रानी दुर्गावती विश्वविद्यालय,जबलपुर

Rani Durgawati University, Jabalpur

Four-Year Integrated (Eight Semester)

B.Sc.B.Ed. Course

Course of Studies & Prescribed Books
Approved by Board of Studies in Education

Faculty of Education
B.Sc.B.Ed. Integrated Course
2018 Onwards

1

STRUCTURE OF THE COURSE

B.Sc. B.Ed.

First Semester

Subject/Paper	Paper/ Practical	Internal	Total	Pds./Week
B.Sc.Part: Foundation Course Moral Values	40	10	50	3
Language – Hindi	40	10	50	3
- English	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	375	75	450	
B.Ed. Part Human Development in Socio-cultural Context	40	10	50	3
School Education in India: Historical Perspective	40	10	50	3
Health, Physical Education & Yoga	-	25	25	2
Work Education	-	25	25	2
Total	80	70	150	
Grand Total	455	145	600	

Second Semester

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc.Part: Foundation Course Basic of Computer	40	10	50	3
Language – Hindi	40	10	50	3
English	40	10	50	3

2

Subject/Paper	Paper	Intern.	Total	Pds./week
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	375	75	450	
B.Ed. Part				
Cognition & Learning	40	10	50	3
Psychology Practical	-	25	25	2
Health, Physical Education & Yoga	-	25	25	2
Work Education	-	25	25	2
Art & Aesthetics	-	25	25	2
Total	40	110	150	
Grand Total	340	260	600	

Third Semester

Subject/Paper	Paper	Intern.	Total	Pds./week
BSc. Part: Foundation Course				
Comp. & ICT in Education	40	10	50	3
Language – Hindi	40	10	50	3
- English	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	375	75	450	
B.Ed. Part		50	50	2
Reading & Reflection on text				
Curriculum Development	40	10	50	3
Arts and Aesthetics	-	25	25	2
Community Living	-	25	25	1 week
Total	40	110	150	

	Grand Total	415	185	600	

Fourth Semester

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc. Part: Foundation Course				
Comp. & ICT in Education	40	10	50	3
Language – Hindi	40	10	50	3
- English	40	10	50	3
Environmental Education	40	10	50	3
Elective I + Practical	60+25	15+25	100	9
Elective II + Practical	60+25	15+25	100	9
Elective III + Practical	60+25	15+25	100	9
Total	415	85	500	
B.Ed. Part				
Inclusive Education	40	10	50	3
Assessment for learning I	40	10	50	3
Total	80	20	100	
Grand Total	495	105	600	

Fifth Semester

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc. Part:				
Foundation Course	40	10	50	3
Entrepreneurship Dev.				
Elective I + Practical/m	60+25	15	100	9
Elective II + Practical/m	60+25	15	100	9
Elective III + Practical/m	60+25	15	100	9
Total	295	55	350	
B.Ed. Part				

4

	Paper	Intern.	Total	Pds./week
P.C.- I: Physical Science	60	15	75	5
P.C.-II: Bio/Maths	60	15	75	5
Assessment for Learning II	40	10	50	3
Basics in Education	40	10	50	3
Total	200	50	250	
Grand Total	495	105	600	

Sixth Semester

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc. Part: Foundation Course Entrepreneurship Development	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 P.C.- I: Physical Science	60	15	75	5
P.C.-II: Bio Science/Maths	60	15	75	5
Gender Issues & Peace Education	40	10	50	3
Schooling, Socialization & Identity	40	10	50	3
Total	200	50	250	
Grand Total	495	105	600	

Seventh Semester

Subject/Paper	Internal/External	Total
B.Ed. Part Pre-Internship	50	50
Internship (100+100)	200	200
External final Teaching (100+100)	200	200
Post-internship	50	50

5

Action Research (25+25)			
Concerns of Education coming from the field:		50	50
A Report		50	50
Total	Grand	600	600

Eighth Semester

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc. Part:				
Foundation Course Environmental Education	40	10	50	3
Elective I + Practicum + Pro.	70+50	30	150	9
Elective II + Practicum + Pro.	70+50	30	150	9
Elective III + Practicum + Pro.	70+50	30	150	9
Total	400	100	500	
B.Ed. Part				
Vision of Indian Education :Issues and Concerns	40	10	50	3
School Management & Leadership	40	10	50	3
Total	80	20	100	
Grand Total	480	120	600	

Bachelor of Science and Bachelor of Education

Rani Durgawati University

COURSE OF STUDIES

For

Four Year Integrated

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

FIRST SEMESTER

Subject/Paper	Paper/ Practical	Internal	Total	Pds./Week
B.Sc. Part: Foundation Course Moral Values	40	10	50	3
Language – Hindi	40	10	50	3
- English	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	375	75	450	
B.Ed. Part Human Development in Socio-cultural Context	40	10	50	3
School Education in India: Historical Perspective	40	10	50	3
Health, Physical Education & Yoga	-	25	25	2
Work Education	-	25	25	2
Total	80	70	150	
Grand Total	455	145	600	

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

(All Electives 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)

Semester Name	Paper	Marks	Paper Code	Name of Papers
I	Paper Theory-I	30	M – 1.1	Algebra, Trigonometry And Vector Analysis
	Paper Theory – II	30	M – 1.2	Calculus And Geometry
	Internal Test	15		Related To Above Papers
	Practicum	25		Related To Above Papers

Work Education: Electricity and Electronics/Agriculture

Foundation Course : Moral Values

आधार पाठयक्रम : नैतिक मूल्य

Contact Periods/week 03

Internal : 10

कुल अंक – 40

प्रश्न एवं अंक निर्धारण

4 व्याख्यात्मक/विश्लेषणशीय प्रश्न – 28 अंक (7 X 4)

2 लघुउत्तरीय प्रश्न – 07 अंक (3.5 X 2)

वस्तुनिष्ठ प्रश्न – 05 अंक (1 X 5 प्रश्न)

(व्याख्यात्मक एवं समीक्षात्मक प्रश्नों में आन्तरिक विकल्प रहेगा)

Moral Values (नैतिक मूल्य)

इकाई 1.
1. नैतिक मूल्य परिधस एवं वर्गीकरण – डॉ. शशि राय
2. आचरण की सभ्यता – सरदार पूर्ण सिंह

इकाई 2.
1. बुद्ध की करुणा – डॉ. भद्रा तिम्म
2. शिकागो व्याख्यान – स्वामी विवेकानन्द

इकाई 2.
1. धर्म और राष्ट्रवाद – महर्षि अरविन्द
2. अप्प दीपो भव – स्वामी श्रद्धानंद

इकाई 4.
1. अंतर्ज्ञान और नैतिक जीवन – डॉ. सर्वपल्ली राधाकृष्णन
2. सादगी – महात्मा गांधी

इकाई 5.
1. भय से मुक्ति – जे कृष्ण मूर्ति

8

2. सत्य के साथ मेरे प्रयोग – महात्मा गांधी की आत्मकथा का संक्षिप्त विद्यार्थी संस्करण (स्रोत)

Foundation Course : Language - Hindi
आधार पाठ्यक्रम : हिन्दी भाषा
प्रश्नपत्र – 1

Contact Periods/week:03

Internal : 10

कुल अंक – …

प्रश्न एवं अंक निर्धारण

4 व्याख्यात्मक / दीर्घउत्तरीय प्रश्न – 28 अंक (7 X 4)

2 लघुउत्तरीय प्रश्न – 07 अंक (3.5 X 2)

वस्तुनिष्ठ प्रश्न – 05 अंक (1 X 5 प्रश्न)

(व्याख्यात्मक एवं दीर्घउत्तरीय प्रश्नों में आंतरिक विकल्प होंगे। आंतरिक मूल्यांकन के लिए दस अंक निर्धारित हैं।)

इकाई 1	1. ज्वलंतजला पुकारती (कविता)	–	जयशंकर प्रसाद
	2. जाग तुझको दूर जाना (कविता)	–	महादेवी वर्मा
	3. उत्साह (निबंध)	–	रामचंद्र शुक्ल
	4. शिरीष के फूल (ललित निबंध)	–	हजारी प्रसाद द्विवेदी
इकाई 2	1. नमक का दरोगा (कहानी)	–	प्रेमचंद
	2. हार की जीत (कहानी)	–	सुदर्शन
	3. जगजन बुद्ध (निबंध)	–	स्वामी विवेकानंद
	4. लोकतंत्र एक धर्म है (निबंध)	–	सर्वपल्ली राधाकृष्ण
इकाई 3	1. कछुआ धर्म (निबंध)	–	चंद्रधर शर्मा गुलेरी
	2. वह तोड़ती पत्थर (कविता)	–	सूर्यकांत त्रिपाठी निराला
	3. सपनों की उड़ान (प्रेरक निबंध)	–	ए.पी.जे. अब्दुल कलाम
	4. चीफ की दावत (कहानी)	–	भीष्म साहनी

Foundation Course : Language English
Paper – 1

Contact Periods/week : 03

Internal Marks : 10

External Marks : 40

Distribution of Marks:

1. Four critical questions are to set be from unit 1. Two questions are to be attempted, Each question will carry 5 marks. (5X2 = 10 marks).

2. Students are required to write a paragraph on a given topic in about 100-125 words. (4x1=4 Marks)

3. Students are required to attempt five questions based on the given unseen passage. Each question will carry marks. (2X5=10 marks)

4. Students are required to attempt six questions on vocabulary. Each question will carry one mark. (1X6=6 marks)

5. Students are required to attempt 10 questions on Grammar. Each question will carry one mark. (1X10=10 marks)

UNIT: I

John Keats- Ode to a Nightingale, Rabindranath Tagore- Where the mind is without fear. Rajgopalachai-Preface to the Mahabharta, J.L.Nehru- Tryst with Destiny, Walt Whitman –O Captain ! My Captain , O Henry – The Last Leaf.

UNIT:II

Paragraph Writing

UNIT:III

Comprehension of an unseen passage

UNIT:IV

Vocabulary: Synonyms, Antonyms, Homophones, Homonyms.

UNIT: V

Grammar & Usage Noun, pronoun, verbs, adjective, adverbs, conjunctions, preposition, articles.

....

10

Elective I – Physics

Paper I: Elements of Mathematical Physics, Mechanics & Relativity

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 completion of this course the students will be able to

1. Acquaint themselves with different mathematical techniques and concepts useful in study of physics

2. Differentiate between scalar and vector fields

3. Explain the physical significance of gradient of scalar field and divergence and curl of vector field

4. Understand the solutions of differential equations of two and three variables and relate those to applications in physics

5. Solve problems on applications of Newton's laws of motion the solution of a single particle under central force field and to a system of particles

6. Understand Keplers laws of Planetary Motion and generalize it to satellites

7. Solve problems of rigid and deformable bodies under gravitational, tensile and compressible force

8. Understand the concept of surface tension and viscosity

9. Understand the phenomena of relativity

Unit – 1: Mathematical Background

Concept of field; gradient of a scalar field and its geometrical interpretations; divergence and curl of a vector field; line, surface and volume integrals; flux of a vector field; Gauss divergence theorem; Green's theorem and Stokes theorem.

Unit -2: Mechanics

Motion in a uniform field; components of velocity and acceleration in different coordinate systems (Cartesian and Polar only); uniformly rotating frame; centripetal acceleration; pseudo forces; Coriolis force and its applications; Foucault pendulum.

11

Motion under central force; Kepler's law; gravitational law and field; potential due to a spherical body; Gauss and Poisson equations for gravitational self-energy.

Unit-3: Mechanics of Rigid Bodies

System of particles; constraints, degree of freedom; centre of mass; centre of mass and laboratory coordinates, equation of motion; conservation of linear and angular momentum; conservation of energy; rocket propulsion; elastic and inelastic collisions.

Rigid body motion; rotational motion; moments of inertia; calculation of moment of inertia of some regular bodies (rod, lamina, disc and sphere); principal moments and axes; gyroscope.

Unit-4: Properties of Matter

Elasticity: Elasticity; small deformations; Hooks law; elastic constants for an isotropic solid; bending moments; bending of beams; beams supported at both the ends, cantilever, torsion of a cylinder and shearing forces; Poisson's ratio; relation between different elastic modulli; elastic fatigue.

Surface Tension: Surface Tension, Angle of Contact, Capillary Rise method; Energy required to raise a liquid in capillary tube: Factors affecting Surface Tension; Applications of surface tension.

Viscosity and fluid mechanics: Concept of Viscous Forces and Viscosity; Steady and Turbulent flow; Reynolds number; Equation of Continuity; Eulers Equation; Bernoullis Principle; Signus effect; Stokes law.

Unit-5: Relativity

Reference systems; inertial frames; Galilean Invariance and conservation laws, Propagation of light. Michelson-Morley experiment; search for ether; Minkowski diagram. Postulates of Special Theory of Relativity; Lorentz Transformations; Lorentz contraction; Time dilation; velocity addition theorem, variation of mass with velocity; mass energy equivalence, particle with zero rest mass; space-time diagram, invariance of laws of physics.

Physics Practical List

1. Acceleration due to gravity 'g' by compound pendulum.
2. Moment of Inertia of 'Fly wheel'.
3. Modulus of rigidity by Maxwell's needle.
4. Young's modulus by Searle's Apparatus.
5. Young's modulus by Searle's method.
6. Modulus of rigidity by Torsion pendulum (Dynamical Method).
7. Moment of Inertia of irregular body by torsional pendulum.

12

8. To determine Young's modulus of the material of beam by the method of bending (using a spherometer.

9. Coefficient of viscosity of gear oil/glycerine.

10. Surface tension of water by capillary rise method.

11. To determine the Poisson's ratio for rubber.

12. Determination of Youngs Modulus, Modulus of rigidity, Poisson's ratio by Searl's method.

Suggested Readings:

- The Mathematics of waves and vibrations, R.K Ghosh, Macmillan
- Introduction to Special Relativity, Robert Resnik, John Wiley & sons (Asia) Pvt. Ltd
- Classical Mechanics, Dr. J.C Upadhaya, Himalaya Publishing House.
- Introduction to Classical Mechanics, David Morin, Cambridge
- Classical Mechanics, John r. Taylor, University Science Books

---

Elective I – Botany

Paper I: Diversity of Microbes and Cryptogams

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (Exterii

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

Objective: To gain understanding of classification and structural and functional organization of viruses, bacteria, algae, fungi , bryophytes and Pteridophyts.

Unit I

Viruses: Discovery, structure, classification reproduction and diseases caused.

Bacteria: Structure, classification, nutrition, reproduction and economic importance and a general account of cyanobacteria and mycoplasmas.

Unit II

Algae: General characters, classification and economic importance. Important features in life history of

Chlorophyta : Volvox, Oedogonium , Coleochete

Xanthophyta : Vaucheria

13

Phaeophyta : Ectocarpus, Sargassum

Rhodophyta : Polysiphonia

Unit III

Fungi : General characters, classification and economic importance. Important features in life history of

Mastigomycotina: Pythium, Phytophthora

Zygomycotina: Mucor

Ascomycotina: Saccharomyces, Eurotium, Peziza

Basidiomycotina: Puccinia, Agaricus

Deuteromycotina: Cercospora, Colletotrichum, General account of Lichens

Unit IV

Bryophyta: General characters, outline classification of Bryophyta. Structure and life history of

Hepaticopsida: Marchantia

Anthocerotopsida: Anthoceros

Bryopsida: Funaria

Unit V

Pteridophyta: General characteristics and outline classification. Important characteristics of Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Structure and reproduction in Rhynia, Lycopoduim, Selaginella, Equisetum, Pteris and Marsilea. Stelar system in pteridophytes.

Practical

Objectives:

- to develop skills of staining of prokaryotes and cryptogamus plant to impart skills of temporary and permanent slide preparations

(i)   To enhance ability to identify the of prokaryotes and cryptogamic plant

(ii)   To familiarize the students with diseases and their causative agents.

Microbes and Bryophytes

1. Study of the genera included under algae and fungi.

2. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophytes and Pteridophyta

3. Observation of disease symptoms in hosts infected by fungi, viruses and mycoplasma. Section cutting of diseased material and identification of the pathogens as per the theory syllabus.

14

4. Gram staining of bacteria (milk, curd, root nodules).

5. Study of crustose, foliose and other types of lichen thalli.

Scheme of Practical Examination

1. Microscopic preparation and identification (Algae/Fungi)	4
2. Identification of diseased specimen and its anatomical preparation.	4
3. Section cutting and staining (Bryophytes)	4
4. Section cutting and staining (Pteridophytes.)	4
5. Comment on the spots (1-5)	5
6. Practical Record/Sessional	4
7. Internal evaluation	5

Suggested Readings

1. Vashishta, B.R. and A.K. Sinha 2007. Fungi .S. Chand and Co. Ltd.

2. Thakur, Anil K. and Susheel K. Bassi 2007. Diversity of Microbes & Cryptogams. S. Chand & Co. Ltd.

3. Vashishta, B.R., A.K. Sinha and V.P. Singh. 2005. Algae . S. Chand & Co. Ltd.

4. Ingraham, John L. and Catherine A. Ingraham. 2004 . Introduction to Microbiology. 3rd edition. Thomson Asia P. Ltd.

5. Sharma, O.P.1992. Text Book of Thallophytes Tata McGraw Hill Publishing Co.

6. Sharma, P.D.1991. The Fungi, Rastogi & Co. Meerut

7. Dube, H.C.1990. An Introduction to Fungi Vikas Publishing House Pvt. Ltd.

8. Puri, P. 1980. Bryophytes Atma Ram & Sons Delhi

9. Clifton, A. 1958. Introduction to Bacteria McGraw Hill & Co. New York

10. Sharma, O.P. 1990, Text Book of Pteridophyta Mcmillan India Ltd.

11. Varhishta,B.R.2015, Pteridophytes S. Chand Co. New Delhi

12. Sporne K.R.The Morphology Of Bryophytes, Hutchinson, London.

13. Perkier N.S.The Pteridophytes

Elective II – Chemistry

Paper I

Contact Periods/week: 05 + 4 Practical

Note: Two questions will be set from each Unit and the candidates will be required to attempt one:

Objectives

After the end of 1st semester the students should be able to:

(i) Auire the background of mathematical knowledge needed for better understanding of chemical principles and derivations and also to apply in solving problems.

(ii) Illustrate how a scientific model can be constructed based on the experimental observations of the behaviours of gases and to explain the properties in terms of microscopic organization.

(iii) Explain the properties of liquid state using inter- molecular forces and to differentiate the colloidal state from true solutions in terms of size of the particles and to relate this attribute with their properties with the number of particles to the colligative properties.

(iv) Appreciate the importance of phenomenon of colloidal chemistry in daily life.

(v) Explain the importance of quantum chemistry in the developing the model of the atom.

(vi) Acquire competancy to predict the patterns in the properties exhibited by the elements.

(vii) Acquire the knowledge of correlating the properties of matter in the solid state to the structure.

(viii) Explain the macroscopic behaviour in terms of microscopic properties.

(ix) Predict the structure of molecules by studying certain physical properties.

16

Instructional Strategy:

The teacher in addition to the lecture method may also use assignment-cum-discussion mode for transaction of such topics which the learner has already learnt in the higher secondary stage. The use of ICT in transaction of solid state may also be adopted by the teacher. In describing the shape of molecules and the interplay of intermolecular forces as they affect the properties of the substances, the teacher may explore the possibility of the use of Ausubel's advance organizer model.

Unit-I   **Mathematical Concepts**

Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like kx, e^x, x^n, $\sin x$, $\log x$; maxima, partial differentiation and reciprocity relations.Integration of some useful/relevant functions; permutations and combinations.Factorials.Probability.

Gaseous States Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state.

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Walls constants, the law of corresponding states, reduced equation of state.

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

Liquid State & Colloids

Intermolecular forces, structure of liquids (a qualitative description).

Structural differences between solids, liquids and gases.

Liquid Crystal : Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases.Thermography and seven segment cell. Colloids- classification & properties of sols (optical &electrical),emulsions & gels.

Unit-II Atomic Structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of and , quantum numbers, radial and angular wave functions and probabillity distribution curves, shapes of

17

s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge.

Periodic Properties

Atomic and ionic radii, ionization energy, electron affinity and electronegativity-definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

Unit-III   SolidState

Definition of space lattice, unit cell. Laws of crystallography-(i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry, Symmetry elements in crystals. X-ray diffraction by crystals.Derivation of Bragg equation.Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Ionic solids -Ionic Solids-Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions.

Unit-IV   Chemical Bonding

Convalent Bond-Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2^- and H_2O. MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference. Weak Interactions-Hydrogen bonding, van der Waals forces.

Unit-V

(A)   Physical Properties and Molecular Structure: Optical activity, polarization (Clausius-Mossoti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

18

(B)   Solutions, Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity & activity coefficient. Dilute solutions, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure.Elevation of boiling point and depression of freezing point.Thremodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.Experimental methods for determining various colligative properties. Abnormal moloar mass, degree of dissociation and association of solutes.

Suggested Readings:

1. Atkins, P.W. & Julio De Paula , Physical Chemistry , OxfordUniversity Press
2. Silbey, R.J. andAlberty , R.A.. , Physical Chemistry John Wiley & Sons, inc.
3. Castellan, G.W. Physical Chemistry ,Narosa Publishing House
4. Coulson ,C.A., Valence, OxfordUniversity Press
5. Chanda ,Manas ,Chemical Bonding ,TMH Publication
6. Raj Gurudeep, Advanced Physical Chemistry ,Goel Publishing House
7. Puri, Sharma &Pathania , Physical Chemistry ,ShobanLalNagin Chand & Company
8. Rakshit , P.C. , Physical Chemistry, New Age International
9. Lee , J.D. ,Inorganic Chemistry , ELBS
10. Cotton &Wilkinson , Inorganic Chemistry, Wiley International

PRACTICALS

1. Analysis of Inorganic mixture containing two cations and two anions including typical combinations. anions: CO_3^{2-}, CH_3COO^- , NO_2^-, SO_3^{2-}, S^{2-}, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-} cations: NH_4^+, Ag^+, Pb^{2+}, Hg_2^{2+}, Cu^{2+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{4+}, Fe^{3+}, Cr^{3+}, Al^{3+}, CO^{2+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+} Insoluble and interfering ions are to be excluded.

2. Titremetric Methods

(a)   Mixture of Na_2CO_3 and $NaHCO_3$ with HCl.

(b)   Estimation of ferrous and ferric by dichromate method.

(c)   Estimation of copper using thiosulphate.

3. Physical Chemistry

19

(a) Determination of surface tension of given liquid using stalgmometer.

(b) Determination of viscosity coefficient of amyl alcohol in water at different concentrations and to calculate excess viscosity of these solutions.

(c) Determination of refractive indices of given set of liquids and calculation of their molar refractions.

Scheme of Examination:

Experiments

(1) Mixture analysis : 6

(2) Titration - 4

(3) Physical experiment - 5

Internal assessment - 5

Viva - 5

Elective III – Zoology

Paper 1: NONCHORDATA, PROTOCHORDATA AND HEMICHORDATA

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Objective - To gain knowledge of classification of Nonchordates and Protochordates, their structure organization and reproductive animals.

Unit-1

1. Classification of lower invertebrates.

2. Classification of higher invertebrates.

3. Protozoa- type study of Plasmodium.

4. Parasitic protozoa & diseases.

5. Porifera - Type study of Sycon.

Unit-2

1. Coelenterata -Type study of Obelia.

2. Polymorphism in coelenterates.

20

3. Coral and coral Reefs.

4. Helminthes - Type study of Liver Fluke.

5. Helminthic and Nematoda parasites (Ascaris, Ancylostoma, Dracunculus, Wuchyeria and Trichinella spiralis).

Unit-3.

