

**Bachelor of Arts and Bachelor of Education
Chhindwara University, Chhindwara (M.P)**

COURSE OF STUDIES

For

Four Year Integrated

B.Sc. B.Ed (Eight Semester) Course

FIFTH SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc Part: Foundation Course Entrepreneurship Dev.	40	10	50	3
Elective I +Practical	60+25	15	100	9
Elective II +Practical	60+25	15	100	9
Elective III +Practical	60+25	15	100	9
Total	295	55	350	
B.Ed Part	60	15	75	5
P.C. I: Physical Science				
P.C. II: Bio/Maths	60	15	75	3
Assessment for Learning II	40	10	50	3
Basic in Education	40	10	50	3
Total	200	50	250	
Grand Total	495	105	600	

- Elective 1 – Physics/Botany
- Elective 2 – Chemistry
- Elective 3 – Zoology/Mathematics

(All the elective will have one theory paper and external practical examination except Mathematics where there will be two theory papers and practicum which will be valued internally)

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Semester Name	Paper	Mark	Paper Code	Name of Papers
IV	Paper Theory-IX	30	M-5.1	Real And Complex Analysis
	Paper Theory-XI	30	M-5.2	Abstract Algebra
	Internal Test	15		Related To Above Papers
	Practicum	25		Related to Above Papers

B.Sc. Component:

Foundation Course: Entrepreneurship Development - I

Contact Periods/week: 03

Maximum Marks - 40

Min. Pass Marks - 13

Interval - 10

Unit I : Entrepreneurship

Definition, Characteristics and Importance, Types and functions of an entrepreneur.

Unit II : Motivational factors of entrepreneurship.

(a) Motivation to achieve targets and establishment of ideas. Setting targets and facing challenges. Resolving problems and creativity. Sequenced planning and guiding capacity. Development of self confidence.

(b) Communication skills. Verbal & Non Verbal Communication. Capacity to influence, Modern Techniques of Communication.

Unit III : (a) Project Report- Evaluation of selected process. Detailed project report Preparation of main part of project report pointing out necessary and viability.

(b) Selecting the form of Organisation - Meaning and characteristics of sole Proprietorship, Partnership and cooperative committees, elements affecting selection of a form of an organisation.

(c) Economic management - Role of banks and financial institutions banking financial plans, working capital-evaluation and management, keeping of accounts.

Unit IV : (a) Production management. Methods of purchase of Raw Materials Management of movable assets/goods. Quality management Employee management. Packing.

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- (c) Marketing Management. Sales and the art of selling. Understanding the market and market policy. Consumer management. Time management.

- Unit V:
- (a) Role of Regulatory institutions – District Industry Centre, Pollution Control Board, Food and Drug Administration, special study of Electricity Development and Municipal Corporation.
 - (b) Role of development organizations. Khadi & village Commission/Board, MP Finance Corporation, scheduled banks, MP Women's Economics Development Corporation.
 - (c) Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban environment scheme, Rani Durgavati Self-Employment scheme, Pt. Deendayal Self-employment scheme.
 - (d) Various grant schemes – Cost of Capital grant, interest grant, exemption from entry tax, project report, reimbursement grant, etc.
 - (e) Special incentives for Women Entrepreneurs, prospects & possibilities.
 - (f) Schemes of M.P. Tribal Finance Development Corporation, schemes of M.P. Antyodaya Corporation, schemes of M.P. Backward Class and Minorities Finance Development Corporation.

Elective I – Physics

Paper V: Solid state Physics and Quantum Mechanics

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note- At least one question will be set from each unit. 20% of the maximum marks will form simple numerical problems and another 20% would be for objective questions with a provision to provide reasoning. All Questions will have 100% internal Choice

Objectives

After the completion of this course, the students will be able to:

1. Understand amorphous and crystalline solids and various types of crystal structures.

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2. Derive expressions for packing fractions of simple cubic, body centered cubic and face centered cubic lattices as well as their coordination numbers.
3. Understand the use of X-rays in studying the crystal structures.
4. Understanding various types of bonding in solids as well as calculate the binding energy of ionic crystals.
5. Understand the concept of lattice vibrations, phonons and specific heat of solids.
6. Understand Einstein and Debye's theory of specific heat of solids.
7. Understand electrical phenomena in solids and the role of quantum mechanics to study the electronic transport in metals, semiconductors and superconductors.
8. Explain the concept of photoelectric effect and the Heisenberg Uncertainty Principle
9. Apply Schrodinger's equation for solving problems of harmonic oscillator and hydrogen atom
10. Explain electrical and magnetic properties of crystals.

Unit-1: Crystal Structure and bonding in solids

Amorphous and crystalline solids, concept of crystal lattice, elements of symmetry, unit cells and Bravais lattices, seven crystal systems, cubic lattices, coordination number, packing fraction of sc, bcc and fcc structures, miller indices, simple crystal structures like sodium chloride, calcium chloride and diamond, lauer's equation for X-Ray diffraction, Bragg's law, X-ray diffraction methods, inter atomic forces and types of bonding, cohesive energy of a solid, binding energy of ionic crystals, Madelung constant, vibrational modes of one dimensional mono atomic lattice, dispersion relations, Brillouin zones.

Unit-2: Quantum Theory

Origin of the quantum theory; failure of classical physics to explain the phenomena such as blackbody spectrum; Wein displacement law and Rayleigh-Jeans law; Ritz combination principle in spectra; stability of an atom; Planck's radiation law; photoelectric effect; Einstein's explanation of photoelectric effect, Compton effect, Einstein's Theory of Specific Heats, Debye's modification, Bohr's Theory of Hydrogen Atom, Experimental verification.

Unit-3: Quantum Mechanics

Wave particle duality, de-Broglie's hypothesis for matter waves (relativistic and non relativistic particle); wave packets; group velocity, phase velocity and particle velocity; experimental demonstration of matter waves; Heisenberg's uncertainty principle, its extension to energy and

time and its application. Consequence of de Broglie's hypothesis; quantization in hydrogen atom; ground state energies of a particle in two dimensional box.

Unit-4: Schrödinger's Equation

Wave function of quantum particle, its properties and significance, operators, Schrödinger's equation, postulates of quantum mechanics, expectation values, applications to particle in one and three dimensional boxes, harmonic oscillator, rigid rotator, reflection at a step potential, transmission across a potential barrier; hydrogen atom.

