boltman distribution law, energy and velocity distribution laws for an ideal gas. Ensembles-microcanonical, canonical, and grand canonical ensembles, phase space, thermodynamic probability, fundamental postulates of statistical mechanics, probabilistic interpretation of entropy, statistical equilibrium. ergodic hypothesis, stationary state and Liouvilleôs theorem,

Postulate of equal apriori probability, Partition function, density of states, Translational, Vibrational, Rotational and Electronic partition function and contributions to thermodynamic properties, Equipartition theorem and Virial theorem, Partition function in a system and for particles, Harmonic oscillator, particle in a box, Derivation of thermodynamic equation of state for ideal and real gases, Gibbôs paradox, Sackur- Tetrode equation.

Unit II: Quantum statistical Mechanics

Limitations of classical statistics, phase space, phase cells, postulates of quantum statistics, indistinguishability, Bose-Einstein statistics ï derivation of distribution function, Application to Photon concept, derivation of Planckôs radiation formula. Elementary idea of Bose-Einstein condensation. Fermi Dirac statistics ï derivation of distribution function, Application of FD statistics to free electrons in metals ï Fermi energy. Comparison of classical and quantum statistics. Symmetric and anti-symmetric wave functions, ensembles in quantum statistics, Degeneracy and non-degeneracy, condition for degeneracy, comparison of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein Distribution functions, Density of States.

Unit III: Applications of Fermi-Dirac Statistics

Ideal Fermi gas, equation of State, Application to electron gas, Diamagnetism and paramagnetism of free electrons, Pauli paramagnetism, Specific heat of solids, Limitations of Dulong, Petitôs law (classical), phonons and electrons, Einstein model of the theory of solids, Debye model of the theory of solids, Electron degeneracy pressure and its application in Astrophysics. Ideal Bose gas, Planckôs radiation law, Wienôs law, Stefan ï Boltzmann law, Black body as a thermodynamic system, Radiation pressure. Bose ï Einstein condensation.

Unit IV: Non-ideal systems and Fluctuations

Cluster expansion for a classical gas, Virial equation of state, Ising model, mean-field theories of the Ising model in three, two and one dimensions, exact solutions in one dimension. Correlation of space-time dependent fluctuations and transport phenomena, Brownian motion, Langevin theory, fluctuation-dissipation theorem, The Fokker-Planck equation.

Reference Books:

1. K. Huang, Statistical Mechanics, John Wiley & Sons, 2008.
2. R. K. Pathria and Paul D. Beale, Statistical Mechanics, Academic Press Inc; 3rd revised edition, 2011.
3. F. Reif, Fundamentals of Statistical and Thermal Physics, Waveland Press, 2010.
4. E. S. R. Gopal, Statistical Mechanics and properties of Matter, Ellis Horwood, 1976.
5. Gupta and Kumar, Statistical Mechanics, 24th edition, Pragati Prakashan, 2011.
6. N. S. Brijlal and P. S. Hemne, Heat, Thermodynamics and statistical physics, S.Chand Publishing, 2008.
7. R. P. Feynman, Statistical Mechanics: a set of Lectures, Perseus Books, 2nd edition, 1998.
8. L. D. Landau, E.M. Lifshitz, Course of Theoretical Physics, Vol.5, Statistical Physics, Part 1 and 2, Butterworth-Heinemann, 3rd edition, 1980.

MSE(P) X.4 : ELECTRONICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I:

Intrinsic and extrinsic semiconductors, Carrier concentrations, Fermi level, donor and acceptor levels in extrinsic semiconductors. Half wave and full wave rectifiers, circuits, wave forms, Rectifiers with L-sections and π-section filters, *Peak Inverse Voltage*, ripple factor, efficiency, Breakdown in diodes, Zener breakdown, voltage regulation, zener regulation against load and line variations. Clippers and Clampers.

Unit II:

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 ï self bias circuit, Load line and operating point. Transistor as an amplifier, transistor as a two port device, frequency response of CE amplifier, Emitter follower, Comparison of transistor configurations, multi stage amplifiers, RC coupling, Transistor as Power amplifier.

MESFET and MOSFET, enhancement and depletion MOSFETS volt-ampere characteristics, MOSFET circuit symbols, DC analysis of FETs, the FET as a switch, the FET as an amplifier, MOSFET as a resistance.

Unit III:

Kirchhoffôs Laws, Maximum Power Transfer theorem. Impedance matching Principle of superposition, Theveninôs and Nortonôs theorems, analysis of networks using Theveninôs and Nortonôs theorems.

Concept of feedbacks in amplifiers and advantages of negative feedback. Requirements for oscillation, Barkhausen criterion, Hartley and Colpitts oscillators, Wien Bridge oscillator, Phase Shift oscillator.

Unit IV:

Elementary considerations of low pass, high pass, band pass, and band stop filters and their characteristics. Differential amplifiers, principle of OP-AMP, OP-AMP parameters, Applications ï Addition, Subtraction, differentiation and integration. Filters with OP- AMP as active device (basic ideas only).

Basic ideas of differentiating and integrating circuits, bistable multivibrators, comparators, square wave generation from a sinusoid, Schmitt trigger, Astable and monostable multivibrators, discrete circuits of astable and monostable multivibrators and wave forms.

Reference Books:

1. Jacob Millman and Arvin Grabel, Microelectronics, McGraw Hill International Editions, 1987.
2. Jacob Millman and Halkias, Integrated Electronics ï Analog and Digital Circuits and Systems.
3. Taub and Schilling, Principles of Communication systems, Tata McGraw-Hill Education,2008.

4. V. K. Mehta & Rohit Mehta, Principles of Electronics, S. Chand & Company, 2010.
5. B. L. Theraja,Basics Electronics- solid state, S. Chand & Company, 2012.
6. Millman, Halkias, and Satyabrata Jit, Millmanôs Electronic devices and circuits, McGraw Hill India, III edition, 2015.
7. Malvino, Leach, and Saha, Digital Principles and Applications, McGraw Hill India, 2015.
8. Malvino and Bates, Electronic Principles, McGraw Hill India, 2013.
9. R. A. Gaekwad, OPAMPS and Linear Integrated Circuits, Prentice Hall, 2000.
10. D. C. Roy, Linear Integrated circuits, New Age International Publishers, 2003.
11. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, John Wiley & Sons,2008.