1. Annelida – Type study of Earthworm.

2. Metamerism & Trochophore Larva of Nereis.

3. Arthropoda – Type study of Prawn.

4. Sting apparatus of Honey Bees.

5. Mouth parts of Arthropods (biting, sucking, chewing and lapping)

Unit-4

1. Mollusca – Type study of Pila.

2. Larval Forms in Mollusca.

3. Echinodermata – Type study of Star Fish.

4. Ambulacral system in Echinoderms.

Unit-5

1. Classification & affinities of Protochordata (Urochordates & Cephalochordates)

2. Urochordata – Type study of Herdmania (Excluding development)

3. Cephalochordata – Classification & affinities.

5. Type study of Balanoglossus.

PRACTICAL

Objective – To develop the skill of identification, staining and study of life cycle of various Protozoan & Helminthic parasites.

1. Study of museum specimens, slides relevant to the type study in theory, from Protozoa upto Hemichordata.

2. Mouth parts of Cockroach.

3. Ctenidium and osphradium of Pila.

4. Salivary gland of Cockroach.

5. Sting apparatus of Honey Bees.

6. Mounting of velum & wheel organ of Amphioxus.

7. Radula of Pila.

8. Study of various Protozoa in pond water.

21

9. Study of life cycle of various Protozoan & Helminthic parasites (as mentioned in theory syllabus) through charts & models.

SCHEME OF PRACTICAL EXAMINATION

1. Spotting	-	10
2. Mounting	-	05
3. Study of Protozoan/Life cycle of Parasites	-	03
4. Practical Records	-	03
5. Viva-voce	-	04
Total	-	**25 Marks**

Referred books -:

1. Textbook Of Zoology Vol I (Invertebrate) Vol II (Vertebrate)-Parker & Haswell

2. Animal Biology (Vol I & Vol II) -Adhikari, Ganguly & Sinha

3. Textbook of Invertebrates -R.L Kotpal

4. Textbook of Vertebrates- R.L Kotpal

5. Practical Zoology Invertebrates & Vertebrates -S.S.Lal

6. Practical Zoology of Chordates and Non-chordates-P.S. Verma

---

Elective III – Mathematics

Contact Periods/week: 65 + 4 Practicum

Maximum Marks – 30+30=60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practicum 5)

Practicum – 25 (Internal)

Paper M - 1.1: ALGEBRA, TRIGONOMETRY AND VECTOR ANALYSIS

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

Objectives:

- To develop understanding of matrices, operations in Matrices and solving equations
- To develop understanding of trigonometric functions and summation of series
- To develop understanding of basic concepts of product of scalar and vector product of three vectors
- To develop understanding of vector differentiation including curl, gradient and Divergence

Unit - I   Matrices- symmetric, skew symmetric, Hermitian and skew Hermitian matrices. Elementary operations on matrices. Inverse of a matrix. Linear independence of row and column matrices. Row rank, column rank and rank of a matrix. Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristics equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations.

Unit - II   Relations between the roots and coefficients of general polynomial equation in one unknown. Transformation of equations. Descart's rule of signs. Solution of cubic equations (cardon method), Biquardratic equations.

Unit - III   Demoivre's theorem and its applications. Direct and Inverse circular and Hyperbolic functions.

Unit - IV   Logarithm of a complex quantity, Expansion of trigonometrical functions. Gregory's series, summation of series

Unit-V   Scalar and vector product of three vectors, Product of four vectors, Reciprocal Vectors. Vector differentiation, Gradient, divergence and curl.

Content as in:

1. H.S. Hall and S.R. Knight : Higher Algebra H.M. Publication
2. S.L. Loney : Plane Trigonometry Part II Mc Millan & Co.
3. B.R. Thakur, Nigam, Sinha, Saran Vector Analysis
4. Manglik and Seth : Vector Calculus

Paper M - 1.2: CALCULUS AND GEOMETRY

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

Objectives:

- To develop understanding of fundamentals of Differential and Integral Calculus
- To make them familiar with the mechanism of deriving equations of surfaces in 2 and 3 dimensions.

23

Unit - I Epsilon – delta definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability.

Unit - II Successive differentiation. Leibinitz's theorem. Maclaurin and Taylor series expansions.

Unit - III Asymptotes. Curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in cartesian and polar coordinates. Integration of irrational algebraic functions and transcendantal functions. Reduction formulae. Definite integrals.

Unit - IV Quadrature. Rectification. Volumes and surfaces of solids of revolution.

Unit- V The straight line and the plane, sphere, cone and cylinder.

Content as in :

1. Thomas & Finney : Calculus, Pearson Education Pvt. Ltd.
2. R.J.T. Bell : Elementary Treatise on Coordinate Geometry of 3 Dimension Momilan
3. S.L. Loney : Elements of Coordinate Geometry

M - 1.3 Mathematics Practicum

List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester 1 Mathematics papers M-1.1 and M-1.2.

- Mathematics seminar.

Education Component:

Human Development in Socio-cultural Context

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks –13

Internal – 10

Objectives:

- To develop a contemporary understanding of human development: its meanings, processes and perspectives in socio cultural context.

24

- To acquire theoretical perspectives and develop an understanding of dimensions of human development with special reference to adolescent learners.
- To develop an understanding about the impact/influence of socio cultural context in shaping adolescent development.
- To make them cognizant of specific issues of adolescent behavior in schools and the critical role in dealing with children of diverse abilities.

Course Content:

Unit-I: Human Development and the Contexts

- Human development: Meaning, Nature and Dimensions
- Role of Heredity and Environment in Development
- Socio-cultural Contexts: Meaning, Nature and its Influences on Human Development: Culture, Caste, Class, Religion and Gender – their bearing on development
- Family: Child rearing practices
- School: School Culture, Climate, School Ethos, Teacher Values and Peer groups

Unit-II: Socio-cultural aspects of personality Development

- Cognitive Development (Piaget, Vygotsky & Bruner)
- Psycho-Social Development (Erikson)
- Moral Development (Piaget & Kohlberg)
- Character Development
- Culture and Personality

Unit-III: Understanding Adolescents

- Nature of Adolescence: stage of development, Socio-cultural context
- Characteristics and concerns of Adolescents
- Biological   : Physical, Sexual, Emotional
- Cognitive   : Abstract Thinking, Meta-cognition
- Psychological   : Identity, Individuation, and Sense of Independence
- Social   : Adolescents expectation, Social expectation Parental expectation, Skepticism, Peer culture, Role model
- Challenges and opportunities during adolescence: Role of Guidance and Counseling

Unit-IV: Socio-cultural Context Shaping Human Development

- Nature of Socio-culture and Environment.
- Physical Environment

25

- Influence of Educational Technology
- Media Exposures
- Dealing with learners from varied socio-cultural context and creating culturally compatible classroom

Transactional Modes:

- Class presentations
- Readings and class discussions
- Assignments
- Survey to study child rearing practices
- Case study analysis to understand contextual influence on development
- Exercises on self concept and personality development
- Use of online videos related to cognitive and moral development
- Case study of an adolescent

Suggested Readings:

- Aives, Phillippe (1962). Centuries of Childhood: A Sociology of Family Life, Knops, New York.
- Ambron, S.R. (1983). Child Development. Holt Rinehart & Winston, New York.
- Atkirson, Richard C. et.al. (1983). Introduction to Psychology. Harcourt Brace Jahonovich Inc. New York.
- Barry, Johnson (1964). Classroom Group Behavior, Macmillan New York.
- Bhargava, Mahesh (1994). Introduction to Exceptional Children, Sterling Publishers Pvt. Ltd. New York.
- Bourne, L.E. (1985): Its Principles and Meaning Holt, Rinehart Land Winston, New York.
- Christian, Jyoti (1984). Classroom Group Dynamic, Anu Books, Meerut.
- DeCecco, John P. (1977). The Psychology of Learning and Instruction Prentice Hall of India Pvt. Ltd. New Delhi.
- Gessel, A.L. & Allagh, F.H. (1946). The Child from Five to Ten, Harper & Brothers, New York.
- Hurlock, E.B., (1964). Child Development, Megraw Hill Book Co. New York.
- Klausmeier, Herber, J. (1985). Educational Psychology, Herper and Row, New York.

26

- Kochar, S.K. (1989). Guidance and Counselling in Collegeand Universities, Sterling Publishers Pvt.Ltd., New Delhi.
- Lindern, H.C. (1980). Educational Psychology in the Classroom (sixth ed.). Oxford University Press, New York.
- Mathur S.S. (1988). A Sociological Approach to Indian Education, Vinod Prakashan, Agra.
- Pastrcha, prem, (1976). Guidance and Counselling in India Education NCERT. New Delhi.
- Smith Ronald E. Samson, I.G. and Samson, Barbara R. (1982). Psychology: The frontiers of Behaviour. Harper and Row Pub. New York.
- Shrivastava, G.N.P. (1986). Recent Trends in Personality study. Agra Psychological Research Cell, Balangunj, Agra.
- Shrivastava, G.N.P. (1999). Shiksha Manovigyanb, Naveen Vikkchardharayen Concept Publishing Company, New Delhi.

School Education in India: Historical Perspective

Contact Periods/week: 03

Maximum Marks – 40
Min. Pass Marks – 13
Internal – 10

Course Description

The course 'School Education in India' seeks to develop an understanding of processes of how and why education system in India evolved over a period of time. It gives an understanding of the socio-historical evolution of Indian education system by drawing attention on history of formal education system. The course will trace the dimensions of basic understanding of culture, politics and economics that impacted school / university education in light of Vedic, Buddhist, Islamic and British education systems.

Course Objectives

- To introduce the systems of education in historical perspective to appreciate education and its relation to socio-political, cultural and economic context
- To explain about formal school system in India in socio-historical context and its institutionalization.

- To appreciate the change and continuities in educational purposes, processes and practices in Indian education
- To develop historical perspective on contemporary educational issues and problems

Unit-I Understanding Educational Systems of Ancient India: Vedic Education

- Understanding 'India' of Ancient times: Economic Activities, Cultural Practices and Social System
- Social Foundation of education during Vedic period
- Origin and development of formal education during the period
- Vedic education system: Critical understanding of Aims, knowledge and educational practices and agencies
- Relevance of Vedic educational practices to contemporary times

Unit-II Understanding Educational Systems of Ancient India: Buddhist Education

- Social development stage during Buddhist Period: Economic Activities, Development of commerce, Cultural Practices and Social System
- Development of Education system and higher learning centers
- Social Foundation of education during Buddhist period
- Buddhist education system: Critical understanding of Aims, knowledge and educational practices and agencies
- Relevance of Buddhist educational practices to contemporary times
- Comparative study of Vedic and Buddhist education systems

Unit –III Development of Islam education during medieval period

- Understanding 'India' of Middle Ages: Economic activities, Commerce, cultural practices, social systems and political formations
- Origin and development of Islam education
- Islam education system: Critical understanding of Aims, knowledge and educational practices and agencies

Unit – IV Education during Colonial period: British education

- Understanding 'India' of Modern period: Economic activities, commerce, cultural practices, social systems and political formations
- The orientalist and anglicist Conflict
- Development of British education in India through 1813 Act, 1835 McCauley Minutes, 1854 Woods Despatch, 1882 Hunter Commission, 1943-44 Sargent Report

- Efforts and Movement by Indians for compulsory education in India – Mahatma Jyotiba Phule, Gokhale Bill(1910), Basic education (1937)
- British education system: Critical understanding of Aims, knowledge and educational practices and agencies
- Contribution of British to Indian education

Transactional Modes:

- Class presentations
- Readings and class discussions
- Assignments
- Survey to study historical places
- Case study analysis to understand contextual influence on historical development
- Use of online videos related to the history of development of education in India

Suggested Readings:

Altekar, A. S. (1965). Education in ancient India. Varanasi: Nand Kishore. Arnold, D. (1993).
Colonizing the body: State medicine and epidemic disease in nineteenth-century
    India. Berkeley: University of California Press.
Blackwell, F. (2004). India: A global studies handbook. Santa Barbara, CA: ABC-CLIO.
Chatterjee, P. (1993). Nationalist thought and the colonial world: A derivative discourse.
    Minneapolis: University of Minnesota Press.
Dharampal. (1983). The beautiful tree: Indigenous Indian education in the eighteenth century.
    New Delhi: Biblia Impex.
Ghosh, S. C. (2001). The history of education in ancient India, c. 3000 BC to AD 1192. New
    Delhi:Munshiram Manoharlal Publishers.
Ghosh, S. C. (2009). The history of education in modern India, 1757-2007. New Delhi: Orient
    Blackswan.
Kumar, D. (2006). Science in a Colony: Concept and Contours. Science and the Raj, 1-31.
    doi:10.1093/acprof:oso/9780195687149.003.0001
Kumar, D. (n.d.). India. The Cambridge History of Science, 669-687.
doi:10.1017/chol9780521572439.029
Mookerji, R. (1951). Ancient Indian education: (Brahmanical and Buddhist). London:
Macmillan.
R N. (1975). Society and culture in India. Meerut: Rajhans Prakashan Mandir.

Thapar, R. (2000). Cultural pasts: Essays in early Indian history. New Delhi: Oxford University Press.

Thapar, R. (2014). The past as present: Forging contemporary identities through history.

Health, Physical Education & Yoga - I

Contact Periods/week: 2 Practical

Maximum Marks – 25
Min. Pass Marks – 08
Internal – 25

Unit I

Physical Education – Meaning Scope, Aims & Objectives of Physical Education. Health Education and recreation to general education. Concept and Importance of Health, Personal and Environmental Hygiene. Nutrition and Balance Diet.

Unit II

Physical Fitness, Motor Fitness, Component of Physical Fitness. Effect of Exercise on different Body Systems.

Unit III

Measurements and Evaluation In Physical Education. Different types of Physical Fitness Test and Motor Fitness Test.

Unit IV

Common Sports Injuries and Their Rehabilitation. First Aid. Snake Bite and Its First Aid.

Unit V

Yoga Harmony of Body and Mind. Instrument of Yoga- Pranayama, Yogasana, Surya Namaskara, Meditation and Mental Health.

Work Education – I

Option I: Electricity and Electronics

Contact Periods/week: 2 Practical

Maximum Marks – 25
Min. Pass Marks – 08
Internal – 25

30

Introduction:

Importance of Work Education has been highlighted in the Nation Policy of Education in 1986 and subsequently in NCF 2005. It has been emphasized that the Work Education should be in the form of well structured, graded programme comprising activities to crater the needs of students. The level of knowledge and skills should be upgraded with the advancement in stage of education. The experience would be helpful to the student on his entry into work force.

Objectives:

On the complication of the course the students will be able to:

- Understand the concept of electricity and to define the term electrons, charge, current, voltage, resistance, power and energy.
- Recognize the importance of safety precaution and cause for electrical accidents.
- Identify and apply safe procedure in actual work situations and the step to be observed in electrical shock treatment.
- Acquire knowledge about tools and instrument required in electrical and electronics field.
- Develop the awareness of series and parallel circuit.
- Acquire knowledge about selecting wire, cables and fuse wires etc.
- Acquaint with functional aspects of various electrical and electronics accessories.
- Identify common measuring instrument.
- Learn connection of different common measuring instrument in the circuit.
- Acquire knowledge about working principal, operation and application of various domestic electrical and electronics appliances.
- Develop skills for dismantling, reassembling and testing of various domestic electrical and electronics appliances.
- Examine schematic layout, wiring diagram and product data of small electrical and electronics project.
- Install DTH, Public Address System (PAS), antenna and repair of T.V. and DVD player.

Learning Outcomes: The student will:

1. Develop practical skills, problem solving skills, experimental skills in him.

31

2. Get exposed to different processes / methods used in electrical and electronic devices.

3. Develop creative thinking for preparing new electrical and electronics devices.

4. Dismantle and assemble electrical and electronics devices.

5. Locate faults in these devices and repair them.

6. Understand the basic electrical quantities.

7. Recall safety precautions during electrical operations.

8. Rewire the fuse.

9. Understand the principles of functioning of electrical appliances.

10. Measure various electrical quantities.

11. Develop practical skills in repairing, maintaining, and making electronic devices used in day-to-day life.

12. Develop problem-solving skills related to electronic devices.

13. Develop creative thinking in the area of electronics.

14. Develop understanding of basic electrical and electronics science.

15. Identify and test electronic components.

16. Develop skill of soldering to construct electronic devices.

17. Locate fault of electronic devices by various methods i.e.

    i. Testing individual components

    ii. By signal flow method

    iii. By measuring voltages at testing points

18. Installation and use P.A. system.

Syllabus:

Unit 1: Basic Electricity

Definitions of basic electrical quantity electrons, charge, current, voltage, resistance, and power and its unit formula and calculations using simple circuits .A.C. and D.C. and graphical representation of amplitude, frequency, phase difference, wave length, Effect of electric current. Test the supply if A.C. / D.C. Single phase and 3 phase system.

Unit 2: Safety Precaution

Presentation and treatment of shock – cause and effect. First aid treatment To perform an exercise on artificial respiration. To remove person from electrical contact Common tools. description, precaution, care and maintenance of tools used for electrical work and personal

32

safety, shock treatment. Rescue and first aid. Sign and symbol their importance and abbreviation.

Unit 3: Electrical Circuit

Close circuit, Open circuit, Leakage circuit, Short circuit, Series circuit, Parallel circuit, Series-Parallel circuit, Ohms Law, Resistance Specific Resistance, effect of temperature on resistance, Power and Energy Formula and calculations using Simple circuits. Draw a wiring diagram of a 2 room set consisting of four points – Bulb, tube light, ceiling fan and three pin plug. Making of a switchboard.

Unit 4: Generation Transmission and Utilization of Electrical Power

Basic principal of electrical generation, Principle of Electro-magnetic Induction, Faraday's Law, Lenz's law. Principle of generator, A.C. and D.C. generator Fleming's right hand rules, Transmission of electrical power single phase and three phase system, Types of transformer study of single phase transformer working principle, types, material used, construction, testing and specifications, Elementary idea about A.C. Generator Distribution of electrical energy, transmission at high voltage, energy losses during transmission. Types of insulator, pole and tower for transmission line, over head and underground distribution, relay and circuit breaker, uses of electrical power in house, factory, farm etc.

Unit 5: House Wiring

Types of wiring system, General rule for electrical wiring, wiring accessories, cleat, casing-capping, CTS or TRS wiring, Lead sheathed wiring, conduit pipe wiring, wiring materials, load calculation of house. Types of wires & cables standard wire gauge. Classification of wires & cables-insulation and voltage grades. Fuse and its importance, general guideline for fuse, types of fuse and MCB. Earthling and its importance and their type, earth resistance fuse and earthling materials. Different types of wiring connection like staircase, Go-down wiring, Call – bell connection, different connection of bulb, tube- light connection etc. Arrangement of bulbs for a decorative series used in festivals, Make a switch board for one room set consisting of four points –Bulb, tube-light, ceiling fan and socket on the board.

Distribution of marks (25)

1.	Internal Exam	–	10 marks
2.	Practical Exam	–	10 marks
5.	Record and Viva Vice	–	05 marks

Suggested Reading:

33

1. Basic Electrical Engineering by M.L. Anwani published by Dhanpat Rai and Sons, New Delhi.

2. Elementary Electrical Engineering by M.L. Gupta published by New Hights Karol Bagh, New Delhi.

3. A Text Book of Electrical Technology by B.L. Theraja and A.K. Theraja published by S.Chand & Company Ltd. Ram Nagar New Delhi – 110055

4. Basic Electrical and house wiring published by G.T. Publication{Lab} India,Jaipur,Rajestan.

5. Principal of Electronics by V.K.Mehta and Rohit Mehta by S.Chand & Company Ltd. Ram Nagar New Delhi – 110055

6. The art of Electronics by Thomas C. Hayer and Paul Hirowitz , Cambridge University Press , International Sales Department, The Edinburgh Building, Cambridge , U.K

Option II: Agriculuure

Contact Periods/week: 2 Practical

Maximum Marks – 25
Min. Pass Marks – 08
Internal – 25

Introduction:

The importance of Work Education has been highlighted in the National Policy of Education in 1986 and subsequently in NCF 2005. It has been emphasized that the Work Education should be in the form of well structured, graded programme comprising activities to cater the needs of students. The level of Knowledge and skills should be upgraded with the advancement in stages of education. The experience would be helpful to the students on his entry into work force.

Objectives/ Learning outcomes: On completion of the course students will be able to:

- Identify different types of ornamental plants, flowers and gardening tools.

- Propagate plant sexually and asexually.

- Identify different types of garden and its component and understand design & features of garden.

- Demonstrate the knowledge of floriculture.

34

- Establish and maintain lawn and kitchen garden
- Demonstrate the ability to grow and maintain Vegetable and Fruit crops
- Identify and categorize fruits and vegetable crops
- Understand application of manures and fertilizers
- Demonstrate the control of insect, pest and diseases in kitchen garden
- Demonstrate the ability for preservation and processing of horticulture produce

ORNAMENTAL HORTICULTURE

Unit-I Identification and study of gardens, tools, equipments, seasonal flower, Ornamental trees, Shrubs, Climbers, Creepers and Indoor plants.

Unit-II Knowledge of propagation of seed bed, Transplanting of seedlings, Pot Filling, Potting, Repotting. Various methods of plant propagation, Training, Pruning, Staking and Descaling etc.

Unit-III Principles of design and layout along with their different types in various types, Important parts and special features of Ornamental Garden.

Unit-IV Commercial cultivation of Rose, Chrysanthemum, gladiolus, marigold and other flower species with reference to improved varieties, Preparation methods nutrition and irrigation requirements with pre and post harvest management practices.

Unit-V Establishment and Maintenance of lawn in ornamental garden.

SCHEME OF EXAMINATION

1. Identification of seasonal flowers, trees, shrubs, climbers, garden tool with summary — 05 each
2. Drawing layout Plan of a Ornamental Garden — 05 marks
3. Knowledge of different styles, various types, important parts & special features of ornamental garden — 05 marks
4. Cultivation of Important Ornamental Plants — 05 marks
5. Viva and Practical Record — 05 marks

Suggested Readings:

1. Gardening in India, Bose, T.K. and Mukherjee, Oxford and IBH, New Delhi
2. Floriculture and landscaping,Bose, T.K. and Mitra R.G; Naya Prakash, Calcutta
3. Floriculture in India, Randhawa, G.S. and Mukhopadhyay, A.K, Allied publishers, New Delhi.
4. Introductory Ornamental Horticulture, Arora, J.S; Kalyani publishers, New Delhi.

5. Planing and Planting Design for Home Gardens, Desai, B.I., I.C.A.R., New Delhi.

6. Flowering Trees, Randhawa, M.S; N.B.T., New Delhi.

7 Garden Flowers, Swarup V;N.B.T., New Delhi.

8. Home Gardening, Trivedi , P; I.C.A.R., New Delhi.

9. Rose, Pal, B.P., I.C.A.R., New Delhi.

Bachelor of Science and Bachelor of Education

Rani Durgawati University

COURSES OF STUDIES

For

Four Year Integrated

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

SECOND SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc.Part: Foundation Course				
Basic of Computer	40	10	50	3
Language – Hindi	40	10	50	3
English	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	375	75	450	
B.Ed. Part				
Cognition & Learning	40	10	50	3
Psychology Practical	-	25	25	2
Health, Physical Education & Yoga	-	25	25	2
Work Education	-	25	25	2
Art & Aesthetics	-	25	25	2
Total	40	110	150	
Grand Total	340	260	600	

- Elective I – Physics/Botany

- Elective II – Chemistry

- Elective III – Zoology/Mathematics

37

(All electives 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)

Semester Name	Paper	Marks	Paper Code	Name of Papers
II	Paper Theory-III	30	M-2.1	Differential Equations And Vector Calculus
	Paper Theory-IV	30	M-2.2	3-D Geometry
	Internal Test	15		Related To Above Papers
	Practicum	25		Related To Above Papers

Work Education: Electricity and Electronics/ Agriculture

B.Sc. Component:

Foundation Course: Basics of Computers

Contact Periods/week: 03

Maximum Marks – 40
Min. Pass Marks – 13
Internal – 10

Objectives: On completion of this course, the student teachers will be able to:

- Appreciate the historical development of computer,
- Demonstrate understanding of the main components of the computer hardware in use.
- Use various digital technologies (hardware and software) for creating resources and providing learning experiences for all types of learners (including differently abled),
- Differentiate between digital and non-digital resources,
- Explain various operating systems and their main functions,
- Use a word processor, spread sheet, drawing and presentation software skillfully and intelligently to produce various teaching learning resources for educational use,
- Use internet technologies efficiently to access remote information, communicate and collaborate with others in different learning situations,
- Understand the social, economic, security and ethical issues associated with the use of Computer and internet.

