

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

SECOND YEAR



2018-19

**JAI NARAIN VYAS UNIVERSITY
JODHPUR**

BOTANY
B.Sc. II Year - 2019

Course/ Theory	Nomenclature	Number of Papers	Number of Periods per week	Max. Marks		Total Marks	Min. Pass Marks
				Internal	External		
Paper I	Palaeobotany, Pteridophytes and Gymnosperms	1	2	10	40	50	54
Paper II	Taxonomy and Embryology of Angiosperms	1	2	10	40	50	
Paper III	Anatomy of Angiosperms, Economic Botany and Ethnobotany	1	2	10	40	50	
PRACTICAL COURSE			6	15	60	75	27

Duration of examination of each theory papers 3 hours
Duration of examination of practicals (for three papers on same day) 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
PALAEOBOTANY, PTERIDOPHYTES AND GYMNOSPERMS

Unit I: Geological time scale, Fossilization. General characters and classification and Pteridophytes. Important characteristics of Psilopsida, Lycopsidea, Sphenopsida and Pteropsida. Stellar systems in Pteridophyta. Structure and reproduction in *Rhynia*.

Unit II: Occurrence, structure and life history of *Lycopodium*, *Selaginella* and *Equisetum*.

Unit III: Occurrence, structure and life history of *Adiantum*, *Marsilea* and *Azolla*. Heterospory in Pteridophyta.

Unit IV: Characteristics of seed plants, evolution of the seed habit. General features of gymnosperms and their classification; evolution, diversity and economic importance of Gymnosperms. *Cycas*: Morphology of vegetative and reproductive parts, anatomy of root, stem and leaf; Reproduction and life cycle.

Unit V: *Pinus* and *Ephedra*: Morphology of vegetative and reproductive parts, anatomy of root, stem and leaf, reproduction and life cycle.

Suggested Laboratory Exercises

Palaeobotany: Microscopic examination of slides of *Rhynia*.

Pteridophytes: Study of external morphology of *Lycopodium*, *Selaginella*, *Equisetm*, *Adiantum*, *Marsilea* and *Azolla*. Microscopic study of temporary double stained preparations of stem/rhizome of *Lycopodium*, *Selaginella*, *Equisetum* and *Marsilea*. Study of temporary single stained microscopic preparations of cone of *Selaginella* and T.S. of Sporophyll of *Adiantum* and sections of sporocarp of *Marsilea*.

Gymnosperms: Study of external morphology of plant parts of *Cycas*: young and old foliage leaf, scale leaf, bulbils, male cone, microsporophyll, megasporophyll and mature seed (if material is not available show photographs). Microscopic temporary double stained preparations of rachis and leaflet of *Cycas*. Study of T.S. of normal and coralloid root by permanent slides.

Study of external morphology of plant parts of *Pinus*: long and dwarf shoot, male cone; female cone; winged seeds. Microscopic temporary preparation of pollen grains (W.M.) of *Pinus*. Study through permanent slides T.S. stem: young and old; male/female cone of *Pinus*.

Study of habit and structure of whole male and female cone of *Ephedra*. Microscopic preparation of male and female flowers of *Ephedra*.

Suggested Readings

Bold, H.C., Alexopolous, C.J. and Delevoryas, T. Morphology of plant and fungi (4th ed.), Harper and Foul, Co., New York, 1980.

Gifford, E.M. and Foster, A.S. Morphology and Evolution of Vascular Plants, W.H. Freeman and Company, New York, 1988.

Pandey, S.N., Mishra, S.P., Trivedi, P.S. A Text Book of Botany Vol. II, VikasPub.House Pvt. Ltd., New Delhi 2000.

Raven, P.H. Evert, R.F. and Eichhom, S.C. Biology of plants, (5th ed.), W.H. Reema and Co., Worth Publication, New York, U.S.A., 1999.

Sharma, O.P. Pteridophytes, Today and tomorrow Publication, 2000.

Sporne, K.R. The Morphology of Gymnosperms, B.I. Publ. Pvt., Bombay, Calcutta, Delhi, 1991.
Vashista, P.C. Gymnosperm, S. Chand & Co. Ltd., New Delhi, 2016.
Vashista, P.C. Pteridophyta, S. Chand & Co. Ltd., New Delhi, 2016.
Wilson, N.S. and Rothewall, G.W. Palaeobotany and evolution of Plants, (2nd ed.), Cambridge University Press, U.K., 1993.

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PAPER -II

TAXONOMY AND EMBRYOLOGY OF ANGIOSPERMS

Unit I: Diversity in plant form in annuals, biennials and perennials, Canopy architecture in angiosperms: tree-origin, development, arrangement and diversity in size and shape, Flower-modified shoot, structure and development of flower, Inflorescence-types of Inflorescence.

Unit II: Angiosperms: Origin and evolution. Some examples of primitive angiosperms. Angiosperm taxonomy; (Alpha-taxonomy, Omega-taxonomy, holotaxonomy) Taxonomic literature. Botanical nomenclature; principles and rules; taxonomic ranks, type concept, principle of priority. Classification of angiosperms; salient features of the systems proposed by Bentham and Hooker and Engler and Prantl.

Unit III: Major contributions of cytology and molecular biology, phytochemistry and taxometrics to taxonomy. Diversity of flowering plants as illustrated by members of the families Ranunculaceae, Papaveraceae, Caryophyllaceae, Capparidaceae, Cucurbitaceae, Rutaceae and Apiaceae.

Unit IV: Diversity of flowering plants as illustrated by members of the families Asteraceae, Acanthaceae, Apocynaceae, Asclepiadaceae, Scrophulariaceae, Lamiaceae, Euphorbiaceae, Musaceae and Poaceae.

Unit V: Embryology: Structure of anther and pistil. Development of the male and female gametophytes; pollen-pistil interactions, self incompatibility; Double fertilization; Development of endosperm and embryo; Brief account of experimental embryology. Basics of gene imprinting.

Suggested Laboratory Exercises

Field study of diversities found in leaf shapes, size, thickness and surface properties.

The following families are for detailed taxonomic studies:

1. Ranunculaceae: *Ranunculus*, *Delphinium*
2. Papaveraceae: *Papaver*, *Argemone*
3. Caryophyllaceae: *Dianthus*, *Gypsophylla*, *Saponaria*
4. Capparidaceae: *Capparis*, *Cleome*
5. Rutaceae: *Murraya*, *Citrus*
6. Apiaceae: *Coriandrum*, *Foeniculum*, *Anethum*
7. Cucurbitaceae: *Luffa* or any Cucurbit
8. Asteraceae: *Helianthus*, *Calandula*, *Sonchus*
9. Acanthaceae: *Adhatoda*, *Barleria*
10. Apocynaceae: *Catharanthus*, *Thevetia*, *Nerium*
11. Asclepiadaceae: *Calotropis*
12. Scrophulariaceae: *Linaria*, *Antirrhinum*
13. Euphorbiaceae: *Euphorbia*, *Phyllanthus*
14. Lamiaceae: *Ocimum*, *Salvia*
15. Musaceae: *Musa*
16. Poaceae: *Avena*, *Triticum*, *Hordeum*, *Poa*, *Sorghum*

Suggested Readings

Bhandari, M.M. Flora of Indian Desert 1990.