Unit-5: Electrical and Magnetic Properties of Crystals

Schrodinger's equation in a constant potential, Fermi energy, Energy band in solids (atomic Peasey Model-qualitative analysis), distinction between metals, insulators and semiconductors; Dia, Para and Ferromagnetism, Langevin's theory of dia and paramagnetism, Curie-Weiss law, ferromagnetism and magnetic domains, ferromagnetic materials, hysteresis.

Physics Practical List

1. To find the value of e/m for electron by Thomson method.
2. To determine the Planck's constant (h) by measuring radiation in a fixed spectral range.
3. To calibrate constant deviation spectrometer.
4. To find dielectric constant of a glass plate with the help of parallel plate capacitor.
5. To study the effect of temperature on the reverse current in junction diode and hence determine the forbidden energy gap.
6. To determine power factor by joule's calorimeter.
7. To determine the height of a distant object using sextant.
8. To determine Rydberg's constant with the help of diffraction grating and hydrogen discharge tube.
9. To find the wavelength of sodium D1 and D2 line by spectrometer.
10. To determine the charge of an electron by Millikan's oil drop method.
11. To study the absorption spectrum of $KMnO_4$ using diffraction grating.
12. Study of Hysteresis loss using B-H curve.

Suggested Readings:

1. Basic Quantum Mechanics, Ajoy Ghatak
2. Quantum Mechanics, Peebles
3. Quantum Mechanics, Agarwal / Hari Prakash
4. Introduction to Quantum Mechanics, Pauling / Wilson

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5. Quantum Mechanics, Schiff
6. Quantum Mechanics, Powell and Crusemann
7. Quantum Mechanics, Eisberg / Resnick
8. Advanced Quantum Mechanics, J. J. Sakurai,
9. Kittel, C., Introduction to Solid State Physics, John Wiley and Sons, New York
10. Pillai, S.O., Solid State Physics, New Age International, New Delhi.
11. Gupta, S.L. and Kumar, V., Solid State Physics, K. Nath and Co., Meerut.

Elective I – Botany

Paper V: Taxonomy of Angiosperms and Economic Botany

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives :

1. To provide an understanding of origin, evolution and taxonomy of Angiosperms.
2. To familiarize the students, teachers with different types of locally available plants of some families.

Unit I – Flower :

A modified shoot, its structure, development and function, structure of anther and pistil; the male and female gametophytes, types of pollination, attractions and rewards for pollinators; pollen-pistil interaction, self incompatibility, double fertilization; formation of seed, endosperm and embryo; fruit development and maturation. Ecological adaptations of seeds and fruits, dispersal strategies, significance of seed – genetic recombination and its significance.

Angiosperms : Terminology for the description of vegetative parts and their modifications – root, stem, leaf and floral parts, types of fruits, ovules and seeds in semi-technical language.

Unit II - Angiosperm taxonomy : Brief history, aims and fundamental components (E, β & γ) taxonomy keys for identification, Botanical nomenclature-principles and rules; taxonomic hierarchy; type concept; principle of priority.

Unit III - Classification of angiosperms: Salient features of the systems proposed by Bentham and Hooker and Engler and Prantl. Major contributions of cytology, phytochemistry and taxometrics to taxonomy.

Unit IV - Diversity of flowering plants: Study of the following families with representative examples. Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae, Acanthaceae.

Unit V- Diversity of flowering plants: Study of the following families with representative examples. Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae and Poaceae. Note to teachers To save plant diversity, students should be instructed not to pluck plants and flowers while submitting a project for practical examination; instead, a well prepared and illustrated field report should be submitted.

Practicals

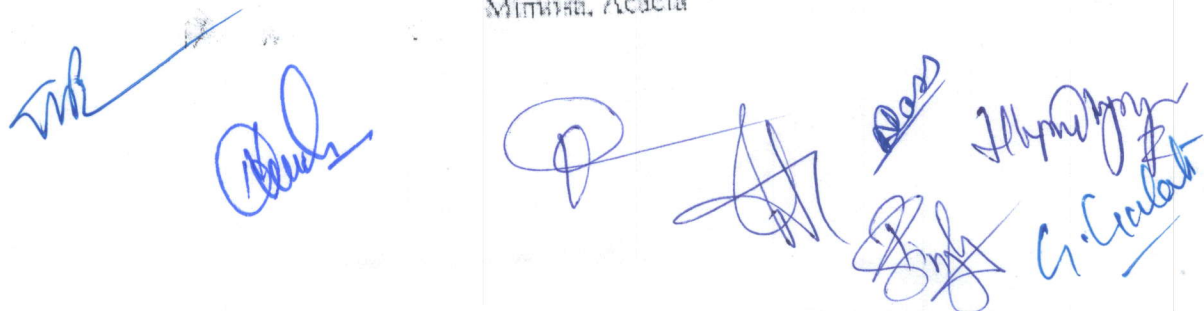
Objectives:

- i) To familiarize the students with technical terms and methods of describing the plant.
- ii) To impart the skills for identification of plant and assigning to its family.
- iii) To provide the field experiences for familiarization of different plants of the families given in the syllabus.

Angiosperms

Classification and description in semi-technical language of at least one plant from each family.