38

UNIT-I: Introduction to Computer

- History of computer
- What is a computer: Computer hardware fundamentals (anatomy, input devices, output devices, storage devices, display devices).
- Types of computers: Super Computer, Server Computer, Workstation Computer, Personal Computer or PC, Microcontroller
- Numeral System
  - Introduction
  - Decimal Numeral System
  - Binary Numeral System: Converting Binary to Decimal and vice versa
  - Hexadecimal Numeral System: Converting Hexadecimal to Decimal and vice versa
- Data sizes: bit, nibble, byte, word, KB, MB, GB, TB, PB
- Measurements of Data Speed: bps, kbps, mbps, gbps

UNIT-II: Hardware and Software

- Hardware Fundamentals
  - Use of digital still and video camera, digital sound recorder, scanner, printer, interactive white board, visualizer, and multimedia projector for creating and using multimedia resources
- Software Fundamentals
  - Software – Meaning and types; System software and Application software
  - Operating systems – Meaning and types; Windows, Linux, Macintosh
  - Navigating the desktop, control panel, file manager, explorer, and accessories
  - Concept, philosophy, types, and advantages of Proprietary software, open source software, shareware and freeware
  - Licenses – Software license, document license, fair use and piracy

UNIT-III: Software Applications

- Application software- Meaning and types
- Introduction to office applications
  - Word processing – Text (Indian and English), common features, functions and use, Educational applications of word processing

39

- o Spreadsheet – Common features, functions and use; Educational applications of spreadsheets-Recording, reporting, and research
- o Presentations – Common features, functions and use; Educational applications of presentations
- o Databases – Common features, functions and use; Educational applications of database
- o Drawing tools – Diagrams, concept maps, timelines, flow charts; Educational applications of these tools
- File formats and conversion, utility tools
- Cloud computing: Meaning and advantages
- Online software tools and applications and their educational use

UNIT-IV: Motherboard and Computer Networks

- Introduction to the motherboard
- Expansion slots: Graphics card, Sound card, Network Interface Cards (NICs), PC Card, Express Card
- Ports: USB, Firewire, Parallel, Thunderbolt, Ethernet
- Definition of network
- Why were networks created?
- Types of common networks: LAN, WAN, The Internet, VPN
- Internet: concept and architecture; Locating internet resources – browsing, navigating, searching, selecting, evaluating, saving and bookmarking
- Computer security: Privacy, hacking, virus, spy ware, misuse, abuse, antivirus, firewall and safe practices

Sessional Work

- Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices
- Practicing word processing using Indian language software
- Practice in installing various system and application software
- Using word processor, spread sheet, and presentation software to produce various teaching learning resources and sharing it online
- Locating internet resources – navigating, searching, selecting, saving and evaluating (use standard internet evaluation criteria)

40

Suggested readings

- Crumlish, C. (1999). The Internet No Experience Required. BPB Publications: New Delhi
- Christopher, M.(2009).Beyond Hardware-Using Existing Technology to promote Higher-Level thinking. Viva Books: New Delhi.
- Evant, M: The International Encyclopedia of Educational Technology.
- James, K.L. (2003). The Internet: A User's Guide. Prentice Hall of India Pvt.Ltd: New Delhi
- Lee, William W., Dianna, L. Owens, (2001) Multimedia based Instructional design: Computer Based Training. Jossey-Bass
- NCERT (2013) Information and Communication Technology for School System: Curricula for ICTs in Education (students and Teachers), Version-1.2, CIET-NCERT, NCERT, New Delhi
  (www.icteurriculum.gov.in)
- Noam Shemtov, Ian Walden.(2014)Free and Open Source Software: Policy, Law and Practice. Oxford University Press
- Sarkar, S.K. & Gupta, A.K.(1998). Elements of Computer Science. S.Coand& Company: New Delhi
- Tahenbaum Andrews (2003). Modern Operating Systems. Prentice Hall of India Pvt.Ltd: New Delhi
- Introduction to Computer: https://en.wikiversity.org/wiki/Introduction_to_Computers

Foundation Course: Language – Hindi

आधार पाठ्यक्रम : हिन्दी भाषा

प्रश्नपत्र – 2

Contact Periods/week: 03

कुल अंक – 40

आन्तरिक मूल्यांकन – 10

प्रश्न एवं अंक निर्धारण

4 समीक्षात्मक/दीर्घउत्तरीय प्रश्न – 28 अंक 1/47 X = 9.13

लघुउत्तरीय प्रश्न – 07 अंक (35 x 2 प्र)

वस्तुनिष्ठ प्रश्न – 05 अंक (1 x 5 प्रश्न)

व्याख्यात्मक एवं समीक्षात्मक प्रश्नों में आंतरिक विकल्प होंगे।

41

Foundation Course: Language English

Paper II

Distribution of Marks:

1. Four critical questions are to set be from unit 1. Two questions are to be attempted. Each question will carry 5 marks. (5 X 2 = 10 marks).

2. Students are required to write a paragraph on a given topic in about 100-125 words. (4 X 1 – 4 marks).

3. Students are required to attempt five questions based on the given unseen passage. Each question will carry 2 marks. (2 X 5 = 10 marks)

4. Students are required to attempt 6 questions on vocabulary. Each question will carry one mark. (1 X 6 – 6 marks)

5. Students are required to attempt 10 questions on Grammar. Each question will carry one mark. (1 X 10 – 10 marks).

UNIT 1 : William Wordsworth –The Solitary Reaper; Tagore (Trans) – A Song of Kabir; Khushwant Singh – The Portrait of a Lady; Mahatma Gandhi – Satyagraha; R.K. Narayan – The Axe; C.V. Raman – Water

UNIT II: Letter Writing – Formal, Informal and Business Letter

42

UNIT III: Expansion of an Idea

UNIT IV: Word formation; Prefixes & Suffixes; Figures of Speech.

UNIT V: Grammar & Usage – Tenses, Modals, Gerunds, Infinitives, determiners, Active and Passive Voice, Direct & Indirect Speech

Elective I – Physics

Paper II: Electromagnetic Theory and Elementary Kinetic Theory

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 completion of this course, the students will be able to

1. Acquaint themselves with concepts of electric fields, electric flux, electric potential, dielectrics and polarization vector.

2. Understand Coulomb's law, Gauss's law Ampere's law, Faraday's law and Lorentz force.

3. Solve the problems on Coulomb's law, Ampere's law and Gauss's law.

4. Understand Ampere's law and its applications.

5. Interpret that a bar magnet has a surface distribution of solenoidal current.

6. Appreciate the physical significance of E and B vectors and their role in the electromagnetic wave propagation.

7. Explain the concept of Poynting vector.

8. Explain varying currents

Unit-1: Electrostatics

Coulomb's law in vacuum expressed in vector form; multipole expansion of fields, work done on a charge in an electrostatic field expressed as a line integral, conservative nature of the electrostatic field, Laplace and Poisson equation in electrostatics and their applications, electric potential φ, $E=$, Torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and application for finding E for symmetric charge distributions,

43

Gaussian pillbox, field at the surface of a conductor, screening of E field by conductor, energy of a system of charges.

Unit -2: Magnetostatics

Force on a moving charge, Lorentz force equation and definition of B. Force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio, Biot Savart's law, Ampere's law and its applications, Field due to a magnetic dipole, magnetization current, magnetization vector, magnetic permeability (linear cases).

Unit -3: Dielectrics and Capacitors

Dielectrics; parallel plate capacitor with a dielectric, dielectric constant, polarization, solution to boundary value problems, conducting and dielectric spheres in a uniform electric field, displacement vector D, molecular interpretation of Claussius-Mossotti equation, boundary conditions satisfied by E and D at the interface between two homogeneous dielectrics, illustration through a simple example.

Unit-4: Time varying Fields and Electromagnetic waves

Faraday's law of electromagnetic induction, Self and mutual inductance, Energy in a static magnetic field; Maxwell's displacement current; Maxwell's equations; electromagnetic field energy density. The wave equation satisfied by E and B; plane electromagnetic waves in vacuum; Poynting vector; reflection at a plane boundary of dielectrics; polarization by reflection; reflection and refraction coefficients at the boundary of two dielectrics (normal incidence only); and total internal reflection; waves in a conducting medium; reflection and refraction by the ionosphere.

Unit-5: Varying Currents

Currents through CR and LR circuits, High resistance by leakage, Alternating and Direct current, Analysis of LC and LCR circuits using complex number representation, Resonance, Q factor, Kirchhoff's law and its application to AC circuits, Transformer and choke coil.

Physics Practical List

1. Conversion of galvanometer into ammeter of given range.

   I.   To determine the resistance of a galvanometer by half deflection.

   II. To determine the figure of merit of galvanometer.

   III. To convert the galvanometer into an ammeter of a given range and to calibrate it.

2. To convert the galvanometer into a voltmeter of a given range and to calibrate it.

44

3. To determine the inductance of a given coil by Anderson bridge method.
4. To study the dependence of capacitance on separation of the plates of capacitor.
5. To study the variation of magnetic field along the axis of a current carrying circular coil.
6. Study of charging and discharging of capacitor.
7. To verify Kirchhoff's current law and voltage law.
8. To determine the high resistance by leakage method.
9. Calibration of voltmeter.
10. Calibration of ammeter.
11. To study ac wave form and to measure rms value of ac voltage using CRO.

Suggested Reading:

1. Electricity Principles and Application, Fowler; Tata McGraw Hills.
2. Electricity and Magnetism, Mahajan; Tata McGraw Hill.
3. Electromagnetic Waves and Radiating systems, Jordan Balman
4. Electricity and Magnetism, K.K. Tewari
5. Electrodynamics, Griffith

Elective I – Botany

Paper II: Cell Biology and Genetics

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 enable the students to have an understanding about origin of life types, and detailed structure of cell inclusions.

Unit I: Origin of life and organization of cell

General account of origin of life, Structural concept of a cell – prokaryotic and eukaryotic organization, cell types

Unit II: Structure and function of cell organelles

Golgi bodies, cytoskeleton, ER, peroxisome, vacuoles, plastids, mitochondria, ribosome.

45

Cell envelopes: Plasma membrane – different models; function; cell wall – structure and function.

Unit III: Structure and function of nucleus

General Trystallizat of nucleus, ultrastructure of nuclear membrane and nucleolus. Chromosome – Trystallizat, morphology, centromere, telomere.

Chromosome alterations – deletions, duplications, translocations, inversions, variation in chromosome number – aneuploidy, polyploidy.

Unit IV : Nucleic acids : DNA

Discovery of DNA as genetic material, its structure and types. DNA replication in prokaryotes and eukaryotes, structure of nucleosome. Satellite and repetitive DNA.

Unit V : Nucleic acid : RNA and cell division

Structure, types (m-RNA, t-RNA, r-RNA) and function of RNA.

Cell division : Cell cycle, mitosis and meiosis

Practical

Objectives:

- To develop skills of staining and slide preparations of lower and higher organism.
- To impart understanding of internal structures and their organization.
- To develop the skills for the preparation of smear for studying of all division.

Cell Biology

1. To study cell structure from onion leaf peels; demonstration of staining and mounting methods.
2. Comparative study of cell structure in onion cells, Hydrilla and Spirogyra. Study of cyclosis in Tradescantia Trystal cells.
3. Study of plastids to examine pigment distribution in plants (e.g. Cassia, Lycopersicon and Capsicum).
4. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
5. Study of electron micrographs of viruses, bacteria, cynnobacteria and eukaryotic cells for comparative cellular Trystallizat.
6. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).

46

Scheme of Practical Examination

1. Preparation of a smear of root tip/anthers to identify different stages of cell division.   5
2. Demonstration of cyclosis in the given material.   5
3. To identify the type of plastids in the given material.   5
4. Comment upon the spots.   5
5. Practical Record/Sessional   5
6. Internal evaluation   5

Suggested Readings

1. Kleinsmith, L.J. and Kish, V.M. 1995 Principles of Cell and Molecular Biology. Harper Collins College Publishers, New York, USA

2. Lodish, H. Beris, A. Zipursky, S.L., Matsudaira, P.Baltimore, D. and Darnell J.2000 Molecular Cell Biology. W.H.Freeman & Co. New York, USA

3. Baltimore, D. and Darnell, J.2000 Molecular Cell Biology. W.H. Freeman & Co. New York, USA

4. Gunning, B.E.S. and Steer M.W.1996. Plant Cell Biology, Structure and Function Jones and Bartlett Publishers Boston Massachusetts

5. Harris, N and Oparka, K.J.1994. Plant Cell Biology. A practical approach IRL Press Oxford U.K.

6. Sharma A.K. and Sharma. A 1999 Plant Chromosomes: Analysis, Manipulation and Engineering Harwood Academic Publishers Australia.

7. Watson, James D, T.A. Baker, S.P. Bell, A. Gann, M. Levine, R. Losick. 2004. Molecular Biology of the Gene, 5th edition, Pearson Education.

8. Gupta, P.K. 2006-07, Cell and Molecular Biology, 3rd edition, Rastogi Publication

Elective II – Chemistry
Paper II

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 the end of the 2nd semester the students should be able to:

* get the knowledge of basic concept of organic chemistry, like the tetravalency of Carbon, the concept of hybridization, the concept of resonance, hyperconjugation, and aromaticity.
* strengthen the knowledge regarding the nomenclature of organic compounds.
* explain the properties of organic compounds in terms of the structure of the functional groups.
* Acquire knowledge regarding the directional characteristics of covalent bond and discuss the stereochemistry of organic compounds centering around the directional characteristics of the covalent bond.
  * highlight the importance of the study of kinetics in elucidation of mechanism of organic reactions.
* explain the reactions in organic chemistry in terms of free radical mechanism, substitution reactions, addition reactions and molecular rearrangement pattern.
* Acquire knowledge regarding the role of aryl radical as it affects the properties of organic compounds.
* develop competency to explain the chemistry of organic compounds in terms of comparative Trystall of alkyl and aryl com
* Differentiate phenols and alcohols on the basis of their acidic and neutral behaviours.

Instructional Strategy:

The teacher while discussing the stereochemistry may use ball and stick model to focus the clarity in concept formation. While adopting the lecture technique, the teacher may make the presentation of subject matter interesting by adopting the structural approach (high lighting

48

importance of reaction mechanism in the teaching of organic chemistry). In the subject treatment of open chain and closed

chain compounds and alkyl and aryl derivatives the teacher may take the help of comparative organizers (a type of advance organizer).

Unit-I: Structure and Bonding

Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Walls interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

Mechanism of Organic Reactions

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, Trystalli and heterolytic bond breaking. Types of organic reactions, Energy consideration.

Reactive intermediates (carbocations, carbanions, free radicals, carbenes, arynes and nitrene with examples). Assigning formal charges on intermediates and other ionic species.

Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Stereochemistry of Organic Compounds

Concept of isomerism. Types of isomerism.

Optical isomerism-elements of symmetry, molecular chirality, enantiomers, sterogeniccentre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccentres, diastereomers, threo and erythrodiastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.

Relative and absolute configuration, sequence rules; D & L and R & S systems of nomenclature. Geometric isomerism-determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism-conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane, derivatives.

Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

Difference between configuration and conformation.

Unit-II: Alkanes and Cycloalkanes

49

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes.Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes.

Mechanism of free radical Trystallizati of alkanes ; orientation, reactivity and selectivity. Cycloalkanes- nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane); theory of strainless rings. The case of cyclopropanering : banana bonds.

Arenes and Aromaticity

Nomenclature of benzene derivatives.The aryl group.Aromatic nucleus and side chain.

Structure of benzene : molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture.

Aromaticity : the Huckel rule, aromatic ions. Aromatic electrophilic substitution-general pattern of the mechanism, role of (and complexes).Mechanism of nitration, Trystallizmi, sulphonationmercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio.Side chain reactions of benzene derivative, Birch reduction.Methods of formation and chemical reactions of alkylbenzenes, alkyny benzenes and Trystall.

Unit-III Alkenes, Cycloalkenes, Dienes and Alkynes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration.The Saytzeff rule.Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free redical additions, Markownikoff's rule, hydroboration-oxidation with $KmnO_4$, Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes.Industrial applications of ethylene and propene. Methods of formation, conformation and chemical reactions of cycloalkenes. Nomenclature and classification of dienes : isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization.Chemical reactions-1, 2 and 1, 4 additions.Diels-Alder reaction.

Nomenclature, structure and bonding in alkynes. Methods of formation.Chemical reactions of alkynes, acidity of alkynes.Mechanism of electrophilic and nucleophilic addition reactions, hydroboration- oxidation, metal-ammonia reductions, oxidation and polymerization.

Unit-IV: Alkyl and Aryl Halides

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN^2 and SN^1 reactions with energy profile diagrams.

Polyhalogencompounds : chloroform, carbon tetrachloride.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relativereactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC. Freons.

Unit-V Alcohols

Classification and nomenclature. Monohydric alcohols – nomenclature, methods of formation of 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 [Pb (Oac)4 and HIO4] and pinacol-pinacol one rearrangement. Tihydric 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 phenoxideion. 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.

Practical:

1. Qualitative analysis of single organic compound.
2. One stage preparation and Trystallization of three organic compound from the list given below –
   (a) Benzoyl chloride to Benzamide.
   (b) Aniline to Acetanilide.
   l Preparation of p-bromo acetanilide from acetanilide.
   (d) Benzoyalation of aniline.
   (e) Preparation of Iodoform.

(f) Benzamide to Banzoic acid.

3. Determination of molecular mass of organic compounds.

Scheme of Examination (Practical) Time allotted – 5 hrs

Experiments

(1)	Qualitative org. analysis	-	5
(2)	One stage preparation	-	5
(3)	Molecular mass determination	-	5
	Internal assessment	-	5
	Viva	-	5

Suggested Readings:

1. Paula YurkanicsBruice, Organic Chemistry, Pearson Education, Ltd.

2. Morison and Boyd, Organic Chemistry, Prentice Hall

3. Solomons and Fryhle, Organic Chemistry, WILEY International

4. Carey, Francis A., Organic Chemistry, Tata McGraw Hill

5. Eliel, Earnest, L., / Wilen, Samuel H., Stereo chemistry of organic compounds, John Willey & Sons, 2004.

6. Tiwari K.S., Vishnoi, N.K., A Test book of Organic Chemistry, VIKAS Publishing House.

7. Agarwal, O.P.,Organic Chemistry, Reactions and Reagents, Goel Publishing House, Meerut.

8. Bhal ,Arun&Bhal, B.S., Organic Chemistry, S. Chand & Company

---

Elective III – Zoology

Paper II: VERTEBRATES

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.

Objective:

To gain knowledge of classification of Vertebrates, their structure, organization, representative animals and comparative anatomy.

52

Unit-1
1. Classification of Vertebrata upto orders with examples.
2. Affinities and special characters of cyclostomes (comparison between Petromyzon and Myxine).
3. Elasmobranches – Type study of Scoliodon.
4. Teleosts – Type study of Labeo.
5. Air bladder and gills in fishes.

Unit-2
1. Amphibia- Type study of frog
2. Parental care, neoteny and metamorphosis in amphibians.
3. Reptilia – Type study of Uromastix.
4. Anatomical peculiarities in snake.
5. Biting mechanism and poison apparatus in snakes.

Unit-3
1. Aves-Type study of pigeon.
2. Flight and perching mechanism in birds.
3. Mammalia – Type study of rabbits.
4. Affinities of Prototheria and Metatheria.

Unit-4
Comparative anatomy from Pisces to Mammalia
1. Comparative study of integumentary system and study of integumentary derivatives (scales, feathers, horns and hooves).
2. Comparative study of digestive system.
3. Comparative study of respiratory system.
4. Comparative study of heart and aortic arches.
5. Comparative study of urinogenital system.
6. Comparative study of brain.

Unit-5
Comparative study of endoskeleton from Amphibia to Mammalia.
1. Skull
2. Limb Bones and Girdles.
3. Vertebrae.

53

4. Special endoskeletal structures (urostyle, astragalus, calcanium, synsacrum, pygostyle)

PRACTICAL

Objective- To study and develop skill of identification of animals, their histology, comparison of anatomy, physiology and their osteology.

1. Study of museum specimen, slides, relevant to the theory from Cyclostomes to Mammalia.
2. Permanent slide preparation- scales of fishes.
3. Comparative study of integument, digestive tract and blood cells of vertebrates through permanent slides.
4. Comparative study of brain of different vertebrates through charts and models.
5. Comparative vertebrate osteology e.g frog, fowl, rabbit (skull, limb bones, girdles, special bones, vertebrae)
6. Comparative study of heart and aortic arches, respiratory system and urinogenital system through charts and models.

SCHEME OF PRACTICAL EXAMINATION

1. Spotting	–	10
2. Mounting	–	03
3. Exercise based on bones	–	05
4. Practical Records	–	03
5. Viva-voce	–	04
Total –		25 Marks

Referred books -:

1. Textbook Of Zoology Vol II (Vertebrate)-Parker & Haswell
2. Animal Biology (Vol II) –Adhikari, Ganguly & Sinha
3. Textbook of Vertebrates- R.L Kotpal
4. Chordates –Jordan and Verma.
5. Zoology of Chordates –Nigam H.C
6. Comparative anatomy of Vertebrates – Kent
7. Outline of comparative anatomy of vertebrates – Kingsley.
8. Element of chordates anatomy – Weichert.
9. Practical Zoology Vertebrates –S.S.Lal
10. Practical Zoology of Chordates –P.S. Verma

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 30+30=60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practicum 5)

Practicum – 25 (Internal)

M -2.1 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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

Objectives :

- To develop understanding of Differential Equations and their applications
- To develop understanding of basic concepts of Vector Integration
- To enable them to solve the problems based on Green, Gauss and Stokes

Unit – I   Degree and order of differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations.

Unit – II   Linear equations and equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x, y, p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories.

Unit – III   Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Linear differential equations of second order. Transformation of the equation by changing the dependent variable/ the independent variable.

Unit – IV   Method of variation of parameters. Ordinary simultaneous differential equations.

Unit – V   Vector Integration, Gauss Theorem, Theorems of Green, Gauss, Stokes and problems based on these.

Content as in :

- Danial Murray: Introductory Course in Differential Equations. Orient Long Man.
- Manglik and Seth Vector Calculus
- B.R. Thakur, Nigam, Sinha and Saren - Vector Analysis

55

M – 2.2: 3-D GEOMETRY

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

Objectives:

- To develop understanding of conicoids
- To develop the ability to reduce second degree equation in 3-Dimensions
- To develop ability to treat general equation of second degree including con-focal conics
- To make them familiar with the mechanism of deriving equations of surfaces in 3-dimensions.
- To enable them to treat conics in polar form

Unit-I   General equation of second degree, Tracing of conics, system of conics, confocal conics

Unit-II   Polar equation of a conic.

Unit – III   Central Conicoids, Paraboloids

Unit – IV   Plane sections of coincoids, Generating lines, Confocal Conicoids

Unit – V   Reduction of second degree equations

Content as in:

5.   R.J.T. Bell : Elementary Treatise on Coordinate Geometry of 3-Dimension Mc. Milan

M – 2.3 Mathematics Practicum

.List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester II Mathematics papers M-2.1 and M-2.2.
- Mathematics seminar.

