

SYLLABUS FOR FOUR YEAR INTEGRATED B.Sc. B.Ed. COURSE

FOURTH YEAR



2020-2021

**JAI NARAIN VYAS UNIVERSITY
JODHPUR**

BOTANY
FOURTH YEAR - 2021

Course/ Theory	Nomenclature	Number of Papers	Number of Periods per week	Max. Marks		Total Marks	Min. Pass Marks
				Internal	External		
Paper I	Plant Physiology and Biochemistry	1	2	10	40	50	36
Paper II	Plant Biotechnology and Molecular Biology	1	2	10	40	50	
PRACTICAL COURSE			4	10	40	50	18

Duration of examination of each theory papers 3 hours

Duration of examination of practical (for both papers on same day) 4 hours

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section–C.

Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.

Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3 Marks

Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 5 Marks.

PAPER I

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Unit I: Plant-water relations: Importance of water to plant life; physical properties of water; diffusion and osmosis; absorption, transport of water and transpiration; physiology of stomata
Mineral nutrition: Essential macro- and micro-elements and their role, mineral uptake; deficiency and toxicity symptoms
Transport of organic substances: Mechanism of phloem transport; source-sink relationship; factors affecting translocation

Unit II: Photosynthesis: Significance; historical aspects; photosynthetic pigments; action spectra and enhancement effects; concept of two photosystems; Z-scheme; photophosphorylation; Calvin cycle; C₄ pathway; CAM plants; photorespiration. Rubisco and its regulation.

Unit III: Respiration: Aerobic and anaerobic respiration; Krebs's cycle; electron transport mechanism (chemi – osmotic theory); redox potential; oxidative phosphorylation pentose phosphate pathway
Basics of enzymology: Discovery and nomenclature; characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and cofactors; regulation of enzyme activity; mechanism of action, Protein structures

Unit IV: Nitrogen and lipid metabolism: Biological Nitrogen fixation and metabolism. Importance of nitrate reductase and its regulation; ammonium assimilation. Structure and function of lipids; fatty acid biosynthesis; β -oxidation; saturated and unsaturated fatty acids; storage and mobilization of fatty acids

Unit V: Growth and development: Definitions; phases of growth and development. Seed dormancy, seed germination. Photoperiodism, physiology of flowering; florigen concept, biological clocks, vernalization. physiology of senescence, fruit ripening. Plant hormones-auxins, gibberellins, cytokinins, abscisic acid and ethylene, history of their discovery, Physiological role and mode of action. Photomorphogenesis; phytochromes and cryptochromes.

Suggested Laboratory Exercises

1. To study the permeability of plasma membrane using different concentrations of organic solvents
2. To study the effect of temperature on permeability of plasma membrane
3. To prepare the standard curve of protein and determine the protein content in unknown samples
4. To study the enzyme activity of catalase and peroxidase as influenced by pH and temperature
5. Comparison of the rate of respiration of various plant parts
6. Separation of chloroplast pigments by solvent method
7. Determining the osmotic potential of *vacuolar sap* by plasmolytic method
8. Determining the water potential of any tuber
9. Separation of amino acids in a mixture by paper chromatography and their identification by comparison with standards
10. Bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant material
11. To study the regulation of stomatal movement using growth regulators, KCl and antitranspirants

Suggested Readings

- Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell (eds.). Plant Metabolism (2nd ed.), Longman, Essex, England, 1997
- Galston, A.W. Life processes in Plants, Scientific American Library, Springer-Verlag, New York, USA, 1989
- Hopkins, W.G. Introduction to Plant Physiology, John Wiley & Sons, Inc., New York, USA, 1995
- Lea, P.J. and Leegood, R.C. Plant Biochemistry and Molecular Biology, John Wiley & Sons,

Chichester, England, 1999

Mohr, H. and Schopfer, P. Plant Physiology, Springer-Verlag, Berlin, Germany, 1995

Salisbury, F.B. and Ross, C.W. Plant Physiology (4th ed.), Wadsworth Publishing Co., California, USA, 1992

Srivastava, H.S. Plant Physiology, Rastogi Publication, Meerut, 2016

Taiz, L. and Zeiger, E. Plant Physiology (2nd ed.), SinauerAssociats, Inc. Publishers, Massachusetts, USA, 1998

Suggested Readings

(for Laboratory Exercises)

Amar Singh. Practical Plant Physiology, Kalyani Publishers, New Delhi, 1977

Moore, T.C. Research Experiences in Plant Physiology: A Laboratory Manual, Springer-Verlag, Berlin, 1974

Nifa, A.J. and Ballou, D.P. Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Fitzreriald Science Press, Inc., Maryland, USA, 1998

Robalts and Tucker, G.A. (Eds.) Plant Hormone Protocols, Humana Press, New Jersey, USA, 2000

Scot, R.P.W. Techniques and Practice of Chromatography Marcel Dekker, Inc., New York, 1995

Wilson, K. and Goulding, K.H. A Biologists Guide to principles and techniques of Practical Biochemistry, Ed-ward Arnold, London, 1986

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PAPER II

PLANT BIOTECHONLOGY AND MOLECULAR BIOLOGY

Unit I: Cell theory and concept of totipotency and pluripotency. Introduction, History and application: plant tissue culture and biotechnology.

Genes, genomics and proteomics: General introduction. Basic tools and techniques of molecular biology: History of genetic manipulation, restriction enzymes, ligases, electrophoresis (Agarose and PAGE) and PCR. General introduction and applications of DNA finger printing, bioinformatics and NanoBiotechnology.

Unit II: Bacterial and viral genome organization (with special reference to plasmids and phage): Genetic recombination in bacteria. Vectors for gene cloning: p-BR322, p-UC18, Cosmids, Phagemids, BAC, PAC, YAC and HAC; c-DNA libraries. Detection and screening of recombinant DNA.

Unit III: General techniques of micropropagation: Fundamental and molecular aspects of organogenesis-somatic embryogenesis and androgenesis. Genetic basis of somaclonal variations and its applications. Protoplast isolation, fusion and somatic hybridization. Cryopreservation of germplasm. Various types of bioreactors. Industrial production of secondary metabolites with special reference to *Ephedra* alkaloids, Shikonin, Diosgenin and *Vinca* alkaloids. Strategies used to optimize secondary metabolite production.

Unit IV: Genetic engineering of plants: *Agrobacterium* as a natural genetic engineer, molecular organization of genetic makeup, t-DNA transfer mechanism integration and expression in plants. Genetic engineering of nitrogen fixation; basic biology, prospects and future challenges. Direct method of gene transfer in plants: Chemical methods electroporation, particle gun delivery, lipofection, microinjection, macroinjection, pollen transformation, laser induced and silicon fiber mediated. Reporter (Luciferase, GUS and GFP) and marker genes.

Unit V: Biotechnology and society: Development of transgenic crop plants against biotic and abiotic stresses. Genetically modified crops: Golden rice, Bt cotton and Bt brinjal (as a model system). Molecular marker assisted plant breeding. Plant Breeder's Rights (PBR) and Intellectual Property Right (IPR) in current regime of WTO. Impact of GM crops on society and environment.