1. Ranunculaceae	:	Ranunculus, Delphinium
2. Brassicaceae	:	Brassica, Alyssum, Iberis, Coronopus
3. Malvaceae	:	Hibiscus, Abutilon
4. Rutaceae	:	Murraya, Citrus
5. Fabaceae : Papilionaceae	:	Lathyrus, Cajanus, Melilotus, Trigonella
Caesalpinioideae	:	Cassia, Caesalpinia Mimosoideae : Prosopis.
		Mimosa, Acacia



6. Apiaceae	:	Coriandrum, Foeniculum, Anethum
7. Acanthaceae	:	Adiantum, Peristrophe
8. Apocynaceae	:	Vincetoxicum, Thevetia, Nerium
9. Asclepiadaceae	:	Calotropis
10. Solanaceae	:	Solanum, Withania, Datun
11. Euphorbiaceae	:	Euphorbia, Phyllanthus
12. Lamiaceae	:	Ocimum, Salvia
13. Chenopodiaceae	:	Chenopodium, Beta
14. Liliaceae	:	Asphodelus, Asparagus
15. Poaceae	:	Avena, Triticum, Hordeum, Poa, Sorghum

Scheme of Practical Examination

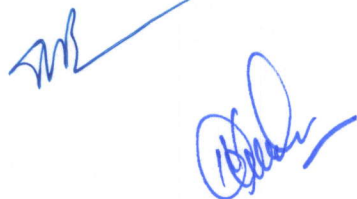
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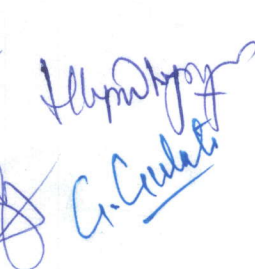
Max. Marks : 25+5=30

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| 1. Description of the given flowering plant in technical language giving floral formula and floral diagram. | 5 |
| 2. Assign the given flowers to their families giving reasons. | 5 |
| 3. Spots (1-5 Nos.) | 5 |
| 4. Field report | 5 |
| 5. Practical record and Sessional | 5 |
| 6. Internal evaluation | 5 |

Suggested Readings

- Gifford, E.M. and Foster, A.S., 1988. Morphology and Evolution of Vascular plants, W.H. Freeman & Co., New York
- Heywood, V.H. and Moore D.M. (eds), 1984. Current concepts in Plant Taxonomy, Academic Press, London
- Jeffrey C., 1982. An Introduction to Plant Taxonomy, Cambridge University Press Cambridge, London
- Singh, G., 1999, Plant Systematic, Theory and Practice, Oxford and IBH Pvt. Ltd., New Delhi
- Jones, S.B. Jr. and Luchsinger, A.E., (1986), Plant systematic McGraw Hill Book Co., New York
- Shukla, P and Misra, S., An Introduction to Taxonomy of Angiosperm, Vikas



Elective II – Chemistry

Paper V

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives : After completing V semester the students should be able to:

- (i) appreciate the role of carbonyl group in determining the chemistry of aldehydes and ketones.
- (ii) acquire the knowledge of methods of preparation and chemical reactions shown by carboxylic acids.
- (iii) appreciate to learn the technique of conversion of carboxylic acids into its useful derivatives.
- (iv) differentiate open chain ethers and cyclic ethers with respect to their chemical reactions.
- (v) Get comprehensive knowledge about the chemistry of nitrogen containing organic compounds and their industrial and domestic applications particularly keeping in focus the preparations of dyes and drugs.
- (vi) gain knowledge about various classes of carbohydrates and appreciate the role of structures in the explanation of various phenomena like mutarotation and determination of ring size.
- (vii) visualize the importance of sugars as bio molecules.
- (viii) learn in detail the chemistry associated with nitrogen based compounds such as amino acids, proteins, peptides, nucleic acids and the biological issues associated with their study.
- (ix) judge and describe the importance of oil, fats, detergents and dyes in daily life.
- (x) prepare some of the dye materials in the laboratory.

Instructional Strategy:

In dealing with the topic of interaction of radiations (uv, visible, IR) with matters (the carbon compounds here) the teachers should encourage the use of constructivist approach by

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promoting open-ended and problem solving techniques in order to enhance the thinking capacity amongst the students.

Visits to some advanced laboratories in the near-by areas should be encouraged to give acquaintance to the students of the use of instrumental techniques in the elucidation of the structures of the organic compounds. The entire descriptive organic chemistry be dealt with in the light of structural parameters

associated with compounds. In transaction of the reaction mechanisms the use of logistic approach and advance organizer model may be made. Seminars and poster sessions may be encouraged to discuss industrial application of organic compounds such as alcohols, phenols, esters, dyes and drugs.

Unit - I: Aldehydes and Ketones

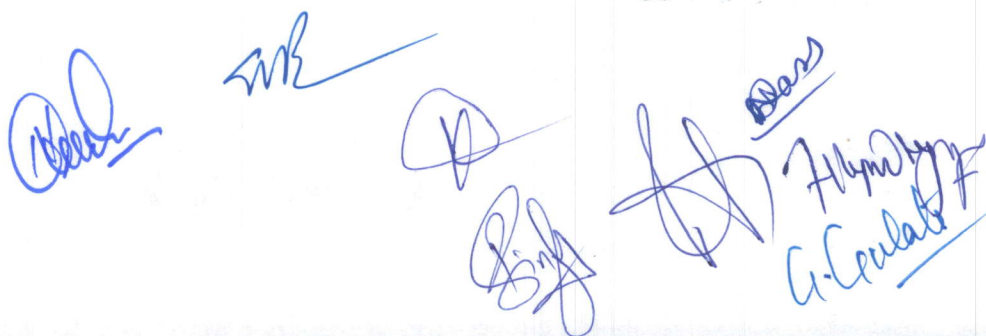
Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketone using 1, 3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophile additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction.

Use of acetals as protecting group. Oxidation of aldehydes. Baeyer-Villiger oxidation of ketones. Cannizzaro reaction. MPV, Clemmensen, Wolff Kishner, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones. An introduction to α, β unsaturated aldehydes and ketones.

Unit - II: Carboxylic Acid & its Derivatives

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acid. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids, hydroxyl acids malic, tartaric and citric acids. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids; methods of formation and effect of heat and dehydrating agents.

Structure and nomenclature of acid chlorides, Esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical Properties, interconversion of acid derivatives by nucleophilic acyl substitution.

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Preparation of carboxylic acid derivatives, chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic)

Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions: cleavage and autoxidation, Ziesel's method. Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

Unit - III: Organic Compounds of Nitrogen

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Halonitroarenes: reactivity, structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel-Phthalimide reaction, Hoffmann bromamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling.

Unit - IV

Carbohydrates: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides.

Cyclic structure of D(+)-glucose. 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. Fats, Oils and Detergents: Natural facts, 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.

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Unit V: 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. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structure of peptide 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.