Education Component:

Cognition and Learning

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives

- Explore the possibilities of an understanding of processes in human cognition and meaning–making them as basis for designing learning environments and experiences in school
- To become aware of different contexts of learning and situate schools as a specialenvironment for learning
- To develop awareness of the different contexts of learning.
- To reflect on their own implicit understanding of the nature and kinds of learning.
- Gain an understanding of different theoretical perspectives on learning with afocus on cognitive views of learning as well as social–constructivist theories;
- Appreciate the critical role of learner's based on differences and contexts in making meanings, and hence draw out implications for schools and teachers.

UNIT1: COGNITION

- Meaning of Cognitionand its Role in learning
- Structure and Process of Cognition:sensation, perception, attention, memory, concept formation and problem-solving in learning.
- Socio-cultural factors that influence cognition

UNIT 2: THEORETICAL PERSPECTIVES ON LEARNING

- Implicit knowledge and beliefs about learning (demystifying misconceptions).
- Perspectives on human learning: Behaviourist (conditioning paradigm in brief), cognitivist, information-processing view, humanist, social-constructivist (drawing selectively on the ideas of Skinner, Piaget, Rogers, Vygotsky).
- Concepts and principles of each perspective and their applicability in different learning situations.

UNIT 3: ROLE OF LEARNER IN LEARNING\

57

- Role of learner in various learning situations, as seen in different theoretical perspectives.
- Role of teacher in teaching-learning situations: a) transmitter of knowledge, b) model, c) facilitator, d) negotiator, e) co-learner. [The focus is on building understanding of different psychological perspectives of learning and helping student teachers to learn to apply them in different learning situations)
- Distinctions between learning as 'construction of knowledge' and learning as 'transmission and reception of knowledge'.

UNIT 4: INDIVIDUAL DIFFERENCES AMONG LEARNERAS

- Dimensions of differences in psychological attributes—cognitive abilities, interest, aptitude, creativity, personality, values.
- Understanding learners from multiple intelligences perspective with a focus on Gardner's theory of multiple intelligences including emotional intelligence.
- Differences in learners based on socio-cultural contexts
- Understanding differences based on a range of cognitive abilities— learning difficulties, slow learners and dyslexics, intellectual deficiency, intellectual giftedness and implications for classroom practices and teaching.

Suggested Sessional Work

- Reflective Written Assignments – comments and grade
- Field observation notes – comments and grade
- Participation in discussions – to be assessed qualitatively (along a set of rubrics)
- Analysis of a learning situation and case study, using theoretical perspectives – to assess for conceptual grasp and clarity of analysis – comments, further questions, grade
- A written test can be given on 'conceptual grasp' of theories of teaching, learning and cognition, as well as 'working understanding' of constructivist approach to construction of knowledge – evaluated with marks
- Assignment on the implications of Piaget/Vygotsky/Ausubel's approach to teaching-learning
- Student panel discussion of selected themes.
- Class presentations
- Readings and class discussions
- Assignments

58

Suggested Reading

- Atkinson, Richard C. et.al. (1983). Introduction to Psychology. Harcourt Brace Johanovich Inc. New York.

- Aggarwal, J.C. Essential of Educational Psychology, Vikas Publishing House, New Delhi, 1994.

- Aggarwal, J.C, Essential of Educational Psychology, Vikas Publishers, Delhi, 1998

- Benjafield, J.G. (1992). Cognition, Prentice Hall, Englewood Cliffs.

- Bereday, George, F., and Lanwery Joseph (1963). Educational and Training of Teacher, Trens, Brother Ltd. London.

- Bhargava, Mahesh, Introduction of Exceptional Children, Sterling Publishers, New Delhi, 1994.

- Bhatia, H.R., A Text Book of Educational Psychology, Delhi: McMilian Co., New Delhi, 1977

- Bhatia, K.K. Educational Psychology and Techniques for Teaching, Kalyani Publishers, Ludhiana, 1994.

- Brown, J.S., Collins A and Dugrid, P (1989). Situated Cognition and the Culture of Learning, Educational Researcher; 32-42.

- Chauhan, S.S. Advanced Educational Psychology, Vikas Publishing New Delhi, 1996

- Gage, N.L. (1964). Theories of Teaching. In Theories of Learning and Instruction. NSSE University Press Year Book, Chicago.

- Gagné, R. M. (1985) The Conditions of Learning and Theory of Instruction (4th edition). New York: Holt, Rinehart and Winston

- Gardner, H. (1999) The disciplined mind: What all students should understand. New York: Simon & Schuster

- Gardner, Howard (1989). Frames of Mind. The Theory of Multiple Intelligences, Basic Books, New York.

- Gardner, Howard (1991). The Unschooled Mind, Basic Books, New York.

- Haas, KB and Packer, HQ: Preparation and use of Audio-Visual Aids, Prentice Hall Inc. 1990

- Jeanne Ellis Ormrod Educational Psychology: Developing Learners, Fourth Edition

- Kundu, C.L. and Tutoo, D.N., Educational Psychology, Sterling Publishers, New Delhi, 1980.

- _____ and Foronha. Educational Psychology. Sterling Publishers, New Delhi.

- _____ Light Experimental Genetics. Englewood Cliffs, NJ, Prentice-Hall

- _____ (1990) Educational Psychology in the Classroom Oxford University Press, New York

- _____ (1979) Cognitive Development: Its Cultural and Social Foundations. Harvard University Press, Cambridge, Mass.

- _____ (1999) Educational Psychology, Prentice Hall of India. Pvt. Ltd., 1999

- _____ Educational Psychology, 5th Ed., VinodPustakMandir, Agra, 1981

- _____ Alexander, Philip H. Winne (1996) Handbook of Educational Psychology

- _____ (1991) Freedom to Learn (revised edition), Columbus, OH: Merrill

- _____ Flavell, J. (1977) Cognitive Development: Psychological and Biological Perspectives (Englewood Cliffs, N.J.)

- _____ G. Padma (1994) Constructing School Knowledge :An Ethnography of Learning in an Indian Village. Sage Publication

- _____ (1985) Technology of Teaching: International Publishing House, Patna

- _____ (1999) Life of Shivananda. NCERT, New Delhi

- _____ Robert D. (1971) Teaching and Learning Process. Prentice Hall Inc. Engewood Cliffs, New Jersey

- _____ Mary (Holden, F) (1999) Modern Psychology and Education, Routledge

- _____ D. Y. and Basakumar P. ShaikshanikaManovijnan Gangotri Prakashan Chennai, 1977

- _____ J. F. (Ed) Educational Psychology, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi. 1999

- _____ Edward L. (2007) Educational Psychology, Published by READ Books

- _____ L.S. (1978) Mind in Society. The Development of Higher Psychological Process Harvard University Press. Cambridge.

- _____ L.S. Mind in Society. Harvard University Press: Cambridge, 1978, Chapter 6.

- _____ J.V. (1985) Vygotsky and the Social Formation of Mind. Harvard University Press

- _____ J.V. (1985) Culture, Communication and Cognition Vygotskian Perspective. Cambridge University Press. Cambridge.

- Kundu, V.L and Totoo, D.N., Educational Psychology, Sterling Publishers, New Delhi.
- Kolb, D.A. (1984) Experiential Learning. Englewood Cliffs, NJ: Prentice-Hall
- Lindgren, H.C. (1980). Educational Psychology in the Classroom Oxford University Press, New York.
- Luria, A.R. (1976) Cognitive Development: Its Cultural and Social Foundations. Havward University Press, Cambridge, Mass.
- Mangal, S.K. Advanced Educational Psychology, Prentice Hall of India. Pvt. Ltd., 1599
- Mathur, S.S., Educational Psychology. 9th Ed., VinodPustakMandir, Agra, 1981
- Patricia A. Alexander, Philip H. Winne (2006) Handbook of Educational Psychology
- Rogers, C.R. (1983) Freedom to Learn (revised edition). Columbus, OH: Merrill
- Rosser, Rosemary A. (1993). Cognitive Development: Psychological and Biological Perspectives, AllyndandBacon:USA
- Sarangapani M. Padma(2003.), Constructing School Knowledge :An Ethnography of learning in an Indian Village, Sage Publication
- Sharma, R.A. (1983). Technology of Teaching; International Publishing House, Meerut.
- Sibia, A. (2006) : Life at Mirambika, NCERT, New Delhi
- Storm, Robert D. (1971). Teaching and Learning Process, Prentice Hall Inc. Englewood Cliffs, New Jersey.
- Sturt Mary, Oakden, E.C. (1999) Modern Psychology and Education. Routledge.
- Shivashankara H.V. and Basakumar P., ShaikshanikaManovijnaan. HanjiPrakashanaDavangere, 1977
- Skinner, C.E. (Ed) Educational Psychology, 4th Ed., Prentice Hall of India Pvt., Ltd., New Delhi, 1996
- Thorndike Edward L. (2007) Educational Psychology, Published by READ Books.
- Vygotsky, L.S. (1978). Mind in Society. The Development of Higher Psychological Process.Havward University Press, Cambridge.
- Vygotsky, L.S. Mind in Society, Harvard University Press: Cambridge, 1978. Chapter 6.
- Wertsch, J.V. (1985) Vygotsky and the Social Formation of Mind. Harvard University Press
- Wertsch, J.V. (1985). Culture, Communication and Cognition.Vygotskian Perspectives. Cambridge University Press, Cambride.

50

- Walia, J.S. Foundation of Educational Psychology, Paul Publishers, Jalandhar, 2001
- White, William, L. (1969). Psychological Principles Applied to Classroom Teaching McGraw Hill, New York.
- Wolfolk , Educational Psychology, Prentice Hall: Englewood Cliff.1987
- Woolfolk, A.E. (2009) Educational Psychology (11th Edition) (My Education Lab Series) Prentice Hall

Psychology Practical

Contact Periods/week: 03

Maximum Marks – 25

Min. Pass Marks – 08

Internal – 25

Any five from the following:

- I.   Intelligence (Verbal, Non-Verbal and Performance Tests)
- II.   Personality
- III.   Creativity
- IV.   Motivation
- V.   Learning
- VI.   Concept Formation
- VII.   Problem Solving

Health, Physical Education & Yoga –II

Contact Periods/week: 2 Practical

Maximum Marks – 25

Min. Pass Marks – 08

Internal – 25

Unit I

Programme of Physical Fitness and Muscular Development (Free Hand and Callisthenic Exercise) : Circuit Training and Weight Training.

Unit II

Athletics is Printing and Distance Running- Crouch Start, Striding, Curve Running and Finishing Technique.

Jumps- Approach Run, Take off, Clearance and Landing.

61

Throws- Hold/Grip, Placement/Swing, Stance, Action, Releasing and Recovery.

Unit III

Layout and Marking of Track and Field and Different Play Grounds.

Unit IV

Teaching Skills of Major Games, Teaching Rules, Officiating and Organizing Tournaments of Major

Games.

-Cricket,Football,Kbaddi,Kho-Kho,Volleyball,Basketball,Table-Tennis,Lawn-

Tennis,Badminton

-Instruction and demonstration of basic skills

-Equipments and dimensions of play fields

-Common rules and interpretation

-Organization and conduct of tournament/competition.

Unit V

Teaching/lesson in physical education and sports (skills)

Art & Aesthetic

Contact Periods/week: 02

Maximum Marks – 25

Min. Pass Marks – 08

Internal – 25

Introduction:

The need of integrate arts education in the formal schooling of our students is to retain our unique cultural identity in all its diversity and richness and encourage little children and creative minds to do the arts. An understanding of the arts and aesthetics will give our children to give ability to appreciate the richness and variety of artistic traditions as well as make them liberal, creative thinker and after all a good citizen of the nation.

In National Curriculum frame work (2000, 2005) and National Education Policy introduced arts education as a mainstream curricular area, which must be taught in every elementary and primary schools as a compulsory subject up to secondary level, keeping this in view, its all the more important that arts education is integrated in the school curriculum to provide an

62
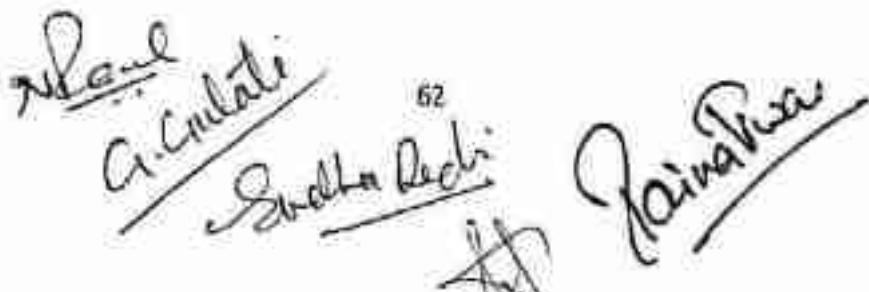
aesthetically viable atmosphere in elementary levels encouraging creativity. For this, not only the art teachers but every teacher should be sensitive to appreciate this.

Aim:

Teaching Arts education in elementary and school may be perceived as a tool for development of aesthetics sensitivity among learners to enable them to respond to the beauty in different form of arts. For effectiveness and interest of teaching, curricular area of arts education are required. Some broader

objectives are follow-

- **Objectives:**
  - अध्ययन-अध्यापन प्रक्रिया को कला के माध्यम से रोचक बनाना।
  - शिक्षण-अधिगम के दौरान आसपास के माहौल, विद्यालय, घर-ससुराल को स्वच्छ एवं सुन्दर रखने हेतु कलात्मक कार्य की प्रेरणा देना।
  - सीखने-सिखाने हेतु सौंदर्य, संवेदना एवं कल्पनाशीलता का समन्वय करना।
  - कलात्मक दृष्टिकोण एवं सांस्कृतिक घटकों की समझ हेतु अवसर उपलब्ध करवाना।
  - अध्यता-अध्यापक के माध्यम से कलाएं तथा प्रकृति जनित वातावरण के निर्माण से विषयबोध प्राप्त करना।
  - प्रकृति-परिवेश, पर्यावरण और गणित जैसे विषयों की विभिन्न कलाओं के माध्यम से सीखने की अवसर प्रदान करना।
  - अध्ययन प्रक्रिया में कलाओं को जोड़कर कार्यानुभव प्राप्त करना।
  - सृजनात्मकता एवं सौंदर्यबोध के विकास से नैतिक एवं राष्ट्रीय भावनाओं का विकास करना।
  - चित्रकार्य, गायन, शिल्प-स्थापत्य एवं अन्य दृश्य-श्राव्य कलाओं को टेक्नोलॉजी के माध्यम से समझना एवं व्यवहार सीखना।
  - कलाओं के साथ अन्य विषयों के समन्वय से राष्ट्रीय धरोहर एवं संस्कृति के प्रति लगाव पैदा करना।
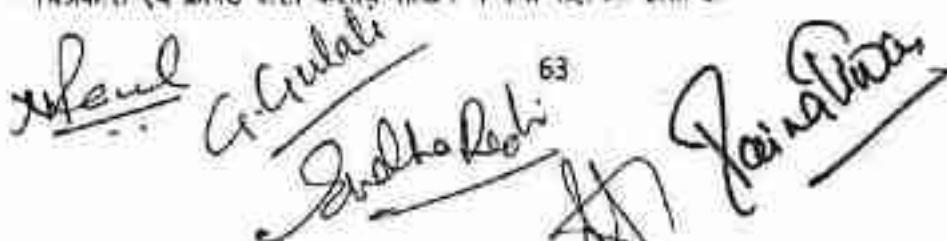 - विभिन्न कलाकारों और उनके जीवन को जानना।

COURSE – CONTENT

Unit – 1 Art क्या है, कलाओं के प्रकार, Concept of Art Education-

- कलाओं का महत्व क्यों समझना है। कलाओं का जीवन में स्थान। कलाओं से जीवनयापन आदि।
- कला और शिक्षा –
  - कला शिक्षण और बालाओं के साथ समन्वित शिक्षण।
  - कला के क्षेत्र (work) विस्तार।

Unit – 2 Visula Art दृश्य कलाएं (Visual)-

- रेखाचित्र, रंगकार्य, स्केचिंग, छाप कार्य, भौंरी चित्र आदि और उनके प्रकार। चित्रकार्य हेतु उनकी गतिविधियाँ।
  - चित्रकारी एवं क्राफ्ट जैसी कलाएं सीखने में कैसे सहायक होती है?

63

- इसे पर्यावरण, भाषाएं, विज्ञान, गणित जैसे विषयों के साथ जोड़ना।
- अनेक गतिविधियों को कला एवं सौंदर्यबोध आत्मसात करना।

Unit – 3 नाटक नृत्य शिक्षा

- अभिनय, रंगमंच, मंच सज्जा, नाटक के संवाद, अभिव्यक्ति, संगीत, लोक नाटक, को समझना व प्रयुक्त करना।
- नाटक की ऐतिहासिक पृष्ठभूमि, भारतीय व पाश्चात्य अवधारणा।
- नाटक, अभिनय गीत, नृत्य गीत, खेल, व्यायाम, योग, व्यक्तित्व विकास एवं जनसम्पर्क शिक्षा को जोड़ना।

Activities & Assignments –

1. विभिन्न कलाओं के बारे में जानने तथा उसके गहराई तक संवाद करें।

2. पाठ्यपुस्तक, उच्च प्राथमिक, माध्यमिक कक्षाओं के पाठ्यपुस्तकों में वर्णित, जिस अध्याय की बात हुई उसकी list बनावें। साथ ही उनके चित्र, मूर्तियां आदि को इकट्ठा करें।

3. अपने क्षेत्र में प्रचलित लोककलाएं जैसे मांडना, भीतिचित्र, गोदना, मेहंदी, मठावर, गौदी, चरखी, रंगोली, आदि के चित्र इकट्ठा करके छात्रों से स्मृति करवाएं।

4. अपने क्षेत्र में पाई जाने वाली सांस्कृतिक धरोहरी, मूर्तिकला, वास्तुकला, छायाकला, स्टोन राज। शिल्प-स्थानलयों के बारे में जानकारी लेकर सूचि बनाएंगे तथा उनके स्थानीय कलाकारों से भेंट करवायेंगे। (Experience) list

5. अपने क्षेत्र एवं भाषा के प्रचलित लोकनृत्य और लोकगीतों की जानकारी ऑडियो, वीडियो के माध्यम से प्राप्त करना तथा स्थानीय कलाकार से वार्तालाप करना।

   (Documentation of Arts, Dance/Folk lore etc.)

6. नाटक, रोलप्ले, एकांकी, एक पात्रीय अभिनय, अभिनय गीत, आदि को वर्गखण्ड के विषयवस्तु के साथ Integrate करके मंचन करें।

7. सामूहिक अभिनय, अभिनय गान, सामूहिक गान, सामूहिक नृत्य आदि करवायें। नाटक हेतु व्यायाम, योगा भौतिक अभिव्यक्ति, संगीत पसन्द करें।

8. छात्रों का परिचय एवं प्रायोगिक कार्य करवा सकते हैं।

Objects:

i. विविध कलाओं के बारे में सूचि बनाएं तथा कलाकारों से वार्तालाप करें।

ii. परिसंवाद, चर्चा, इन्टरव्यु का आयोजन करें जिसमें क्षेत्रीय कलाकारों से मुलाकात हो सके।

iii. नाटकों को वाचन, मंचन करवायें। (Reading and Acting)

iv. सांस्कृतिक संग्रहालय, क्षेत्रों की फिल्म मुलाकात का आयोजन करें एवं एसाइन्मैन्ट तथा प्रोजेक्ट कार्य करें। (Field visit/Report)

v. जनजातीय, लोककलाएं, भीतिचित्र, छायाकलाएं, मूर्तिकला, वुडनआर्ट, ग्लास (Glass Painting), डेजिटल आर्ट, प्राचीन एवं गोर्बन आर्ट, कैंब्रिक कलाएं आदि प्रस्तुत कर सकते हैं। (Research based Projects)

Reference:-

i. NCF – 2005

ii. Position papers of Arts and Craft and Drama, Music

iii. Basic Education
iv. Wikipedia – Art Education
v. Learning Cerve, Art Education volume.
vi. Drama and Theatre in Education, Dodd, Nigel and Winifred Hickson (1980).
vii. Kabad se Jugad: Little Science- Arvind Gupta, Eklavya.
viii. Joy of making Indian Toys, Popular Science, S. Khanna (1992) New Delhi, NBT.
ix. Creative Drama in the primary Grade, Vol-I/II, McCaslin, Nellie 1997, London, Longwin.
x. Learning through Art, Sahi, Jain & Sahi, Eklavya, 2009.
xi. Deevaswapna, Gujebhai Badheka, Indore.

Websites:-
i. www.Art integrated learning/Edu./primary
ii. www.Basic Education through Art
iii. www.Indian Arts and Culture
iv. www.Youtube/Art/Primary education
v. DD Bharti- Arts & Culture, www.ddbharti.dd.org.in.

Work Education II

Option I: Electricity and Electronics

Contact Periods/week: 2 Practical

Maximum Marks – 25
Min. Pass Marks – 08
Internal – 25

Syllabus:

Unit 1: Electrical and Electronics measurement and measuring Instrument

Introduction, use, type (based on working and construction) and connections of Ammeter, voltmeter, wattmeter, frequency meter, power factor meter, meager, ohmmeter, Energy meter and Multi-meter. Measuring technique and precaution during their operation in electrical circuit. Introduction of multi- meter and method of its uses, testing of electrical appliances using multi-meter, Principle of fault location and demonstration using multi-meter.

65

Unit 2: Basic Electronics

Conductor, Insulator and Semiconductor materials, extrinsic and intrinsic semiconductor materials, P- Type and N-Type Semiconductor material, doping, formation of P-N junction diode, forward, and reverse biasing of diode, characteristic and application. Formation of P-N-P and N-P-N junction transistor, biasing of transistor, characteristic, and their application. Soldering – Principle, method, and materials. Practice of soldering.

Unit 3: Electronics component and Materials

Study of electronic components-sign and symbols recognition, specification and testing of components like resistors, capacitors, coil, diode, transistor, zener diode, photo diode, LED, solar cell, P.C. Board, bread board, I.C. (Integrated circuits) using multimeter. Integrated circuits fabrication – Advantages and limitations of I.Cs.

Unit 4: Construction of common Electronics Circuit

Construction of eight L.E.D. disco light, Testing of disco light checking individual components, Construction of battery eliminator. (using half wave/full wave circuit), Testing of battery eliminator, checking individual components. Simple construction of fire alarm (using photocell), Construction of audio amplifier, Construction of oscillator, Construction of Musical bell, Construction of Simple emergency light, Regulated power supply, Testing of musical bell, emergency light, amplifier and oscillator by measuring voltages, Construction of light operated switch. PAS (Public Address System)-(a) Components of PAS and their specification. (b) Demonstration – Installation (c) Connectors used with microphones (d) Locating and repairing of minor faults in PAS.

Unit 5: Repairing of Home Appliances

House appliance repairing like Electrical Press, Heater, Immersion Rod, Electrical Kettle, Fan, Cooler, and Mixer, Rewire the fuse, To find the fault in above electrical appliances and rectify them, Outline the principles of working of Washing Machine and locating faults, Microwave – Outline the working principle and maintenance of a microwave. To study the construction, working and maintenance of different types of electrical motors.

Distribution of marks:

- Internal Exam   –   10 marks
- Practical Exam   –   10 marks
- Record and Viva Vice   -   05

WORK EDUCATION- II

Option II: Agriculture – KITCHEN GARDENING & FRUIT PRESERVATION

Syllabus:

Unit–I   Kitchen gardening – Importance, Establishment & Management.

Unit–II   Identification and cultivation of vegetable crops suitable for kitchen gardening viz: Pea, Carrot, Onion, Okra, Chilli and Radiishete. Identification and cultivation of Fruit crops suitable for kitchen gardening viz: Citrus, Papaya, Banana, Grapes and Mango etc.

Unit–III Applied knowledge of common manures, fertilizers their uses and methods of application, Identification knowledge of common pesticides and their uses in kitchen garden.