Suggested Laboratory Exercises

1. Demonstration of the technique of micropropagation by using different explants, e.g. auxiliary and shoot meristems
2. Demonstration of the techniques of anther culture
3. Isolation of protoplasts from different tissues using commercially available enzymes
4. Demonstration of root and shoot formation from the apical and basal portions of stem segments in liquid medium containing different hormones
5. Demonstrations/poster on GM crops and related issues
6. Extraction of DNA from given plant materials

Suggested Readings

Bhojwani, S.S. Plant Tissue Culture: Application and Limitation, Elsevier Science Publishers, New York, USA, 1990

Old, R.W. and Primrose, S.B. Principles of Gene Manipulation, Black well Scientific Publications, Oxford, U.K., 1986

Raghavan, O. Embryogenesis in Angiosperms: A Developmental and Experimental Study, Cambridge University, Press, New York, USA, 1986

Vasil, I.K. and Thorpe, T.A. Plant Cell and Tissue Culture, Kluwer Academic Publishers, The Netherlands, 1994

Suggested Readings**(for Laboratory Exercises)**

Ball, R.D. (ed.) Plant Cell Culture Protocols, Humana Press, Inc. New Jersey, USA, 1999

Dixon, R.A. (ed.) Plant Cell culture: A Practical Approach, IRL, Press Oxford, 1987

Glick, B.R. and Thompson, J.E. Methods in Plant Molecular Biology and Biotechnology, CRC Press, Boca Raton, Florida, 1993

Roberts, J. and Tucker, G.A. (eds.) Plant Hormone Protocols Humana Press, New Jersey, USA 2000.

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(B.Sc. B.Ed. Part–IV Practical Examination – 2021)

Time : 4 Hours

Max. Marks : 50
Mim. Pass. Marks : 18

Q. 1. Perform the Physiological experiments allotted to you by lots and report the results in suitable form (Major)	8
Q. 2. Perform the Physiological experiments allotted to you by lots and report the results in suitable form (Minor)	5
Q. 3. Prepare culture medium and aseptically inoculate Explants/ Extract DNA from the given plant material.	10
Q. 4. Identify and comment upon the given spots 1 to 6 (covering all disciplines of Two Theory Papers)	2x6 = 12
1. _____	
2. _____	
3. _____	
4. _____	
5. _____	
6. _____	
Q. 5. Practical record	5
Q.6. Internal Assessment	10

	TOTAL 50

ZOOLOGY

Course	Nomenclature	Marks Per Paper/ Practical Board	Number of Periods per week	Internal Marks	University Examination Marks	Total for the Year	Min. Pass Marks
Paper I	Ecology and Behavior	Theory 50	2	Theory 10	Theory 40	50	36
Paper II	Applied Zoology	Theory 50	2	Theory 10	Theory 40	50	
PRACTICAL COURSE (One Board)		Practical 50	3 X 2	Practical 10	Practical 40	50	18

Duration of each theory paper

3 hours

Duration of practical examination

5 hours

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section –C.

Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.

Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3 Marks.

Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 5 Marks

PAPER I

Ecology and Behaviour

Unit 1: Introduction of ecology, definition, history, sub division and scope of ecology. Environmental factors; physical factors- soil, water, air and temperature. Biotic factors- interspecific and intraspecific relations, neutralism, mutualism, commensalism, antibiosis, parasitism, predation, competition. Concept of

limiting factors, Liebig's law of minimum, Shelford's law of tolerance, combined concept of limiting factors.

Unit 2: Population and community ecology, measurement of population density, Factors affecting population growth, growth factors, dispersal, characteristic of community, concept of ecosystem and niches.

Food chain, food web, Ecological pyramid. Energy flow in an ecosystem, biogeochemical cycles of CO₂, N₂, O₂, S and P; Prospects and strategies of sustainable development.

Unit 3: Brief introduction to the major ecosystem of the world and ecological succession, conservation of natural resources; Ecology in relation to Thar desert, Brief account of environmental pollution, global warming and its impact upon Human race.

Unit 4: General survey of various types of animal behavior; Methods of studying animal behavior, Role of hormones and pheromones in behavior, Biological rhythms.

Unit 5: Learning and Memory: Conditioning, Habituation, Insight learning, Association learning, Reasoning and Communication; Wildlife of Rajasthan and its conservation.

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PAPER II

Applied Zoology

- Unit 1: Poultry keeping: Types of poultry breeds, poultry housing, farm and farm management, system of poultry farming; Grading, handling and marketing of eggs; Poultry diseases and Vermiculture; Methodology and products.
- Unit 2: Sericulture: Different kinds of silk producing insects in India and its potentialities, Host plants of silk insects, Grainage, rearing and life cycle, Breeding and various diseases of silkworm, Reeling and fibre technology, Economics of sericulture.
- Unit 3: Apiculture: Different kinds of honey bees found in India and, their identification. Identification of Queen, worker and drone, Importance of keeping bees in artificial hives and different kinds of hives, Care and management of bee colonies, Bee enemies and their control, Extraction and processing of honey from the comb, Utility and economics of production of honey, Honey bees and pollination strategy in agricultural crops.
- Unit 4 : Pest Management : Insect pests of important crops (cotton, Rice, sugar cane & pulses), insect pest of veterinary and medical importance, pest outbreaks and assessment of losses caused by the insect pests on crops; population dynamics of insect pests; Principles of Biological, mechanical and cultural methods of pest control, Integrated Pest Management (IPM), Principles of pest control by pesticides, Important vertebrate pests, birds and mammals with special reference to rodents and their management.
- Unit 5: General principles of aquaculture; transportation of fish seed and brooders, Induced Breeding, Composite fish culture, Lay out of fish farm and its management, By-products of fishing industry; Prawn culture; Management of water bodies for aquaculture.

Practical

1. Study of different spraying and dusting equipment
2. Use of pesticides and precautionary measures
3. Measurement of temperature and relative humidity
4. Estimation of soil moisture
5. Estimation of water holding capacity of different soils
6. Ecosystem study : Aquarium
7. Pond water study to identify zoo-planktons and their permanent preparations
8. Permanent preparation of any two stored grain pests. Two parasitic insects and termites

9. Honey bee : Permanent preparation of pollen basket and mouth parts
10. Permanent preparation of mouth parts of butterfly, moth, mosquito and cockroach
11. Project report based upon study of local fauna

Distribution of Marks

		Maximum Marks: 50	
		Minimum Pass Marks: 18	
		Regular	Ex.
Applied Zoology Experiment		08	15
Ecology Experiment		08	15
Spots (four)		08	08
Project report on local fauna		07	---
Permanent preparation		04	04
Viva-voce		05	08
		<hr/>	<hr/>
		40	50
Internal assessment		10	---
	Total	<hr/>	<hr/>
		50	50

List of Recommended Books:

1. Parihar, R.P.: Fish Biology and Indian Fisheries, Central Publication House, Allahabad
2. Kovaleve, P.A., Silkworm Breeding Stocks, Central Silk Board, Marine Drive, Mumbai
3. Roger, A. Morse, The ABC and XYZ of Bee Culture, A.I. Root & Co., Medina, Ohio 44256.
4. Metcalf C.L. and W.P. Flint, Destructive and Useful Insects, Tata McGraw Hill Publishing Co. Ltd., New Delhi – 110 051
5. Bomford, Mason and Swash, Hutchinson's Clinical Methods, Beilliers Tindal, ELBS edition
6. Gorbman, A., Dickhoff, W.W., Vigna, S.R., Clark, N.B. and Ralph, C.L. Comparative Endocrinology, John Wiley & Sons Inc., New York
7. Beauchamp, T.L. and J.F. Chidress. Principles of Biomedical ethics. Oxford University Press.
8. Nayar, B.V., Pest Management and Pesticides Indian Scenario, Namratha Publications, Madras
9. Odum : Ecology (Amerind)
10. Odum : Fundamentals of Ecology (W.B. Saunders)
11. Ricklefy: Ecology (W.H. Freeman)
12. Turk and Turk: Environmental Science (W.B. Saunders)
13. Dobzhansky, Ayala & Valentine: Evolution (W.H. Freeman)
14. Dobzhansky: Genetics and Origin of species (Columbia University Press)
15. Major: Population, Species & Evolution
16. White: Animal Cytology & Evolution.

CHEMISTRY
FOURTH YEAR

Course	Nomenclature	Number of Papers	Number of Periods per week	External	*Internal	**Practical	Total
Paper I	ORGANIC CHEMISTRY	1	2	40	10		50
Paper II	Physical Chemistry	1	2	40	10		50
PRACTICAL COURSE			2	40	10		50

CHEMISTRY
PAPER I
ORGANIC CHEMISTRY

Unit I: Spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy.