Synthetic Dyes: Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

Suggested Readings

1. Bahl, Arun and Bahl B.S., A Textbook of organic chemistry, S. Chand & Co. Ltd., New Delhi
2. Finar, I.L., Organic Chemistry, Vol. I, ELBS Ltd.
3. Hart Crane Hart, Organic Chemistry, S. Chand Co Ltd.
4. Morrison, R.T., & Boyd, R.N., Organic Chemistry, PHI Ltd.
5. Chaturwal, G.R., & Anand, S.K., Spectroscopy, IIPH Ltd.
6. Sharma, Y.R., Elementary Organic Spectroscopy, S. Chand Co. Ltd.
7. May, J.Mc., Organic Chemistry, Brooks/Cole

PRACTICAL:

1. Double stage preparation of two organic compounds from the list given below.
 - a. Aniline to acetanilide and then to p-bromo acetanilide.
 - b. Aniline to acetanilide and then to p-nitro acetanilide.
 - c. Benzoic acid to Benzoyl chloride & then to Benzamide.
 - d. Benzoyl chloride to Benzamide and then to benzoic acid.

2. Chromatography

(A) Thin Layer Chromatography Determination of R_f

- a. values and identification of organic compounds. Separation of green leaf pigment - (spinach leaves may be used)
- b. Preparation and separation of 2, 4-dinitrophenyl hydrazones of acetone, butanone, hexan-2 and

3-use using toluene and light petroleum (60:60).

c. Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).

(B) Paper chromatography: Ascending and circular Determination of R_F values and identification of organic compounds.

a. Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid. Leucine and glutamic acid. Spray reagent ninhydrin.

b. Separation of a mixture of D, L-alanine glycine, and L-Leucine using n-butanol: acetic acid: water (4:5:1). Spray reagent-aniline hydrogen phthalate.

3. Qualitative analysis of mixture of organic compounds (Separation technique & analysis, preparing suitable derivatives)

Elective III – Zoology

Paper V: ANIMAL PHYSIOLOGY, BIOCHEMISTRY & IMMUNOLOGY

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives : To study the biomolecules and their functions with reference to different physiological processes in vertebrates and to understand the defence mechanism in humans.

Unit-1.

1. Classification, structure and function of biomolecules. (Carbohydrates, Proteins and Lipids)
2. Carbohydrate metabolism (Glycolysis, Kreb's cycle, ETC).
3. Glycogenesis, glycogenolysis and neoglucogenesis.
4. Lipid metabolism (biosynthesis and breakdown)
5. Enzymes – classification and mechanism of action.

Unit-2.

1. Physiology of digestion and absorption in vertebrates with special emphasis to mammals.
2. Hormonal regulation of digestion.

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3. Physiology of respiration in vertebrates, factors affecting oxygen dissociation, neural control of respiration.

Unit-3.

1. Blood and circulation – components, Blood groups, Rh factor, Blood pressure, ECG, Cardio-cycle and Cardiac output.
2. Osmoregulation.
3. Physiology of excretion in vertebrates with special emphasis to mammals.

Unit-4,

1. Structure and properties of nervous tissue.
2. Conduction of nerve impulse.
3. Types of muscles and their properties.
4. Various theories & physiology of muscle contraction

Unit-5.

1. Immune system in self defence.
2. Innate & adaptive Immunity.
3. Humoral & cell mediated Immunity.
4. Antibody structure & interactions with antigens.
5. Auto Immunity, Vaccination, Allergies, Cancer, Immunodeficiencies.

PRACTICAL

Objective – To develop skills of performing physiological, biochemical and immunological tests to know the actual process of life.

1. Identification of blood groups of human.
2. Preparation of blood film & study of human blood corpuscles.
3. Study of haemin crystal from human blood.
4. Estimation of haemoglobin.
5. Total count of RBC and WBC in human blood.
6. Study of blood pressure by auscultatory method.
7. Study of coagulation time and bleeding time.
8. Qualitative test for identification of carbohydrates, proteins and lipids.
9. Estimation of glucose and glycogen in given sample.
10. Quantitative estimation of protein by Lowry method.
11. Testing activity of salivary amylase (effect of temperature and pH)







12. Study of reflexes (knee jerk, pupil constriction etc)

SCHEME OF PRACTICAL EXAMINATION

1. Qualitative Estimation of Biomolecules	-	05
2. Quantitative Estimation of Protein/ Enzyme-activity	-	08
3. Hematology Experiment	-	03
4. Demonstration of reflexes/ Blood Pressure	-	02
5. Practical Records	-	03
6. Viva-voce	-	04

Referred books -:

1. Biochemistry -Campbell.
2. Biochemistry - Harper
3. Biochemistry - Nelson and Cox
4. Animal Physiology -Eckert and Freemann
5. General and Comparative Physiology - William S. Hoar.
6. Comparative Anatomy - Prosser.
7. Animal Physiology -Chatterjee.
8. Immunology - Kubly.
9. Immunology -Roitt & Roitt.
10. Laboratory techniques - Swaroop, Arora & Pathak.

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 30+10 = 40

Min. Pass Marks – 20

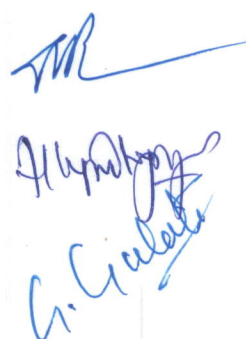
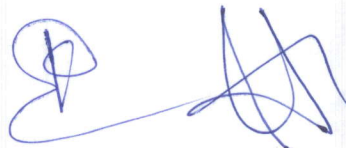
Internal – 15 (Theory 10 & Practicum 5)

Practicum – 25 (Internal)

M - 5.1: REAL AND COMPLEX ANALYSIS

Time : 3 Hrs. Max. Marks : 30

Pass Marks : 10



NOTE : Two questions will be set from each unit with Internal choice

Objectives : To acquaint students with rigorous treatment of elementary Real and Complex variables.

- Unit - I Riemann integral. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus.
- Unit - II Improper integrals and their convergence, comparison tests; Abel's and Dirichlet's tests.
Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.
Series of arbitrary terms. Convergence, divergence and Oscillation.
- Unit - III Partial derivation and differentiability of real-valued functions of two variables. Schwartz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piecewise monotonic functions.
- Unit - IV Complex numbers as ordered pairs. Geometric representation of complex numbers. Stereographic projection.
Continuity and differentiability of complex functions. Analytic functions. Cauchy-Riemann equations. Harmonic functions.
- Unit - V Elementary functions. Mapping by elementary functions. Mobius transformations. Fixed points. Cross ratio. Inverse points and critical mappings.