MSE(P) X.5 : CORE LAB – II

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any TEN of the following experiments)

1. Regulated power supply.
2. Active fillters: low pass (single pole) and Active filters: high pass (double pole).
3. Voltage follower.
4. Colpitts' oscillator.
5. Sawtooth generator using transistors and Miller sweep circuit using OPAMPS (for different frequencies).
6. Op-amp as an integrator and differentiator, summing and log amplifier.
7. Use of IC 741 - Determination of input offset voltage, current, CMRR, slew rate, and use as Inverting and non-inverting amplifier and difference amplifier, summing amplifier and comparator.
8. Op-amp as an inverting and non-inverting amplier.
9. Coder and encoder.
10. IC 555 Timer - Astable and Monostable and Bistable multi vibrators, VCO missing pulse detector and Sawtooth generator.
11. Half adder and full adder.
12. Schmidt trigger using transistors and OPAMPS - Trace hysteresis curve , determine LTP and UTP.
13. Boolean algebra-Logic gates.
14. Bootstrap Amplifier (frequency response, input & output resistance).
15. Op- amp astable multivibrator.
16. Second order Low pass, High Pass and Band Pass filters using OPAMP (study the frequency response)

Reference books:

1. Paul B. Zhar and A.P. Malvino, Basic Electronics - A Text Book Manual, JMH publishing, 1983.
2. A. P. Malvino, Basic Electronics - A textlab manual, Tata McGraw Hill, 1992.

3. R. Bogart and J. Brown, Experiments for electronic devices and circuits, Merrill International series, 1985.
4. Buchla, Digital Experiments, Merrill International series, 1984.
5. B. L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methusen & Co. 1950.
6. E.V. Smith, Manual of experiments in applied Physics, Butterworth, 1970.
7. R. A. Dunlap, Experimental Physics, Modern methods, Oxford University Press, 1988.
8. D. Malacara (ed), Methods of experimental Physic- series of volumes, Academic Press Inc., 1988.
9. S.P. Singh, Advanced Practical Physics ï Vol I & II, Pragati Prakasan, Meerut, 2003.

MSE(P) X.6 : COMPUTER LAB – II

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any EIGHT of the following experiments)

Programming in C:

1. Check whether given number is odd or even.
2. Find the largest and smallest number in the input set.
3. Compute the Fibonacci sequence.
4. Check whether the input number is prime or not.
5. Compute the roots of a quadratic equation.
6. Generate Pascalôs triangle.
7. To add two m x n matrices.
8. To find the sum and average of a data stored in a file.
9. Linear least-squares fitting to data in a file.
10. To find the trajectory of a projectile shot with an initial velocity at an angle. Also, find the maximum height travelled and distance travelled. Write the trajectory data to a file specified and plot using Gnuplot.

Programming in Perl:

1. Searching for a pattern in a string.
2. Counting the number of characters, words and lines in a given file.
3. Sorting strings.
4. Check whether the input number is prime or not.
5. Compute the roots of a quadratic equation.
6. Linear least squares fitting to data in a file.

MSE(P) X.7 : TEACHING OF PHYSICS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Objectives:
The student teacher will be able to

- understand the nature and scope of Physics
- understand the different pedagogical approaches to teaching of Physics
- plan learning designs based on problem situations, inquiry and projects,
- explore the use and relevance of different learning resources and materials in teaching of Physics
- study the facilities and materials available in Physics labs for teaching Physics at higher secondary level,
- Familiarize with different types of curricular projects in Physics, their purpose and themes.
- analyse the textbooks and other instructional materials with reference to the content, its organization, learning experiences and other characteristics
- prepare tools for assessing learning of Physics

COURSE CONTENT:

Unit I: Aims, Objectives and Approaches to Teaching/ Learning Physics
Objectives of teaching Physics at +2 level in India (State CBSE and the ICSE)Boards), Objectives/ Standards of teaching Physics in senior secondary schools in other countries; Approaches to teaching/learning Physics; Investigatory and Group investigatory methods; data collectionand experimental skills, recording, analyzing and reporting skills.
Problem solvingand Problem based learning; Demonstration and Discussion strategies, methods of independent study, experimental and field projects, experiential learning method; ICT integrated approaches to teaching; e-learning; on-line learning of science; Task based learning; designing of group tasks; seminar presentations: Planning, organizing and presentation skills.
(The above may be taught with illustrations of topics at senior secondary level; certain curricular projets of the Western countries may be referred to identify the topics suitable)

Unit II: Planning for Preparation for Teaching / Learning of Physics
Planning of Physics lessons with required components; Planning of different types of lessons: Problem based ï Task based ï STS oriented ï Content and Skill based Experiential learning lessons; planning for practical work in physics; understanding of lab. Techniques, skills in conducting experiments.

Suggested topics for pedagogic analysis

1. Motion: Description of Motion (uniform, accelerated and retarded), equations of motion, Relation between force and acceleration, projectile motion, work and energy, momentum, conservation of momentum and energy.
2. Current Electricity: Definition of electric current, cells as sources of electromotive force (emf), emf and voltage, resistance and resistivity, Ohmôs law, resistances in series and parallel with numerical examples.

(The above topics are only illustrative and other topics can be chosen by the teacher depending on resources).

Unit III: Instructional and Curricular Resources

Physics Textbooks, Lab. manuals, Journals on Physics Education, Teacher Manuals, Worksheets, Teaching Learning Aids, Laboratory work, Multimedia and web based resources.

Lab as a Resource : Evolution of practical work in Physics and its purpose; Demonstration of content specific experiments on topics related to +2 content; set of experiments in the lab to illustrate process skills related to learning of Physics; Planning, designing and demonstrations of experiments, recent trends and issues in practical work.