Proton magnetic resonance (^1H PMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

Unit II: Heterocyclic Compounds

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basic nature 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 Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit III: Carbohydrates

Classification and nomenclature. Monosaccharides, interconversion of glucose and

fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threodiastereomers. Conversion of glucose into mannose. , mechanism of osazone formation, Formation of glycosides, ethers and esters. Cyclic structure of D(+)-glucose. Determination of ring size of monosaccharides, Mechanism of mutarotation. Structures of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides(starch and cellulose)without involving structure determination.

Unit IV: Amino Acids, Peptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids; Acid-base behavior, isoelectric point, electrophoresis and separation of amino acids by chromatography.

Preparation and reactions of α -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins.selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Peptide structure determination, end group analysis, Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation.

Nucleic acids: introduction. Constituents of nucleic acids.Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Unit V: Fats, Oils, Detergents and Synthetic Polymers :Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates. Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes

Books Recommended:

1. Advanced Organic Chemistry by Morrison & Boyd
2. Organic Chemistry by Behal&Behal
3. Text Book of Organic Chemistry by M.K. Jain
4. Polymer Chemistry by P. Bahadur and N.V. Shastri.

PAPER II PHYSICAL CHEMISTRY

Unit I: Elementary Quantum Mechanics

Black-body radiation, Planck's radiation law, photoelectric effect. Compton effect, De Broglie hypothesis, the Heisenberg's uncertainty principle, Schrodinger wave equation and its importance, physical interpretation of wave function.

Adsorption: Difference between adsorption, absorption and sorption, Chemisorption, adsorbent and adsorbate, reversible and irreversible adsorption, characteristics of adsorption, adsorption of gases by solids, factors affecting adsorption, types of adsorption, types of adsorption isotherms, Freundlich and Langmuir adsorption isotherms. Numericals

Unit II: Spectroscopy

Introduction: electromagnetic radiation, regions of the spectrum, Basic features of different Spectrometers, Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum: Diatomic molecules, Energy levels of a rigid rotator (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotator, isotope effect. Numericals.

Unit III: Vibration and Raman Spectroscopy

Vibrational Spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum.

Raman Spectroscopy: concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules. Numericals.

Unit IV: Electronic Spectrum: Origin of electronic spectrum, Selection rules, vibrational course structure and rotational fine structures considering no interaction of rotational and vibrational energies. qualitative description of selection rules and Franck-Condon principle.

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

Unit V: Solid State

Crystal state, classification of crystals, 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. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Numericals.

Books Suggested:

1. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
2. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern
3. Ltd.
4. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania,
5. ShobhanLalNagin Chand & Co.
6. Physical Chemistry by S.C.Ameta, A.V.Singh, R.Ameta, R.Mathur
7. BhoticRasayan by K.R. Genwa, RBD, Jaipur.

Practicals

Laboratory Course

Organic Chemistry:

(a) Qualitative Analysis: - Analysis of an organic mixture is containing two solid components, using water, NaHCO_3 and NaOH for separation. [10]

(b) Synthesis of organic compounds:- [10]

(i) Acetylation of salicylic acid, aniline and p-nitroacetanilide.

(ii) Preparation of iodoform from ethanol and acetone.

(iii) Preparation of methyl orange.

Physical Chemistry [15]

(a) Colloids: To determine precipitation value for the following sols and also verify Hardy's Schultz law (i) As_2S_3 Sol (ii) $\text{Fe}(\text{OH})_3$ Sol .

(b) Distribution law: To determine the partition coefficient of benzoic acid between water and benzene at R.T.

(c) Adsorption: To study the adsorption of acetic acid by activated charcoal and verify the Freundlich adsorption isotherm.

Viva-Voce [5]**Internal (Sessional/Record) [10]****Books Suggested (Laboratory Courses):**

1. Practical Chemistry, S.Giri, D.N.Bajpai and O.P.Pandey Publ. S. Chand
2. Experimental Organic Chemistry Vol I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
3. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
4. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
5. Experiments in General Chemistry, C.N.R. Rao and U.C. Agarwal, East-West Press.
6. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
7. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
8. Advanced Experimental Chemistry, Vol. I-Physical, J.N. Gurtu and R. Kapoor, S. Chand & Co.

PHYSICS

B. Sc. – B. Ed. IV Year

PHYSICS

Course	Nomenclature of Theory Papers	Number of Periods per week	Univ. Exam.	*Internal	Total
Paper I	Nuclear Physics	2	40	10	50
Paper II	Relativity And Electrodynamics	2	40	10	50
PRACTICAL COURSE		2	40	10	50

PAPER I NUCLEAR PHYSICS

Unit I: Rutherford scattering and Rutherford's nuclear model. Constituents of nucleus, discovery of neutron. Mass of proton and neutron. Measurement of charge radius (i) by Hofstadter experiment, (ii) by electron scattering method, (iii) by Mesonic X-ray Method. Measurement of potential radius (i) from lifetime of π -emitters (ii) from neutron scattering experiment. Variation of nuclear radius with mass number A. Nuclear spin and parity, Magnetic dipole moment of nuclei, Rabi's method for determination of nuclear magnetic moment. Electric quadrupole moment of nucleus.

Unit II: Mass defect, Mass difference, packing fraction and binding energy of nucleus. Plot of binding energy per nucleon against mass number. Liquid drop model of Nucleus. WEIZSACHER's Semi Empirical Mass formula (Volume, Surface, Coloumb – asymmetry and pairing energy terms). Predication of stability against beta-decay for members of an isobaric family. Stability limits against spontaneous fission. Energetic of Symmetric fission.

Unit III: The law of radioactive decay, statistical nature of radioactivity. Radio active growth and decay. Ideal equilibrium, transient equilibrium and secular equilibrium Radioactive series. Types of nuclear reactions (only qualitative statement). The balance of Mass and energy in nuclear reactions. Q equation. Solution of the Q equations, concept of centre of mass in nuclear reaction, view of proton-proton collision and neutron-nucleus collision in CM frame.

Unit IV: Alpha decay: Disintegration Energy, Range of α -particles, Geiger Nuttal's Law. α -

spectrum and fine structure. Long range α - particles, α - particles paradox–Barrierpenetration, Gamow Theory of α -emission.

Beta Decay: β -ray spectrometer (principle and working). β -ray spectrum; and its qualitative explanation.

Nuclear Energy: Nuclear induced fission, energy released in fission of U 235. Fission chain reaction, Neutron cycle in a thermal reactor. Four factor formula. Elementary idea of nuclear reactors. Nuclear fusion; fusion in stars, carbon and pp cycle problems of controlled fusion.

Unit V: Radiation Detectors: Introduction of various Methods used in detection of nuclear radiation. Detailed description of principle and working of following detectors based on detection of free-charge carriers – (i) Ionization Chamber, (ii) Proportional Counter, [iii] Geiger-Muller Counters, dead time, recovery time and paralysis time. Particle accelerators: Principle and working of Vande-Graff Generators Cyclotron and linear accelerators.

Elementary Particles: Properties of particles, Classification into leptons, mesons and baryons, conservation laws (only qualitative discussion) energy, momentum, angular momentum, charge, Lepton numbers, Iso-spin, Strangeness and Baryon number. Quark model (only qualitative idea).

Books suggested:

1. Alonso & Finn: Fundamental University Physics – Vol. III, Addison Wesley.
2. S.N. Ghoshal : Atomic & Nuclear Physics – Vol. II, S. Chand, New Delhi.

PAPER II

RELATIVITY AND ELECTRODYNAMICS

Unit I: Electromagnetic Waves: Displacement current, Maxwell's equations, Electromagnetic wave equation, Poynting theorem, Plane Electromagnetic waves in free space, wave impedance of free space, Propagation of plane Electromagnetic waves in non-conducting and conducting media, Skin depth, propagation of Electromagnetic waves in ionized gases, Polarization of Electromagnetic waves.