Content as int

1. R.R. Goldberg, Methods of Real Analysis
2. S.C. Mallic, Mathematical Analysis
3. T.M Apostol, Calculus (vol I), Introduction to Real Analysis, John Wiley and sons
4. James Ward Brown and Ruel V Churchill, Complex Variable And Applications, McGraw Hills

M - 5-2 ABSTRACT ALGEBRA

Time : 3 Hrs. Max. Marks : 40

Pass Marks : 10

NOTE : Two questions will be set from each unit with Internal choice

Objectives : To acquaint with rigorous treatment of Abstract algebra

Unit - I Group-Automorphism, inner automorphism. Automorphism groups and their computations. Conjugacy relation. Normaliser. Counting principle and the class equation of a finite group.

Center for Group of prime-order.

Unit - II Abelianizing of a group and its universal property. Sylow's theorems. P-Sylow subgroup. Structure theorem for finite Abelian groups.

Unit - III Ring theory - Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an integral Domain.

Unit - IV Euclidean Rings; Polynomial Rings. Polynomials over the Rational Field

Unit - V Eisenstein Criterion, Polynomial Rings over commutative Rings. Unique factorization domain.

Principal ideal domain and Euclidean Domain

Content as in:

1. N. Herstein - Topics in Algebra Wiley Eastern

M - 5.3 Mathematics Practicum

Max. Marks : 25

Pass Marks : 10

List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester V Mathematics papers M-5.1 and M-5.2.
- Mathematics seminar.

Education Component:

PC - 1. Physical Sciences - I

Contact Periods/week: 05

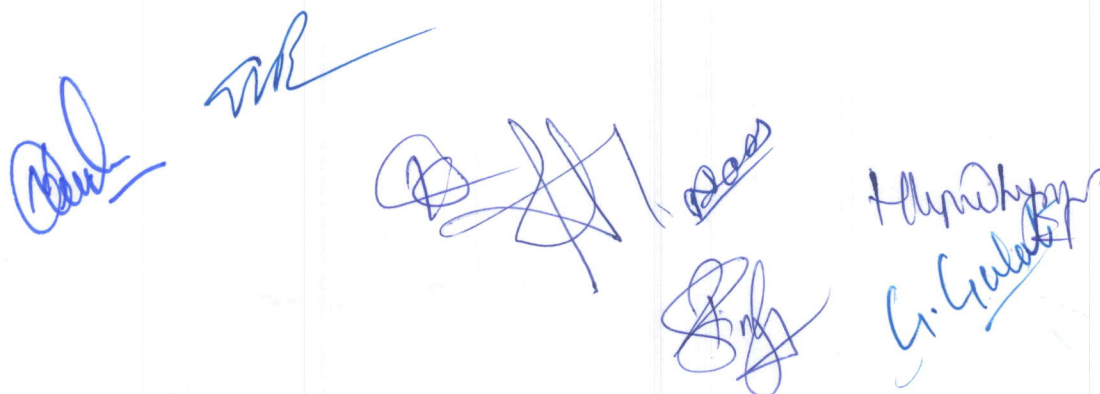
Maximum Marks - 60

Min. Pass Marks - 20

Internal - 15

Course objectives:

The student teacher will be able to develop the following competencies through the course.



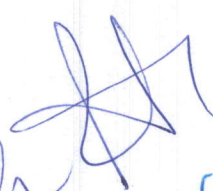
1. Gains an understanding of the nature of knowledge and its validity in physical sciences.
2. Reviews the contributions of physical scientists to the knowledge domain of physical science.
3. Integrates the knowledge in physical science with the other school subjects.
4. Traces the changing trends in learning of physical science with respect to its goals and approaches to learning.
5. Analyses the physical content with respect to its categorization, process skills, knowledge organization and other critical issues.
6. Develop concept maps representing units, themes interrelatedness among concepts.
7. Develop task-oriented objectives based on the content themes/units.
8. Views learner as a constructor of knowledge.
9. Identifies the physical concepts that are alternatively conceptualized by teachers and students in general.
10. Examine the content to seek an understanding that different themes require differential treatment.
11. Explores the different ways of creating learning situations in learning of physical concepts.
12. Formulates meaningful inquiry episodes, problem solving situations, investigatory projects based on secondary school content in physical sciences.
13. Examines the different pedagogical issues in the content of learning physical sciences.
14. Develop the aptitude of apt-decision making ability.

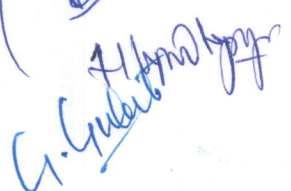
Course Content

Unit: I: The nature and scope of science

- Nature of science and place of physical sciences in it.
- Facts, concepts, theories and generalization into laws.
- Mutual interdependence between theories and experimental work.
- Historical evolution of major physical concepts and theories.
- Contribution of some Indian and International physical scientists to the knowledge domain of science with special reference to the methods of discovery / investigation adopted.
- The place of physical sciences in the school science curriculum.
- Integration of knowledge in physical sciences with the other school subjects.





- Professions/prospects in the area of physical sciences in contemporary world.

Unit: 2 Facilitating-learning situations in physical sciences.

- Objectives of learning physical science in the light of NCF, 2005 specially laying emphasis on behaviourism versus constructivism.
- Training in process skills (observation, classification, interpretation, control of variables, measuring, hypothesizing, experimenting, inferring, predicting and communicating).
- Meta-cognitive thinking in learning of physical science
- Implication of development processes in science learning based on Piaget, Bruner, Ausubel, Driver, Novak and some other constructivists in facilitating learning situation in physical science

Unit: 3 Knowledge conceptions in physical sciences

- Process of concept formation
- Identification of alternative conceptualization (misconceptions) of students and teachers in few related topics of physical science and remedial intervention in teaching.
- Content analysis of selected units and suitable pedagogy for their teaching
- Concept mapping in teaching units at secondary stage science curriculum.
- Writing task-oriented objectives.