Curricular Resources : Study of curricular projects at the State/ National / International Levels in physics; Critical analysis of CBSE syllabus and textbooks in Physics based on the validities enumerated in NCF 2005.

Unit IV: Assessment in Learning Physics

Tools and techniques of assessment in Physics learning: Tools used for assessing factual and conceptual knowledge in physics; assessment of practical work: rubrics for assessing practical work (performance abilities and skills); assessment of practical/ lab records; assessment of attitude towards practical work; course work; assignments; group discussions.

Assessment of project work, investigatory projects; group discussions; seminar presentations and participation.

Need for periodic assessment of the above and the strategies used for periodic assessment.

Using assessment feedback to improve teaching and learning in physics. Analysis of question papers in Physics prepared by State / CBSE Boards; setting of question papers following the patterns in State/CBSE.

Scoring of physics answer papers.

Sessional Activities:

Preparation of different types of lesson plans in the Higher Secondary Level.

Desiging practicals in the laboratory; Preparation of Rubrics.

References:

1. National Curriculum Framework, 2005, NCERT, New Delhi.
2. Steve Alsop, Keith Hicks (2007), Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
3. John I. Lewis (1972), Teaching School Physics : A UNESCO Sourcebook ï Penguin Education, UK.
4. McIntosh Techniques and Problems of Assessment: A Practical Handbook for teachers.
5. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its publications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. NCERT Textbook in Physics for XI and XII students.
8. State Textbook in Physics for XI and XII students.
9. Nathan S Washton (1967) Teaching Science Creatively, Saunders Company, London.
10. History of Physics in the 20th Century, Internet Browsing.
11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All: Methods for Constructing Understanding, Allyn and Bacon, London.
12. School Science Review : The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.

13. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
14. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.

ELEVENTH SEMESTER

MSE(P) XI.1 : QUANTUM MECHANICS - II

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I:

Approximation Methods for time-independent problems: The WKB approximation, connection formulae, barrier tunneling, application to decay ï bound states, penetration of a potential barrier, Time independent perturbation theory, non-degenerate and degenerate cases, anharmonic oscillator, Stark and Zeeman effects in hydrogen. Variational Method, Expectation value of energy, ground state and excited states, application to ground state of Hydrogen and Helium atoms, Van der Waals interaction.

Unit II:

Approximation Methods for time-independent problems (contd.):Time dependent Perturbation theory, Transition probability, constant and harmonic perturbations, Application to interactions of an atom with the electromagnetic field, emission and absorption of radiation, selection rules, the dipole approximation, the Born approximation and scattering amplitude. *Relativistic kinematics*: Relativistic kinematics of scattering and reactions. Elastic, Inelastic reactions, Decay of a particle A Ÿ B + C, A + B Ÿ C, P + P¯ Ÿ P + P¯ + P + P.

Unit III: Relativistic Quantum Mechanics

Klein Gordon equation, plane-wave solutions, negative energy. Equation of continuity. The difficulties of the Klein-Gordon equation. The Dirac equation: The free-particle Dirac equation in the Hamiltonian form. The algebra of Dirac ɔ matrices, Plane wave solutions of the free-particle equation, the two-component form of the solution in the Dirac-Pauli representation, standard normalisation of the solutions. Non-relativistic reduction and g factor.

Unit IV: Quantisation of fields

Principles of canonical quantisation of fields, The Lagrangian formulation for a field, Classical Hamiltonian equations, quantisation of bosonic and fermionic fields, creation and annihilation operators, Fock states, Number representation.

Reference Books:

1. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Plenum Press, New York, 1984.
2. L. I. Schiff, Quantum Mechanics, 3rd Edition, McGraw Hill, Koyakusha Ltd., New Delhi, 1968.
3. N. Zettili, Quantum Mechanicsï Concepts and applications, John Wiley & Sons, 2004.
4. V. K. Thankappan, Quantum Mechanics, New Academic Science Ltd, 4th revised edition, 2014.
5. A. K. Ghatak and S. Lokanathan, Quantum Mechanics : Theory and Applications, 3rd Edition, Macmillan India Limited, Madras, 1994.
6. David J Grifith, Introduction to Quantum Mechanics, Addison Wesley; 2nd edition,

2004.
7. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition, McGraw Hill, 2010.
8. R. Eisberg and R. Resnick, Quantum Mechanics, 2nd edition, Wiley, 2002.
9. G. Aruldhas, Quantum Mechanics, 2nd edition, PHI Learning of India, 2002.
10. B. C. Reed, Quantum Mechanics, Jones and Bartlett Learning, 2008.
11. Stephen Gasiorowicz, Quantum Physics, John Wiley & Sons; 3rd edition, 2003.
12. E. Merzhacher, Quantum Mechanics, John Wiley & Sons; 3rd edition, 1998.

MSE(P) XI.2 : SPECTROSCOPY

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Atomic spectroscopy

Spectroscopic terms and their notations. Spin-orbit interaction, quantum mechanical relativity correction; Lamb shift. Zeeman effect, Normal and anomalous Zeeman effect, Paschen-Back effect. Stark effect, Weak field and strong field effects, quantum mechanical treatment of stark effect. Hyperfine structure of spectral lines: Nuclear spin and hyperfine splitting, intensity ratio and determination of nuclear spin. Breadth of spectral lines, natural breadth, Doppler effect and external effect.

Unit II: Vibrational and Rotational Spectroscopy of Molecules

Vibrational coarse structure of electronic spectra, Vibrational analysis of band systems, Deslanderôs table, Progressions and sequences, Information derived from vibrational analysis, Franck-Condon principle, rotational fine structure and the R, P and Q branches, Fortrat diagrams, dissociation energy, examples of iodine molecule.

Classification of molecules, interaction of radiation with vibrating molecules, Rotational spectrum of a rigid, diatomic molecule, example of CO, selection rule, intensities, the spectrum of a non-rigid rotator, example of HF, spectrum of a symmetric top molecule. Example of CH_3Cl, Instrumentation of Microwave Spectroscopyï information derived from rotational spectra.