Bhojwani, S.S. and Bhatnagar, S.P. The Embryology of Angiosperms, 4th Revised and enlarged edition, Vikas Publ., New Delhi, 2016.

Davis, P.H. and Heywood, V.H. Principles of Angiosperm Taxonomy, Oliver and Boyd, London, 1963.

Fegerig K. and Vender PifiThe Principles of Pollination Ecology, Pergamon Press, 1979.
Gifford, E.M. and Foster, A.S. Morphology and Evolution of Vascular Plants, W.H. Freemad and Company, New York, 1979.
Heywood, V.H. and Moore, D.M. (eds.) Morphology and Evolution of Vascular Plants, W.H. Freeman and Company, New York, 1984.
Jeffrey, C. An Introduction to Plant Taxonomy, Cambridge University Press, Cambridge, London, 1982.
Jones, S.D. Jr. and Suchsinger, A.E. Plant Systematic (2nd ed.) McGraw-Hill Book Co., New York, 1986.
Maheshwari, J.K. Flora of Delhi, CSIR, New Delhi, 1963.
Redford, A.E.: Fundamentals of Plant Systematics, Harper and Row, New York, 1986.
Sharma, O.P. Taxonomy: Tata McGraw Hill Pub. Company Ltd., New Delhi 2000.
Singh, G. Plant Systematics – Theory and Practices, Oxford and IBH Pvt. Ltd., New Delhi, 1999.
Singh, V., Pandey, P.C. and Jain, D.K. Angiosperms, Rastogi Pub., Meerut, 2016

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PAPER- III
ANATOMY OF ANGIOSPERMS, ECONOMIC BOTANY AND ETHNOBOTANY

Unit I: Anatomy of Angiosperms: Concept of stem cell in plants. Root system; Root apical meristem; differentiation of primary and secondary tissues and their roles; structural modification for storage, respiration, reproduction and for interaction with microbes.

Unit II: Shoot system: The shoot apical meristem and its histological organization; vascularization of primary shoot in monocotyledons and dicotyledons; cambium and its functions; formation of secondary xylem, a general account of wood structure in relation to conduction of water and minerals; characteristics of growth rings, sapwood and heart wood; secondary phloem-structure, function relationship; Periderm.

Unit III: Abnormal secondary growth and Leaf: Abnormal secondary growth in stems due to abnormal origin and activity of cambium. Leaf: Internal structure in relation to photosynthesis and water loss; adaptations to water stress; senescence and abscission.

Unit IV: Economic Botany, Food plants: Rice, wheat, maize, potato, sugarcane. Fibers: Cotton and Jute. Vegetable oils: Groundnut, mustard and coconut, General account of sources of firewood, timber and bamboos. Beverages: Tea and coffee; Rubber.

Unit V: Spices and Condiments: General account. Medicinal plants with special reference to Rajasthan: *Aloe, Asparagus, Commiphora, Boswellia, Pedalium, Ziziphus, Haloxylon, Tribulus, Vitex*, and *Withania*. Ethnobotany: Introduction, methods of Ethnobotanical studies, knowledge of aboriginals in Rajasthan.

Suggested Laboratory Exercises

Anatomy: L.S. of shoot tip of study cytohistological zonation and origin in leaf primordial.

Anatomy of primary and secondary growths in monocots and dicots using hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood. Microscopic study of wood in T.S., T.L.S. and R.L.S. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf). Anatomy of root, primary and secondary structures, Abnormal secondary growth in stem.

Economic Botany: Food plants: Study of morphology and structure. Simple microchemicals tests of the food storing tissues in rice, wheat, maize, potato and sugarcane. Microscopic examination of starch in these plants (except sugarcane).

Fibers: Study of cotton fiber, tests for cellulose.

Vegetable oils: study of hand sections of Groundnut, Mustard and Coconut and staining of oils droplets by Sudan III and Sudan Black

Field visits: To study sources of firewood (10 plants), timber-yielding trees (10 trees) and bamboos. A list to be prepared mentioning special features

Medicinal plants & Spices: Black pepper, cloves, cardamom - describe them in briefly. Study of 10 medicinal plants. Write their botanical and common names, parts used and diseases/disorders for which they are prescribed.

Beverages & Rubber: Coffee, Tea & Rubber

Ethnobotany: Ethnobotanically important plants of Rajasthan (*Abrus, Leptadenia* and *Calotropis*)

Suggested Readings

Cutter, E.G. Plant Anatomy: Experiment and Interpretation, Part II. Organs, Edward Arnold, London, 1971.

- Esau, K. Anatomy of Seed Plants, 2nd John Wiley & Sons, New York, 1977.
- Fahn, A. Plant Anatomy. 2nd ed. Pergamon Press, Oxford, 1974.
- Kocchar, S.L. Economic Botany in Tropics. 2nd ed. Mac-millan India Ltd., New Delhi, 1998.
- Mauseth, J.D. Plant Anatomy, The Benjamin/Cummings Publ. Company Inc., Menloc Park, California, USA, 1988.
- Sambamurthy, A.V.S.S. and Subramanyam, N.S. A Text book of Economic Botany, Wiley Eastern Ltd., New York, 1989.
- Sharma, O.P. Hill's Economic Botany (Late Dr. A.F. Hill, Adapted by O.P. Sharma), Tata McGraw Hill Co., Ltd., New Delhi, 1996.
- Simposon, B.B. and Conner-Ororzaly, M. Economic Botany Plants in Our World, McGraw Hill, New York, 1986.

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Practical

Time : 5 Hours

Max. Marks : 50

Mim. Pass. Marks : 18

- Q. 1. Cut a T.S of the given material "A" (Pteridophyta/ Gymnosperm) and make double stained temporary mount of the same. Draw labelled diagram. Identify the material giving reasons. Leave your preparation for inspection. 5
- Q. 2. Make suitable preparation of the reproductive parts of the given material "B" (Pteridophyta/ Gymnosperm). Draw labeled diagram. Identify and comments upon the features of interest. Leave your preparation for inspection. 5
- Q. 3. Describe the given flower in semi technical language with floral diagram and floral formula, mentioning special features of identification. 5
- Q. 4. Prepare a temporary slide of the given Gynoecium / Androecium/Embryo material. Draw a Labeled Diagram and comment on it from Embryological point of view. 3
- Q. 5. Cut aT.S./V.S. of given stem/root/leaf and make a double stained preparation of the same. Draw a labeled diagram (outline & cellular) and identify with special features. 5
- Q. 6. Identify and comment upon the given spots 1 to 6 (covering all disciplines of Three Theory Papers) 2x6 = 12
1. _____
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____
- Q. 7. Practical record 5
- Q.8. 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	Chordate Structure and Function	Theory 50	2	Theory 10	Theory 40	50	54
Paper II	Developmental Biology	Theory 50	2	Theory 10	Theory 40	50	
Paper III	Immunology, Microbiology and Biotechnology	Theory 50	2	Theory 10	Theory 40	50	
PRACTICAL COURSE (One Board)		Practical 75	3 X 2	Practical 15	Practical 60	75	27