Unit II: Reflection and Refraction of Electromagnetic waves: Boundary conditions at the surface of discontinuity, reflection and refraction of Electromagnetic waves at the interface of non-conducting media, Fresnel's equations and their experimental verification, reflection and transmission coefficients, Brewster's Law and degree of polarization, total internal reflection, phase difference between parallel and perpendicular components and polarization of the reflected wave, reflection from a conducting plane.

Unit III: Interaction of Electromagnetic waves with matter: Normal and anomalous dispersion of light, empirical relations, Lorentz theory of dispersion of gases, experimental demonstration of anomalous dispersion in gases, scattering of electromagnetic waves and scattering parameters, Thomson, resonant and Rayleigh's scattering cross-section, polarization of scattered light, coherent and incoherent scattered light, dispersion in liquids and solids, Clausius-Mossotti equation and Lorentz-Lorentz formula.

Unit IV:Relativistic Mechanics: Coordinate transformation, contravariant and covariant vectors, tensors of second and higher rank, addition, subtraction, contraction, outer and inner product of tensors, covariance of tensor equations, Minkowski space, geometrical interpretation of Lorentz transformation, space like and time like intervals, four vectors, four dimensional gradient, divergence and curl operators, four-velocity, four-acceleration, four-momentum, four-force, relativistic classification of particles.

Unit V:Relativistic Electrodynamics: Invariance of charge, transformation of surface charge density, transformation of volume-charge density and current density, Equation of continuity in the covariant form, Scalar and vector potentials, Transformation of Electromagnetic potentials, Lorentz condition and its covariant form, Electromagnetic field tensor, Covariance of Maxwell's equations, Transformation of Electro-Magnetic fields, Lorentz-force in a covariant form, Electromagnetic field due to a moving charge.

Books suggested:

1. S.P. Puri: Electrodynamics, Tata McGraw Hill.
2. J.D. Jackson: Classical Electro-dynamics, John Wisely, New York
3. B.B. Laud: Electromagnetic, John Wisely, New York
4. E.C. Jordan: Electromagnetic waves, PHI, New Delhi
5. D. J. Griffiths: Introduction to Electrodynamics, PHI

EXPERIMENTS FOR PRACTICAL WORK

Note: Any 13 experiments to be performed by all the students out of following list.

1. Determination of Planck's constant using solar cell/ LED.
2. Determination of Stefan's constant (B-B method).
3. Study of characteristics of a GM counter and verification of inverse square law for the same strength of a radioactive source.
4. Determination of coefficient of rigidity as a function of temperature using torsional oscillator (resonance method).
5. e/m measurement by Helical Method.
6. Measurement of magnetic field using Ballistic galvanometer and search coil.
7. Measurement of electric charge by Millikan's oil drop method.
8. To study hysteresis loss of transformer by B-H curve using CRO.
9. Determination of dielectric constant of solids and liquids.
10. Determination of velocity of sound in air.
11. Verification of Cauchy's formula.
12. Study of Lissajous patterns.
13. Determination of separation of plates of Etalon using spectrometer.
14. To verify Fresnel's formula for the reflection of light.
15. Study of series and parallel LCR resonance circuit.
16. Study of characteristics of a GM counter and determination of dead time of GM tube.
17. To study the viscous fluid damping of a compound pendulum and to determine the damping coefficient and Q of the Oscillator.

Note: - New experiments may be added on availability of equipments.

MATHEMATICS

TEACHING AND EXAMINATION SCHEME

Subject/Paper	Period/Week		Exam. Hours	Theory Paper	Summative Test
	L	P			
MATHEMATICS					
Paper I	3	-	3	60	15
Paper II	3	-	3	60	15
Paper III	3		3	60	15

MATHEMATICS

Paper I : Analysis and Laplace Transforms
Paper II : Mechanics II (Dynamics of Rigid Bodies and Hydrostatics)

Note: Each theory paper is divided in three parts i.e. Section – A, B and C.

Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 1 mark.

Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.

Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Exam. Hours: 03:00

Max. Marks: 60

Paper – I

Analysis and Laplace Transforms

Unit 1 : Dedekinds theory of real numbers. Linear sets. Upper and Lower bounds, Limiting points, Weierstrass's theorem. Derived sets, Enumerable Sets, Open and Closed sets.

Unit 2 : Theory of Riemann integration, Darboux theorem. Fundamental theorem of integral calculus, Mean value theorem of integral calculus.

Unit 3 : Functions, Limits, and continuity. Differentiability, Concept of an analytic function, Cartesian and Polar form of Cauchy-Riemann equations. Harmonic function, Conjugate function, Laplace's differential equations, Orthogonal system, Construction of analytic functions. Power Series: Absolute convergence of power series, circle and radius of convergence of power series, sum function of a power series.

Unit 4: Basic definition and Properties of complex integration Complex integration as the sum of two line integrals, Inequality for complex integrals. Curves in complex plane, Cauchy-Goursat theorem, Connected regions, Indefinite integral (or Anti Derivative). Derivative of Single-valued functions $F(z)$. Cauchy's integral formula, Extension of Cauchy's integral formula to multiconnected, regions, Cauchy's integral formula for the derivative of an analytic function, Successive derivative of an analytic function, Morera's Theorem. Liouville's Theorem, Poisson's integral formula.

Unit 5: Laplace Transforms and Inverse Laplace Transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Convolution theorem. Applications of Laplace Transform to the solution of differential equations.

SUGGESTED BOOKS

Shanti Narayan: Real Analysis; S.Chand & Co., New Delhi.
G.N.Purohit: Real Analysis; Jaipur Publishing House, Jaipur.
Bhargava, Goyal: Real Analysis (Hindi Ed.); Jaipur Publishing House, Jaipur.
Gokhroo, Saini, Ozgha: Real Analysis (Hindi Ed.); Jaipur Publishing House, Jaipur.
Shanti Narayan: Theory of Functions of a Complex Variable; S.Chand & Co., New Delhi.
Gupta, K.P. : Complex Analysis; Pragati Prakashan; Meerut
Gokhroo, Saini & Yadav: Complex Analysis (Hindi Ed.); Navkar Publication, Ajmer
G.N. Purohit: Complex Analysis; Jaipur Publishing House, Jaipur.
S. Ponnusamy: Foundations of Complex Analysis, Narosa Publishing House,
Bombay, New Delhi.
V. Karunakaran: Complex Analysis, Narosa Publishing House. Bombay, New
Delhi (2002).
N.Levinson and R.M. Redheffer: Complex Variables, Tata McGraw-Hill Publ.
Co. Ltd., New Delhi (1980).

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Paper II Mechanics – II

(Dynamics of Rigid Bodies and Hydrostatics)

Unit 1: Moments and Products of inertia. D'Alemberts' principle, the general equations of motion of a rigid body, Motion of the center of inertia and motion relative to the center of inertia. Motion about a fixed axis under finite forces.

Unit 2: The compound Pendulum. Reaction of the Axis of rotation. Motion of a rigid body in two dimension under finite forces.

Unit 3: Fluids and Fluid Pressure, homogeneous and heterogeneous fluids, Surface of equal pressure, fluid at rest under action of gravity, Fluid pressure on Plane surfaces.

Unit 4: Centre of pressure, resultant pressure on curved surfaces.

Unit 5: Equilibrium of floating bodies, Centre of buoyancy, Surface of buoyancy. Stability of equilibrium of floating bodies, Meta Centre.

SUGGESTED BOOKS

Loney, S.L. : Rigid Body Dynamics; Cambridge Univ. Press.

Gupta, P.P. : Rigid Body Dynamics, Vol.I; Krishna Prakashan, Mandir; Meerut

Bansal, J.L. : Rigid Body Dynamics; Jaipur Publishing House, Jaipur.