Unit III: Infra red and Raman Spectroscopy

Vibrational energy of an anharmonic oscillatorï diatomic molecule (Morse curve), IR spectra ï spectral transitions and selection rules, example of HCl, the vibration ï rotation spectra of diatomic molecule, Example of CO, Born-Oppenheimer Approximations, Effect of Breakdown of Born-Oppenheimer approximation, normal modes of vibrational of H_2O and CO_2. Instrumentation for IR spectroscopy.

Raman Effectï classical and quantum theories, Pure rotational Raman spectra, Examples of O_2 and CO_2, Rotational Raman Spectrum of Symmetric top molecules, Examples of $CHCl_3$, vibration Raman spectrum of a symmetric top molecule, Example of $CHCl_3$, combined use of Raman and Infrared Spectroscopy in structure determination, Examples of CO_2 and NO_3, Instrumentation for Raman spectroscopy.

Unit IV: Spin Resonance Spectroscopy

Interaction between nuclear spin and magnetic field, Level population, Larmor precession, resonance condition, Block equations, Relaxation times, spin-spin and spin-lattice relaxation, The Chemical Shift, spin-spin interaction. Example of ethyl alcohol.. Instrumentation for NMR spectroscopy, FTNMR. A brief account of NMR in medicine Electron spin spectroscopy, Total Hamiltonian Fine structure, Electron-Nucleus coupling and hyperfine structure ESR spectrometer.

Reference Books:

1. C. N. Banwell and E M McCash, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill (1994).
2. G. M. Barrow, Introduction to Molecular Spectroscopy, McGraw Hill.
3. N. Tralli and P. R. Pomilla, Atomic theory, McGraw-Hill, New York, 1999.
4. G. Aruldas, Molecular Structure and Spectroscopy, Prentice Hall India Learning Private Limited, 2nd edition, 2007.
5. B. H. Mahan, University chemistry, 3rd edition , (Chapters 3, 10, 11 and 12), Narosa, New Delhi, 1975.
6. E. Hecht, Optics, Addison-Wesley, 2002.
7. S. G. Lipson, H. Lipson and D. S. Tannhauser, Optical physics, Cambridge University Press, USA, 1995.
8. B. P. Straughan, Stanley D. Walker, Spectroscopy Vol. I and II, Chapman and Hall 1976.
9. G. Herzberg, Spectra of Diatomic Molecules, Krieger Pub Co., 2nd edition, 1989.

MSE(P) XI.3 : SOLID STATE PHYSICS – I

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Dielectric properties of solids

Macroscopic description of static dielectric constant, the static electronic and ionic pollarizabilities of molecules, orientation polarization, the static dielectric constant of gases, Local electric field at an atom. Lorentz field, of dipoles inside cavity. The static dielectric constant of solids, Clausius- Mossotti relation, the complex dielectric constant and dielectric losses. Polarization catastrophe.Dielectric losses and Debye relaxation time. Classical theory of electronic polarization and optical absorption

Unit II: Ferroelectricity

Basic properties of ferroelectric materials. Classification and prop-erties of ferroelectrics. Dipole theory of ferroelectricity, objections against the dipole theory, ionic displacements and behavior of Barium titanate above the curie temperature, theory of spontaneous polarization of Barium titanate. Thermodynamics of ferroelectric transitions. Landau theory of phase transitions, Dielectric constant near the curie point.Ferroelectric domains

Unit III: Band Theory of Solids

Statement and proof of Bloch theorem. Explanation of periodic potentials in solids. Reciprocal lattice, periodic boundary conditions, density of states. Construction of Brillouin zones for a square lattice. Nearly free electron model and solution at the boundary. Discussion of energy gap using nearly free electron model.Tightly bound electron approximation, application to simple cubic , BCC and FCC lattices. Constant energy surfaces, Fermisurfaces.square lattice. Overlapping of bands.(asgiven in A J Dekker)Superconductivity:Elementary ideas of BCS theory. Formation of Cooperpairs and explanation based on theory (as given inIbach and Luth). Energy gap, Meissner effect fluxquantisation, Josephson tunnelling,Josephsonjunction.Theory for DC and AC bias.HighT csuperconductors.(as given in Ibach and Luth).

Unit IV: Elastic Constants of crystals

Definition of elastic strains and stresses in a solid. Elastic compliance and sti ness constants,Applications to cubic crystals and isotropic solids. Elastic waves and experimental determination of elastic constants.(as given in C Kittel)

Reference Books:

1. A. J. Dekker, Solid state physics, Prentice Hall, 1985.
2. C. Kittel, Introduction to solid state physics, 7th Edn., John Wiley, New York, 8th edition, 2012.
3. N. W. Ashcroft and N. D. Mermin, Solid State Physics, Saunders College Publishing, Cengage Learning India Private Ltd., Twelfth Indian Reprint 2011.
4. H. Iback and H. Luth., Solid State Physics, Narosa, New Delhi, 1996.
5. S. O. Pillai, Solid state physics, New Age International Publications, Sixth Revised Edition,2012.
6. M. A, Wahab, Solid state physics, Narosa Publishing House, New Delhi, Seventh Reprint, 2011.

MSE(P) XI.4 : DIGITAL AND COMMUNICATION ELECTRONICS (SYSTEMS)

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Digital logic gates

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, De Morganôs theorem. NAND and NOR as universal gates. Logic gate characteristics, The NMOS inverter, NMOS logic gates, The CMOS inverter, CMOS logic gates, The BJT inverter, the TTL NAND gate, emitter coupled logic (ECL) circuits, comparison of logic families.

Unit II: Communication Systems

Basic block diagram of communication system ï Transmitter, channel and Receiver.
Amplitude Modulationï Expression for AM Wave, frequency spectrum, power, single side band transmission. Amplitude modulated class C amplifier, SSB balanced modulator, detection of AM signals, diode envelope detectorï basic circuit and input-output waveforms, detection of SSB signals, comparison of signal to noise ratio, Frequency modulation, Expression for FM carrier, frequency spectrum, modulation index, average power, Phase modulation, The Varactor diode circuit for frequency modulation, detection of FM signals ï Fosterï Seeley discriminator and ratio detector (only basic circuits and principles).