Duration of examination of each theory papers

3 hours

Duration of examination of practicals

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
Chordate Structure and Function

- Unit 1: Classification and characters of phylum Chordata (excluding extinct forms) up to orders, Comparisons of habit, habitat, external features and anatomy of *Balanoglossus*, *Herdmania* and *Branchiostoma* (excluding development).
- Unit 2: Ascidian tadpole larva and its Metamorphosis, Affinities of Hemichordate, Urochordate and Cephalochordates, Habit, Habitat and salient features of Petromyzon, Ammocoete larva.
- Unit 3: Integument including structure and development of placoid scales, feathers and hairs, Jaw suspensorium, limbs and girdles of *Rana*, *Uromastix*, *Columba* and *Oryctolagus*.
- Unit 4: Heart and aortic arches, respiratory system and alimentary canal of *Scoliodon*, *Rana*, *Uromastix*, *Columba* and *Oryctolagus*.
- Unit 5: Brain, urinogenital system (*Scoliodon*, *Rana*, *Uromastix*, *Columba* and *Oryctolagus*), Identification of poisonous and non poisonous snakes. Biting mechanism in snakes, flight adaptations in birds. Adaptations in aquatic mammals.

PAPER II
Developmental Biology

- Unit 1: Formation of egg and sperm, vitellogenesis and fertilization. Types of eggs and sperms, parthenogenesis, regeneration.
- Unit 2: Planes and patterns of cleavage in chordates, significance of cleavage and blastulation, Morphogenetic cell movement, Fate maps and significance of gastrulation.
- Unit 3: Development of *Branchiostoma* (*Amphioxus*) up to gastrulation; chick egg and its development up to the formation of primitive streak, Extra embryonic membranes of chick, development of placenta in rabbit, types and functions of placenta in mammals.
- Unit 4: Various types of stem cells and their applications (with special reference to embryonic stem cells), Cloning of animals: nuclear embryonic transfer technique, nuclear transfer technique; Identical, Siamese and fraternal twins and Artificial insemination.
- Unit 5: Organogenesis of alimentary canal, eye, kidney, gonads and brain in mammal.

PAPER III
Immunology, Microbiology and Biotechnology

Unit 1: Types of immunity (innate and acquired, humoral and cell mediated), Antigen: Antigenicity of molecules, haptens, Antibody: Structure and functions of each class of immunoglobulins (IgG, IgM, IgD, IgA and IgE), antigen – antibody reactions.

Unit 2: Theory of spontaneous generation; Germ theory of fermentation and diseases: Works of Louis Pasteur, John Tyndal, Rober-Koch and Jenner, Bacteria: Cell membrane, patterns of arrangement; structure of capsule and cell envelops; organization of cytoplasmic membrane of Gram - negative and Gram - positive strains, Genetic material of bacteria: (i) Chromosome (ii) Plasmids.

Unit 3: Asexual and sexual reproduction in Bacteria ,Culture of Bacteria: Carbon and energy source, Nitrogen and minerals and Organic growth factors, Effect of environmental factors on bacterial culture: Temperature, hydrogen ion concentration; Medical importance of Gram-negative and Gram-positive bacteria.

Unit 4: Recombinant DNA technology: Introduction and principles, restriction endonucleases, cloning vehicles (plasmids, bacteriophages); methods of gene transfer and applications.

Unit 5: Environmental Biotechnology (outline idea only): Metal and petroleum recovery, pest control, waste-water treatment, Food, Drink and Dairy Biotechnology (outline idea only): Fermented food production: dairy products, alcoholic beverages and vinegar: microbial spoilage and food preservation.

Practical

1. Study of microbes in food material (like curd, etc.)
2. Bacteria culture
3. DISSECTION/ demonstration of dissection

Scoliodon : General anatomy, alimentary canal, afferent and efferent blood vessels, urinogenital system, brain and cranial nerves – V, VII, IX and X only and internal ear *Labeo / Wallago*, Brain V, VII, IX and X Cranial nerves, afferent and efferent blood vessels, air sacs, and internal ear.

Rattus: General anatomy, digestive, blood vascular and urinogenital systems

4. OSTEOLOGY

Articulated and disarticulated skeleton of *Rana*, *Varanus*, *Gallus* and *Oryctolagus*

5. PERMANENT PREPARATIONS

Scoliodon: Placoid scales, Ampulla of Lorenzini.

6. Identification, systematic position and comments of the following animals:
Hemichordata: *Balanoglossus*

Urochordata: *Salpa*, *Doliolum* and *Herdmania*

Cephalochordata: *Petromyzon* and *Myxine*
 Pisces: *Zygaena*, *Scoliodon*, *Pristis*, *Torpedo*, *Trygon*, *Protopterus*, *Labeo*,
Heteropneustis (Saccobranchus), *Belone*, *Exocoetus*, *Anabas* and *Echeneis*
 Amphibia: *Necturus*, *Amphiuma*, *Amblystoma*, *Axolotal larva*, *Hyla*, *Uraeotyphlus*
 Reptilia: *Trionyx*, *Chelone*, *Varanus*, *Uromastix*, *Ophiosaurus*, *Naja*, *Bungarus*,
Echis, *Hydrophis*, *Eryx*, *Ptyas*, *Crocodilus* and *Gavialis*
 Aves: *Columba*, *Pavo*, *Choriotis*, *Francolinus*, *Streptopelia*
 Mammalia: *Meriones*, *Funambulus*, *Rattus*, *Hemiechinus*, *Suncus*, *Ptecopus*,
Presbytis and *Macaca*

7. Microscopic Study

Hemichordata: Section through proboscis and branchiogenital region
Branch stoma: T.S. oral hood, pharynx, gonads, intestine and caudal region
Scoliodon: T.S. gill and scroll valve

Rana: T.S. through various organs, T.S. and L.S. of developmental stages Reptilia:
 V.S. skin of lizard

Aves: V.S. skin, different types of feathers

Chick embryology: Whole mounts of embryos of 18, 24, 33, 48 and 72 hours

Mammalia: T.S. through various organs

Note: Each regular student is required to keep a record of practical work done by him/her duly checked by the teacher which will be submitted at the time of practical examination.