Prasad, B.N. : Hydrostatics; Krishna Prakashan, Mandir; Meerut

Mathur, S.M. : A Text Book of Hydrostatics; Ramesh Book Depot, Jaipur.

Sharma, Gokhroo, K. Saini, Agarwal.: Elements of Hydrostatics; Jaipur Publishing House, Jaipur.

Evaluation Plan B.Ed Fourth Year

S.N	Paper	Name of the Paper	External	Internal	Total
1	First	Knowledge & Curriculum	70	30	100
2	Second	Understanding Inclusive Education	70	30	100
6	Third	Pedagogy Course I (Part II)	35	15	50
7	Fourth	Pedagogy Course II (Part II)	35	15	50
9	Fifth	Health & Physical Education (EPC)	0	50	50
	Total		210	140	350
		Marks for Activities			
		1.Co-curricular Activities(in College 10 Marks			
		2.Individual Appraisal 10 Marks			
		1. School internship (14 weeks) 60 Marks			150
		2.A Project Report on the various aspects of school where internship was performed. 40 Marks			
		3.ICT Based lessons (At least 5) 20 Marks			
		4. Co-curricular Activities(in School) 10 Marks			
		Final Lesson			100
	Grand Total				600

1. In Fourth year, the total internship program will be spread in duration of 14 weeks. This rigorous internship in surrounding schools will enable the student-teacher to perform better as a teacher. Only 10 students will be allowed to deliver lessons in a school.
2. During internship program the student-teacher will ensure that they get a teaching exposure of secondary and senior secondary level preferably.
3. Co-curricular & Extra-curricular activities (in college) must be spread all through the year which should also include special days' celebration.
4. Individual appraisal of the student-teachers will be done on some set criteria about their year-long activities, individual attributes & personal qualities like discipline, honesty, dedication, commitment etc.
5. School internship will include the participation of the Student- teacher in all the activities of the school including teaching.
6. The student teacher will prepare a project report on the various aspects of the school on some set criteria where internship will be performed.
7. The student teacher will deliver at least 5 ICT based lessons while doing the internship.
8. Co-curricular & Extra-curricular activities (in School) must be spread all through the internship program which should also include special days' celebration
9. Each candidate should be prepared to teach two lessons (One in each subject) at the final Practical Examination. However, the candidates will deliver one lesson (in the subject of their choice) for final practical out of prepared two lessons. The external examiner may

pick up at least 10% of the candidate to deliver two lessons (if required), Lessons to be assessed by the Board of Examination consisting of:

(a) one external examiner from any discipline.

(b) Two internal examiners of whom one would be the Principal of the College and other would be a member of the faculty of the College any discipline and marks will be awarded out of 100.

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B.Ed
Paper I
Knowledge and Curriculum

Objectives:

The student teacher will be able to:

- To understand the way in which the curriculum is driven by assessment.
- To critically analyse various samples of textbook
- To identify various dimensions of the curriculum and their relationship with the aims of Education.
- To examine the epistemological basis of education.
- To discuss the basics of modern child centered education.
- To identify relationship between the curriculum framework and syllabus.
- To understand the relationship between power, ideology and the curriculum.
- To help prospective teachers to take decisions about and shape educational and pedagogic practice with greater awareness of the theoretical and conceptual under pinnings that inform it,
- To discuss the basis of modern child-centered education
- To understand education in relation to modern values like equity and equality, individual opportunity and social justice and dignity.

COURSE CONTENT

Unit –I Knowledge Generation

1. Epistemology-Meaning, philosophical basis of knowledge according to Indian & Western philosophy.
2. Distinction between (a) knowledge and skill (b) Teaching and Training (c) Knowledge and wisdom (d) Reason and belief.
3. Chronological review on Knowledge generation, myth based faith and logical based knowledge, various structures of society and knowledge patterns and their relationship.

Unit –II Child- Centered education

1. Modern Child-Centered Education, Meaning, Concept and its basis.
2. Educational Thoughts on child centered Education – Gandhi, Tagore, Dewey, Plato, Buber and Freire.

Unit – III Process of knowing and forms of knowledge

1. Process of construction of knowledge, factors involved in construction of knowledge, role of knower & known in construction and transmission of knowledge, the role of culture in knowing
2. Categorisation of knowledge; basis of categorisation, the essential forms of knowledge, basis of selection of categories of knowledge in school education, the responsibility of selection, legitimization and organisation of categories of knowledge in schools, ways in which school knowledge gets reflected in the form of curriculum, syllabus & textbooks.
3. Make a presentation, feedback collect Folk songs, Folk culture and Customs to find out modern values.
(a) Organize a debate on Social equality.

- (b) Organize a poster designing competition for awareness of girl's education and Female infanticide.
- (c) Student should contact the people of nearby area of school for social issues.
- (d) For collecting information related to Folk songs, Folk culture and Customs, student should contact rural people.
- (e) To understand how to sing folk songs, the student should be present in the folk song events.

Unit –IV Curriculum & Its determinants

1. Meaning & need of curriculum, differentiations between curriculum framework, curriculum, syllabus and text books; facets of core curriculum in Indian context.
2. Curriculum at National level – NCF 2005 and NCFTE 2009 (General Introduction).
3. Determinants of curriculum: (a) Social-political-cultural-economic diversity (b) socio-political aspirations including ideologies (c) Economic necessities & technological possibilities. (d) National priorities and international Context
4. Consideration in curriculum making. (a) forms of knowledge & its characteristics in different school subjects (b) relevance & specificity of educational objectives for concerned level. (c) Critical issues: Environmental concerns, gender differences, values & social sensitivity.

Unit V Curriculum Development & Textbooks

1. Different approaches of curriculum development: Subject centered: learner centred and constructivist
2. Role of external agencies in providing curriculum and pedagogic supports to teachers within schools; teachers' role in transacting, developing and researching curriculum.
4. Operationalization of curriculum into learning situations: Selection & development of learning resources i.e. textbooks, teaching learning materials and resources outside the school-local environment, community & media.
6. Process of curriculum evaluation: Evolving assessment modes, need of model of continuous & comprehensive evaluation; feedback from learners, teachers, community and administrators.

Practicum/Field Work(Any two from the following)

1. Analysis of social myths in the light of scientific values and culture.
2. Plan a child centered activity for enhancement of children education and values based on Gandhian or Tagore's thoughts.
3. Conduct a survey on feedback of curriculum from learners and teachers. Prepare a report.
4. Critical review of a text book in reference to gender issues social sensitivity and the local contexts/references included in the book.
5. Critical review or analysis of the text book at upper primary and senior secondary level.

Reference

1. Schilvest, W.H. (2012), Curriculum: prospective paradigm and possiilty. M.C.MLLAN publication.
2. Hirst, Paul, H. Knowledge and the curriculum. Routledge publication.
3. Letha rammohan (2009). Curriculum instrchon and evaluation. Agerwal publication, Agra.
4. Scolt, dand (2003). Curriculum studies: curriculum knowledge. Routledgefalmes, m.y.