Unit: 4 Approaches to constructing knowledge in physical science

- Approaches to concept learning, reflection on conceptual framework about certain physical concept.
- Lecture and demonstration methods making them interesting using different techniques including inquiry, problem solving strategies, investigatory approach; guided discovery approach; inductive and deductive approach, learning through project work.
- Self learning strategies.
- Cooperative and collaborative learning; group investigation and group discussion
- Role of un and semi structured experimental work in learning physical science.
- Use of analogies in evolving the meaning of a physical science concept.

Unit: 5 Use of ICT in classroom processes in physical sciences

As learning through

- Project making / power point presentation / innovative techniques and interactive media
- Online learning and internet

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Books recommended:

- Mohapatra, J.K. & Mohapatra, M., New Dimensions of science Curriculum, Ajay Verma Commonwealth Publishers (1999).
- Thomas, R.M. & Kobayashi, V.: Educational Technology-its creation, development & cross cultural transfer, Pergamon Books Ltd. (1987).
- Nedulsky, L., Science Teaching & Testing, Harcourt, Brace & World Inc. (1965).
- Das, G.L., The Teaching Of Science, Oxford University Press (1963).
- Vaidya, N., Science Teaching For The 21st Century, Deep & Deep Publication New-Delhi.
- Gupta, S.K., Teaching Physical Sciences in Secondary Schools, Sterling Publishers Pvt. Ltd. (1989).
- Singh, U.K. & Nayak, A.K., Science Education, Commonwealth Publishers (1997).
- Joyce, B. & Weil M., Models of Teaching, Allyn and Bacon Needham Heights Mass (1986).
- Anderson, H.O., Readings in Science Education for the Secondary School, The Macmillan Company (1969).
- Sharma, R.C., Modern Science Teaching, Dharmpat Rai & Sons (2000).
- Saxena, A.B., Understanding Learning Physics.
- Saxena, A.B. & Jadhav, V.G., M.P. Hindi Granth Academy.
- Madhukar, I., Internet based Distance learning, Author Press, India (20

PC - 2. Biological Sciences - 1

Contact Periods/week: 05

Maximum Marks - 60

Min. Pass Marks - 20

Internal -

Objectives: The pupil teachers will be able to:-

1. Gain the knowledge and understanding of nature and scope of Biological Science.
2. Review the contributions of Biologists
3. Integrate the knowledge in Bio Science with other school subjects
4. Analyse the biological content with respect to the categories, process skills, knowledge organization and other critical issues with the changing trends in learning of Biology
5. Develop concept maps and process-oriented objectives based on the content themes/units

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6. Identify the biological concepts that are alternatively conceptualized by teachers and learners in general.
7. Design lesson in Biology based on learning experience of various methods Models of teaching.
8. View learner as constructor of knowledge
9. Explore the different ways of creating learning situations in Biology
10. Formulate meaningful inquiry episode, problem solving situations, investigatory project based on secondary school Biology
11. Examine the different pedagogical issues in the learning biology
12. Know the importance and functions of computer programming and internet services in spreading of Biological information.

Unit I: Nature and Scope of Biological Science

- Nature of Science with particular reference to Biological Science.
- Relation of Biological Science with other disciplines
- History of development of Biological concepts and theories based on secondary syllabus
- Biological Science as a structure of organization and experiences.
- Thrust areas in Bio Science and their impact on modern community
- Landmark discoveries in Biological Science.
- Contributions of Indian and International Biologists
- Professional avenues in Biological Science

Unit II: Curricular reforms and Changing trends in learning Biological Science

- Objectives of learning Biological Science
- Development of process skills-observation, classification, experimenting, hypothesizing, inferring, predicting and communicating.
- Construction of concepts of Biology
- Learning as constructing of knowledge (with concrete examples from biology)

Unit III Concept analysis in Biology text books

- Analysis of text book (at major concepts level) suggestion of suitable strategies for classroom transactions with reference to CBSE and State Boards syllabi of IX and X class
- Content mapping in teaching learning process

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- Skills related to diagram drawing

Unit IV: Approaches to constructing knowledge in biological science

- Approaches to concept learning, conceptual change model (reconstructing ideas about certain biological concepts)
- Different types of methods; Lecture, demonstration problem solving strategies inquiry, investigatory approach, guided discovery approach, inductive & deductive approach, learning through projects.
- Cooperative and collaborative learning; group investigation
- Self learning strategies
- Multi Media with interactive learning approach
- Use of analogies in evolving the meaning of a biological concept

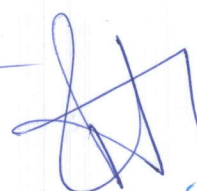
Unit V: ICT in classroom processes in Biological Science

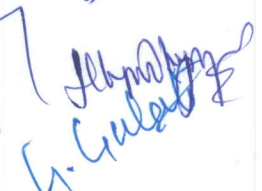
- ICT Material and its use in teaching and learning of Biological Science
- Learning through power point presentation and interactive media
- Use of internet and on line learning

Books suggested:

1. Das, R. C (1985): Science Teaching in Schools, Sterling Publication Innovations in Teacher Education Science Teacher Education Project (STEP) McGraw Hills, New York.
2. Kulshrestha: Teaching Biology (Hindi version) International Publishing House, Meerut, 1978.
3. Mangal S.K.: Teaching of Physical and Life Sciences, Arya Book Dep., New Delhi
4. Mason M and Ruth P Peters: Teacher Guide for Life Sciences, published by Dr. Van Nostrand Company, Inc., New York.
5. National Curriculum Frame Work, 2005, NCERT, New Delhi.
6. NCERT (2006): Science text book for Classes IX, New Delhi.
7. NCERT (2007): Science text book for Classes X, New Delhi.
8. NCERT: Environmental Education: Process for pre-service Teacher Training Curriculum Development, UNESCO-UNDP International Series 26 prepared by NCERT, New Delhi.





- Understand and appreciate the uses and significance of mathematics in life
- Learn successfully, various approaches of teaching mathematics and to use them judiciously.
- Know the methods of planning Instruction for the classroom
- Construct test items in mathematics.
- Appreciate and organize activities to develop aesthetic sense of mathematics.
- Obtain feed back both about teaching as well as students learning
- Use the tools of ICT for effective transaction of Mathematics Teaching.