Distribution of Marks

Maximum Marks: 75
 Minimum Pass Marks:
 27

	<u>Regular</u>	<u>Ex.</u>
Major dissection/ diagrammatic presentation of dissection (one)	15	20
Minor dissection/ diagrammatic presentation of dissection (one)	06	11
Permanent preparation (one)/Study of microbes in food material (like curd, etc.)/Bacteria culture Spots (eight)	10	10
Viva-voce	24	24
	10	10
	<hr/>	<hr/>
	65	75
Internal assessment	<hr/>	<hr/>
	10	--
	<hr/>	<hr/>
Total	75	75

List of Recommended Books

5. Arey, L.B. : Developmental Anatomy, Asia Publishing House, Mumbai
6. Chopra, V.L. : Genetic Engineering and Biotechnology, Oxford & I.B.H., New Delhi
7. Das, S.M. : The Indian Zoological Memoirs, Herdmania, Lucknow Publishing House, Lucknow
8. Jorden, E.L. and Verma, P.S.: Chordate Zoology and Animal Physiology, S. Chand & Co., N. Delhi
9. Kotpal, R.L. : Chordate Zoology, Rastogi Publication, Meerut
10. Dalela, R.C. : A Text Book of Chordate Zoology, Jai Prakash Nath Publication, Meerut
11. Bhatia, A., Jain, N. and Kohli, N.S.: An outline of Biotechnology, Ramesh Book Depot, Jaipur
12. Balinsky : Introduction to Embryology (CBS College Publishers)
13. Kuby : Immunology (W.H. Freeman)
14. R.A. Meyers (Ed.) : Molecular Biology and Biotechnology (VCH Publishers)
15. Jain, P.C. : Text Book of Embryology, Vishal Publication, Jalandhar
16. Srivastava, M.D.L. : An Introduction to Comparative Anatomy of Vertebrates, Pothishala Ltd., Allahabad
17. Thillayampalam, E.M. : Scoliodon, Lucknow Publishing House, Lucknow
18. Weichert, G.K. : Anatomy of the Chordates, McGraw Hill, New York
19. Lewis, C.D. and Lewin, R., Biology of Gene, McGraw Hill, Toppan Co. Ltd.
20. Winchester, Genetics, Oxford IBH Publications
21. Agarwal, R.A., Srivastava, Anil Kumar and Kaushal Kumar: Animal Physiology and Biochemistry, S. Chand & Co. Ltd., New Delhi.

B.Sc II Year

CHEMISTRY

Course	Nomenclature	Number of Papers	Number of Periods per week	External	*Internal	**Practical	Total
Paper I	INORGANIC CHEMISTRY	1	2	40	10		50
Paper II	Organic Chemistry	1	2	40	10		50
Paper III	PHYSICAL CHEMISTRY	1	2	40	10		50
PRACTICAL COURSE			2	60	15		75

Duration of examination of each theory papers

3 hours

Duration of examination of practicals

5 hours

NOTE- *There shall be two summative tests of 10 marks each; Out of 20 internal marks a candidate will have to get a minimum of 8 marks for a pass.

**In practical examination out of 30 students have to score minimum of 11 marks to pass

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 3.5 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 7.5 Marks.

Paper -I

Inorganic Chemistry

Unit I: Chemistry of Transition Elements

General characteristics and Periodicity in properties with emphasis on their electronic configuration and multiple oxidation states of 3d, 4d and 5d series elements. Coloured ion formation, magnetic, catalytic properties and complex formation tendency in 3d series elements.

Unit II: Coordination compounds

Werner's coordination theory and experimental verification, Effective Atomic Number concept, chelates, nomenclature of coordination compounds, stereoisomerism in complexes of coordination number 4 and 6. Complexometric titrations and theory of metallochrome indicators.

Unit III: f-Block elements

Chemistry of Lanthanides: Electronic structure, oxidation state, ionic radii, colours, spectral and magnetic properties. Lanthanide contraction and its consequences.

Chemistry of actinides: General characteristics, comparative treatment with lanthanides in respect to ionic radii, oxidation states, Magnetic behaviour and spectral properties.

Unit IV: Concepts of acids and bases: Arrhenius, Bronsted-Lowry, Lewis and Usanovich concept. Acid base titrations and theory of indicators, Redox titrations.

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

Unit V: Quantitative analysis

Types of quantitative analysis: Gravimetric and volumetric analysis.

Precipitation, Co-precipitation and Post precipitation.

Errors in chemical analysis: types of error and their minimization;

Accuracy, Precision, Standard Deviation.

Books Recommended:

1. Inorganic Chemistry by SatyaPrakash
2. Inorganic Chemistry by B.R. Puri & L.R. Sharma
3. Inorganic Chemistry by SangeetaLoonker, Ramesh Book Depot, Jaipur

PAPER -II

ORGANIC CHEMISTRY

Unit I: Electromagnetic Spectrum: Absorption Spectra

Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. UV applications including identification of groups

Unit II: Alcohols

Classification and nomenclature.

Monohydric alcohols – nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols – nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol-pinacolone rearrangement.

Trihydric alcohols – nomenclature and methods of formation, chemical reactions of glycerol.

Phenols

Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols – electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit III: 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 ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic 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 .

Unit IV: Carboxylic Acid

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation, esterification and hydrolysis of esters (acidic and basic). Reactive methylene compounds: malonic ester and acetoacetic ester – preparation and synthetic applications. Mechanism of Claisen condensation

Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions – cleavage and autoxidation, Ziesel's method for methoxy group.

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide, reactions of Grignard and organolithium reagents with epoxides.

Unit V: 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.

Alkyl and Aryl amines: Reactivity, structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basic nature 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, Hofmann 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.

Books Recommended:

1. Advanced Organic Chemistry by Mukherji, Singh & Kapoor
2. Organic Chemistry by Bahal and Bahal
3. Advanced Organic Chemistry by Morrison & Boyd
4. Carbonic Rasayan By K.M. Gangotri, RBD.

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PAPER -III PHYSICAL CHEMISTRY

Unit I: Mathematical Concepts

Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like a^x , e^x, x^n , $\sin x$, $\cos x$, $\tan x$, $\log x$; maxima and minima, partial differentiation. Integration of some useful functions; like $x^n, 1/x, e^x$, constant, $\sin x$, $\cos x$, integration by parts. Permutations and combinations. Probability.

Unit II: Gaseous State

Deviation from ideal behavior, Vander Waals equation of state and its discussion. Critical Phenomena: PV isotherms of real gases, continuity of states, relationship between critical constants and Vander Waals constants, the law of corresponding states, reduced equation of state.

Molecular velocities: Root mean square, average and most probable velocities (No derivation). Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect). Numericals.

Unit III: Liquid and Colloidal State

Liquid State: **Intermolecular forces, structure of liquids (a qualitative description).**

Structural differences between solids, liquids and gases. Liquid crystals: Classification-nematic, smectic and cholestric phases. Theory of liquid crystal (Swarm theory).

Colloidal State: **Definition of colloids, classification of colloids.**

Solids in liquids (sols): properties – kinetic, optical and electrical; stability of colloids, Hardy-Schulze law, protective action, Gold number. Liquids in liquids (emulsions): types of emulsions, preparation, Emulsifier, Theory of Emulsion.

Liquids in solids (gels): classification, preparation and properties, imbibitions and synchysis. General applications of colloids.

Unit IV: Solutions

Types of liquid mixtures, ideal and non-ideal mixtures, vapour pressure of liquid mixtures, distillation of immiscible liquid mixtures.

Partially miscible liquids-phenol-water, triethylamine-water, nicotine-water-systems, consolute temperature-lower and upper, Effect of impurity on consolute temperature- Phenol-water system, immiscible liquids, Principal and Methodology of steam distillation. Numericals

Unit V: Chemical Kinetics

Rate, order, molecularity and stoichiometry of a reaction, Derivation of Integrated rate law and characteristics of zero, first and second order reactions, Pseudo-first order reaction, Determination of the order of reaction-differential method, method of integration (hit and trial method), half-life method and isolation method.