5. Kelly, AV. (2009). The curriculum: theory and practice sage publication Singapore.
6. श्रीवास्तव, एच.एस.एवंचतुर्वेदी, एम. जी (2010). पाठ्यचर्याऔरशिक्षणविधियों, शिक्षाप्रकाशन, जयपुर
7^प यादव, शियाराम, पाठ्यक्रमविकासअग्रवाल प्रकाशन.2011
8. Shulman L. S. (1986) those who understand: knowledge growth in teaching. Educational researcher, 4-14
9. Sinha, S. (2000) Acquiring literacy in schools, seminar, 38-42
10. Sternberg, R.J. (2013). intelligence, competence, and expertise, in A.J. Elliot & C.S. Dweck (Eds), handbook of competence and motivation (pp
11. Tagore, R. (2003) Civilization and progress. in crisis in civilization and other essays. New delhi: rupa&co.
12. Pathak, A (2013) Social implications of schooling: knowledge pedagogy and consciousness. Aakar books

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Paper II

Understanding Inclusive Education

Objectives:

The student teacher will be able to:

- Understand concept, meaning and significance of inclusive education
- Bring about an understanding of the culture, policies and practices that need to be addressed in order to create an inclusive school.
- Appreciate the need for promoting inclusive practice and the roles and responsibilities of the teachers.
- Develop critical understanding of the recommendations of various commissions and committees towards teacher preparation for inclusive education, understand the nature of difficulties encountered by children.
- Prepare teachers for inclusive schools.
- Analyze special education, integrated education, mainstream and inclusive education practices.
- Identify and utilize existing resources for promoting inclusive practice.
- Develop a positive attitude and sense of commitment towards actualizing the right to education of all learners.
- Prepare a conducive teaching learning environment in varied school settings.
- Develop the ability to conduct and supervise action research activities.

COURSE CONTENT

Unit I: Introduction, Issues & perspectives of Inclusive Education

1. Definitions, concept and importance of inclusion and disability.
2. Historical perspectives of inclusive education for children with diverse needs.
3. Difference between special education, integrated education and inclusive education.
4. Advantages of inclusive education for education for all children in the context of right to education.
5. N.C.F 2005 and adaptation of teaching learning material.

Unit II: Policy Perspective

1. Recommendations of the Indian Education Commission (1964-66).
2. Scheme of Integrated Education for Disabled Children
3. National Policy on Education (NPE, 1986-92).
4. National Curriculum Framework, 2005 NCERT
5. The Convention on the Rights of the Child (specific reference to inclusive education).
6. UNESCO Conventions, declaration and recommendations related to Rights of persons with Disabilities.

UNIT III: Diversity in the classroom

1. Diversity- Meaning and definition.
2. Disability – psychological construction of disability identity, discrimination.
3. Models of disabilities & Barriers to learning and participation.
4. Concept, Nature, and Characteristics of Multiple Disabilities, classroom management for inclusive education

UNIT IV: Curriculum, Pedagogy and assessment in Inclusive School

1. Inclusive curriculum- Meaning and characteristics.
2. Teaching and learning environment with special reference to inclusive school
3. Guidelines for adaptation for teaching/ practicing science, mathematics, social studies , languages, physical education, yoga, heritage, arts, theatre, drama etc in inclusive settings.
4. Utilization of records/ case profiles for identification, assessment and intervention for inclusive classrooms.
5. Techniques and methods used for adaptation of infrastructure, content, laboratory skills and play material in inclusive classroom.

Unit V: Teacher Preparation and Inclusive Education

1. Review of existing educational programmes offered in secondary school (general and special education).
2. Skills and competencies of secondary school teachers in inclusive settings.
3. N.C.F 2005 and curriculum for teacher preparation and transaction modes.
4. Roles, responsibilities and professional ethics of an inclusive education teacher and teacher educators.

Practicum/Field Work(Any two from the following)

1. Observe inclusive teaching strategies in an inclusive classroom and report your observations.
2. With the help of teacher educators, conduct an extension/expert lecture on emerging issues on inclusive education and prepare a report on it.
3. To study the educational resources for persons with disability (POD) in local schools and report your observations.
4. Prepare an instructional design for your pedagogy subject basing it on inclusive learners.
5. Find out the facts about inclusive education in existing scenario with reference to our Nation through internet search compile a summarized report.

References

- 1.Maitra,Krishna(2008):INCLUSION ISSUES AND PERSPECTIVES (For Teachers,Teachers' Educators and Parents): Kanishka Publishers, Distributors New Delhi-110002
- 2.Ahuja. A, Jangira, N.K. (2002): Effective Teacher Training; Cooperative Learning Based Approach: National Publishing house 23 Daryaganj, New Delhi 110002.
- 3.Jangira N.K. and Mani, M.N.G. (1990): Integrated Education for Visually Handicapped, Gurgaon, Old Subjimandi, Academic Press.
- 4.Jha. M.(2002) Inclusive Education for All: Schools Without Walls, Heinemann Educational publishers, Multivista Global Ltd, Chennai, 600042, India.
5. Sharma, P.L. (1990) Teachers handbook on IED-Helping children with special needs N. C. E R T Publication.
6. Sharma P.L (2003) Planning Inclusive Education in Small Schools, R .I E. Mysore
- 7.Agnihotri, R.K. (1995). Multilingualism as a classroom resource. In K. Heugh, A Siegruhn, & P. Pluddemann (Eds.) Multilingual education for South Africa 9pp. 3-&). Heinemann Educational Books.
8. T., Ainscow, M., Black-Hawkins, K., Vaughan, M., & Shaw, L. (2000). Index for inclusion: Developing learning and participation in schools. Centre for Studies on Inclusive Education.

9. Carini, P.F. (2001). Valuing the immeasurable. In starting strong: A different look at children, schools, and standards (pp. 165-181). New York: Teachers College Press.
10. Delpit, L.D. (2012) Multiplication is for white people: raising expectations for other people's children, the new press.
11. GOI. (1966). Report of the education commission: Education and national development. New Delhi: ministry of education.
12. GOI (1986). National policy of education. GOI.
13. GOI.(1992 , 1998), National policy on education, 1986 (As modified in 1992). Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/NPE86-mod92.pdf
14. Govinda R. (2011). Who goes to school? Exploring exclusion in Indian education. Oxford University Press.
15. Parekh, B.C. (2000). Rethinking multiculturalism: Cultural diversity and political theory (pp 213-230) Palgrave.
16. UNESCO. (1989) UN convention on the rights of the child. UNESCO.
17. UNESCO. (2006). United Nations convention on the rights of persons with disabilities.
18. UNESCO. (2009) Policy guidelines on inclusion in education UNESCO

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Paper-III& IV
Pedagogy of Mathematics
(Part II)

OBJECTIVES:

Students-teachers will be able to-

- Identify difficulties in learning concepts and generalization, and provide suitable remedial measures.
- Develop ability to teach proof of theorems and develop mathematical skills to solve problems.
- Develop understanding of the strategies for teaching exceptional student in mathematics.
- Develop capacity to evaluate and use instructional materials in mathematics education.
- Develop skills to be a successful mathematics teacher.
- Construct appropriate assessment tools for evaluating mathematics learning.
- Familiarize with the development of curriculum in mathematics.
- Understand and use of learning resources in Mathematics.

COURSE CONTENTS

Unit: 1 Mathematics curriculum at Secondary Level

1. Principles and approaches of curriculum construction.
2. New trends in mathematics curriculum.
3. A critical appraisal of existing mathematics curriculum at secondary stage prescribed by board of secondary education Rajasthan.
4. Enrichment in mathematics teaching for developing creativity.
5. Some highlights of curriculum like vision of school mathematics, main goals of mathematics education, core areas of concerns in school mathematics, curricular choices at different stages of school mathematics education.

Unit: 2 Learning resources in mathematics

1. Recreational Activities
 - a. Mathematics club
 - b. Mathematics Fairs
 - c. Mathematical Games
 - d. Mathematical Quiz
 - e. Mathematical Puzzles
 - f. Mathematical Project
 - g. Mathematical Model
2. Importance and setting up of Mathematics Laboratory.
3. Importance of Support Material: On-line and off-line Resources.
 - a. Text books of Mathematics.
 - b. References Material-Journals, Reference books, Encyclopedia, News Letters and on line resources.
 - c. Using community resources for mathematical teaching e.g. interviewing local persons to know the indigenous knowledge of Mathematics etc.

Unit: 3 Professional Development of Mathematics Teacher

- 1.Importance of in-service programmes for mathematics teacher.
- 2.Role of mathematics teachers' association.
- 3.Development of professional competencies of mathematics teacher.
- 4.Professional ethics of mathematics teacher.