Unit–IV   Fruit Preservation – Principles of Fruit preservation, Different methods of fruit preservation, Causes of Spoilage and their remedies.

Unit–V   Preparation of some fruit products; Jam, Jelly, Squashes, Ketchup & Pickles.

SCHEME OF EXAMINATION (25 marks)

1. Identification of seasonal vegetables and Fruit Crops with comments — 05 marks
2. Drawing layout Plan of a Kitchen Garden — 05 marks
3. Principles and different methods of fruit preservation — 05 marks
4. Preparation method of Jam, Jelly, Ketchup, Sauce and Pickles. — 05 marks
5. Viva and Practical Record — 05 marks

Suggested Readings:

1. Handbook of Horticulture; I.C.A.R., New Delhi

2. Preservation of fruits and vegetables, GirdharlalSidhapa; I.C.A.R., New Delhi

3. Fruit & vegetable preservation industries in India, Bhutani, R.C. ; C.F.T.R.I.; Mysore.

4. Vegetable production in India, Chauhan, D.V.S.; Ram Prasad and Sons, Agra.

5. Commercial fruits; Singh, S.P.; Kalyani Publishers, New Delhi.

6. Instant Horticulture; Gupta, S.N.; Naik, K.B, Jain Brothers, New Delhi.

67

Bachelor of Science and Bachelor of Education

Rani Durgawati University

COURSES OF STUDIES

For

Four Year Integrated

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

THIRD SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
BSc. Part: Foundation Course				
Comp. & ICT in Education	40	10	50	3
Language – Hindi	40	10	50	3
- English	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	375	75	450	
B.Ed. Part		50	50	2
Reading & Reflection on text				
Curriculum Development	40	10	50	3
Arts and Aesthetics	-	25	25	2
Community Living	-	25	25	1 week
Total	40	110	150	2
Grand Total	415	185	600	

- Elective 1 – Physics/ Botany.

- Elective 2 – Chemistry.

- Elective 3 – Zoology/Mathematics

68

(All electives 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)

Semester Name	Paper	Mark	Paper Code	Name of Papers
III	Paper Theory-V	30	M-3.1	Advanced Calculus
	Paper Theory-VI	30	M-3.2	Differential Equation
	Internal Test	15		Related To Above Papers
	Practicum	25		Related to Above Papers

B.Sc. Component:

Foundation Course: Computers & ICT in Education – I

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives: On completion of this course, the student teachers will be able to:

- Appreciate the historical development of various educational media,
- Explain ICT and its application in education,
- Plan multimedia based learning content using open source authoring software,
- Develop technology integrated learning materials using ICT tools,
- Explain different approaches of ICT integration in education,
- Use various ICTs for project based/problem based constructivist learning environment,
- Use ICT for designing innovative pedagogical approaches,
- Use various web 2.0 technologies for educational purpose,
- Create collaborative learning situation using various web 2.0 tools and technologies,
- Develop skills in using various e-learning tools and technologies.

UNIT-I: Introduction to Information and Communication Technology

- Use of Technology in Education: A look back
  - Role of technology in enhancing learning, basic theories of communication, system theory and learning theory

- Historical account of the development of various educational media (audio, print, video, storage, display, projection)
- Review of the role of technology in traditional pedagogical practices- programmed learning, Keller's plan, Computer Based Instruction, Mastery Learning
- Role of technology in emerging pedagogical practices; importance of new media literacy
- Information and Communication Technology: Meaning, nature and advantages

UNIT II – Multimedia and E-learning

- Multimedia:
  - Concept, meaning and procedure of creating multimedia
  - Multimedia tools- Audio editing, video editing, screen casting, graphic editing, basics of animation, and creating interactive multimedia contents
- E-learning:
  - Concept, types, characteristics, advantages and limitations
  - E-learning tools and technologies-Learning Management Systems (LMS)
  - E-content authoring tools- Open source and proprietary alternatives
  - Re-usable learning objects (RLO) – Meaning, types and characteristics. RLO repositories

UNIT III – Web 2.0 Technologies

- Web 2.0 technology and tools: Meaning characteristics and types
- Social networking and social book-marking – Educational applications
- Blog and micro blog – Reflective journaling and other educational applications
- Wiki – Collaborative authoring and projects
- Instant messaging and its educational applications
- Educational applications of online forums/discussion groups and chats
- Social media sharing – Video, presentations, audio (podcasts), graphics, and text
- Web 2.0 tools for creating, sharing, collaborating, and networking

UNIT-IV: ICT and Pedagogy

- Approaches to integrating ICT in teaching and learning: Technological Pedagogical Content Knowledge (TPCK)
- Subject specific ICT tools for creating and facilitating learning

70

- Subject specific online resources and their use
- Designing technology integrated learning experiences
- ICT integrated Unit plan – Use of Web 2.0 for creating constructivist learning environment
- Assistive technology for children with special needs: Tools and processes; Universal Design for Learning (UDL)
- ICT for Pedagogical Innovations
  - Project/problem based learning (PBL): Role of ICT in developing technology integrated PBL unit
  - Web Quest and virtual field trips: Concept, process, and use in the classroom
  - Multiple intelligences in classroom: ICT tools and applications
  - Mobile learning and related applications
  - Open Educational Resources – Meaning and importance, various OER initiatives
  - Massive Open Online Courses (MOOC)-Concept and use
  - Flipped classrooms: Meaning and possibilities

Sessional Work

- Creating digital concept maps, flow charts, timelines for a particular content
- Creating screen cast video of a lesson
- Creating a podcast using audacity and sharing it on podcasting site
- Shooting, editing, and sharing of videos segment on any educational topic
- Creating a simple 2D animation using pencil or Tupi
- Creating and editing various graphics
- Creating account in teachertube/slideshare and sharing your video/presentation. View and comment on others contributions
- Enrolling and completing some MOOC courses of interest
- Creating resources for flipped classroom and practicing flipped learning in school
- Evaluating OER resources, Creating and sharing OER materials
- Developing technology integrated unit/lesson plans and trying out this in schools
- Hands on experience on subject specific software tools like Geogebra, PhET, Stellarium,etc.
- Taking part in an ICT integrated online project based or problem based learning activity

71

- Developing a multimedia e-content for a topic using eXe Learning

Suggested readings

- Andrew, M. L. (2004). Understanding Open Source and Free Software Licensing.Oreilly:Cambridge
- Bharihok,D. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi
- CEMCA (2010) Quality Assurance in Multimedia Learning Materials (QAMLM), Commonwealth Educational Media Center for Asia, 13/14 SarvaPriyaVihar, New Delhi.
- CEMCA (2014).Professional Development Programme on OER-based eLearning, Commonwealth Educational Media Center for Asia, 13/14 SarvaPriyaVihar, New Delhi.
- CEMCA (2014) Technology Tools for Teachers, Commonwealth Educational Media Center for Asia, 13/14 SarvaPriyaVihar, NewDelhi.
- Curtis, J. B (2011).The World Is Open: How Web Technology Is Revolutionizing Education.Jossey- Bass:SanFransisco
- David, M. (2009).Project Based Learning- Using Information Technology- Second Edition .Viva Books: New Delhi.
- Evant, M: The International Encyclopedia of Educational Technology.
- Gwen, S. and Lynne Schrum.(2014). Web 2.0 How-to for Educators, Second Edition. ISTE
- Howard Pitler, Elizabeth R. Hubbell, and Matt Kuhn.(2012)Using Technology with Classroom Instruction That Works, 2nd Edition.ASCD:Denver
- Jane Hunter (2015).Technology Integration and High Possibility Classrooms: Building from TPACK
- Katherine Cennamo, John Ross, Peggy Ertmer. (2013).Technology Integration for Meaningful Classroom Use: A Standards-Based Approach. Wadsworth: AU
- Lee, William W., Dianna, L. Owens, (2001) Multimedia based Instructional design: Computer Based Training. Jossey-Bass
- Liz Arney (2015.)Go Blended!: A Handbook for Blending Technology in Schools
- Loveless Avril (2001).ICT-pedagogy and the curriculum-Subject to change.Routledge Falmer: London.

- Mishra, S.(Ed.) (2009). STRIDE Hand Book 08: E-learning. IGNOU:New Delhi. Available at http://webserver.ignou.ac.in/institute/STRIDE_Hb8_webCD/ STRIDE_Hb8_ index.html

- NCERT (2013) Information and Communication Technology for School System: Curricula for ICTs in Education (students and Teachers), Version-1.2, CIET-NCERT. NCERT, New Delhi (www.icteurriculum.gov.in)

- NCERT (2013) National Repository of Open Educational resources (NROET), CIET-NCERT, NCERT, New Delhi (nroer.gov.in)

- Noam Shemtov, Ian Walden.(2014)Free and Open Source Software: Policy, Law and Practice. Oxford University Press

- RoblyerM.D., Aaron H. Doering (2012).Integrating Educational Technology into Teaching (6ᵗʰ Edition)

- Shalin Hai-Jew. (2012). Open-Source Technologies for Maximizing the Creation, Deployment, and Use of Digital Resources and Information. Information Science Reference:USA

Foundation Course: Language – Hindi

आधार पाठ्यक्रम : हिन्दी भाषा

प्रश्नपत्र – 3

Contact Periods/week: 03

कुल अंक – 40

आन्तरिक मूल्यांकन – 10

प्रश्न एवं अंक निर्धारण

4 व्याख्यात्मक/दीर्घउत्तरीय प्रश्न – 28 अंक (7 × 4 प्र.)

लघुउत्तरीय प्रश्न – 07 अंक (3.5 × 2 प्र.)

वस्तुनिष्ठ प्रश्न – 05 अंक (1 × 5 प्र.)

व्याख्यात्मक एवं समीक्षात्मक प्रश्नों में आन्तरिक विकल्प होंगे।

इकाई – 1	1.	विनागी गुलामी (निबंध)	–	राहुल सांकृत्यायन
	2.	फांस (कहानी)	–	गोविन्द मिश्र
	3.	विराम चिन्ह (निबंध)	–	रामविलास शर्म
	4.	हमारा सौरमण्डल		(संकलित)
	5.	जीवन 'उत्पत्ति और संरचना		(संकलित)
इकाई – 2	1.	इन्द्रधनुष का रहस्य (वैज्ञानिक लेख)	–	डॉ. जगपूरण जैन
	2.	चली फगुनहट बीरे गाम (ललित निबंध)	–	विवेकी राय

इकाई – 3	3.	भोजन और स्वास्थ्य	–	(संकलित)
	1.	कक्षा और अध्यापक (लेख)	–	डॉ. विजयबहादुर सिंह
	2.	पृथ्वी संकट में है (पर्यावरणीय निबंध)	–	प्रभाकर क्षत्रिय
	3.	मेरे सहयात्री (यात्रा वृत्तांत)	–	अमृतलाल बेगढ़
	4.	दूरदर्शन अतीत और वर्तमान	–	(संकलित)

Foundation Course: Language English

Paper III

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Distribution of Marks:

1. Four critical questions are to be set from unit I. Two questions are to be attempted. Each question will carry 5 marks. 5 X 2 = 10.

2. Out of three topics, students are required to write a report on any one topic only. . X 5 = 5.

3. Students are required to attempt 10 questions on Unit III. Each question will carry 1 marks. 1 X 10 = 10.

4. Students are required to attempt 5 questions on Unit IV. Each question will carry one mark. 1 X 5= 5.

5. Students are required to attempt 2 questions on Unit V. Each question will carry 5 marks. 5 X 2= 10.

UNIT I: Tina Morris – Tree Nissim Ezekiel – Night of the Scorpion George Orwell – What is Science ? A.G.

Gardiner – On the Rule of the Road Robert Frost – Stopping by Woods on a Snowy Evening. K.

Aludiapillai – Communication & Information Technology.

UNIT II: Report Writing.

UNIT III: Production of speech sounds, classification of sounds, Transcription.

UNIT IV: Common errors in English Words often confused.

UNIT V: Presentation Skills Drafting a CV

Elective I – Physics

Paper III: Thermodynamics and Statistical Physics

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 completion of this course, the students will be able to

1. Acquaint themselves with the concept of ideal and Real gas.
2. Describe historical development of laws of thermodynamics.
3. Appreciate the concept of probability.
4. Develop and understand the statistical basis of thermodynamics.
5. Explain the fundamental difference between classical and quantum statistics.
6. Appreciate the concept of indistinguish-ability of particles.
7. Understand Bose- Einstein and Fermi-Dirac Statistics.

Unit-1: Ideal and Real Gases

Brownian motion; estimation of the Avogadro number; specific heat of monoatomic gas: extension to di and tri atomic gases; behavior of gases at low temperatures; adiabatic expansion of an ideal gas, applications to atmospheric physics.

Transport phenomenon in gases; mean free path; collision cross sections; estimates of molecular diameter, transport of mass momentum and energy, dependence of mean free path on temperature and pressure.

Real and Van der waals gas; equation of state; reduced equation of state; nature of Van der waals forces; comparision with experimental P-V curve; the critical constants gas and vapour; J-T cooling, Boyle temperature and inversion temperature.

Unit -2: Thermodynamic relationships and Liquefication of gases

Thermodynamic relationships; Thermodynamic variables; extensive and intensive, Clausus-Clapeyron heat equation; thermodynamic potentials and equilibrium of thermo dynamical systems.

Principle of regenerative cooling and of cascade cooling. liquification of hydrogen and helium, refrigeration cycles, cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

Unit- 3: The Laws of Thermodynamics

The Zeroth law; various indicator diagrams; work done by and on the system; first law of thermodynamics; internal energy as a state function and other applications; reversible and irreversible changes; Carnot cycle and its efficiency; Carnot theorem and the second law of the thermodynamics; different versions of the second law; practical cycles used in internal combustion engines; entropy; principle of increase of entropy; The thermodynamic scale of temperature; its identity with the perfect gas scale; impossibility of attaining the absolute zero; third law of thermodynamics.

Unit – 4: The Statistical Basis of Thermodynamics

Probability and thermodynamic probability; principle of equal a priory probability, probability distribution and its narrowing with increase in number of particles; the expressions for average properties; accessible and inaccessible states; distribution of particles with a given total energy into a discrete set of energy states. Equilibrium before and after two systems in thermal contact, bridge with macroscopic physics; probability and entropy; Boltzmann canonical distribution law and its applications; law of equipartition of energy.

Unit-5: Maxwellian Distribution of Speeds in an Ideal Gas

Distribution of speeds and of velocities, distinction between mean, rms and most probable speed values, Doppler broadening of spectral lines.

Transition to quantum statistics, 'h' as a natural constant and its implications, cases of particles in a one – dimensional box and one dimensional harmonic oscillator , Indistinguishability of particles and its consequences; Bose- Einstein, and Fermi-Dirac statistics; Fermi level and Fermi energy, thermodynamic behaviour of an ideal Fermi gas.

Physics Practical List

1. To study the characteristics of photovoltaic cell.
2. To simulate the decay probability curve.
3. To determine the mechanical equivalent of heat by Joule's calorimeter.
4. To verify Newton's law of cooling.
5. To determine the thermal conductivity of a non- conducting material by Lee's Disc.
6. To find the temperature of Hot metal bob using calorimeter.

76

7. To verify the Stefan's law of radiation by using an incandescent lamp.

8. To determine latent heat of ice.

9. To study thermo e.m.f of Fe-Cu junction.\

10. To determine thermal conductivity of rubber tube.

11. To determine specific heat ratio of air by element and dorsem apparatus.

12. To determine efficiency of an electric kettel.

Suggested readings

- Laud, Introduction to Statistical Mechanics, Macmillan publication.

- F. Reif, Statistical Physics, McGraw-Hill publications.

- Sears& Salingers, Thermodynamics, Kinetic theory and Statistical thermodynamics, Narosa publishing house, New Delhi.

- Thermodynamics and Statistical Mechanics, Loknathan and Gambhir

---

Elective I – Botany

Paper III: Diversity of Vascular Plants

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 : (i) To provide an understanding of structural and functional organisation of gymnosperms and angiosperms and their evolutionary trends.

(ii) To enable the students to be familiar with diversity of plant habit and their basic body plan.

Unit I - Gymnosperms: General characteristics of gymnosperms and their outline classification. Evolution and diversity of gymnosperms. Origin of seed habit, geological time scale, fossilisation and fossil gymnosperms.

Unit II - Gymnosperms: Morphology of vegetative and reproductive parts, anatomy of root, stem and leaf, reproduction and life cycle of Pinus, Cycas and Ephedra.

77

Unit III - Angiosperms: Origin and evolution, fossil angiosperms, brief characteristics of angiosperms, primitive angiosperms (Magnoliaceae and Winteraceae) The basic body plan of a flowering plant – modular type of growth. Diversity in plant form in annuals, biennials and perennials. Convergence of tree habit in gymnosperms, monocotyledons and dicotyledons, trees – largest and longest lived organisms.

Unit IV - The shoot system:

The shoot apical meristem and its histological organisation. Vascularisation of primary shoot monocotyledons and dicotyledons, formation of internodes, branching pattern; monopodial and sympodial growth. Canopy architecture; cambium and its functions; formation of secondary tissue xylem; a general account of wood structure in relation to conduction of water and minerals; characteristics of growth rings, sapwood and heart wood, role of woody skeleton; secondary phloem- structure-function relationships; periderm.

Unit V - Leaf:

Origin, development, arrangement and diversity in size and shape (leaf morphology) internal structure in relation to photosynthesis and water loss; adaptations to water stress; senescence and abscission.

The root system:

The root apical meristem; differentiation of primary and secondary tissues and their roles; structural modification for storage, respiration and interaction with microbes.

Practical

Objectives:

i) To develop the skills of section cutting and double staining of vascular plants.

ii) To provide field experiences to students for studying plant habits and basic body plan.

1. Cycas :

(i) Habit, armour of leaf bases on the stem, very young leaf (circinate vernation) and old foliage leaves, bulbils, male cone, microsporophyll, Megasporophyll, mature seed.

(ii) Study through slides – normal root (T.S.), stem (T.S.), Ovule (L.S.) microsporophyll.

(iii) Study through hand sections or dissections – coralloid root (T.S.), Rachis (T.S.), leaflet (T.S.).

78

2. **Pinus :**

(i) Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. of wood showing growth rings, male cone, 1st year, 2nd year and 3rd year female cones, winged seeds.

(ii) Study through permanent slides – root (T.S.), female cone (L.S.), ovule (L.S.), embryo (W.M.) showing polycotyledonous condition.

(iii) Study through hand sections or dissections – young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S.), male cone (L.S.), male cone (T.S.), pollen grains (W.M.).

3. **Ephedra :**

(i) Habit and structure of whole male and female cones.

(ii) Permanent slides – female cone (L.S.).

(iii) Hand sections/dissections-node (L.S.), internode (T.S.) macerated stem to see vessel structure; epidermal peel mount of vegetative parts to study stomata, male cone (T.S. and L.S.) pollen grains.

4. Study of any commonly occurring dicotyledonous plant (for example Solanum nigrum or Kalanchoe) to understand the body plan and modular type of growth.

5. Life forms exhibited by flowering plants (by a visit to a forest or a garden) Study of tree like habit in cycads, bamboos, banana traveller's tree (Ravenala madagascariensis) or Yucca and comparison with true trees as exemplified by conifers and dicotyledons.

Scheme of Practical Examination:

1. Section cutting and double staining (Gymnosperms).	5
2. Section cutting and double staining (Angiosperms).	5
3. Preparation of Report on field visit for studying plant habits.	5
4. Comment upon the spots (1-5).	5
5. Practical record.	5
6. Internal evaluation	5

Suggested Readings

- Bhatnagar, S.P. and Moitra, A.1996 Gymnosperms, New Age International Ltd : New Delhi

- Gifford, E.M. and Foster, A.S., 1988, Morphology and evolution of Vascular plants, W.H. Freeman & Company, New York

- Sundera Rajan, S.2003. Plant Morphology. Annual Publication Pvt. Ltd. New Delhi

79

- Vashishta, B.R. 2003. Pteridophyta. S. Chand & Co. New Delhi
- Vashishta, B.R. 2005. Gymnosperms. S. Chand & Co. New Delhi
- Sporne, K.R. The Morphology of Pteridophyta. Hutchinson, London
- Raizada & Sahani, Gymnosperms. FRI Publication
- Singh V., Pande, P.C. and Jain D.K. 2004 Diversity and Systematics of Seed Plants, Rastogi Publication
- Singh V. Pande, P.C and Jain D.K. 2004. Structure, Development and Reproduction in Angiosperms, Rastogi Publications
  Naik V.N. 1984 Taxonomy of Angiosperms Tata McGraw-Hill Publishing Company Limited, New Delhi

Elective II – Chemistry

Paper III

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 3rd semester the students should be able to:

(i) make a comparative study of group 13-17 elements and rationalize the importance of comparative study.

(ii) explain the structure and properties of the compounds of p-block elements including noble gas family particularly keeping focus on the recent discoveries.

(iii) acquire the knowledge of characteristic properties of transition elements and explain the properties in terms of oxidation states exhibited by the elements.

(iv) compare the chemistry of first, second and third transition series elements and explain the stereo chemistry associated with complexes.

(v) appreciate to learn the theories involved in coordination chemistry and judge their comparative contribution in the study of complexes.

80

(vi) explain the principles involved in the extraction of elements and correlate this with the thermodynamical principles.

(vii)   acquire the knowledge of characteristic properties shown by lanthanides and actinides and utilize the knowledge in the isolation of lanthanides.

(viii) appreciate the similarities between later actinides and later lanthanides.

(ix) construct the knowledge of different theories of acids and bases and judge the wider applicability of Lewis concept.

(x) appreciate to gain knowledge of some non-queous solvents line ammonia and liquid sulpher dioxide and compare them with aqueous system.

Instructional Strategy:

To handle the study of descriptive chemistry, the teacher should highlight the role of structures as they affect the trends in properties. To make the subject matter presentation interesting and lucid in approach, the chemistry associated with the elements be discussed in terms of the trend in oxidation states exhibited by the respective elements. The subject treatment of isolation of elements be highlighted in the framework of thermodynamic principles. The different theories proposed to discuss the coordination compounds be dealt with in terms of their need and limitations. To discuss the acid base system and the chemistry of non aqueous solvents the possibility of the use of Ausubel's Advanced Organizer model should be explored by the teacher.

Unit-I s-Block Elements

Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls

p-Block Elements Part-I

Comparative study (including diagonal relationship) of group 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of group 13-24, hydrides of boron-diborane and higher boranes, borazine, borohydrides.

p-Block Elements Part-II & Chemistry of Noble Gases

Fullerenes, carbides, fluorocarbons, silicates (Structural principle), tetrasulphurtetranitride, basis properties of halogens, interhalogens. Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

81

Unit-II Chemistry of Elements of First Transition Series :

Characteristic properties of d-block elements.

properties of the elements of the first transition series, their binary compounds such a Carbides, Oxides and Sulphides. Complexes illustrating relative stability of their oxidation states, coordination number and geometry. Chemistry of Elements of Second and Third Transition Series :

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

Unit-III A. Coordination Compounds

Werner's coodination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

B. Oxidation and Reduction

Use of redox potential data-analysis of redox cycle, redox stability in water-Frost.Latimer and Poubaix diagrams. Principles involved in the extraction of the elements.

Unit-IV A. Chemistry of Lanthanide Elements :-

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

B. Chemistry of Actinides :

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am form U, similarities between the later actinides and the later lanthanides.