Theories of Reaction Rate: Simple collision theory and its limitations, transition state theory (equilibrium hypothesis) and derivation of the rate constant, Thermodynamical formulation of rate constant, Comparison of collision theory and transition state theory, Numericals.

Books Suggested:

1. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
2. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wile Eastern Ltd.
3. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania, Shobhan Lal Naginchand & Co.
4. Physical Chemistry, Bahl and Tuli, S. Chand & Co. (P) Ltd.
5. Physical Chemistry, Vol. I & II, S. Pahari, New Central Book Agency (P) Ltd

Laboratory Course

Inorganic Chemistry: [20]

Gravimetric analysis

- (i) To estimate Barium as barium sulphate.
- (ii) To estimate copper as cupric oxide/ copper (I) thiocyanate.
- (iii) To estimate Zinc as Zinc oxide.

Organic Chemistry: [20]

(i) Calibration of Thermometer: - The following compounds may be used for the calibration purpose 800-820 (Naphthalene), 113.50-1140 (Acetanilide), 132.50-1330 (Urea) and 1220 (Benzoic acid).

(ii) Qualitative Analysis: - Identification of organic compounds (one liquid and one solid) through the functional group analysis (containing only one functional group).

Physical Chemistry: [15]

Viscosity and Surface Tension:

- (I) To determine the surface tension of a given organic liquid by Stalagmometer .
- (II) To determine the viscosity of the given organic liquid by Ostwald Viscometer
- (III) To determine the composition of a binary solution by surface tension measurement.
- (IV) To determine the composition of a binary solution by Viscosity measurement.

Viva-Voce [5]

Internal (Sessional/Record) [15]

Books Suggested (Laboratory Courses):

1. Practical Chemistry S.Giri, D.N.Bajpai and O.P.Pandey Publ. S. Chand
2. Practical Chemistry, K.M. Gangotri, R.B.D. Jaipur.

PHYSICS

Course	Nomenclature of Theory Papers	Number of Periods per week	Univ. Exam.	*Internal	Total
Paper I	Electromagnetics	2	40	10	50
Paper II	Statistical and Thermal Physics	2	40	10	50
Paper III	Quantum Mechanics and Spectroscopy	2	40	10	50
PRACTICAL COURSE		2	60	15	75

PAPER -I ELECTROMAGNETICS

Unit I: Vector Fields: Scalar and Vector fields, gradient of a scalar field, divergence of vector field and their physical significance, curl of vector field, line integral of vector field, surface integral and flux of a vector field. Gauss law, its integral and differential form, statement and explanation of Gauss theorem and Stokes theorem.

Unit II: Electrostatics: Potential and field of an arbitrary charge distribution, concept of multipoles, Potential & field due to a dipole and quadrupole, torque on a dipole in an electric field. Electrostatic energy of a uniformly charged sphere. Classical radius of an electron.
Electric field in matter: Atomic and molecular dipoles, polarizability, permanent dipole moment, Dielectrics, polarization Vector, capacity of parallel plate condenser with partially or completely filled dielectrics, electric displacement and Gauss Law in general form, electrostatic energy of a charge distribution in dielectrics. Lorentz local field and Clausius-Mossotti equation.

Unit III: Electrostatic fields: Conductors in an electric field, boundary condition for potential, boundary conditions for electrostatic field at electric surface, uniqueness theorem, method of images and its application for system of point charge near a grounded conducting plane. Poisson's and Laplace equation in Cartesian, cylindrical and spherical polar coordinates (without derivation).
Solution of Laplace equation in Cartesian coordinates, potential at a point inside a rectangular box.

Unit IV: Magnetics: Biot-Savart law, Ampere circuital law in integral and differential forms, divergence of B field, Force on a current carrying wire and torque on a current carrying loop in magnetic field.

Magnetic field in matter: Magnetization Vector, uniform magnetization and surface current, non-uniform magnetization, B,M,H Vectors and their inter-relations, Bohr magneton, orbital magnetic moment and angular momentum, Electron Spin and Magnetic moment, Magnetic Susceptibility.

Unit V: Electromagnetic Induction, Faraday's laws of Electromagnetic induction, its integral and differential form; Lenz's law; Self and mutual inductance, measurement of self inductance by Rayleigh method; Energy stored in magnetic field.

Transient response: Charge and discharge of condenser through resistance, determination of high resistance by leakage, growth and decay of current in LR circuit; A. C. Circuits, use of j operator in alternating current circuits. LCR circuit in series and in parallel (A.C.), phase diagram, Resonance and Q factor, Sharpness of resonance.

Books suggested:

Berkeley: Physics Course, Vol. II: Electricity and Magnetism, Tata McGraw Hill.

Spiegel, M.R.: Vector Analysis, Schaum's Outline Series, McGraw Hill.

Laud, B.B.: Electro-magnetics, Wiley Eastern.

Matveev, A.N.: Electricity and Magnetism, Mir Publishers, Moscow.

Griffiths: Introduction to Electrodynamics, PHI.

PAPER -II

STATISTICAL AND THERMAL PHYSICS

Unit I: Statistical Method: Particle States, distribution of particles in two particle states, Probability of a given distribution, distribution corresponding to maximum probability, relative probability curve with increasing number of particles, binomial distribution, Standard deviation, micro-states and macro-states of a system, principle of equal 'a priori' probabilities, equilibrium state, fluctuations, reversibility and irreversibility, States of a particle inside a box, number of accessible states between an infinitesimally small energy interval, momentum interval, phase space, statistical weight of a configuration of a macro state, indistinguishable and distinguishable particles, entropy and principle of increase of entropy, statistical ensemble, time and ensemble averages; Thermal interaction between two systems, zeroth law of thermodynamics, concept of temperature.

Unit II: Canonical ensemble, Boltzmann canonical distribution, partition function, a two state system, paramagnetic susceptibility, heat capacity, Boltzmann formula for entropy, average energy and fluctuations, free energy, adiabatic interaction, enthalpy, general interaction, Gibbs free energy, first law of thermodynamics, phase transitions, Clausius-Clapeyron equation.

Ideal Classical Gas, Maxwell velocity and speed distributions, partition function, entropy (Sackur-Tetrode relation), Gibbs paradox; equation of state, ideal gas temperature scale, Vander-Waal's equation of state; heat capacities of monatomic and diatomic gases, ortho and para hydrogen.

Unit III: Systems with variable Energy and Particle Number: Chemical potentials, grand canonical distribution, Partition function, number fluctuations, grand potential, equation of state of an ideal classical gas, Saha's ionization formula, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein Statistics, Fermi gas at 0K temperature; thermionic emission, strongly degenerate boson gas; Bose-Einstein Condensation, liquid helium.

Unit IV: Macroscopic Thermodynamics: Second law of thermodynamics; Carnot cycle, Carnot theorem, thermodynamic temperature scale and its identity with perfect gas temperature scale, entropy change in isothermal, and adiabatic expansions of an ideal gas; Thermodynamic potentials, Maxwell's equations C_p-C_v , C_p/C_v , Black body radiation, energy density and pressure, Stefan-Boltzmann law, Wien's displacement law, Planck's law.