Unit III: Pulse Modulation and Digital Communication

Pulse transmission, inter-symbol cross-talk, pulse-amplitude modulation, pulse-width modulation, pulse-position modulation, pulse-code modulation, effect of noise, advantages and applications of Pulse-Code Modulation (PCM).
Digital Communication: The microprocessor, Fundamentals of data communication, coding, digital codes, error detection and correction codes.

Unit IV: Terrestrial and Satellite Communication

Electromagnetic spectrum ï communication channels ï Ground wave propagation, sky wave propagation ï ionosphere and its functions, space wave, tropospheric scattering.
Satellite communication : Orbits, station keeping, satellite altitude, transmission path, path loss, noise consideration, effective isotropic radiated power.
Fibre-optic Communication : Principles of light transmission in a fibre, losses in fibres, dispersion, light sources for fibre optics, photodetectors, fibre-optic communication systems (Block diagram).

Reference Books:

1. Jacob Millman and Arvin Grabel, Microelectronics, 2nd Edition, McGraw Hill International Edition, 1987.
2. Dennis Roddy and John Coolen, Electronic Communications, 3rd Edition, Prentice Hall, India, 1991.
3. George Kennedy and Bernard Davis, Electronic Communication Systems, Tata McGraw Hill, 1993.

MSE(P) XI.5 : CORE LAB – III

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any TEN of the following experiments)

1. Determination of the paramagnetic susceptibility of salt by Gauyôs method.
2. Determination of the paramagnetic susceptibility of the given salt by Quinckeôs method.
3. Study of mercury spectrum by superimposing it on brass spectrum.
4. Sodium spectrum analysis by using Edser-Butler fringes.

5. Temperature coefficient of resistance of a thermistor.
6. Analysis of the powder X-ray photograph of a simple cubic crystal.
7. Thermionic work function of a metal (Richardson-Dushmann formula).
8. Determination of Stefanôconstant.
9. Determination of the polarisabilities of themolecules of an uniaxial crystal using spectrometer.
10. Photoelasticity in crystalline solids.
11. Thermal expansion coefficient in solids.
12. Optical rotatory dispersion of an uniaxial crystal.
13. Birefringence of quartz using spectrometer.
14. Fermi energy of copper.
15. Verication of Langmuir-Child's law.
16. Thermoluminescence(plotting Glow curve)
17. Curie temperature of a ferroelectric material.
18. Determination of the polarisabilities of the molecules of an uniaxial crystal using spectrometer.
19. Thermal expansion coefficient in solids.
20. Frank Hertz experiment.
21. Magnetic hysterisis.
22. Measurement of magneto resistance of semiconductors.
23. Variation of depletion capacitance with bias voltage in pn diode.
24. Variation of junction voltage with temperature in pn diode and hence determine the energy gap of a p-n diode.
25. Determine the energy gap of given semiconductor using four probe method.
26. Analysis of the powder X-ray photograph of a cubic crystal (KCL;NaCl:CaCl03).
27. Thermionic work function of a metal (Richardson Dushman Equation).
28. B H curve of a ferromagnetic material.
29. Schottky correction of workfunction using thermionic emission apparatus.
30. Velocity of sound using a signal generator and an oscillator.

Reference books:

1. B. L. Worsnop and H.T. Flint - Advanced Practical Physics for students - Methusen & Co. 1950.
2. E.V. Smith, Manual of experiments in applied Physics, Butterworth, 1970.
3. R. A. Dunlap, Experimental Physics, Modern methods, Oxford University Press, 1988.
4. D. Malacara (ed), Methods of experimental Physic- series of volumes, Academic Press Inc., 1988.
5. S.P. Singh, Advanced Practical Physics ï Vol I & II, Pragati Prakasan, Meerut, 2003.

MSE(P) XI.6 : SOLID STATE PHYSICS LAB

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any EIGHT of the following experiments to be done)

1. Dispersion relation and cut off frequency in the case of a monatomic lattice using lattice dynamics kit.
2. Photovoltaic cell.
3. Photoconductive cell.
4. Determination of the energy gap of semiconductors by four-probe method.
5. Temperature variation of the junction voltage of a p-n diode.
6. Temperature variation of the reverse saturation current in a p-n diode.
7. Depletion capacitance of a junction diode.
8. Determination of material constant of an intrinsic semiconductor.
9. Schottky effect.
10. Ionic conductivity of an alkali halide crystal.
11. Dielectric constant and its temperature variation.
12. Ultrasonic velocity and elastic constants of a solid.
13. Determination of Curie temperature of a magnetic material.
14. Optical rotatory dispersion of an uniaxial crystal.
15. Birefringence of quartz using spectrometer.
16. Paramagnetic susceptibility by Gouy balance method.
17. Fermi energy of copper.
18. Cell parameter(s) from an X-ray powder diffractogram.
19. Verification of Langmuir-Childôs law.
20. Thermoluminescence.
21. Curie temperature of a ferroelectric material.
22. Dielectric constant and its temperature variation.

MSE(C)-XI.7 : INTERNSHIP PROGRAMME 2 (Senior Secondary Level)

Credits : 4 **Max. Marks: 100**
Duration: 4 Weeks **$C_1 + C_2$: 50**
C_3 : 50

Objectives:
To provide field experience to the students to develop competencies and skills required for effective classroom teaching at the senior secondary level; class management; evaluation of student learning; organization of cocurricular activities; to enable students to develop proper professional attitudes, values and interests; to establish a closer professional link between RIE Mysore and schools in the region.

COURSE CONTENT:
The course is organized into activities distributed over two phases.