Research in teaching and learning of mathematics.

Practicum/Field Work-Any one of the following-

1. Critical appraisal of existing Mathematics Syllabus of secondary classes as prescribed by State Board.
2. Organise any mathematical Game in the class (VI-X any one) and write your Experiences.
3. Write a reflective Journal on 'Professional Ethics of Mathematics Teacher'.

Reference

- 1.धाकड़, परशुराम त्रिवेदी, शिल्पा (2009) "गणित शिक्षणविधियों"साहित्यागारचोड़ारास्ता, जयपुर
- 2.मंगल, एस.के. (2005) "गणित शिक्षण"आर्यबुकडिपो, नईदिल्ली
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- 6.कुलश्रे ठ, अरुण कुमार (2013) "गणित शिक्षण"आर.लाल.बुकडिपो, मेरठ:-001
- 7- Sarna, C.S gupta,R.Ggary P.K (2003) " textbook of mathematics arya book depot, New Delhi
- 8- Siddiqui,musibulhaseen (2009) "Teaching of mathematics" A.P.H. publishing corporation New Delhi
- 9- Dapur, J.N. (1998), "Suggested Experiments in Arya book depot New Delhi-5

Paper-VI & VII
Pedagogy of Physical Science
(Part II)

Objectives-

Student-teachers will be able to:-

1. Understand the approaches of curriculum construction.
2. Explore new trends in Physical Science curriculum.
3. Explore different ways of creating learning situations for different concepts of Physical science.
4. Facilitate development of scientific attitudes in learners.
5. Select appropriate learning resources and teaching –learning
6. Develop ability to use Physical science concepts for life skills.
7. Develop competencies for teaching, learning of Physical science through different measures.
8. To introduce with Professional development programmes of teachers

COURSE CONTENT

Unit 1: Physical Sciences curriculum

1. Principles and approaches of curriculum construction.
2. New trends in Physics curriculum.
3. A critical appraisal of existing Physical Science curriculum at senior secondary stage prescribed by board of secondary education Rajasthan.
4. Enrichment in Physics teaching for developing scientific creativity.
5. Physics Curriculum- Vision, Main goals of teaching Physics, Core areas of curricular choices at different stages of school in Physics education.

Unit 2: Learning resources and teaching learning material in Physical Sciences

1. Learning resources science club, Science fair, exhibition, projects, quiz, Models, Puzzles, Scrap Book, Field Trips.
2. Developing science kit and Physical science laboratory: Designing Physics laboratory. Planning and organizing field observation; audio-visual materials, multimedia-selection and designing. Use of ICT
3. Physics text books and reference materials- news- letters, Encyclopedia, Reference books and other online resources.

Unit 3: Professional Development of Teachers

1. Professional competencies of subject teacher
2. Professional development programs for teachers; planning, organization & evaluation.
3. Professional Ethics of Physical Science teacher.
4. Reflective & Innovative practices in professional development of teachers.

Practicum/Field Work (Any one of the following)-

1. Preparation of Scrap book containing original Scientific Cartoons/Stories/Latest articles/play etc. useful for physics teaching.
2. Analyse physical science textbooks (Senior secondary Level) in the light of the syllabus and from the perspective of the child.
3. List out few Qualities of good Physics Teacher.

References-

1. Heiss, Oburn and Hoffman: Modern Science, the Macmillan Company, New York 1961.
2. Thurber W. and A. Collette: Teaching Science in Today's Secondary schools, Boston Allyn and Bacon Inc., New York, 1959.
3. Vaidya, N. "The Impact of Science Teaching", Oxford and IBH Publishing Company, New Delhi, 1971.
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Paper-VI & VII
Pedagogy of Chemistry
(Part II)

Objectives-

Student-teachers will be able to:-

1. Understand the approaches of curriculum construction.
2. Explore new trends in Chemistry curriculum.
3. Explore different ways of creating learning situations for different concepts of Chemistry.
4. Facilitate development of scientific attitudes in learners.
5. Select appropriate learning resources and teaching –learning material
6. Develop ability to use Chemistry concepts for life skills.
7. Develop competencies for teaching, learning of Chemistry through different measures.
8. To introduce with Professional development programmes of teachers.

COURSE CONTENT

Unit 1: Chemistry curriculum at secondary and Senior Secondary level

1. Principles and approaches of curriculum construction.
2. New trends in Chemistry curriculum.
3. A critical appraisal of existing Chemistry curriculum at senior secondary stage prescribed by board of secondary education Rajasthan.
4. Enrichment in Chemistry teaching for developing scientific creativity.
5. Chemistry Curriculum- Vision, Main goals of teaching Chemistry, Core areas of curricular choices at different stages of school Chemistry education.

Unit 2: Learning resources and teaching learning material in

1. Learning resources science club, Science fair, exhibition, projects, quiz, Models, Puzzles, Poster Making
2. Developing science kit and chemistry laboratory: Designing Chemistry laboratory. Planning and organizing field observation; audio-visual materials, multimedia-selection and designing. Use of ICT. Using community resources in science. Pooling of learning resources in school complex/ block/district level.
3. Chemistry Text books and reference materials- news- letters, Encyclopedia, Reference books and other online resources.

Unit 3: Professional Development of Teachers

1. Professional competencies of subject teacher
2. Professional development programmes for teachers; planning, organization & evaluation.
3. Professional Ethics of Chemistry teacher.
4. Reflective & Innovative practices in professional development of teachers.

Practicum/Field Work –(Any one of the following)

1. Write a reflective journal on 'Developing Scientific Creativity'
2. Prepare ICT based lesson plan in Chemistry and Execute it.

3. Read any Article /book on Professional Development of teachers and prepare a abstract.

References-

1. Yadav, M.S.1995, Teaching of Chemistry, Anmol Publication, New Delhi.
2. Megi, J.S. & Negi, Rasuita, 2001, Teaching of Chemistry.
3. Yadav, M.S. 2000: Teaching Science at Higher level, Anmol Publications, New Delhi.
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10. Singh, Y.K. & Sharma Archnesh, 2003 : Modern Methods of Teaching Chemistry A.P.H. Publishing corporation, Daryaganj, New Delhi.

Paper-VI & VII
Pedagogy of Biological Science
(Part II)

Objectives: -

Student-teachers will be able to:-

1. Understand the approaches of curriculum construction.
2. Explore new trends in Biological Science curriculum.
3. Explore different ways of creating learning situations for different concepts of biological science.
4. Facilitate development of scientific attitudes in learners.
5. Select appropriate learning resources and teaching –learning material
6. Develop ability to use biological science concepts for life skills.
7. Develop competencies for teaching, learning of biological science through different measures.
8. To introduce with Professional development programmes of teachers.

COURSE CONTENT

Unit 1: Biological Science curriculum

1. Principles and approaches of curriculum construction.
2. New trends in Biological science curriculum.
3. A critical appraisal of existing Biological science curriculum at Seniorsecondary stage prescribed by board of secondary education Rajasthan.
4. Enrichment in Biological science teaching for developing scientific attitude.
5. Biological Science Curriculum- Vision, Main goals of teaching Biological Science, curricular choices at different stages of school Biological Science education.

Unit 2: Learning resources and teaching learning material in Biological Science

1. Learning resources science club, Science fair, exhibition, projects, quiz, Models Puzzles, Poster Making
2. Developing science kit and biological science laboratory; Designing biology laboratory. Planning and organizing field observation; audio-visual materials, multimedia-selection and designing. Use of ICT. Using community resources in science. Pooling of learning resources in school complex/ block/district level.
3. Biological Science Text books and reference materials- news- letters, Encyclopedia, and other online resources.

Unit 3: Professional Development of Teachers

1. Professional competencies of subject teacher
2. Professional development programs for teachers; planning, organization & evaluation.
3. Professional Ethics of Biological Science teacher.
4. Reflective & Innovative practices in professional development of teachers.