Unit V: Temperature changes in Joule and Joule-Thomson expansions, Regenerative cooling, adiabatic demagnetization and production of low temperatures, third law of thermodynamics, negative temperatures. Transport Phenomena: Mean free path, collision cross-sections, mean free time, viscosity, thermal conductivity and self-diffusion.

Books suggested:

1. Reif : Statistical Physics, Berkeley, Vol. 5, McGraw Hill.
2. Mandl : Statistical Physics, ELBS and Wiley.
3. Reif : Fundamentals of Statistical and Thermal Physics, McGraw Hill.
4. C. Kittel and H. Kroemer : Thermal Physics, CSS.
5. W.G.V. Rosser: An Introduction to Statistical Physics, Elis Horwood.
6. Lokanathan and Gambhir: Statistical and Thermal Physics, Prentice Hall.

PAPER -III
QUANTUM MECHANICS AND SPECTROSCOPY

Unit I: Development of quantum theory: Blackbody radiation and their characteristics, failure of classical physics to explain spectral distribution of blackbody radiation, Planck's quantum Hypothesis, Average energy of Planck oscillator, Planck's radiation formula, Wien's law, Rayleigh-Jean's Law, Stefan-Boltzmann's Law; Failure of classical physics to explain photo-electric effect and Compton effect, photons as carrier of energy and momentum of electro-magnetic waves.

Unit II: Wave Mechanics and Schrödinger equation: Phase velocity and group velocity of waves, wave particle duality; De Broglie Hypothesis; De Broglie group and phase velocity, wave packet, Heisenberg uncertainty principle, Statement and its equation from wavepacket in space and time; Application of uncertainty principle such as (i) Non-existence of electron in nucleus, (ii) Ground state of H-atom, (iii) Natural line width of spectral lines, X-ray microscope, Particles passing through (a) single slit and (b) double slit and observed on screen behind, explanation of distribution in terms of probability amplitude and interference of probability amplitude.

Postulates of Quantum Mechanics: Wave functions, Schrödinger superposition principle, operators in Quantum mechanics, Hermitian operators, expectation values, Interpretation of wave-function, symmetric and anti-symmetric wave functions, concept of parity; Probability density, Schrödinger equation, Schrödinger equation for free particle; Arguments in favour of this equation.

Unit III: Application of Schrödinger equation: Schrödinger equation for particle moving in potential field, Time dependent and time independent Schrödinger equation, Stationary states, Orthogonality of wave functions, Probability current density, Ehrenfest Theorem, Simple solution of Schrodinger

equation (Restricted to one dimensional case), Particle in one dimensional infinite well, Particle in one dimensional finite well (one or both sides of well may be non-rigid), Calculation of reflection and transmission coefficient for potential step and potential barrier.

Unit IV: Atomic Spectroscopy: Orbital angular momentum, electron spin and Stern Gerlac experiment, Total angular momentum, Spin-orbit interaction, Vector model of atom and quantum numbers associated with atom, L-S coupling and j-j coupling, Statement of Hund's Rule and Lande Interval Rule (without derivation), Fine structure of spectral lines, spectral terms up to two valence electron system, Pauli's exclusion principle.

Unit V: Atom in magnetic field: Magnetic moment of atom, contribution from orbital and spin angular momentum, gyro-magnetic ratio; Interaction energy of atom in magnetic field, splitting of energy levels, using good quantum numbers in Normal Zeeman effect, Anomalous Zeeman effect and Paschen-Back effect, Selection rules for dipole transitions.

Molecular spectroscopy: qualitative features of molecular spectra, rigid rotator, rotational and vibrational energy levels of diatomic molecules, rotational-vibrational spectra.

Books suggested:

1. Semat: Atomic Physics
2. Alonso and Finn: Fundamental University Physics, Vol. – III.
3. Beiser: Concepts in Modern Physics
4. Waghmare: Quantum Mechanics
5. Wehr, Richards, Adair: Physics of the Atom, Narosa.

EXPERIMENTS FOR PRACTICAL WORK

Note: Any 15 experiments to be performed by all the students out of following list.

1. Low resistance by Carey Foster Bridge.
2. Variation of magnetic field along the axis of circular Coil.
3. Study of an RL Circuit for Phase relations.
4. Study of rise and decay in CR Circuit.
5. Study of electro-magnetic function and verification of Faraday's Laws.
6. Determination of temperature coefficient of platinum resistance thermometer using Carey Foster Bridge.
7. Determine thermal conductivity of a bad conductor by Lee's method.
8. Determination of Ballistic Constant of a Ballistic galvanometer using condenser.
9. Determination of Ballistic Constant of a Ballistic galvanometer by steady deflection method.
10. Determination of high resistance by method of leakage.
11. Study of Gaussian distribution using statistical board.
12. Determination of mutual inductance of a coil.
13. Experimental verification of the first law of thermodynamics by discharging the condenser.
14. Study of variation of total thermal radiation with temperature.
15. Plot thermo emf versus temperature and find the neutral temperature and temperature of inversion.
16. Determination of Self Inductance of a Coil using Ballistic galvanometer.

17. To study the electromagnetic damping of a compound pendulum.
18. To study the excitation of normal modes and measure frequency splitting using two coupled oscillator.
19. Study of dependence of velocity of wave propagation on line parameters using torsional wave apparatus.
20. Study of variation of reflection coefficient on nature of termination using torsional wave apparatus.

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MATHEMATICS

- Paper I : Co-ordinate Geometry of 3-Dimensions and Vector Calculus.**
Paper II : Numerical Analysis and Linear Programming.
Paper III : Differential Equations.
-

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

Co-ordinate Geometry of 3-Dimensions and Vector Calculus.

Unit 1 : Sphere, Cone and Cylinder (Rectangular Coordinates only)

Unit 2 : The Central Conicoids (referred to principal axes). Tangents and tangent planes, Polar planes and polar lines, Section with a given centre, Enveloping cone, Enveloping cylinder and related problems.

Unit 3 : Equations of the normal to an ellipsoid, number of normals from a given point to an ellipsoid, Cone through six normals, Conjugate diameter and diametral planes and their properties. Cone as a Central surface. Paraboloids.

Unit 4 : Plane Sections of Conicoids, Umbilics, Generating lines of hyperboloid of one sheet and its properties.

Unit 5 : Vector Calculus : Curl, Gradient and Divergence & Identities involving these operators. Theorems of Stoke, Green and Gauss (Statement, application and verification only).

SUGGESTED BOOKS

Gupta, Juneja : Vector Analysis; Ramesh Book Depot, Jaipur.

Gokhroo, Saini, Bhati : Vector Calculus (Hindi Ed.); Navkar Prakashan, Ajmer

Bhargava, Banwari Lal : Vector Calculus (Hindi Ed.); Jaipur Publishing House, Jaipur

Bell, R.J.T.: Coordinate Geometry of Three dimensions; Macmillan India Ltd., New Delhi

Vasistha, Agarwal : Analytical Solid Geometry; Pragati Prakashan, Meerut

Gokhroo, Saini & Rathi : Analytical 3-D Geometry (Hindi Ed.); Jaipur Pub. House, Jaipur

Bansal, Bhargava, Agarwal : 3-D Coordinate Geometry II; Jaipur Pub. House, Jaipur

Paper II
Numerical Analysis and Linear Programming

Unit 1: Difference operators and factorial notation, Differences of polynomial, Newton's formulae for forward and backward interpolations. Divided differences, relation between divided differences and Simple difference. Newton's general interpolation formulae, Lagrange interpolation formula.