Unit-V A. Acids and Bases :

Arrhenius, Bronsted- Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

B. Non-aqueous Solvents :

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

Suggested Readings:

1. Cotton, F.A. , G. Wilkerson, G. andGaus, P.L. , Basic Inorganic Chemistry; John Wiley and Sons, New York.

2. Lee, J.D. , Concise Inorganic Chemistry ELBS

3. Sharpe, A.G., Inorganic Chemisry .ELBS

82

4. Malik, Madan and Tuli; Modern Inorganic chemistry; S. Chand and Company Ltd.

5. Douglas, Bodie, E., Concepts and Models of Inorganic chemistry

6. Malik, Madan and Tuli; Advanced Inorganic Chemistry S. Chand and Company Ltd.

7. Huheey, James E; Inorganic Chemistry 4th Ed - New Delhi: Pearson Education.

8. Manku, G.S., Theoretical principles of Inorganic Chemistry, Tata McGraw – Hill Publishing Company, New Delhi

9. Soni P.L., Textbook in Inorganic chemistry (a modern approach) Sultan Chand and Sons, New Delhi:

Practical:

List

1. Semi micro analysis of inorganic mixture containing fine ions including typical combinations, insolubles and interfering ions. anions: CO_3^{2-}, CH_3COO^-, NO_2^-, SO_3^{2-}, S^{2-}, F^-, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-}, PO_4^{3-}, $C_2O_4^{2-}$, BO_3^{3-} cations: NH_4^+, Ag^+, Na^+, K^+, Pb^{2+}, Hg_2^{2+}, Hg^{2+}, Cu^{2+}, Cd^{2+}, Bi^{3+}, As^{3+}, Sb^{3+}, Sn^{4+}, Fe^{3+}, Cr^{3+}, Al^{3+}, CO^{2+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}.

2. Estimation of hardness water by EDTA method.

3. Estimation of chloride using voblard method.

4. Estimation of glucose aniline or phenol.

Scheme

Experiments: Time allotted – 5 hrs

(1)	Mixture analysis	-	10
(2)	Volumetric Estimation	-	5
	internal assessment	-	5
	Viva	-	5

Elective III – Zoology
Paper III

Contact Periods/week: 05 + 4 Practical

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

Objectives:

To study structure and function of cell, various aspects of genetics, inheritance and evolution.

Unit-1

1. The cell – history of cell biology, cell theory, prokaryotes and eukaryotic cell.

2. Nuclear organization of cell.

3. Extra nuclear organization of cell.

4. Plasma membrane- theories structure and function.

5. Cell reproduction – amitosis, mitosis and meiosis.

Unit-2

1. Chromosome – structure, types (lamp brush, salivary and beta chromosomes), structural and numerical changes.

2. Mendelian principles of heredity

3. Post Mendelian genetics

4. Sex chromosome system: chromosome theory of sex determination, sex linked inheritance (haemophilia & colour blindness)

Unit-3

1. Linkage & crossing over (theories of linkages, significance of linkage and mechanism of crossing over)

2. Linkage maps

3. Human chromosomes and maps, eugenics (common genetic diseases in man-sickle cell anemia, alkaptoneuria and albinism)

4. Euphenics and euthenics.

Unit-4

1. Multiple factors (blood groups)

84

2. Twins- physical and mental traits
3. Cytoplasmic inheritance- maternal effects in Limnea shell coiling
4. Carbon di-oxide sensitivity in Drosophila and kappa particles in Paramoecium

Unit-5

1. Brief account of origin of life on earth
2. Origin of eukaryotic and prokaryotic cells
3. Concept of evolution (micro and macro evolution)
4. Lamarckism, neo-Lamarckism, Darwinism and neo-Darwinism
5. Evidences and mechanism of evolution, species and speciation

PRACTICAL

Objective- to develop skills of identification of cell and its organelles and to gain the ability to recognize aspects of genetic and cytogenetic techniques for understanding the processes of inheritance

1. Study of prokaryotic and eukaryotic cell through charts and models
2. Demonstration of mitochondria in cheek epithelial cells by Janus green staining
3. Demonstration of mitosis in onion root tip cells
4. Study of meiosis in grass hopper testes
5. Demonstration of Polytene chromosomes in Chironomus/Drosophila larvae
6. Demostration of Barr bodies in hair root bulb cells and cheek epithelial cells
7. Pedigree analyses through charts and handouts
8. Karyotype analysis through charts and handouts
9. Problem solving of linkage analysis and human blood types

SCHEME OF PRACTICAL EXAMINATION

1. Spotting	–	04
2. Temporary Preparation (Exercise-I)	–	04
3. Temporary Preparation (Exercise-II)	–	06
4. Problem Solving/Karyotype/Pedigree	–	04
5. Practical Records	–	03
6. Viva-voce	-	04
Total -		25 Marks

Internal assessment - 05 Marks

G. Gulati

85

Referred books -:

1. Textbook of cell biology-de Robertis
2. Textbook of cell biology-Karp
3. Textbook of cell biology- Alberts et. Al.
4. Textbook of cell biology- Cooper
5. Cell and Molecular Biology- P.K. Gupta
6. Principles of Genetics- Gardner et. Al.
7. Principles of Genetics- Klug and Cummings
8. Principles of Genetics- P.K. Gupta
9. Genetics and Principles of heredity- Winchester
10. Evolution- Dodson
11. Evolution-Douglas J Futuyma
12. Evolution- V. B. Rastogi
13. Ecology and Evolution- Dalela
14. Meaning of Evolution- G. G. Simpson

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 30+30=60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practicum 5)

Practicum – 25 (Internal)

M - 3,1: ADVANCED CALCULUS

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

Objective: To develop understanding of advanced calculus

Unit-I Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests. Cauchy's integral test. Ratio tests. Raabe's logarithmic, de Morgan and Bertrand's tests. Alternating series. Leibnitz's theorem. Absolute and conditional convergence.

Unit-II Continuity, sequential continuity. Properties of continuous functions Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations.

86

Darboux's intermediate value theorem for derivatives. Taylor's theorem with various forms of remainders.

Unit-III Limit and continuity of functions of two variables. Partial differentiation. Change of variables. Euler's theorem on homogenous functions. Taylor's theorem for functions of two variables.

Jacobians. Indeterminate forms.

Unit -IV Maxima, minima and saddle points of functions of two variables. Lagrange's multiplier method.

Unit - V Beta and Gamma functions. Dirichlet's integrals. Double and triple integrals. Change of order of integration in double integrals.

Content as in

S.C. Mallick - Mathematical Analysis ; Wiley Eastern Limited

M - 3.2 DIFFERENTIAL EQUATION

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

Objectives : To develop understanding of advanced differential equations with Application.

Unit - I Series solutions of differential equations – power series method, Bessel, Legendre and Hypergeometric equations. Bessel, Legendre and Hypergeometric functions and their properties – convergence, recurrence and generating relations.

Unit - II Orthogonality of functions. Sturm Liouville problem. Orthogonality fo eigen functions. Reality of eigenvalues. Orthogonality of Bessel functions and Legendre polynomials.

Unit - III Laplace Transformation - Linearity of the Laplace Transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms. Convolution theorem. Solution of integral equations and systems of differential equations using the Laplace transformation.

Unit - IV Partial differential equations of the first order. Lagrange's solution. Some special type of equations which can be solved easily by methods other than the general method. Charpit's general method of solution.

87

Unit - V   Partial differential equations of second and higher orders. Classification of linear partial differential equations of second order. Homogenous and non-homogenous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's methods.

Content as in:

1. D.A.Murray:Introductory Course in Differential Equation Orient Long Man
2. Murray and R.spigel: Theory and Problems Of Laplace transformations.Schaum series.
3. Sneddon:Elements of Partial Differential Equation, McGraw-Hill

M - 3.3 Mathematics Practicum

List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester III Mathematics papers M-3.1 and M-3.2.
- Mathematics seminar.

Education Component:

Curriculum Development

Contact Periods/week: 03

Maximum Marks – 40
Min. Pass Marks – 13
Internal – 10

Objectives

- To understand the concept and principles of curriculum.
- To make the distinction between curriculum and syllabus
- To understand the bases and determinants of curriculum studies.
- To gain insight into the development of curriculum.
- To appreciate the need for continuous and comprehensive curriculum reconstruction.
- To enable students to understand implementation and evaluation of curriculum.

UNIT-1: Concept of curriculum

- Meaning and nature of curriculum; Need for curriculum in schools.
- Differentiating curriculum framework, curriculum, syllabus and unit; their significance in school education.

- Facets of curriculum: core curriculum, Co-curriculum, Hidden curriculum. Activity based curriculum.
- Curriculum visualized at different levels: National level; State level, school level, class level and related issues.

UNIT-III: Determinants and considerations of curriculum

- Determinants of Curriculum; Socio-political, Cultural, Technical and Economical
- Curriculum considerations:
a. Educational objectives,
b. Learners characteristic: Nature of learner, their Socio cultural Context and learning process
c. Relevance of stage of schooling
d. Teachers experiences and concerns,
e. Environmental concerns,
f. Gender, Inclusiveness, social sensitivity.

UNIT-III: Curriculum development

- Concept, Need and Scope of curriculum development.
- Strategies of curriculum development.
- Guiding principles of curriculum development.
- Approaches of curriculum development: Administrative approach, Grass root approach, Demonstration approach, System approach.

UNIT-IV: Implementation and Evaluation of Curriculum

- Role of school philosophy and Administration in creating context for curriculum development, Available infrastructure, Curriculum sites, resources (library, laboratory, school playground, neighbourhood etc.
- Teacher's Role in Curriculum construction, Curriculum Transaction, researching in curriculum.
- Role of a teacher as a critical pedagogue.
- Role of external agencies in providing curriculum and pedagogical supports to teachers within schools-local, regional, national.
- Models of curriculum evaluation: Tyler model, Hilda Taba.

Sessional Work

- Study of NCF 2005 as well as the earlier school curriculum frameworks

89

- Discussion on purpose of curriculum framework
- Critical Evaluation of the extend to which the curriculum framework is reflected in the syllabus
- Interaction with school teachers and principal, how they operationalise the prescribed curriculum into an action plan

  How curriculum is evaluated and revised

Mode of Transaction

Lecture, Discussion, debate, Project, Activities etc.

Suggested readings:

- Aggarwal, Deepak (2007): Curriculum development: Concept, Methods and Techniques. New Delhi. Book Enclave.
- Arora, G.L. (1984): Reflections on Curriculum. NCERT.
- Bob Moon and Patricia Murphy (Ed) (1999). Curriculum in Context. Paul Chapman Publishing, London.
- Butchvarov,P.(1970). The Concept of Knowledge, Evanston, Illinois: North Western University Press.
- Chomsky, N (1986). Knowledge of Language, Prager, New York.
- Datta, D.M. (1972). Six ways of Knowing. Calcultta University Press, Calcultta.
- G.W. Ford and Lawrence Pungo,(1964). The structure of Knowledge and the curriculum. Rand McNally & Company, Chicago.
- Joseph Schwab, (1969). The Practical: A language for curriculum. School Review, November.
- Kelley, A.B. (1996). The Curricular Theory and Practice. Harper and Row, US.
- Kumar Krishna (1997). What is Worth Teaching. Orient Longman, New Delhi.
- Margaret, K.T. The open Classroom, Orient Longman: New Delhi, 1999.
- NCERT (1984). Curriculum and Evaluation, NCERT, New Delhi.
- NCERT (2006): Systematic reforms for Curriculum change. New Delhi.
- Dewey, John (1966). The Child and the Curriculum. The University of Chicago Press.
- NCTE (2009) National Curriculum Framework for Teacher Education.
- NCERT (2000). National Curriculum Framework for School Education, NCERT, New Delhi.

90

- NCERT (2005). National Curriculum Framework, NCERT, Sri AurobindoMarg, New Delhi.
- NCERT (2014). Basics in Education, NCERT, Sri AurobindoMarg, New Delhi.
- Nirantar (1997). Developing a Curriculum for Rural Women, Nirantar, New Delhi.
- Padma M. Sarangapani (2003). Constructing School Knowledge, An Ethnography of learning in an Indian Village, Sage Publication Inc., New Delhi.
- Prema Clarke (2001). Teaching & Learning: The Culture of pedagogy, Sage Publication, New Delhi.
- Steven H. Cahn (1970). The Philosophical Foundation of Education, Harper & Row Publishers, New York.
- Taba, Hilda (1962).Curriculum Development. Theory and Practice, Har Court, Brace and Wald, New York.
- Wiles, J.W. & Joseph Bondi (2006): Curriculum Development: A Guide to Practice. Pearson Publication.
- Wheeler D.K. (1967) Curriculum Process, University of London Press.

Reading and Reflecting on Text

Contact Periods/week: 02

Maximum Marks – 50

Min. Pass Marks – 17

Internal – 50

Course objectives

- To engage students closely with text and develop taste for readings.
- To enable students to read, interpret and reflect on different types of text.
- To enable students to appreciate knowledge present in either English medium textbooks/journals/articles or other available material present in the regional language.
- To facilitate students to self-learning, self-reflection and ability to express their though in writings or debates and discussion.

Unit: I- Understanding the Text

- Identifying the text as a tool: meaning of text and its form, expression and procedure
- Nature and role of available literature: textbook, journals, articles, abstracts, extended abstracts, encyclopedia

91

- Surveying a text : making notes, understanding how facts, ideas are connected and giving reflections, making inferences
- Role of conceptual and analytical framework in understanding the text

Unit II- Engaging with narrative and descriptive accounts

- Selection of children literature, adult literature and inclusive literature: nature of text and its form, selection of movies, stories, chapters from fiction, autobiographical narratives, historical narratives etc.
- Reading for comprehending and visualizing the accounts (individual and group reading)
- Discussion and debate on characters, context and scenarios and sharing interpretations
- Writing summary, scene, abstract, dialogue, report with key idea in the text

Unit III- Engaging with subject related reference books

- Selection of a problem or issue and articulating guided questions
- Selection of text from various types of resources
- Preparing notes, writing summary and connect it with issues or problems initiated
- Group and individual assignment and presentation on any educational idea/text

Suggested Readings

1. Ashton-Warner, S. (1963). Teacher. New York: Simon and Schuster. Hindi translation- Poorva Yangnik Kushwaha. Granth Shilp Publisher.
2. Asimov, Isaac. (1982). How did we find out about Beginning of life? Hindi translation- Arvind Gupta.
3. Badheka, Gijubhai. (1931). Divaswapna
4. Darwin, Francis. (2009). Charles Darwin ki Aatmakatha, Sasta Shitya Mandal Publication. New Delhi.
5. Gorky, Maxim. (2005). Ek chote ladke aur ek choti ladki ki kahani jo barfili thand mein thither kar mare nahi. Anurag Trust, Niralanagar, Lucknow.
6. Graff, G. & Birkenstein, C. (2014). They say, I say: The Moves That Matter in Academic Writing. Third Edition. W.W.Norton & Company.
7. Holt, J. C. (1964). How children fail. New York: Pitman. Hindi- Bachche Asafal Kaise Hote Hain. Eklavya Publication.
8. Holt, J. C. (1974). Escape from childhood. New York: E.P. Dutton. Hindi- Bachpan se Palayan. Eklavya Publication.

92

9. Kumar, Krishna. (2014). What is worth Teaching. Orient Blackswan Private Limited. New Delhi.1-22.

10. Kuroyangi, Tetsuko. (1981). Totto-Chan: The Little Girl at the Window. English translation : Britton, D. Hindi translation: Poorva Yagnik Kushwaha.

11. Ramchandran, Vimla. (2005). Why School Teachers are demotivated and disheartened. Economic and Political Weekly. 2141-2144.

12. India Untouched: Stories of a People Apart, Feature Documentary by Stalin K.

Community Living

Contact Periods/week: 2 Practical.

Maximum Marks – 25

Min. Pass Marks – 08

Internal – 25

Objectives:

1. To provide real-life community experience to the student-teachers.
2. To provide knowledge and skills to conduct various surveys, case studies and interviews.
3. To create awareness on various socio-cultural and environmental issues and problems.
4. To inculcate the value of work in student-teachers.
5. To develop leadership skills among student-teachers.
6. To develop an understanding of sharing of responsibility.
7. To encourage participation in various social activities.
8. To acquaint student-teachers with the real working culture of the village schools.
9. To provide exposure to student-teachers of remote village living.

Activities

'Working with Community' is a programme to provide the real-life community experience to the student-teachers. It will be organized in camp-mode. The student-teachers have to stay in a village for five days and to work with the community. They will undertake the activities like educational survey, case study, 'shramdaan', interviews, visiting schools and other govt. and non-governmental organisations of the village. They will launch door-to-door campaign on various themes, like, girl-child education, literacy, 'Swachh Bharat Abhiyaan', female foeticide, health and hygiene, cleanliness, save water, organic farming, environmental awareness, etc. Awareness campaign will be launched by organizing cultural activities in the

evening. After completion of the camp, the student-teachers have to submit a report of the five days.

Modes of Assessment

The student-teachers will be assessed on the basis of their active participation in various activities, Individual and group presentations and report submission.

Art & Aesthetic

Contact Periods/week: 02

Maximum Marks – 25
Min. Pass Marks – 08
Internal – 25

COURSE - CONTENT

Unit-1: कला– शिल्प स्वायत्ती की समझ

- कला के भिन्न भिन्न प्रकारों के बारे में जानना। समझना, सजावट, वर्तन, मूर्तिकला शिल्प, चित्रकला, प्रस्तुति आदि।
- Historical perspectives/importance: integration of life, culture of India.
- सीखने में Art & craft dh skills, observation, analysis, synthesis, problem solving and evaluation.
- गतिविधि कार्ययोजना/पेपर

Unit-2: नृत्य एवं संगीत कलाएं

- शास्त्रीय नृत्य, क्षेत्रीय नृत्य, राष्ट्रीय नृत्य।
- नृत्य का अभ्यास, प्रकार, सामाजिक विकास की प्रदेश सांस्कृतिक विरासत। (लावणी, गरबा, गौड़ी, छत्तीसगढ़ी आदि)

Unit-5: कलाएं एवं टेक्नोलॉजी का समन्वय–

- विभिन्न कलाओं को Website पर अपलोड/डाउनलोड करना
- Dezitelaization of Arts
- कलाएं की प्रवृति Activity से ICT जोड़ना।
- कलाओं का आत्मसातीकरण (ICT के माध्यम से)

(Introduction, objectives, activities, assignments, projects, references and web-sites as per II Semester in the context of the above course content)

Bachelor of Science and Bachelor of Education

Rani Durgawati University

COURSES OF STUDIES

For

Four Year Integrated

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

FOURTH SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc. Part: Foundation Course				
Comp. & ICT in Education	40	10	50	3
Language – Hindi	40	10	50	3
• English	40	10	50	3
Environmental Education	40	10	50	3
Elective I + Practical	60+25	15+25	100	9
Elective II + Practical	60+25	15+25	100	9
Elective III + Practical	60+25	15+25	100	9
Total	415	85	500	
B.Ed. Part				
Inclusive Education	40	10	50	3
Assessment for learning I	40	10	50	3
Total	80	20	100	
Grand Total	495	105	600	

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

(All electives 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)

Semester Name	Paper	Mark	Paper Code	Name of Papers
IV	Paper Theory-VII	30	M-4.1	Elements of Groups And Rings
	Paper Theory-VIII	30	M-4.2	Mechanics
	Internal Test	15		Related To Above Papers
	Practicum	25		Related to Above Papers

B.Sc. Component:

Foundation Course: Computers & ICT in Education – II

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives: On completion of this course, the student teachers will be able to:

- Explain the role of ICT in authentic and alternative assessment,
- Develop e-portfolio and assessment e-rubrics,
- Understand the social, economic, security and ethical issues associated with the use of ICT,
- Appreciate the scope of ICT for improving the personal productivity and professional competencies,
- Demonstrate the use of web conferencing/teleconferencing tools and technologies,
- Appreciate the use of ICT in improving educational administration,
- Explain the emerging trends in information and communication technology,
- Use ICT for self-directed professional development.

Unit I: ICT for Assessment

- ICT and Assessment
    - Electronic assessment portfolio – Concept and types; e-portfolio tools
    - Creation and use of electronic rubrics for assessment
    - Online and offline assessment tools – Rubrics, survey tools, puzzle makers, test generators, reflective journal, question bank
    - ICT applications for Continuous and Comprehensive Evaluation (CCE)

96

o Learning analytics and feedback

UNIT II – ICT and Management

- National ICT policies, curriculum and schemes, ICT@Schools, NME-ICT
- Educational technology standards – UNESCO,ISTE, CEMCA and AECT
- ICT for personal management: e-mail, task, events, diary, networking
- ICT for educational administration: Scheduling, record-keeping, student information, electronic grade book, connecting with parents and community
- Managing the ICT infrastructure: Software installation, troubleshooting of hardware, seeking and providing help, storage and backup, updating and upgrading software

Unit III: ICT for Professional Development

- ICT for professional development: Tools and opportunities
- Electronic teaching portfolio- Concept, types, tools; portfolio as a reflective tool for professional development
- Role of ICT in Self-directed professional development
- Professional development: Role of teleconferencing, EDUSAT- the Indian experiment; web conferencing tools and techniques
- Technology and design based research: Pedagogical implications for professional development

Unit IV: Emerging Trends in ICT Applications

- Pedagogy for e-books and rhizomatic learning
- Innovative pedagogy: Learning design informed by analytics
- Seamless learning – Role of mobile technology
- Ubiquitous computing and its educational promises
- Game based learning and one-to-one computing
- 3-D printing and its educational promises
- Social media for pedagogical innovations
- Threshold concepts and pedagogical applications
- Dynamic Assessment based Pedagogical Practices

Sessional Work

- Creating account in wikispace/Tikipedia/mediawiki and adding/editing content
- Developing an educational blog in www.blogger.com, www.wordpress.com, or www.edublog.com

97

- LMS experience- hands on various features of LMS – the ICT course may be provided through LMS
- Evaluation of RLO repositories and creating RLO and uploading to repositories
- A critical study of some e-learning courses and enrolling and completing some free e learning courses
- Field visit to the EDUSAT center and take part in teleconferencing
- Planning and creating digital rubrics for any topic
- Organize web conferencing using Skype/Yahoo Messenger/Google+
- Review of ICT labs (plans and equipments/resources) in school from internet
- Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
- Developing an electronic assessment portfolio
- Developing an electronic teaching portfolio
- Readings on emerging ICT trends in education
- Review of national ICT policy and curriculum
- Using FOSS tools for timetabling, grade sheet
- Creating social bookmarking account and creating social bookmarking of internet resources using any social bookmarking tools (diigo,delicious,stumbleupon, Shelfari)

Suggested readings:

- Andrew A Kling(2010).Web 2.0 (Technology 360). Lucent Books: New Delhi.
- AthanassiosJimoyiannis (Editor) (2011). Research on e-Learning and ICT in Education. Springer: USA
- Barbara B. Levin, Lynne Schrum (2012). Leading Technology-Rich Schools (Technology & Education, Connections (Tec). Teachers College press:New York Bruce M. Whitehead, Devon Jensen. Floyd A. Boschee.(2013). Planning for Technology: A Guide for School Administrators, Technology
- Coordinators, and Curriculum Leaders. Corwin:New Delhi
- Cabmbridge, D (2010).E-Portfolios for Lifelong Learning and Assessment.John Wiley and Sons
- Costantino,P.M., DeLorenzo,M.N., Kobrinski,E.J.(2006).Developing a professional teaching portfolio: a guide for success. Pearson

98

- EdD L. Robert Furman (2012).Instructional Technology Tools: A Professional Development Plan

- Foster,B.R., Walker,M.L., Song,K.H.(2006)A beginning teaching portfolio handbook:documenting and reflecting on your professional growth and abilities.Prentice Hall

- Imison,T., Taylor,P.H.(2001). Managing ICT in the Secondary Schools. Heinemann:Oxford

- Jean-Eric Pelet (2014).E-Learning 2.0 Technologies and Web Applications in Higher Education (Advances in Higher Education and Professional Development (Ahepd)).Idea Group: U.S.

- LaxmanMohanty, NeeharikaVora (2008). ICT strategies for schools- a guide for school administrators. Sage Publications: New Delhi.

- Lynne Schrum, Barbara B. Levin. (2010).Leading 21st-Century Schools: Harnessing Technology for Engagement and Achievement. Corwin: New Delhi

- ManojKumar Dash (2010). ICT in teacher development, Neel Kamal Publications: New Delhi.