Practicum/Field Work (Any one of the following)

1. Being a Biology teacher how you will remove superstitions from the Society. Report your Strategic planning.
2. Plan and Organize a Quiz Competition in a school, on the themes of Biology. Report entire activity
3. Group Discussion on 'Professional Ethics of Biological Science teacher'. Write your conclusions.

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Paper-VI & VII

Pedagogy of General Science

(Part II)

Objectives: -

Student-teachers will be able to:-

1. Understand the approaches of curriculum construction.
2. Explore new trends in General Science curriculum.
3. Explore different ways of creating learning situations for different concepts of General science.
4. Facilitate development of scientific attitudes in learners.
5. Select appropriate learning resources and teaching –learning material
6. Develop ability to use General science concepts for life skills.
7. Develop competencies for teaching, learning of General science through different measures.
8. To introduce with Professional development programmes of teachers.
9. To plan organization and report on various programmes of Professional development of teachers.

COURSE CONTENT

Unit 1: General Science curriculum at secondary level

1. Principles and approaches of curriculum construction.
2. New trends in General science curriculum.
3. A critical appraisal of existing General science curriculum at secondary stage prescribed by board of secondary education Rajasthan.
4. Enrichment in General science teaching for developing scientific creativity.
5. General Science Curriculum- Vision, Main goals of teaching General Science, Core areas of concerns in General science, curricular choices at different stages of school General Science education.

Unit 2: Learning resources and teaching learning material in General Science

1. Learning resources science club, exhibition, projects, quiz, Models Science fair, Puzzles .
2. General science laboratory- Set up and importance
3. General Science Text books and reference materials- news- letters, Encyclopedia, Reference books and other online resources.
4. Identification and use of learning resources in general science exploring alternative sources; Developing science kit and laboratory; Planning and organizing field observation; audio-visual materials, multimedia-selection. Use of ICT. Using community resources in science. Pooling of learning resources in school complex/ block/district level.

Unit 3: Professional Development of Teachers

1. Professional competencies of subject teacher
2. Professional development programmes for teachers; planning, organization & evaluation.
3. Professional Ethics of general Science teacher.
4. Reflective & Innovative practices in professional development of teachers.

Practicum/Field Work-(Any one of the following)

1. Analyse General Science Curriculum of upper primary classes(VI-VIII) and Give your Suggestions keeping in mind the recommendations of NCF 2005.
2. Arrange an activity for the students where they will Face a problem to be solved Creatively like- make paper planes(*Hawaijahaj*) and fly it to maximum Distance, move/ let it fall an empty bottle kept in a shut room(without touching it)etc. Report your Observations and Interesting Findings
3. Organise a group discussion on ‘Reflective & Innovative practices in professional development of teachers’ and summarize your conclusions.

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Paper V

Health and Physical Education

(Part-I)

Objectives:

The student teacher will be able to:

- Help them to understand the concept of holistic health, its various dimensions and determinants and the importance of sports and yoga for development of holistic health.
- Develop positive attitude towards health as individual and be collectively responsible to achieve it.
- Equip them to know their health status, identify health problems and be informed for taking remedial measures.
- Make them aware about rules of safety in hazardous situation (illness, accident and injury) and equip them with first aid measures about common sickness and injuries.
- Encourage them to learn and to form right habits about exercise, games and sports, sleep, rest and relaxation.
- Sensitise, motivate and help them to acquire the skills for physical fitness, learn correct postural habits and activities for its development.
- Create interest for the practice of yogasanas and meditations through which they learn the skills/art of self-control, concentration, peace and relaxation to avoid ill effects of stress, strain and fatigue of routine life.
- Understand various policies and programmes related to health, physical education and yoga.
- Help them to understand the process of assessment of health and physical fitness.
- To enable the students to understand & manage stress and strain.

COURSE CONTENT

Unit-I Health and Body Functioning

1. Concept of health, importance, dimensions and determinants of health; Health needs of children and adolescents, including differently-abled children
2. Understanding of the body system—skeleton, muscular, respiratory, circulatory and digestive in relation to health fitness, bones, muscles and joints, their functions, common injuries of bones, common health problems and diseases—its causes, prevention and cure, immunisation and first aid

Unit-II Food, Nutrition and Diseases

1. Food and nutrition, food habits, timing of food, nutrients and their functions, diversity of Indian food, seasonal foods and festivals, economics of food, preservation of food value during cooking, indigenous and modern ways to preserve food, shift in food practices and its Globalisation, practices related to food hygiene, Dietary requirements of human body with special emphasis on the nutritional needs according to age, sex, occupation, pregnancy and also with reference to sports-personship; Need for diet planning; malnutrition and deficiency diseases with prevention measures.

2. Communicable and Non-communicable diseases; Reproductive and sexual health, hygiene, RTI, STI, HIV/AIDS, responsible sexual behaviour, measures to prevent diseases transmission; Harmful effects of self-medication and patient's rights.
3. Pollution—types, causes, influence of various types of pollution on human health and prevention; Proper sewerage disposal; Construction of compost and soak pit; Anti-mosquito and anti-rodent measures; Water conservation, seed banking, water management and re-cycling
4. Occupational health hazards and its prevention; Commonly-abused substance and drugs and ways of prevention and inhibition

Unit-III Physical fitness safety & Security

1. Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.
2. Safety and security — disasters in and outside schools, ways of prevention, safety from snake and dog bites, animal attacks, prevention and treatment.

Unit-IV Sports & Health And Yoga

1. Fundamentals skills of games and sports; Sports for recreation and competition; Rules and regulations of sports; sports ethics; sports awards and scholarships, sports-personship
2. Games and sports — athletics (general physical fitness exercises), games (lead-up games, relays and major Indian, Western and traditional games) rhythmic activities, gymnastics and their impact on health.
3. Development of physical fitness; Postures; Importance of relaxation; Fitness tests; Resources and services for games and sports
4. *Yogic* practices — importance of *yoga*, *yogasanas*, *kriyas* and *pranayams*
5. Management of stress and strain and life skills.

Unit-V: Role of Institutions

1. Role of institutions (school, family and sports), health services, policies and major health and physical education-related programmes and role of media in promoting sports and health activities.
2. Health and physical Education and its relationship with other subject areas like Science, Social Science and Languages.

Practicum/Field Work (Any five of the following ensuring that one activity from each unit has been covered With Special Emphasis on Yoga)

- (1) Conduct a BMI (Body Mass Index) Test of the class & maintain the record.
- (2) Prepare a chart of the various stages of immunisation for the child & demonstrate it in class.
- (3) Prepare a chart of the common diseases, their causes & cure. Explain it to students.
- (4) Conduct a survey of any institute/organisation and find out the unhygienic places and corners there and also find out the remedial suggestions to make the place tidy.
- (5) Organise a 100 meter sprint session and record it. Afterwards do an analysis in the class of the mistakes committed or promptness shown by the participants.

- (6) Organise a suggestive session among the peers about animal attack experiences (Such as dog, bull, snake, ape etc) and note down how they reacted in the situation and also suggest the best option to depend. Prepare a report of the same.
- (7) Organise a session of Yogasanas&Kriyas& and after the completion of the session, mention how it felt to you.
- (8) Paste some sports related newspaper/magazine cuttings in your file and share the contents in a session organised in the class.
- (9) Write an essay on any favourite game of yours and state how it helped you in keeping mentally & physically fit and what you liked most about the game.
- (11) Generally there are many trends of self-medication by home-prepared prescriptions. List such prescriptions & experiences associated with it prepare a report.
- (12) Prepare a dietary plan for a child of pre-adolescent age with the help of doctor/expert & display it in school & prepare it as a document.
- (13) Visit any industry to find out the health hazards for the workers there.
- (14) Organise a recreational sport in group & share how it was recreational.
- (15) Demonstrate some fitness exercises to students/peers & mention how it helps in developing physique & mental health.

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