Unit 2: Central differences, Gauss, Stirling and Bessel interpolation formulae. Numerical Differentiation. Numerical integration, Trapezoidal, Simpson's and Weddle's rules.

Unit 3: Solution of linear difference equations with constant and variable coefficients. Solution of Algebraic and Transcendental equations, Iterative, Regula Falsi and Newton Raphson methods.

Unit 4: Convex sets and their properties, introduction to linear programming problems. Mathematical formulation; Graphical method of solution of linear programming problems for two variables.

Unit 5: The simplex technique and its application to simple L.P. problems. Concepts of duality in linear programming. Framing of dual programming. Elementary theorems of duality.

SUGGESTED BOOKS

Gokhroo, Saini : Linear Programming (Hindi Ed.), Navkar Prakashan, Ajmer.
Mittal, Sethi : Linear Programming, Pragati Prakashan, Meerut
Goyal, Mittal : Numerical Analysis, Prograti Prakashan, Meerut
Bansal, Bhargava : Numerical Analysis (Hindi Ed.); Jaipur Publishing House, Jaipur
Saxena, H.C. : Numerical Analysis; S.Chand & Co., New Delhi
Gokhroo : Numerical Analysis (Hindi Ed.); Navkar Prakashan, Ajmer
Bhargava, Sharma, Bhati : Linear programming (Hindi Ed.); Jaipur Publishing House, Jaipur.

Paper III

Differential Equations

Unit 1: Exact and reducible to exact differential equations of first order and first degree. First order higher degree differential equations solvable for x,y,p. Clairaut's form and singular solutions.

Unit 2: Linear differential equations with constant coefficients, Homogeneous linear differential equations with variable coefficients. Simultaneous differential equations, Total differential equations of the form $Pdx + Qdy + Rdz = 0$, by method of inspection and method for homogeneous equations.

Unit 3: Linear differential equations of second order of the form $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$.

Exact Linear differential equations of n^{th} order. Exact Non-Linear differential equations. Differential equations of the various forms e.g., (i) $\frac{d^2y}{dx^2} = f(y)$ (ii) Equations not containing y directly (iii) Equations not containing x directly and other forms. Method of variation of parameters to the solution of second order linear differential equations.

Unit 4: Series solutions of Second Order Linear differential equations, Power series method, Bessel and Legendre equations. Partial differential equations of the first order, Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit (general) method of solution.

Unit 5: Partial differential equations of second and higher order. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's method of integrating $Rr + Ss + Tt = V$.

SUGGESTED BOOKS

Sharma, Gupta : Differential Equations; Krishna Prakashan, Meerut

Ray, Chaturvedi : Differential equations; Kedar Nath, Ram Nath & co., Agra.

Bansal, Dhama : Differential equations (Vol. II); Jaipur Publishing House, Jaipur

Gokhroo, Saini, Kumbhat : Differential equations (Hindi Ed.); Navkar Prakashan, Ajmer

Gokhroo, Saini, Oza : Partial differential equations; Jaipur Publishing House, Jaipur.

Evaluation Plan for B. Ed. Second Year

S.N	Paper	Name of the Paper	External	Internal	Total
1	First	Fundamentals of Contemporary Indian Education	70	30	100
2	Second	Learning Enrichment through Information and Communication Technology	-	50	50
3	Third	Schooling, Socialisation and Identity	-	50	50
6	Grand Total				200

TEACHING SCHEME & CONTACT HOURS

Paper	Contact Hours Per Week	Marks Theory	Sessionals	Duration of Exam
Paper I	4.5hrs (45 minutes 6 periods)	70	30	3 hrs.
Paper II	4.5hrs (45 minutes 3 periods)	70	30	3 hrs.
Paper III	4.5hrs (45 minutes 3 periods)	70	30	3 hrs.

B.Ed-II Year
Paper-I
Fundamentals of Contemporary Indian Education

Objectives:

The student teacher will be able to:

- Contextualize contemporary India and education.
- Evolve a deeper understanding of its purpose and its relationship with society and Humanity.
- Understand the classroom in social context.
- Provide a setting for interaction, generation of dialogue and the opportunity to appreciate diverse perspectives of issues.
- Critically analyse human and child rights.
- Engage with concepts which are drawn from a diverse set of disciplines.
- Learn about policy debates overtime the implementation of policies and actual shaping of school education.
- Understand the prominent social determinants.

COURSE CONTENT

UNIT – I: Diversity in Society & Education:

1. Education: Meaning, Concept and Nature.
2. Social & Cultural Diversity: Meaning, Concept and their Impact on Education.
3. Social, Cultural, economic and Political Perspective of Society and Education.
4. Role of the school in developing National, Secular and Humanistic identities.
5. Determinants of identity formation in individuals and groups: Social categories, such as Caste, Class, Gender, Religion, Language and Age.

UNIT–II: Issues of Cotemporary Indian Society & Constitutional Provisions

1. Meaning & concept of: Pluralistic and Egalitarian culture identity, gender equality, poverty and Gender sensitization and their relation with education.
2. Concept of inequality, discrimination, marginalization and their impact on education and society.
3. Preamble, Fundamental rights & duties of citizens & directive principles of National policies.
4. Constitutional provisions on human & child right, and values.
5. Role of NCPCR (National commission on Protection of Child Right)
6. National integration and National security.

UNIT – III School in Social Context

Understanding the nature and processes of socialisation

- (i) At home: family as a social institution; parenting styles and their impact; transmission of parental expectations and values.
- (ii) Socialisation and the community: neighbourhood, extended family, religious group and their socialisation functions.
- (iii) At school: impact of entry to school; school as a social institution; value-formation in the context of schooling.
- (iv) Various dimensions of self and the impact of socialisation on development of self.
- (v) Understanding interface between home, community and school; inter-linkages within wider socio-cultural contexts.

(vi) Paradigm Shift in Pedagogical Concept with reference to social context.

UNIT– IV Emerging Indian Concerns and their educational implications

1. Meaning, Concept and Impact of Liberalisation Globalization and Privatization on Education.
2. Stratification of Education: concept and process.
3. Social Mobility, Social Cohesion, Technological Invasion and Knowledge Explosion.
4. Education for marginalized group like women, Dalits and Tribal people.

UNIT – V Contemporary Issues and Policies

1. Contemporary challenges related to equalization of opportunities in education.
2. Right to Education and Challenges in implementation, SSA, Naye Taleem.
3. Education and Industrialization.
4. Learning without Burden – Prof. Yashpal Committee Report.

PRACTICUM/FIELD WORK (Any two from the following) :

1. Arrange a discussion session in class how cultural diversity in school benefits the students
2. Observe mid day meal of a school to assess its nutritive value and social integral value (when children from various socio-cultural background religion, caste etc. come together)
3. List down some of the habits of students which they bring exclusively from home or outside school.
4. Present a report in class about the education of marginalized group.
5. Examine policy & constitutional provision on equality and right to education.