Phase 1 : Internship (3 weeks)

Phase 2 : Post-Internship and Critical Reflection of Internship Experience

Activities:

- Student teachers will teach 12 lessons (including 2 practicals) at Senior Secondary level
- Student teachers will observe a minimum of 5 lessons of their peers
- The student teachers will organize various activities- co-curricular and extended subject based in the school.
- The student teachers will participate in various academic and administrative activities including monitoring and supervising students in school conducted tests and examinations.
- The student teachers will diagnose the learning difficulties of students and provide remedial instruction.
- The student teachers will conduct CCE and unit tests and prepare evaluation records
- The student teachers will carry out action research project, analyse and write the report

(C1 : Observation, Evaluation and Activity Records; C2 : Action Research Report & Post-Internship Activities; C3 : Teaching)

TWELFTH SEMESTER

MSE(P) XII.1 : LASER PHYSICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I:

Radiative transitions and emission, line widths, Radiative decay of excited states, homogeneous and inhomogeneous broadenings, Absorption, Spontaneous and Stimulated emissions, Einsteinôs A and B coefficients, Absorption and gain of homogeneously broadened radiative transitions, gain coefficient and stimulated emission cross-section for homogeneous and inhomogeneous broadening.

Unit II:

Necessary and sufficient conditions for laser action (population inversion and saturation intensity), exponential growth factor, threshold requirements for laser with and without cavity, laser gain saturation, laser amplifiers, rate equations for three and four level systems, pumping mechanisms.

Unit III:

Laser cavity modes ï longitudinal and transverse modes in rectangular cavity, TE and TM modes, FP cavity modes, spectral and spatial hole burning, stability of laser resonator and stability diagram, unstable and ring resonators, semiconductor diode lasers.

Unit IV:

Q-switching and Mode locking, active and passive techniques, generation of giant pulses and pico second and femto second optical pulses, properties of laser beam and techniques to characterize laser beam. He- Ne laser: excitation mechanism and applications, Ti- sapphire laser: excitation mechanism and applications.

Reference Books:

1. W. T. Silfaust, Laser Fundamentals, Cambridge University Press, 2008.
2. J. T. Verdeyen, Laser Electronics, III Ed., Prentice Hall of India, 1994.
3. A. Ghatak and K. K. Thyagarajan, Lasers Theory and Applications, McMillan India Limited, 2000.
4. W. Koechner, Solid State Laser Engineering, Springer, 2013.
5. L. V. Tarasou, Laser Age in Physics, Mir Publications, 1981.
6. Semiconductor Laser Fundamentals, T. Suhara, CRC Press,2004.

MSE(P) XII.2 : MATERIAL PHYSICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Nano Materials

Introduction to Nanotechnology, Nanoparticles, definition of structural features, properties of nanoparticles in comparison with the bulk material, Zero dimensional nanostructures-nanoparticles, one-dimensional nanostructuresï nanowires and nanorods, two dimensional nano structures: films, special nanomaterials.

Unit II: Preparation and Properties of Nanomaterials

ôTop Downô and ôBottom Upô methods: cluster beam evaporation, ion beam deposition, pulsed laser methods, carbon nanotubes and nanofibres, nanostructured polymers (only qualitative),some of the applications such as in fuel cells, chemical sensors, and catalysis. Quantum dots, synthesis and applications.

Unit III: Liquid Crystals

Main types and properties: Introduction. The building blocks, small organic molecules, Long helical rods, associated structures, Nematics and Cholesterics. Nematics proper. The Cholesterics: A distorted form of the nematic phase. Smectic: Smectics A, Smectic B, Smectic C. Other mesomorphic phases, exotic smectics, long range order in a system of long rods. Remarkable features of liquid crystals and their applications.

Unit IV: Smectics

Symmetry of the main smectic phases. Liquid layers, solid layers, continuum description of smectics A and C. Statics of smectic A. Remarks of phase transitions and pre-critical phenomena, The C-A, A-N, C-N transitions.

Reference Books:

1. Guozhong Cao, Ying Wang, Nanostructures and Nanomaterials: Synthesis Properties and Applications, World Scientific, 2011.
2. Gan-Moog Chow,Kenneth E. Gonsalves, Nanotechnology ï Molecularly designed materials- Vol-622, American Chemical Society, 1996.
3. B. C. Crandall, Nanotechnology Molecular speculations on Global Abundance, MIT Press, 1996.
4. D. Bimerg, M. Grundmann and N. N. Ledentsov, Quantum Dot Heterostructures, John Wiley & Sons, 1999.
5. L. Banyai and S. W. Koch, Semiconductor Quantum Dots, World Scientific, 1993.
6. J. H. Fender, Nanoparticles and Nanostructured Films ï preparation, characterization and application, John Wiley & Sons, 2008.
7. H. C. Hoch, H. G. Craighead and L. W. Jelinski, Nanofabrication and Bio-system , Cambridge University Press, 1996.
8. K P Jain, Physics of semiconductor Nanostructures, Narosa, 1997.
9. Charles P Poole Jr., Frank J. Owens, Introduction to Nanotechnology, Wiley-Interscience publication, 2003.
10. T. Pradeep, Nano:The Essentials, McGraw Hill Professional, 2008.
11. J. H. Davies, Physics of Low ï dimension semiconductors, Cambridge University Press,

1998.
12. B. Kramer (Ed.), Advances in Solid State Physics- Vol.41, Springer, 2004.
13. P. G. De Gennes and J. Prist, The Physics of Liquid Crystals, 2nd Edition, Clarendar Press, Oxford, 1998.
14. S. Chandrashekhar, Liquid Crystals III Ed., Cambridge University Press, 1992.
15. G. Verlogen and W. H. de Jen, Thermotropic Liquid crystals: Fundamentals, Springer Science & Business Media,2012.
16. E. Priestly, Introduction to Liquid crystals, Springer Science & Business Media, 2012.

MSE(P) XII.3 : NUCLEAR PHYSICS

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Nuclear Properties

Nuclear radius ï determination by mirror nuclei ï mesonic X-rays, nuclear masses ï Bainbridge and Jordon mass-spectrograph ï Nierôs mass spectrometer ï Nuclear stability ï Odd-even rules ï Nuclear quantum numbers (Principal, orbital and spin) ï Nuclear angular momentum, Nuclear moments ï Spin, magnetic dipole moment ï Relation between and - Determination of nuclear magnetic moment by molecular beam experiment ï Experimental determination of electron and proton magnetic moments.