- MHRD-GOI (2004 and revised 2010) National ICT @ Schools Scheme, Department of School Education and literacy, MHRD, Govt. of India, New Delhi

- MHRD-GOI (2012) National Mission on Education through ICTs NME-ICT), Department of Higher Education, MHRD, Govt. of India, New Delhi

- MHRD-GOI (2012) National ICT Policy for School Education, Department of School Education and literacy, MHRD, Govt. of India, New Delhi

- Mary Webband Margaret Cox (2014).Information and Communication

- Technology- Assessment for Learning in the ICT Classroom (Inside the Black Box).Learning Sciences:US.

- Michael Thomas (2009). Handbook of Research on Web 2.0 and Second Language Learning. Information Science Reference: US.

- Mishra, S.(Ed.) (2009). STRIDE Hand Book 08: E-learning. IGNOU:New Delhi. Available at http://webserver.ignou.ac.in/institute/STRIDE_Hb8_webCD/STRIDE_Hb8_index.html

- Mohit K (2003). Design and implementation of Web-enabled Teaching Tools: IRM Press,UK.

99

- Montgomery, K., Wiley, D.A.(2004).Creating E-portfolio using powerpoint- A Guide for Educators. Sage:New Delhi.
- Pradeep Kumar (2011). Web Resources in Pedagogy. Apple Academics: Oakville.
- Renata Phelps, Anne Graham. (2013).Technology Together: Whole-School Professional Development for Capability and Confidence. ISTE:USA
- Rena M. Palloff, Keith Pratt (2011).The Excellent Online Instructor: Strategies for Professional Development. Wiley: San Francisco
- Ronghuai Huang, Kinshuk, Jon K. Price (Editor) (2014) ICT in Education in Global Context: Emerging Trends Report 2013-2014 (Lecture Notes in Educational Technology). Springer: USA
- Rosemary Papa.(2010).Technology Leadership for School Improvement. Sage:New Delhi.
- Semenov, Alexy (2005). Information and Communication Technologies in Schools A handbook for Teachers. UNESCO
- Sonny Magana, Robert J. Marzano (2013),Enhancing the Art & Science of Teaching With Technology (Classroom Strategies)
- Steven W. Anderson, Deborah Siegel. (2014).The Tech-Savvy Administrator: How do I use technology to be a better school leader? ASCD
- Theodore Lee(2008). Professional Development of ICT Integration for Teachers.VDM Verlag: Germany.
- UNESCO. (2001). UNESCO Report: Teacher Education Through Distance Learning Technology- Curriculum – Cost – Evaluation. UNESCO.
- UNESCO. (2002). UNESCO Report: Information and Communication Technologies in Teacher Education, A Planning Guide. Division of Higher Education, UNESCO.)
- UNESCO. (2002). UNESCO Report: Information and Communication Technology in Teacher Education, A Curriculum for Schools and Programme of Teacher Development. Division of Higher Education, UNESCO.
- UNESCO, Bangkok. (2003). Final Report, Building Capacity of Teachers/Facilitators in Technology-Pedagogy Integration for Improved Teaching and Learning. Bangkok, Thailand.June 18-20.

100

- UNESCO, Bangkok. (2003). Final Report, The Workshop on the Development of Guideline onTeachers Training on ICT Integration and Standards for Competencies, Beijing, China. September 27-29.
- UNESCO, (2005). UNESCO Report: How ICT Can Create New, Open Learning Environments Information And Communication Technologies In Schools A Handbook For Teachers, Division of Higher Education, UNESCO.
- Viva Lachs (2000). Making Multimedia in the Classroom-A Teacher's Guide.RoutlegdeFarmer :London.
- W.J. Pelgrum and N.Law(2003). ICT in Education around the world-Trends, Problems and Prospects UNESCO: Paris.

Foundation Course: Language – Hindi
आधार पाठ्यक्रम : हिन्दी भाषा
प्रश्नपत्र – 4

Contact Periods/week: 03

कुल अंक – 45

आन्तरिक मूल्यांकन – 15

प्रश्न एवं अंक निर्धारण

4 समीक्षात्मक/दीर्घउत्तरीय प्रश्न – 28 अंक (7 × 4 प्र)

लघुउत्तरीय प्रश्न – 07 अंक (3.5 × 2 प्र)

वस्तुनिष्ठ प्रश्न – 05 अंक (1 × 5 प्र)

व्याख्यात्मक एवं समीक्षात्मक प्रश्नों में आंतरिक विकल्प होंगे।

इकाई 1.
1. आरण निर्भरता (जैमारिक निबंध) — पंडित बालकृष्ण भट्ट
2. गुलरा का फूल (एक अरण्य कथा) — मुवेरनाथ झब
3. मध्यप्रदेश की लोक कलाएं — (संकलित)
4. मध्यप्रदेश का लोक साहित्य (संकलित)

इकाई 2.
1. पढ़ो न प्राण की बात आज (चिंतनपरक) — रमेशचन्द्र शाह
2. गेहू और गुलाब (वैचारिक निबंध) — रामवृक्ष बेनीपुरी
3. शब्द शक्तियां (अभिधा, लक्षणा, व्यंजना) — (संकलित)
4. मध्यप्रदेश की चित्रकला, मूर्तिकला एवं स्थापत्य कला — (संकलित)

इकाई 3.
1. जनसंचार के माध्यम (प्रिंट, इलेक्ट्रानिक एवं सोशल मीडिया) — (संकलित)
2. पत्रकारिता के विविध आयाम — (संकलित)
3. पत्रभाषा हिन्दी — (संकलित)

Foundation Course: Language English

Paper IV

Contact Periods/week: 03

Maximum Marks – 40
Min. Pass Marks – 13
Internal – 10

Distribution of Marks

1. Four critical questions are to set be from unit I. Two questions are to be attempted. Each question will carry 5 marks. 5X 2 = 10. Marks

2. Students are required to write a précis of an unseen passage. 5 X 1 = 5. Marks

3. Students are required to translate a passage from English to Hindi and a passage from Hindi to English. Each passage which is to be translated will carry 5 marks. 5 X 2 = 10. Marks

4. Students are required to attempt 7 questions on Unit IV. Each question will carry one mark. 1 X 7 = 7.

5. Students are required to attempt 2 questions from Unit V. Each question will carry 4 marks. 4 X 2 = 8.

UNIT I: C. Rajagopalachari – Three questions; C.P. Soron – Ramanujan; Roger Rosenblatt – The power of W.E.; Desmond Morris - A short extract from the Naked Ape; O Henry – The Gift of Magic Ruskin Bond – The Cherry Tree

UNIT II: Précis Writing

UNIT III: Translation – English to Hindi, Hindi to English

UNIT IV: Proverbs in English ,Punctuation

UNIT V: Communication - Communication through Media

Conversations :-

I. Introducing yourself & others

II. Expensing opinions, likes & dislikes

III. Making requests & offers

IV. Beginning a conversation

V. Asking the way

VI. Expressing doubts & uncertainties

VII. Talking about future events.

Foundation Course: Environmental Education

Paper I

Contact Periods/week: 03

<div align="right">

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10
</div>

Distribution of Marks

All five units are compulsory. Two questions to be set from each unit, one to be attempted.

Objectives:

(i) To provide an understanding to the students about basic aspects of the environment and its concerns.

(ii) To generate awareness about the social issues of the environment.

(iii) To enable the students to analyse, evaluate and draw inferences about problems and concerns related to environment.

(iv) To create awareness about the legal framework for protection of environment and wild life.

Unit I: The multidisciplinary nature of Environmental Studies: Definition, Scope and importance: Need for Public awareness. Natural resources: Renewable and Non-renewable resources and associated problems. Forest resources: Use and over exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.

Unit II: Water resources: Use and over utilization of surface and ground water, floods, Drought, conflicts over water resources; dams – benefits and problems. Minerals resources: Use and over exploitation, Environmental effects of extracting and using mineral resources; case studies.

Unit III: Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agricultural techniques fertilizer and pesticide problems, water logging and salinity;

case studies. Energy resources: growing energy needs renewable and non-renewable energy resources and use of alternative energy sources – case studies. Land resources: Land as resource, land degradation, man induced landslides, Soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life-styles

103

Unit IV: Social issues and environment. From unsustainable to sustainable development, Rural, industrial, agricultural fields; Urban problems related to energy, water conservation, rain water harvesting, Watershed management. Resettlement and Rehabilitation of people: Its problems and concerns, case studies. Environmental ethics: Issues and possible solutions, case studies. Wasteland reclamation, consumerism and waste products

Unit V: Environmental Acts: Environmental Protection Act; Air (prevention and control of Pollution Act)

Water (prevention and control of pollution Act.); Wild life protection Act; Forest conservation Act; Issues involved in enforcement of environmental legislation; Public awareness; Human rights, Value education, HIV/AIDS, Women and Child welfare; Role of Information Technology in environment and human health – case studies.

Elective I – Physics

Paper IV: Oscillations, Waves and Optics

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 completion of this course, the students will be able to

1. Explain the phenomena pertaining to the concept of waves, their relationship with various forms and wave propagation.

2. Explain formation of images and various defects of images.

3. Discuss the phenomena of interference, diffraction and polarization.

4. Design experiments to observe different optical phenomena and relate them with daily life.

Unit-1: Oscillations

Free Oscillations of simple system; small oscillation approximation solutions; damped oscillation, forced oscillation and resonance; linear and transverse oscillations of a mass between two springs; Diatomic molecule; reduced mass concept.

104

Free oscillations of system with two degree of freedom; normal modes, longitudinal and transverse oscillation of coupled masses and energy transfer between modes;

Waves in media: propagation of longitudinal waves in an elastic solid and in a fluid.

Unit-2: Geometrical Optics

Fermat's Principle: principle of extremum path, general theory of image formation; cardinal points of an optical system, general relationships, thick lens and lens combinations; Lagrange equation of magnification, telephoto lenses, matrix method in paraxial optic-thin lens formula comparison between Huygens and Ramsden eyepiece.

Aberration in images: Chromatic aberration, achromatic combination of lenses in contact and separated lenses, Monochromatic aberrations and their reductions, the aplanatic points of a sphere and other applications, aspherical mirrors, oil immersion objectives, meniscus lens.

Unit-3: Wave Optics & Interference

Interference of Light: the principle of superposition, n slit interference, spatial and temporal coherence, optical path retardations, lateral shift of fringes, localized fringes; thin films, Newton's rings and its application. Michelson interferometer, its application for precision determination of wavelength, wavelength difference and width of spectral lines.

Unit-4: Fresnel Diffraction and Fraunhoffer diffraction

Fresnel diffraction: Fresnel half-period zones, plates, straight edge and rectilinear propagation. Fraunhoffer diffraction: Diffraction at single slit, double slit and N slit (diffraction grating), blazed grating, diffraction at a circular aperture and a circular disc.

Unit 5: Resolving Power and Polarization

Resolution of images, Rayleigh criterion, resolving power of telescope, grating and prism.

Double refraction and optical rotation: Refraction in uni-axial crystals, its theory, Phase retardation plates; Nicol Prism; rotation of plane of polarization, origin of optical rotation in liquid and in crystals; optical activity; production and detection of linearly and circularly polarised light; Fresnel theory; Faraday rotation; Lorentz half shade polarimeter.

Physics Practical List

1. To determine the wavelength of laser light by grating.
2. To determine radius of curvature of given plano convex lens by Newton's ring apparatus.
3. To determine wavelength of different colours by using transmission grating.
4. To verify Newton's law of combination of lenses by Nodal light assembly.

105

5. To study the optical rotation by cello tape.

6. To determine the specific rotation of sugar using Laurent's half shade polarimeter.

7. To determine Brewster's angle for a glass surface.

8. To determine resolving power of a telescope.

9. To determine the refractive index of water by Boy's method.

10. Find the frequency of ac mains by meldes apparatus.

11. To determine the wavelength of sodium light by Michelson Interferometer.

12. To detect linearly, circularly and elliptically polarizes light using Babinet compensator.

13. To find the Cauchy's constant for the material of given prism.

Suggested Reading:

1. Ghatak, Physical Optics

2. Sears and Zemanski, Optics and Atomic Physics

3. Goyal, R.P., Unified Physics, Shivlal Agrawal and Co..

4. Waves and Vibration, J. Pain

Elective I – Botany

Paper IV: Genetics and Biotechnology & 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 : To enable the students to analyse patterns of inheritance, structural and functional aspects of genes and their application in the study of biotechnology to enable student to know use of plant for human welfare

Unit I

Mendelian genetics: Mendel's is law of inheritance, linkage and crossing over, allelic and non allelic interactions.

105

Gene expression: Structure of gene, transfer of genetic information, genetic code, ribosomes transcription, translation, protein synthesis, regulation of gene expression in prokaryotes and eukaryotes, proteins, 1D, 2D and 3D structure.

Unit II

Genetic variation: Mutations – spontaneous and induced, transposable genetic elements, DNA damage and repair Extranuclear genome : Presence and function of mitochondrial and plastid DNA; plasmids.

Unit III

Genetic engineering :

Tools and techniques of DNA recombinant technology, cloning vectors, genomic and c-DNA library, techniques of gene mapping and chromosome walking.

Unit IV

Biotechnology: Functional definition, cellular tot potency, basic aspect of plant tissue culture, differentiation and morphogenesis. Biology of Agro bacterium, Vectors for gene delivery and marker genes. Salient Achievements in crop biotechnology.

Unit V

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

Spices	:	General account
Beverages	:	Tea and Coffee
Medicinal Plants	:	General account

Practical

Objectives:

i) To develop the skills for the preparation of inheritance pattern.

ii) To impart the skills of isolation of DNA

iii) To familiarize the students with the technique of micro propagation and isolation of protoplast.

iv) To study identify plant for human welfare

Genetics

1. Working out the laws of inheritance using seed mixtures/flowers.

107

2. Working out the mode of inheritance of linked genes from test cross and/or F2 data.

3. Isolation of DNA from plant material.

4. Isolation of protoplasts from different plant tissues.

5. Demonstration of the technique of micro propagation.

6. Identification of plant and their used in human welfare

Scheme of Practical Examination

Max. Marks : 25+5=30

Time : 3 hrs.

1. Demonstration of techniques of micro propagation.   5

2. Isolation of protopinst from different tissues.   5

3. Demonstration of Mendel's laws of inheritance.

4. Comment upon the spots. (1-5)   5

5. Practical Record/Sessional

6. Internal evaluation   5

4. Viva-voce   5

5. Sessional and practical record.   5

Suggested Readings

1. Gardner, E.J. Principles of Genetics, John Wiley and Sons Inc. New York

2. Snustad, D.P. and Simmons, M.J., 2000, Principles of Genetics. John Wiley & Sons Inc. USA

3. Atherly, A.G. Girton J.R., and Mc Donald, J.F. 1999, The Science of Genetics, Saunders College Publishing, Fort Worth USA

4. Stent, G.S., 1986, Molecular genetics, CBS Publications

5. Wolfe S.L., 1993, Molecular and Cell Biology, Wadsworth Publishing Co., California, USA

6. Russel P.J., 1998, Genetics, The Benjamin/Cummings Publishing Co. Inc., USA

7. Ablerts, B. Bray, D., Lewis, J. Raff M., Roberts, K and Watson LD., 1999, Molecular Biology of Cell, Garland Publishing Co. Inc. New York. USA

8. Dixon, R.A., 1987, Plant Cell Culture, A Practical approach IRL. Press Oxford

9. Smith, R.H., 2000, Plant Tissue Culture, Techniques and Experiments, Academic Press New York

10. Kumar, U. 2003, Methods in Plant Tissue Culture, 2nd edition, Agrobios, India

108

11. Dwivedi, Padmanabh. 2004. Plant Tissue Culture, Scientific Publishers (India)

12. Watson, James D., T.A. Baker, S.P. Bell, A.Gann, M.Levine, R.Losick 2004. Molecular Biology of the Gene. 5th edition, Pearson Education

13. Gupta, P.K. 2006-07. Cell and Molecular Biology. 3rd edition, Rastogi Publication .

16. Pandey B.P 2000 Economic Botany S.Chand & Co. New Delhi.

17. Bhattacharya S.K. 2001 Hand Book Of Medicinal Plants.

Elective II – Chemistry

Paper IV

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 the candidates will be required to attempt one:

Objectives:

After completing this semester the students should be able to:

(i) acquire the knowledge of basic terms involved in thermo-dynamics and assess their significance in study of the thermodynamics.

(ii) develop the mathematical form of first law of thermodynamics from law of conservation of energy and appreciate the application of this law in Joule-Thompson effect and various thermo chemical laws.

(iii) develop the concept of entropy by Carnot cycle and examine it as a criteria of spontaneity and equilibrium.

(iv) Comprehend the concept of free energy change and chemical potential and correlate the free energy change with feasibility of any physical and chemical process.

(v) Judge the importance of ClausiusClapeyron equation in the study of various processes.

(vi) Understand Gibb's phase rule equation and apply this equation to one component and two component systems.

109

(vii) Get acquaintance with the importance of critical solution temperature for some partially miscible liquids.

(viii) Correlate electrical conductance with various parameters that affect this and learn the application of conductivity measurement in determining certain important physical parameters.

(ix) Visualize the difference between reaction velocity and mechanical velocity and appreciate to learn the techniques to determine the reaction velocity.

(xi) Correlate reaction rate and temperature and carefully examine the development of some theories based on this correlation.

Instructional Strategy:

In teaching thermodynamics the teacher should make a conscious effort to convey the importance of mathematical modelling of concepts in physical sciences. Intentional cognitive conflict at times may also be used as a teaching strategy particularly in the transaction of Joule-Thomson effect. The use of concept attainment model may be practiced while discussing various enthalpies. The use of Inductive and deductive approach may be practiced in dealing with the Le-Chatelier Principle. Use of ICT may be made in the transaction of phase equilibrium. The practice of experimental approach may be highlighted while discussing Distribution Law, conductance and its applications and ascertaining the kinetic parameters of some reactions cooperative learning may be practiced in dealing with chemical equilibrium.

Unit I Thermodynamics – I

Definition of thermodynamic terms: system, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law- Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU&dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

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

110

Unit II Thermodynamics –II

(A) **Second law of thermodynamics:** need for the law, different statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

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

Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A &G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

(B) **Chemical Equilibrium**

Equilibrium constant and free energy.Thermodynamic derivation of law of mass action.Le Chatelier's principle. Reaction isotherm and reaction isochore-Clapeyron equation and Clausis – Clayron equation, applications.

UNIT III: Phase Equilibrium

Statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system – water, CO_2 and S systems. Phase equilibria of two component system – solid-liquid equilibria, simple eutectic – Bi-Cd Pb- Ag systems, desilverisation of lead.

Solid solutions – compound formation with congruent melting point (Mg-Zn) and incongruent melting point, $(NaCl-H_2O)$, $(FeCl_3-H2O)$ and $CuSO_4H_2O)$ system.Freezing mixtures, acetone-dry ice.

Liquid – liquid mixtures – Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system-azeotropes-HCl-H2O and ethanol – water systems.

Partially miscible liquids – Phenol-water, trimethylamine-water, nicotine-water systems. Lower and upper consolute temperature. Effect of impurity onconsolute temperature. Immiscible liquids, steam distillation. Nernst distribution law – thermodynamic derivation, applications.

111

UNIT IV: Electrochemistry

Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-insoluble salt- anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes-standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements.Computation of cell EMF.Calculation of thermodynamic quantities of cell reactions (DG, DH and K), polarization, over potential and hydrogen overvoltage.

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and PKa determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. Buffers – mechanism of buffer action, Henderson-Hazel equation. Hydrolysis of salts. Corrosion – types, theories and methods of combating it

UNIT V: Chemical Kinetics

Definition of rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light and catalyst. Reaction order, mathematical expression for zero order, first and second orders. Determination of order of reactions-half-life, differential, integration and isolation methods.Radioactive decay as an example of first order reaction. Experimental methods of kinetics: conductometric, potentiometric and spectrophotometric

G.Gulati

112

(elementary ideas). Simple collision theory, expression for the rate constant (without derivation). Transition state theory based on thermodynamic equilibrium. Expression for rate constant involving equilibrium

Suggested Readings for Semester IV

1. Glastone, S., Chemical Thermodynamics East - West Publication
2. Glastone ,S., Physical Chemistry – East – West Publication
3. Atkins,P.W., &Paula,J.D., Physical Chemistry , Oxford Press
4. Silby,R.J., and Alberty,R.A., Physical Chemistry John Wiley & Sons, Inc.
5. Gurudeep Raj, Advanced Physical Chemistry Goel Publication
6. Puri, Sharma &Pathania, Physical Chemistry SobanLalNagin Chand & Company
7. Rakshit,P.C., Physical Chemistry New Age International
8. Laidler, K.J., Chemical Kinetics T.M.H Publication

CHEMESTRY PRACTICALS

1. Determination of transition temperature of given solid by thermometric method.
2. To determine the solubility of benzoic acid in water at different temperatures and to determine H of dissolution process.
3. To determine the strength of given acid conductometrically using given standard alkali solution.
4. To determine ionization constant of weak acid conductometrically.
5. To determine solubility and solubility product of sparingly soluble salt conductometrically.
6. To study the rate constant of hydrolysis of ethyl acetate catalysed by H^+ ion at room temperature.
7. To compare the strength of HCL and H_2SO^4 by studying kinetics of hydrolysis of ethylacelate.
8. Determination of rate constant of inversion of cane suger in presence of an acid using polarimeter.
9. Determination of order of saponification of ester with NaOH.
10. Determination of strength of acid by potentionmetric titration.
11. Determination of partition coefficient of I_2 in water and chloroform.
12. Determination of enthalpy of neutralization of weak acid/weak base vs. strong acid/strong base to determine the enthalpy of ionization of weak acid/weak base.

113

Semester IV

Two experiments are to be done by the examinee each containing $7^{1/2}$ marks.

Experiments	—	15
Internal assessment	—	5
Viva	•	5

Elective III – Zoology

Paper IV : LABORATORY TECHNIQUES AND MOLECULAR BIOLOGY

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Objective – To understand the molecular basis of inheritance & development of phenotype to utilize it as bacteriological tool and study the usage & application of lab techniques.

Unit-1.

1. Cell fractionation, different types of centrifuges.
2. Microscopy (light, TEM, SEM).
3. Principles and types of Chromatography & Electrophoresis.
4. Microtomy (Concepts, principles, types of microtome & their uses).
5. General idea of some common fixatives, stains and reagents.
6. pH – Definition, study of pH-meter, determination of pH.

Unit-2.

1. Structure and types of Nucleic acid (DNA & RNA).
2. Concept of genes, genome & proteome.
3. Nucleosome concept (solenoid model), split genes overlapping genes, pseudo genes.
4. Concept of DNA replication and repair (Eukaryotic & Prokaryotic)
5. Types, causes & effects of Mutation.

Unit-3.

1. Transcription (in Prokaryotes & Eukaryotes).
2. Translation in Prokaryotes & Eukaryotes.
3. Genetic Code.

G. Gulati

114

4. Gene regulation in Prokaryotes (lac operon & trp operon).

Unit-4

1. Techniques used in recombinant DNA technology
2. Uses of vectors, linkers, adaptors, & genetic library
3. Gene cloning & its significance.
4. Application of genetic engineering.

Unit-5.

1. Polymerase chain reaction.
2. Gene therapy.
3. DNA fingerprinting.
4. Animal cell and tissue culture and their applications.

PRACTICAL

Objective – To develop skills to use common laboratory instruments to analyse cellular & biochemical processes & products and identification of molecular events of inheritance along with vehicles of heredity.

Identification of spots related to theory.