Reference

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Paper II

Learning Enrichment through Information And Communication Technology

Objectives:

The student teacher will be able to:

- Understand the concept of Educational Technology and Information Technology and its role in construction of knowledge
- Prepare teachers for ICT class room
- Develop the abilities and the skills to use computer as a learning device.
- Develop the professional skills related to ICT
- Develop an spirit of appreciation towards ICT
- Develop the professional ethics in uses of ICT
- Develop the competencies for generating information through internet

COURSE CONTENT

UNIT 1: RELEVANCE OF ICT IN EDUCATION

- i. Role of Information technology in 'construction of knowledge'
- ii. Concept of Educational technology
- iii. Computer assisted Learning, online education, Virtual classroom

UNIT 2: VISUALISING LEARNING SITUATIONS USING AUDIO-VISUAL AND OTHER MEDIA

1. Use of audio Medias in Education.
2. Use of television and video in education
3. Use of newspaper in education.

UNIT 3: USE OF COMPUTERS IN SCHOOLS

- (1) Functional knowledge of operating computers–on/off, word processing, use of power point, excel, Computer as a learning tool,
- (2) Effective browsing of the internet for discerning and selecting relevant information, Survey of educational sites based in India, Downloading relevant material.

UNIT 4: VISUALISING TECHNOLOGY-SUPPORTED LEARNING SITUATIONS

- (1) Preparation of learning schemes, Interactive use of audio-visual programme, Developing PPT slide show for classroom use, Use of available software or CDs with LCD projection for subject learning interactions
- (2) Generating subject-related demonstrations using computer software, Enabling students to plan and execute projects (using computer based research) Engaging in professional self-development.
- (3) Collaborative learning tasks Interactive use of ICT: Participation in Yahoo groups, creation of 'blogs', etc.

UNIT 5: TECHNOLOGICAL ADVANCEMENTS IN EDUCATION

(1) Innovative usage of technology: Use of technology integration in resource-plenty as well as resource-scarce situations

(2) Critical issues in 'internet usage' – authenticity of information, addiction, demerits of social networking group.

Practicum/Field Work (Any Five of the following)

1. Organise a symposium about 'construction of knowledge' and prepare the minutes.
2. Prepare a power point presentation on any 2 general topics and present them before peers.
3. Prepare a five minutes programme of teaching with a video recording of self and put the content on CD and submit it for appraisal.
4. Watch a programme broadcast on television on educational topics & prepare an interpretational report.
5. Collect & analyse news matter related to educational issues in local context (At least 7 days news).
6. Conduct an extempore session about various issues of social media & draft summaries in the form of report.
7. Through an intensive search on internet find out some Educational apps and mention their utilities.
8. Conduct an informative session with the help of the Teacher Educator on the topic, 'how to use search engines efficiently and precisely'. List the outcomes (session to be conducted in the presence of expert)
9. How a mobile as a device can be used as teaching tool write a note on it on your self experiences.
10. Search at least four free educational e-books and write them on CD and submit it.

References:

1. Srinivasan, T. M. (2002). Use of computers and multimedia in education. Jaipur: Aavisakar Publication.
2. Alexis, M. L. (2001). Computer for every one. Leon: Vikas Publishing house Ltd: New Delhi.
3. Norton, P. (1998). Introduction to computers. New Delhi: Tata McGraw Hill Publishing Co 104
4. Peter Norton's Introduction to Computers (2000), Tata McGraw-Hill Publications, New Delhi
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Paper III

Schooling, Socialisation and Identity

Objectives:

The student teacher will be able to:

- Become aware of the processes of socialisation at home and school that act as shaping factors in identity formation of the school-going child (in Indian contexts);
- Reflect critically on factors that shape identity formation and influence sense of self of the growing 'student' as well as 'teacher' in school as well as in out of school situations;
- Begin to understand the processes that have shaped/continue to shape one's own sense of identity as 'student' and a 'person' located in multiple social contexts and roles;
- Begin to become critically aware of 'self' and 'identity' and 'free' oneself through self-understanding, from tendencies that lead to crystallising and limiting of one's identity as a teacher and a human being; and
- Reflect on one's aspirations and possibilities in order to develop a growing sense of agency as a 'teacher', a 'professional', as well as a 'human being'.

COURSE CONTENT

UNIT 1: SOCIALISATION

1. Understanding the nature and processes of socialisation
 - (i) At home: family as a social institution; parenting styles and their impact; transmission of parental expectations and values;
 - (ii) Socialisation and the community: neighbourhood, extended family, religious group and their socialisation functions; and
 - (iii) At school: impact of entry to school; school as a social institution; value-formation in the context of schooling.

UNIT 2: EMERGENCE OF 'PERSON' AND 'IDENTITY'

1. Aspirations: Meaning, positive & negative aspirations, realistic & unrealistic aspiration
2. Factors that influence aspirations: intelligence, sex, interests, Values, Family Pressures, Group expectations, cultural traditions, competition with others, past experiences, the Mass Media, personal Characteristics.
3. Self Concept: Meaning, Self concept in reference to parents expectation, Attitude towards members of the family, physical state of the child, Biological Maturation(Early-average-late), Impact of radio & television etc, school opportunities, school demands, religious affiliations, opinion of peers, family economic problems, family personal problems, attitude towards peers.
4. The influence of technology and globalisation on identity formation.

UNIT 3: SCHOOLING AND IDENTITY FORMATION:

1. Schooling as a process of identity formation: ascribed, acquired and evolving.
2. Factors influencing teacher-student relationship, Early school experiences in Identity formation
3. Factors influencing attitudes toward Education: Sex, child training Methods, home influence, social class, religion, ethnic group, peers, personal adjustment.
4. Role of the school in developing national, secular and humanistic Identities.

UNIT-4: COPING WITH SOCIAL COMPLEXITIES: ROLE OF EDUCATION

1. Expanding human activities and relations; increasing complexity, homogenisation of culture versus preservation of distinctive identities; competition, uncertainty and insecurities and the resultant identity conflicts.

UNIT 5: EVOLVING AN 'IDENTITY' AS A TEACHER

- 1.The impact of one's own socialisation processes; awareness of one's own shifting identities as 'student', 'adult' and 'student-teacher' and influences that have acted/continue to act on oneself.
- 2.Reflections on one's own aspirations and efforts in becoming a 'teacher'.
- 3.Social image of the teacher in present context.
- 4.Teacher appraisal

Practicum/Field Work(All Activities are Compulsory)

1. After standing the pic 'self- concept' prepare a reflective journal mentioning how the school teachers formed your self- concept.
2. Recall your childhood experiences about your social surroundings & recollect the persons who played an imposing role in forming your- self& identity.
3. Organise a Brain-storming session on the topic values can't be taught they are caught mention who were the prominent speakers & contributors.
4. Recall a situation where you find yourself ill -treatedwrite your experiences.
5. What you thought of teaching profession before joining this B.Ed. Program & what you think now after experiencing internship program. Prepare a note focusing on your weaknesses & strengths.

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