Unit II: Nuclear Models

Liquid drop model ï Formula for binding energy of a nucleus ï Application to (i) stability of isobars, (ii) fission process (mechanism and energy released) ï Bohr ï Wheeler condition for spontaneous fission.

Shell model ï Evidences for magic numbers ï stability of magic nuclei ï single particle potential ï spin-orbit coupling and level scheme. Explanation of nuclear magnetic moments and spins.

Unit III: Nuclear Decay Modes

Potential barrier around a nucleus ï V ~ r diagram ï Nuclear potential well height of the barrier ï Failure of classical theory to explain Alpha ï decay.

Alpha-Decay :Wave mechanical explanation ï tunneling ï Geiger ï Nuttal law (no derivation) ï Experimental evidences and verification.

Beta decay : Beta ray spectrum ï Classification of Beta decay ï neutrino hypothesis ï [Life times in Beta decay ï allowed and forbidden transitions ï Sargent diagram ï comparative half periods ï ft values ï Fermi selection rules ï Kurie plots ï (as in Chapter 6 of Nuclear Physics ï R D Evang).

Gamma Decay : Internal conversion ï Mossbauer effect.

Nuclear excited states ï meta stable states ï nuclear isomerism ï independent and genetically related isomeric transitions ï islands of isomers ï Auger effect ï characteristic X-rays.

Unit IV: Nuclear Fission, Fusion and Reactors

Nuclear reactions, Q values, threshold energy, Reactions induced by protons, deuterons and particles, photo disintegration.

Nuclear fission ï Neutrons released- cross sections ï thermalization of neutrons ï moderators

ï Neutral energy spectrum ï conditions for controlled chain reaction in a homogeneous spherical reactor ï critical size ï Brief description of a nuclear reactor.
Nuclear fusion ï C ï N and H ï H cycle ï Plasma ï condition for maintained fusion reaction ï Pinch effect ï Plasma containment ï Tokomac.

Reference Books:

1. E. Segre, Nuclei and Particles : An Introduction to Nuclear and Subnuclear Physics, Benjamin/Cummings, 1980.
2. I. Kaplan, Nuclear Physics, Narosa Publishing House, 1997.
3. A. Beiser, Perspectives of Modern Physics, McGraw-Hill Inc., 1969.
4. D. Halliday, Introductory Nuclear Physics, Wiley, 1951.
5. C. M. H. Smith, A Textbook of Nuclear Physics, Pergamon Press, 1965.
6. R. D. Evans, Atomic Nucleus, McGraw-Hill, 1955.
7. H. A. Bethe and P. Morrisson, Elementary Nuclear theory, Courier Corporation, 2006.
8. S. Glasstone, Source Book on Atomic Energy, Krieger Publishing Company, 1979.
9. Marimer and Sheldon- Vol.I and II, Physics of Particles and Nuclei, American Institute of Physics, 1994.
10. H. A. Enge, Introduction to Nuclear Physics, Addison-Wesley Pub. Co., 1966.
11. Littlefield and Thorley, Atomic and Nuclear Physics: An introduction, Springer Science & Business Media,2012.

MSE(P) XII.4 : SOLID STATE PHYSICS II

Credits: 4 (4L + 0T +0P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 2 hrs **C3: 50**

COURSE CONTENT:

Unit I: Elements of Crystallography

X-ray diffraction by crystals: The reciprocal lattice. Ewald sphere and construction. Scattering by an electron and atom. Atomic scattering factor. Anomalous scattering. Fourier analysis and inversion of Fourier series. Physical significance. Geometrical structure factor of the unit cell. Absent re ections and space groups [Sherwood, p290{302, p320{332, p342{358]. Experimental techniques: Weissenberg and precession methods. Cell parameter and space group determination. Molecular weight determination. Low angle scattering.Reduction of intensities to structure amplitudes. Various corrections. Absolute scale factor and temperature factor from statistical methods. Statistical method for nding the presence of center of symmetry [Stout and Jensen, p90,91, 94,106, 117,120, 122,128,148,156, 195,211]

Unit II: Structure analysis

Fourier analysis of electron density. Patterson synthesis. Harker sections and lines. Heavy atom methods. Direct methods for phase determination.The inequality relations. Difference Patterson synthesis and error Fourier synthesis.Figure of merit. Cyclic Fourier renement, Dierence Fourier synthesis Refinement of structures: The least squares method. Accuracy of the parameters. Bond lengths and angles SAXS:Particle size. Study of fibre structures.

Unit III: Imperfections in Solids

Different types of imperfections.Schottky and Frenkel de-fects. Expression for energy for the formation of Frenkel and Schottky defects. Diffusion in metals. Kirkendall e ect. Ionic conductivity in pure and doped halides. Photocon-ductivity. (as in C Kittel). Dislocations: Buerger's Vector. Expression for strain in the case of edge and screw dislocations. Low-angle grain boundaries.(As in Wahab and C Kittel)

Unit IV: Magnetic properties

Definition of Magnetisation and susceptibility. Hunds rule. Calculation of L,S and J for 3d and 4f shells. Setting up of Hamiltonian for an atom in an external magnetic field. Based on this , explanation of diamagnetism, Van Vleck Paramagnetism and quantum theory of paramagnetism using the above hamiltonian,in solids(see Ashcroft and Mermin). Interpretation of the Weiss field interms of exchange integral(Page 473-474, A J Dekker). Calculation of the singlet-triplet splitting, Spin Hamiltonian and Heisenberg model.(as given in Ashcroft N.W. and Mermin N.D) Magnetic resonance: Phenomenological description, Relaxation mecha-nisms,Derivation of Casimir-Durpe relation. Nuclear Magnetic moments, condition for resonance absorption, Setting up of Bloch's equations, obtaining solutions for the steady state case and that of the weak RF field, expression for power absorption, change of inductance near resonance. Dipolar line width in a rigid lattice. (as given 498-512 of AJ Dekker).