Unit - 1 Nature of Mathematics

- The growth and development of mathematics.
- The abstract nature of mathematics
- The significance of mathematics
- The two kinds of mathematicians viz., Pure and Applied.
- The views and thoughts of mathematicians about the nature, scope and significance of mathematics.
- The inevitable role of mathematics in school curriculum
- Historical evolution of certain mathematical concepts.

Unit - 2 The Structure of Mathematics.

- Axiomatic systems and their classical examples from geometry and algebra
- Undefined terms in mathematics
- Definitions in mathematics and defining properties (conditions) in a definition.
- Types of proofs in mathematics: Direct proof and Proof by contradictions. Disproof in mathematics by counter examples.
- Mathematical generalization, Mathematical conjectures and proof by mathematical induction.
- Distinction between proof and verification
- Paradoxes and Fallacies

Unit 3: Approaches to constructing knowledge in Mathematics.

- Intuitive learning
- Learning by guided discovery strategies
- Learning by expository strategies
- Learning by searching patterns
- Conjecture making
- Learning mathematics collaboratively in groups
- Self learning strategies

Unit 4: Pertinent Pedagogical Issues

- Analysis of Mathematical content of school textbooks
- Learning of Mathematics by gifted children
- Learning of Mathematics by slow learners



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- Mathematical modelling as a unifying theme
- Venn diagrams as a tool for teaching-learning of mathematics

Unit 5: ICT in Mathematics Teaching

- Windows Fundamentals: Creating, editing and managing files and folders, Windows explorer, My Computer, Opening and exploring external disc/ floppy, CD writing and editing.
- Use of the Mathematical software such as M3, Equation editor, Math type, Math...

Suggested readings

1. Mosley L.H. and Bosely D.M.: Managing M3, Office
2. Towney, D.A.: Learning through Computer
3. C. Shes T and John S.: Learning and Teaching with Computer
4. Roy, G.: Computer Applications
5. What is Mathematics? An elementary approach in ideas and methods.
6. Richard Courant & Herbert Robbins Oxford University Press
7. The Art of Mathematics - Jerry P. King - Plenum Press
8. Techniques of Problem Solving - Steven G. Kravt, University Press
9. Culture, Excitement and Relevance of Mathematics - V. Krishnamurthy, Wiley Eastern Limited.
10. Instructional manual for Math type.
11. Instructional manual for Mathlab.

Assessment for Learning - II

Contact Period/week: 03

Maximum Marks - 40

Min. Pass Marks - 13

Internal - 1

Objectives

- Develop assessment tasks and tools to assess learners' performance
- Analyse, manage and interpret assessment data
- Analyse the reporting procedures of learners' performance in schools
- Develop indicators to assess learners' performance on different types of tasks
- Examine the issues and concerns of assessment and evaluation practices in schools

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- Understand the policy perspectives on examinations and evaluation and their implementation practices
- Trace the technology based assessment practices and other trends at the international level

UNIT I: Tools and Techniques of Assessment

- Meaning and Difference between tools and techniques
- Project work
- Field Trips and Field Trips
- Laboratory work
- Journal Writing
- Concept Mapping
- Written and Interview /Oral Test

UNIT II: Planning & Construction of assessment tool

- Consideration of what and why to assess (content and objectives)
- Differentiation between instructional, learning and assessment objectives
- Stating of Assessment Objectives
- Preparation of a blueprint
 - Weightage to content, objectives, difficulty level, types of questions, allocation of time
 - Assembling the test items
- Guidelines for administration
- Scoring procedure – manual and electronic
- Development of Rubrics

UNIT III: Implementation and Reporting of assessment

- Reporting Students Performance – content and formats; Progress reports, Cumulative records, Profiles, and Open house
- Analysis and Interpretation of Students' Performance
 - Processing test performance
 - Calculation of percentile and percentile rank
 - Interpreting performance
- Feedback
 - Role of Feedback in Improving Learning and Learners' Development

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- o Ascertaining student needs, identifying student interests and feeding forward for improving learning
- o Using feedback for reporting to different stakeholders – students, parents, and administrators
- o Use of Feedback for teachers' self-improvement

UNIT IV: Issues and Concerns in Assessment and Evaluation

- Examination Stress, Anxiety and unwanted Consequences
- Malpractices
- Need for Examination Reforms:
- Recommendation of different commission: University Education Commission, Secondary Education Commission, Education Commissions; Recommendation of NCERT 2005

Sessional Work

- Analyse answers given by the learners for one particular question
- Select any ten questions from the Class VI-XII textbook of the subject of your choice which
- Lend scope to the creativity of the learners
- Study the key points of the 1st Term assessment of any student of Class VI-XII
- Devise a strategy to incorporate the suggestions given in the 1st CCE report for the
- Presentation of papers on issues and concerns / trends in assessment and evaluation
- Presentation of papers on examination and evaluation policies
- One sessional test

Suggested readings:

- Bransford, J., Brown, A.L., & Cocking, R.R. (Eds.). (2000). How people learn: Brain, mind, experience, and school, Washington, DC: National Academy Press.
- Burke, K. (2005). How to assess authentic learning (4thEd.). Thousand Oaks, CA: Corwin.
- Burke, K., Fogarty, R., & Belgard, S (2002). The portfolio connection: Student work linked to standards (2ndEd.) Thousand Oaks, CA: Corwin.
- Carr, J.F., & Harris, D.E. (2001). Succeeding with standards: Linking curriculum, assessment, and action planning. Alexandria, VA: Association for Supervision and Curriculum Development.

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- Danielson, C. (2002). Enhancing student achievement: A framework for school improvement. Alexandria, VA: Association for Supervision and Curriculum Development.
- Gentile, J.R. & Lahey, J.P. (2003). Standards and mastery learning: Aligning teaching and assessment so all children can learn. Thousand Oaks, CA: Corwin.
- Gunkley, T.R., & Bailey, J.M. (2001). Developing grading and reporting systems for student learning. Thousand Oaks, CA: Corwin.
- Natarajan V. and Kalahreshna SP (1983) Assessing non-Scholastic Aspects-Learners Behaviour, New Delhi: Association of Indian Universities.
- NCERT (1985). Curriculum and Evaluation, New Delhi: NCERT
- Newman, F.M. (1996). Authentic achievement: Restructuring schools for intellectual quality. San Francisco, CA: Jossey-Bass.
- Nitko, A.J. (2001). Educational assessment of students (3rd ed.). Upper Saddle River, NJ: Prentice Hall.
- Norris N. (1990) Understanding Educational Evaluation, Kogan Page Ltd.
- Singh H.S. (1974) Modern Educational Testing. New Delhi: Sterling Publication
- Ward & Ward (2007) Assessment in classrooms.