Reference Books:

1. A. J. Dekker, Solid state physics, Prentice Hall, 1985.
2. C. Kittel, Introduction to solid state physics, 7th Edn., John Wiley, New York, 8th edition, 2012.
3. N. W. Ashcroft and N. D. Mermin, Solid State Physics, Saunders College Publishing, Cengage Learning India Private Ltd., Twelfth Indian Reprint 2011.
4. H. Iback and H. Luth., Solid State Physics, Narosa, New Delhi, 1996.
5. S. O. Pillai, Solid state physics, New Age International Publications, Sixth Revised Edition,2012.
6. M. A, Wahab, Solid state physics, Narosa Publishing House, New Delhi, Seventh Reprint, 2011.
7. G. H. Stout and L. H. Jensen, X-ray structure determination, MacMillan, USA, 1989.
8. M. F. C. Ladd and R. A. Palmer, Structure determination by X-ray crystallography, Plenum Press, USA, 2003.
9. D. Sherwood, Crystals, X-rays and proteins, Longman, London, 1976.
1. L. V. Azaro, Introduction to solids, McGraw-Hill Inc, USA, 1960.
2. J. Weertman and J. R. Weertmann, Elementary dislocation theory, McMillan, USA, 1964.
3. T. Egami and S. J. L. Billinge, Underneath the Bragg Peaks Structural Analysis of Complex materials, Pergamon materials Series, Series Editor R W Cahn, volume 7, Elsevier Ltd, 2003.

MSE(P) XII.5 : CORE LAB – IV

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 6 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any TEN experiments)

1. Randomocity of radioactive decay.
2. Nomogram method: Measurement of endpoint energy of beta rays.
3. Study of linearity of the NaI(Tl) gamma ray spectrometer with SCA and hence determination of energy of unknown gamma source.
4. Determination of the rest mass energy of the electron using MCA.
5. Study of the variation of resolution of NaI(Tl) spectrometer as a function of energy
6. Cockroft-Walton voltage multiplier.
7. Coincidence circuit.
8. Linear pulse amplier.
9. Transistorised binary circuit.
10. Pulse shaping circuits.
11. Linear Gate.
12. Transistorised binary circuit.
13. Schmitt trigger.
14. Variable delay line.
15. Pulse recorder.
16. Display devices.
17. Feather analysis: End-point energy of beta rays measurement.

MSE(P) XII.6 : NUCLEAR PHYSICS LAB

Credits: 2 (0L + 0T +2P) **Marks: 100**
Contact hrs per week: 4 **C1 + C2: 50**
Exam Duration: 4 hrs **C3: 50**

COURSE CONTENT:

(Any EIGHT of the following experiments to be done)

1. Z dependence of external Bremsstrahlung radiation.
2. Fermi-Kurie plot: Determination of the end-point energy of beta rays using a plastic scintillation detector.
3. Determination of the resolving time of a coincidence circuit.
4. Determination of source strength by gamma-gamma coincidence.
5. Determination of source strength by beta-gamma coincidence.
6. Multichannel analyser : Study of the variation of energy resolution as a function of gamma ray Energies.
7. Half-life of Indium-116 measurement.
8. Energy Resolution of a NaI (TI) scintillation spectrometer.
9. Compton scattering determination of the rest energy of an electron.
10. Beta absorption coefficient measurement.
11. Dekatron as a counter of signals.
12. Gamma-ray absorption coefficient measurement.

13. End-point energy of beta particles by half thickness measurement.
14. Common source amplifier.
15. Astable multivibrator using timer IC 555.
16. Dead time of the G.M. counter.

Reference books:

1. L. Gerward,H. S. Sahota, Experiments in Nuclear Physics:(Lab Manual), Department of Physics, Guru Nanak Dev University, 2012.
2. H. S. Hans, Nuclear Physics: Experimental And Theoretical, New Age International,2008.

MSE(P) XII.7 : RESEARCH IN PHYSICS EDUCATION

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Course Objectives:

The student teacher will be able to

- understand the current reform movements in Physics Education,
- critically examine the areas of research in Physics Education,
- familiarize with the concept and methods in Action Research,
- encourage teachers to take up research as a measure of Professional Development.

COURSE CONTENT:

Unit I: Trends in Research in Physics Education

Diversity in Research, areas of research, transition from behaviourist to Constructivist model, Developmental, experimental and correlational studies with examples. A comparison of studies in India and other countries, Implications to classrooms, vision of Science Education Research ï Policy Perspectives in India.

Unit II: Action Research and Investigatory Projects in Physics

Meaning, scope, some typical Action Research studies, steps involved and role of the teacher, as an indicator of professional growth.

Planning investigatory projects and studying its effectiveness in learning, Teacher as a reflective practitioner.

Unit III: Professional Development in Physics Education

Physics Abstracts and current contents : Physics Education journals relating to School Education : (School Science Review, Journal of Physics Education, Journal of Research in Science Teaching, Bulletin of Indian Association of Physics Teachers, NCERT Journals, etc). Format of reporting, writing abstracts, papers, graphical and numerical data and conclusion, acknowledging the references.

Other Resources : Online surfing, Internet Browsing, Web resources, Online journals, virtual laboratories, Wikipedia, Patenting and copy right rule.

Unit IV: Supporting Agencies for Researching Teachers

Role of National and State agencies like NCERT, RIEs, SCERT, EIC, IASE in conducting inservice programmes, conferences, monitoring capacity building and evaluating functions of them. Academic staff colleges and Universities in conducting orientation and refresher courses for inservice teachers. Financing agencies for research.

Seminar, conferences, workshops, paper presentations by NSTA, Indian Physics Association, Indian Science Congress, NSTC, NCERT and others. Teacher autonomy as a researcher.

Sessional Activities:

Reviewing of Research articles on Physics Education

Hands on Activities on Report Writing, conducting Action Research, etc.

References:

1. Costa, L. Marques and R. Kempa (2000). Science Teachersô Awareness of findings from Education Research. ï Research in Science and Technology Education.
2. Journal of Research in Science Education
3. School Science Review
4. Physical Review
5. Home pages on web : NCERT, ERIC, NSTA, IAPT, etc.

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