Basics in Education

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

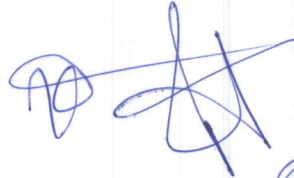
Internal – 10

Objectives: The course intends to make the learners:

- To understand nature and meaning of education
- To understand determinants of education
- To understand and identify different ways of knowing and forms of knowledge
- To appreciate and establish relationship between different facets of knowledge
- To develop a critical understanding about the nature of school knowledge
- To distinguish and there by establish linkages between school knowledge and local knowledge
- To appreciate normative character of education and teaching
- To establish connections between textual knowledge with contextual knowledge

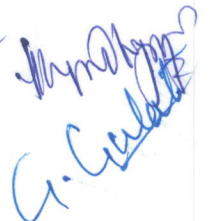












- To understand and appreciate how different educational thinkers at different historical junctures conceived and conceptualized education

Unit I: Education: Conceptual Framework

- Education: Concept, Meaning, Nature, and Modes/Agencies of Education
- Modes of Education: Formal, Non-formal and informal modes
- Education as Normative Act: Aims of Education-Socio-cultural, politico-economic and historical analysis
- Determinants of Purpose and Process of Education: Community, Religion, State and Market

Unit II: Understanding Knowledge

- Knowledge: Meaning, Nature, and Sources
- Knowing: Meaning, Nature, and Ways
- Different facets of Knowledge and their Relationship: Particular/Local-Universal, Concrete-Abstract; Practical-Theoretical
- Manifestation of Knowledge: Local, Contextual, Textual, and Institutional
- Information, content, Knowledge and Wisdom School Knowledge
- School: Meaning and Nature
- Functions of School: Cognitive, Socio-cultural, Politico-economic and Normative.
- A critical understanding of:
 - * Institutionalization of knowledge
 - * Disciplinary knowledge
 - * Authoritative knowledge
- Knowledge in text-book: Nature and Limitations

Unit III: Trends in Education Theory and Practice: Indian

- Basic Education (M.K. Gandhi)
- Integral Education (Sri Aurobindo Ghosh)
- Liberationist Pedagogy (Rabindranath Tagore)
- Man Making Education (Sri Vivekananda)

Unit IV: Trends in Education Theory and Practice: Western

- Idealist Notion of Education (Plato)
- Naturalistic Concept Education (Rousseau)
- Humanization of Education (Pestalozzi)

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- Lecture-rum discussion
- Observational studies
- Analysis of textual knowledge
- Critical/Reflective study of contemporary aims of education, and their determinants.
- Local knowledge and school knowledge: A critical understanding of relationship (Practicum)
- Observational and critical study on how text-book determines every activity of teacher and learner and teaching and evaluation in school. (A critique on text-book culture in school)

1. Agrawal, A (1995), 'Dismantling the Divide Between Indigenous and Scientific Knowledge' *Development and Change*, 26:413-39
2. Ant Weiner, C. (1998). 'Low Knowledge and Local Knowing: An Anthropological Analysis of Contested "Cultural Products" in the Context of Development. *Anthropos*, 93:46-94.
3. Berger, P. and T. Luckmann (1966). *The Social Construction of Reality. A Treatise in Sociology of Knowledge*. Penguin Books, London.
4. Bernstein(1971), 'On Classification and Framing of Educational Knowledge', in *Class, codes and control, volume 3: Towards a Theory of Educational Transmission*. Second edition (1977) edited by M.F.D. Young.
5. Butchvarov, P. (1970), *The Concept of Knowledge*. Evanston, Illinois: North Western University Press.
6. Chomsky, N (1986), *Knowledge of Language*, Praeger, New York.
7. Datta, D.M. (1972). *Six ways of Knowing*. Calcutta University Press, Calcutta
8. Dewey, John () *Experience and Education*.
9. Keddie, N. (1971) : *Classroom Knowledge*, in. M.F.D Young.
10. Krishna Murthy, J. (1947) *On Education*, Orient Longman, New Delhi.
11. Kumar Krishna (1991) *Political Agenda of Education* Sage Publication, India Pvt. Ltd New Delhi.








12. Kumar Krishna (1988), 'Origin of India's Textbook Culture', *Comparative Education*, 32(4): 452-
13. Kumar Krishna (1996), 'Agriculture, Modernization and Education: The contours of a point of Departure', *Economic and political weekly*, 31 (35-37) 2367-373
14. Kumar Krishna (1996), *Learning From Conflict*, Orient Longman, New Delhi.
15. Maiti, R.S. (1964), *Educational Ideas and Ideals of Gandhi and Tagore*, New Book Society, New Delhi.
16. Manoj Das (1999), *Sri Aurobindo on Education*, National Council for Teacher Education, New Delhi.
17. Margaret (1999), *The Open Classroom: A Journey Through Education*, Orient Longman, New Delhi.
18. Phillips, D.C. (Ed)(2000), *On Behalf of The National Society for the Study of education (NSSE), Constructivism in Education. Opinions and Second Opinion on Controversial Issues. Part - I*, The University of Chicago Press, Chicago.
19. Peters, R.S. (1967), *The Concept of Education*, Routledge, U.K.
20. Premia Clarke (2001), *Teaching & Learning: The Culture of pedagogy*, Sage Publication, New Delhi.
21. Steven H. Cahn (1970) *The Philosophical Foundation of Education*, Harper & Row Publishers, New York.
22. Sykes, Marjorie (1988) : *The Story of Nis Talim, Naitalan Samiti: Wardha.*



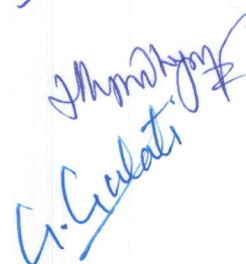











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