1. Study of DNA and RNA through charts and models.
2. DNA isolation.
3. DNA staining.
4. Quantification of DNA by DPA.
5. Quantification of RNA by Orcinol.
6. Culture of bacteria.
7. Restricting growth of bacteria in culture.
8. Paper chromatography.
9. Histological slide preparation.
10. Visit to nearest pathology/UTD for exposure to instruments like RT-PCR, ELISA

SCHEME OF PRACTICAL EXAMINATION

1. Spotting — 08
2. Molecular Biology/Bacteriology Experiments — 05
3. Chromatography/Histological Staining — 04
4. Practical Records and Tour report — 04
5. Viva-voce — 04

115

Referred books -:

1. Experimental Biochemistry- Wilson & Walker
2. Bioinstrumentation-Boyer
3. Molecular Biology –Dravid Frifelder
4. Genes – Benjamin Lewin.
5. Biotechnology –V. Satyanarayan.
6. Biotechnology – B.D.Singh
7. Biotechnology – R.C.Dubey

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 30+30=60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practicum 5)

Practicum – 25 (Internal)

M – 4.1 ELEMENTS OF GROUPS AND RINGS

Time : 3 Hrs. Max. Marks : 30

Pass Marks : 12

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

Objectives : To develop understanding of Groups ,Sub –Groups and Rings

Unit – I   Definition of a group with examples and simple properties, subgroups, Generator of groups, cyclic groups

Unit - II   Coset decomposition, Lagrange's theorem and its consequences, Fermat's and Euler's theorems.

Unit – III   Homomorphism and Isomorphism, Normal-subgroups, Quotient groups, the fundamental theorem of Homomorphism.

Unit – IV   Permutation groups, Even and Odd permutations, the alternating group, Cayley's theorem.

Unit – V   Introduction to rings, subrings, Integral Domains and Fields, characteristic of a ring.

Content as in

1. I.N. Heirstein - Topics in Algebra wiley Eastern limited
2. John B Fraleigh, A First Course in Abstract Algebra,Pearson
3. Joseph A Gallian, Contemporary Algebra, Narosa Publication

M – 4.2 MECHANICS

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

Objectives :

- To develop understanding of dynamics of a particle
- To develop the skill of solving two problems dealing with forces in space.
- To develop understanding of motion in resisting medium
- To develop the understanding of the dynamics of rigid bodies.
- To develop the understanding of the dynamics of a particle involving varying mass.

Unit – I	Analytical conditions of equilibrium of coplanar forces. Virtual work.
Unit – II	Velocities and accelerations along radial and transverse directions, and along tangential and normal directions.
Unit – III	Catenary, Simple harmonic motion. Elastic strings.
Unit – IV	Stable and unstable equilibrium, Poinset's central axis.
Unit – V	Forces in three dimensions, Motion in a resisting medium. Motion of particles of varying mass.

Content as In :

1. S.L. Loney	Statics	Mc Millan & Co
2. S.L. Loney	Dynamics	"

M – 4.3 Mathematics Practicum

List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester IV Mathematics papers M-4.1 and M-4.2.
- Mathematics seminar.

117

Education Component:

Inclusive Education

Contact Periods/week: 03

Objectives

On completion of this course the students will be able to:

- Develop sensitivity towards Inclusive Education,
- Understand the concept, need and scope of Inclusive Education,
- Understand the philosophical and historical perspectives of Inclusive Education.
- Understand the implication of inclusive education on Education for All movement,
- Understand the global and national commitments towards Inclusive Education,
- Develop a critical understanding of the recommendations of various committees/commissions/policies/schemes towards teacher preparation for inclusive school,
- Identify, analyze and utilize various instructional strategies for Inclusive Schools,
- Identify and utilize existing resources for promoting inclusive practices,
- To develop positive attitude and sense of commitment towards actualizing the Right to Education of all learners,
- Examine the issues of identity and diversity in society in general and education in particular,
- Understand as how to seek parental commitment and NGOs support for utilizing available resources for education in Inclusive Schools, and
- understand the nature, needs and functional assessment of learners with reference to diverse needs and how to create conducive teaching-learning environment in Inclusive Schools.

UNIT I: Introduction and Initiatives Taken for Inclusive Education

- Concept, need and scope of Inclusive Education.
- Philosophy of Inclusive Education.
- Education of All Movement and Inclusive Education(A journey from segregation to inclusion)

118

- The Universal Declaration of Human Rights (1948) and the UN Convention on the Rights of the Child (CRC).
- Salamanca Statement and Framework for action on Special Needs Education (UNESCO, 1994)
- The National Policy of Education (1986),
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995, and RCI Act,
- Sarva Shiksha Abhiyan, RMSA and Inclusive Education.
- Scheme of IEDSS 2009, Right to Education Act 2009, and Right to Persons with Disability Bill, 2014.

UNIT II: Creating an Inclusive School

- Index of Inclusion- culture, policy and practice
- Removal of Barriers for effective learning in inclusive school
- Factors for successful inclusion, features of an inclusive school, role and functions of regular classroom teachers and resource teachers in an inclusive school.
- How an inclusive environment is created by the teachers in school? Support services required in an inclusive school.
- Role of parents, community, school functionaries and NGOs in Inclusive Education.

UNIT III: Diversity in the Classroom

- Diversity and inclusion, whole school scenario with reference to diversity, diversity in the classroom.
- Nature and needs of learners with diverse needs in inclusive setting with reference to learners with
- Visual, hearing, locomotors and neuromuscular impairments,
- Cerebral palsy, intellectual impairment and learning disabilities,
- Multiple and other disabilities (Autism spectrums disorder, behavioral, emotional and speech disorder, ADD and ADHD, Learners with special health problems.
- Environmental/ ecological difficulties and learners belonging to other marginalized groups.

UNIT IV: Teaching in Inclusive School

- Adaptation in instructional objectives and curricular activities for meeting diverse needs of learners in inclusive school

119

- Need for flexible evaluation system and alternate assessment. Instructional strategies (challenges in teaching all children, assessing instructional needs)
- Multi-methodology, multicultural approaches, differential instruction, collaborative learning and system approach, competencies required for the teachers in inclusive schools.
- Assistive Devices and Strategies for meeting learning needs of diverse learners

Modes of Transaction:

Lecture-cum-discussion, group work, field visits of schools/NGOs and the Institutions working in the education of learners with diverse needs to get first hand exercise on Inclusive practices, library studies and project works.

Sessional Work

The students may take any two of the following activities

- Field visits to schools/ Institutions/ NGO promoting education of learners with diverse needs in inclusive settings and have discussions with the teachers/ functionaries and make observation and analysis of teaching learning practices there.
- Analysis of policy documents related to inclusive education
- Make a list of existing resources in the local area and discuss the use and limitations based on survey of schools with reference to Inclusive practices.
- Study of TLM and equipments used in the education of learners with diverse needs
- Conduct suitable action research in an inclusive setting
- Conduct a survey on the type of supportive services needed for inclusion of learners with special needs
- Preperation and implementation of IEP or case studies.

Suggested Books:

- Ainscow,M. and Booth, T (2002) Index for Inclusion: Developing Learning and Participation in Schools. Bristol: CSIE.
- Ainscow, M., Dyson, A. and Booth, T. (2006) Improving Schools, Developing Inclusion, London: Routledge.
- Ainscow, M. (1999) Understanding the Development of Inclusive Schools, London: FalmerPress.
- Booth, T., Nes,K., Stromstab, M. (2003) Developing Inclusive Teacher Education, London: Routledge Falmer.

- Clough, P. and Corbet, J. (2002) Theories of Inclusive Education – A Students' Guide, Paul Chapman Publishing Ltd.
- Deiner, L. Penny. (2010), Inclusive Early Childhood Education 5th Ed. Wadsworth Cengag learningBelmont, CA USA
- Hegarty, S. and Mithu Alur (2002) Education and Children with Special Educational Needs- Segregation to Inclusion, New Delhi: Sage Publication India Pvt. LtdIEDSS 2009 MHRD, New Delhi
- Index of Inclusion (2014) NCERT, New Delhi.
- Jangira, N.K. and Ahuja, A. (2002): Effective Teacher Training: Cooperative Learning Based Approach: National Publishing house 23 Daryaganj, New Delhi
- Jangira N.K. and Mani, M.N.G. (1990): Integrated Education for Visually Handicapped, Gurgaon, Old Subjimandi, Academic Press.
- Jha.M.(2002) Inclusive Education for All: Schools Without Walls, Heinemann Educational Publishers, Multivista Global Ltd, Chennai
- Julka, A (2006) Inclusive children and youth with disabilities in Education- a guide for practitioners NCERT, New Delhi
- Karantha, P. and Rozario, J. (2003) Learning Disabilities in India, New Delhi: Sage Publication India Pvt. Ltd.
- Loreman, Tim, Deppeler, J. and Harvey,D. (2005) Inclusive Education- a Practical Guide to Supporting Diversity in the Class, London: Routledge Falmer.
- Lowenfeld, B (1973) (Ed) The Visually Handicapped Child in School New York: Jhon Day
- National Policy of Education 1986 (revised 1992)
- Nind, M., Rix, J., Sheehy, K. & Simmons, K. (2005) Curriculum and Pedagogy in Inclusive Education. Values into Practice. London: RoutledgeFalmer
- Nielsen, L.B. (1998) The Exceptional Child in a regular Classroom- an Educator' Guide., Corwin Press Inc. A Sage Publication Company, California.
- Nind, M., Rix, J., Sheehy, K.,and Simmons, K. (2005) Curriculum and Pedagogy in Inclusive Education Values and Practice. London: Routledge Falmer.
- O'Hanlon, C. (2003) Educational Inclusion as Action Research. Glasgow: Open University PressPersons with Disabilities Act. 1995

- Rao, Indumati et al (2011) Moving away from Label, Bangalore CBR NETWORK (south asin)
- Rehabilitation Council of India Act 1992
- Rehabilitation Council of India Act 2005 Annual Report
- Right to Education Act 2009
- RMSA (2009) for detail www.rmsa.nic.in
- SSA (2002) for detail www.ssa.nic.in
- World Bank (2003)Inclusive Education: Achieving Education for All including those with Disabilities and Special Educational Needs.
- York-Brar, J., Sommers, W.A. et al. (2001) Reflecting Practice to Improve School,Corwin Press Inc. A Sage Publication Company, California.
- Ysseldyke, J.E. and Algozzine,B. (1998) Special Education A Practical approach for Teachers, New Delhi: Kanishka Publishers Distributors.

Assessment for Learning I

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives: On completion of this course the students will be able to:

- Understand the nature of assessment and evaluation and their role in teaching learning process.
- Understand the perspectives of different schools of learning on learning assessment
- Realise the need for school based and authentic assessment
- Examine the contextual roles of different forms of assessments in schools
- Understand the different dimensions of learning and the related assessment procedures tools and techniques
- 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

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

UNIT-I: Perspectives on Assessment and Evaluation

- Meaning of Assessment, Measurement, Tests, Examination, and Evaluation and their interrelationships
- Concept of different types of Assessment: Assessment – of Learning; for learning; as Learning and in Learning
- Principles of Assessment and Evaluation
  - Behaviourist, Cognitivist and Constructivist
- Purposes of Assessment: Monitoring of Learning, Providing Feedback, Promotion, Placement, Certification, Grading and Diagnostic.

UNIT-II: Assessment in school

- Need for continuous, formative and diagnostic assessment Classification of assessment based ono
  - Purpose: prognostic, formative, diagnostic and summative
  - Scope: teacher made, standardized
  - Attribute measured: achievement, aptitude, attitude, etc.
  - Nature of interpretation: norm referenced, criterion referenced
  - Context: internal, external
- Need for Continuous and Comprehensive Assessment
- Grading: Concept, Types and Application

UNIT-III: New Trends in Evaluation (Need and Use)

- Question bank, Grading system, Online Examination, Open Book Examination, Credit System, Exam on Demand (meaning & uses only)
- Performance based assessment
- Assessment through Rubrics
- Portfolio Assessment

UNIT-IV: Elementary Statistics

- Nature of Data: grouped and Ungrouped

123

- Organization and presentation of Data: Bar diagram, histogram, polygon, ogive, and Pie Chart
- Measure of central tendency: Mean, Median and Mode
- Measure of dispersion: Range, Quartile Deviation, Mean Deviation, and standard deviation
- Concept of Correlation: Rank order correlation

Sessional Work

- Develop a Power Point Presentation on the current practices of Assessment and
- Evaluation at the Upper Primary Stage
- Analyse the question papers of the subject of your choice (Previous-3 Years)
- Classes X and XII (any board) in the light of new approach of assessment
- Develop a question paper for upper primary and secondary stage to assess all the aspects of language learning using ICT as a tool.
- Planning of an achievement test
- Planning of other assessment tools
- School visits followed by presentation on evaluation practices in schools
- Data processing and interpretation of any achievement test of school students

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., &Belgrad, 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.
- Danielson, C. (2002). Enhancing student achievement: A framework for school improvement. Alexandria, VA: Association for Supervision and Curriculum Development.
- Gentile, J.R. &Lalley, J.P. (2003). Standards and mastery learning: Aligning teaching and assessment so all children can learn. Thousand Oaks, CA: Corwin.

124

- Guskey, T.R., & Bailey, J.M. (2001). Developing grading and reporting systems for student learning. Thousand Oaks, CA. Corwin.
- NatrajanV.andKulshreshtaSP(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 intellectualquality. San Francisco, CA: Jossey-Bass.
- Nitko, A.J. (2001). Educational assessment of students (3rded.). Upper Saddle River, NJ:Prentice Hall.
- Norris N.(1990) Understanding Educational Evaluation, Kogan Page Ltd.
- Singh H.S.(1974) Modern Educational Testing, NewDelhi: Sterling Publication
- Ward &Ward (2007) Assessment in classrooms.

Four Year Integrated
B.Sc.B.Ed. (Eight Semesters) Course

FIFTH SEMESTER

Subject/Paper		Paper	Intern.	Total	Pds./week
B.Sc. Part:					
Foundation Course Entrepreneurship Dev.		40	10	50	3
Elective 1 + Practical/m		60+25	15	100	9
Elective II + Practical/m		60+25	15	100	9
Elective III + Practical/m		60+25	15	100	9
	Total	295	55	350	
B.Ed. Part					
P.C.- I: Physical Science		60	15	75	5
P.C.-II: Bio/Maths		60	15	75	5
Assessment for Learning II		40	10	50	5
Basics 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 electives 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)

126

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 - 1

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 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 target 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.

127

(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. Antyavasai 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.

128
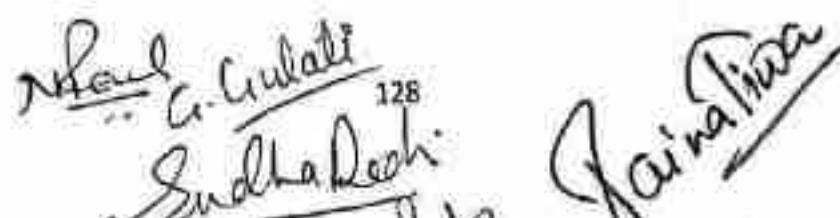
2. Derive expressions for packing fractions of simple cubic, body centered cubic and face centered cubic lattices as well as their coordination numbers.
3. Understand the use of X-rays in studying the crystal structures.
4. Understanding various types of bonding in solids as well as calculate the binding 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 Bravias 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, lauers equation for X-Ray diffraction, Braggs 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; Plancks 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

G. Gulati

129

ShobhaRani

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

Unit-4: Schrödinger's Equation

Wave function of quantum particle, its properties and significance; operators; Schrödinger's equation; postulatory basis 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

Schrödinger's equation in a constant potential, Fermi energy, Energy band in solids (Kronig-Penney 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 to 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 Millikans oil drop method.
11. To study the absorption spectra 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

130

5. Quantum Mechanics, Schiff

6. Quantum Mechanics, Powell and Crasemann

7. Quantum Mechanics, Eisberg / Resnick

8. Advanced Quantum Mechanics, J. J. Sakurai,

9. Kittel, C., Introduction to Solid State Physics, John Wiley and Sons, Newyork

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 1 – Botany

Paper V: Taxonomy of Angiosperms and Economic Botany

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 2c

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 student, 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.

131

Unit II - Angiosperm taxonomy : Brief history, aims and fundamental components (£, 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 taximetrics 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 : Faboideae	:	Lathyrus, Cajanus, Melilotus, Trigonella
Casesalpinoideae	:	Cassia, Caesalpinia Mimosoideae : Prosopis, Mimosa, Acacia

132

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

Scheme of Practical Examination

Time : 3 hrs.   Max. Marks : 25+5=30

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 Publishing House, New Delhi

- Bhattacharya, B. 2005, Systematic Botany. Narosa Publishing House, New Delhi

133

Elective II – Chemistry

Paper V

Contact Periods/week: 05 + 4 Practical

<div align="right">

Maximum Marks – 60

Min. Pass Marks – 24

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

</div>

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, nuclic 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 in

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 posters 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.Witting reaction.Mannich reaction.

Use of acetals as protecting group.Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones.Cannizzaro reaction.MPV, Clemmensen, Wolff Kishner, LIAlH4 and NaBH4 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, effects of substituents on acid strength.Preparation of carboxylic acids.Reactions of carboxylic acids 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.

135

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-Phthalamide 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 threodiastereomers. 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.

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 a-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 Craine Hart, Organic Chemistry, S. Chand Co Ltd.

4. Morrison, R.T., &Boyd,R.N., Organic Chemistry, PHI Ltd.

5. Chatwal, G.R., & Anand, S.K., Spectroscopy, HPH Ltd.

6. Sharma,Y.R., Elementary Organic Spectroscopy, S. Chand Co. Ltd.

7. Marry,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 p then to Benzamide.

    d. Benzoyl choloride to Benzamide and then to benzoic acid.

2. Chromatography

(A) Thin Layer Chromatography Determination of Rf

    a. values and identification of organic compounds.Separation of green leaf pigments (spinach leaves may by used)

    b. Preparation and separation of 2, 4-dinitrophenyl hydrazones of acetone, butanone, hexan-2 and

137

3-one 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 Rf 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 by 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. Gycogenesis, 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.

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, Cardiac 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)

139

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 Fremann
5. General and Comparative Physiology - William S. Hoar.
6. Comparative Anatomy - Prosser.
7. Animal Physiology -Chaterjee.
8. Immunology - Kuby.
9. Immunology -Roitt & Roitt.
10. Laboratory techniques - Swaroop, Arora & Pathak.

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 30+30
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

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 in:

1. R.R. Goldberg,Methods of Real Analysis
2. S.C. Mallic,Mathematical Analysis
3. T.M Apostal,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

<div align="right">Time : 3 Hrs. Max. Marks : 30</div>

<div align="right">Pass Marks : 10</div>

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

Objectives : To acquaint with rigorous treatment of Abstract algebra

141

Unit - I	Group-Automorphisms, 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	Einestein 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 - 1

Contact Periods/week: 05

Maximum Marks – 60

Min. Pass Marks – 26

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 categories, 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: 1: 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

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).
- Nedalsky, L., Science Teaching & Testing, Harcourt, Brace & World Inc. (1965).
- Dass, 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, Allynn and Bacan Needham Heights Mass (1996).
- Anderson, H.O., Readings in Science Education for the Secondary School. The Macmillan Company (1969).
- Sharma, R.C., Modern Science Teaching, Dhampat Rai & Sons (2000).
- Saxena, A.B., Understanding Learning Physics.
- Saxena, A.B. & Jadho, V.G., M.P. Hindi Granth Academy.
- Madhukar, L, 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 – 15

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

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 solutions, 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
- Concept mapping in teaching learning process

146

- 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 approaches 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. Kulshresiha: 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, UNESSCO-UNDP International Series 26 prepared by NCERT, New Delhi.

147

9. NCERT: Procedures for Developing on Environmental Education Curriculum UNESCO-UNDP International Environmental Education Programme, Environmental Education Series 22, New Delhi.

10. Nair, PKG (1985) : Principle of Environmental Biology, UNESCO training of science teachers and educators, UNESCO, Bangkok

11. Sood J.K: Teaching Life Sciences, published by Kohli Publication, Chandigarh.

12. Sharma, R.C.: Modern Science Teaching, Dhanapat Rai and Sons, Delhi

13. Sytnik, K.M.: Living in the Environment – A source book for Environmental Education, UNESCO.

14. New UNESCO Source Book for Teaching Science; Unesco, Paris, Richardson, J.S. science Teaching in Secondary schools, Prentice Hall, New York

15. Smith, M.D. (1975): Learning and its Classification: Boston: Allyn and Bacon, Inc.

16. Sood, J.K. (1989) : New Directions in science Teaching: Kohli Publishers ; Chandigarh

17. Edwin, A, Harper Jr. A and Erian S Harper (1992): Preparing objective Examination. A handbook of Teachers, Students and Examination; Prentice Hall of India Pvt. Ltd., New Delhi.

PC – 2. Mathematics - 1

Contact Periods/week: 05

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15

Objectives: To enable the pupil teacher to:

- 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 affective 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. Disp oof 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

- Mathematical modeling 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 softwares such as M.S. Equation editor, Math type, Matlab.

Suggested readings

1. Mosley L.E. and Boody D.M.: Mastering M.S. Office
2. Tawney, D.A.: Learning through Computer
3. O'Shea T and John S: Learning and Teaching with Computer
4. Roy, G: Computer Applications
5. What is Mathematics? An elementary approach to 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. Krant, Universities Press
9. Culture, Excitement and Relevance of Mathematics –V. Krishnamurthy, Wiley Eastern Limited.
10. Instructional manual for Math type.
11. Instructional manual for Matlab.

Assessment for Learning - II

Contact Periods/week: 03

Maximum Marks – 40
Min. Pass Marks – 13
Internal – 11

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

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

UNIT I: Tools and Techniques of Assessment

- Meaning and Deference 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

151
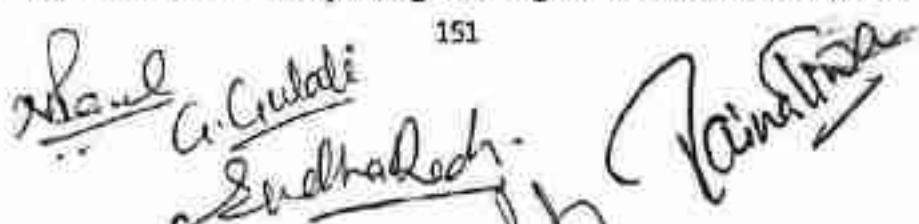
o Ascertaining student needs, identifying student interests and feeding forward for improvinglearning

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 NCF 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 Ist Term assessment of any student of Class VI-XII
- Devise a strategy to incorporate the suggestions given in the Ist 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., &Belgrad, S (2002). The portfolio connection: Student work linked tostandards (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.

- Danielson, C. (2002). Enhancing student achievement: A framework for school improvement. Alexandria, VA: Association for Supervision and Curriculum Development.
- Gentile, J.R. &Lalley, J.P. (2003). Standards and mastery learning: Aligning teaching and assessment so all children can learn. Thousand Oaks, CA: Corwin.
- Guskey, T.R., & Bailey, J.M. (2001). Developing grading and reporting systems for student learning. Thousand Oaks, CA. Corwin.
- NatrajanV.andKulshreshtaSP(1983). Assessing non-Scholastic Aspects-Learners Behaviour, New Dlehi: Association of Indian Universities.
- NCERT(1985). Curriculum and Evaluation, New Delhi:NCERT
- Newman, F.M. (1996). Authentic achievement: Restructuring schools for intellectualquality. San Francisco, CA: Jossey-Bass.
- Nitko, A.J. (2001). Educational assessment of students (3rded.). 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 textural 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 a 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)

154

- Instrumental and Pragmatic Education (John Dewey)

Transactional Modes:

- Lecture-cum 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)

Suggested Readings:

1. Agrawal, A (1995). 'Dismantling the Divide Between Indigenous and Scientific Knowledge' Development and Change, 26:413-39

2. Ant Weiler, 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, Penguine 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, Prager, 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.

155

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. Mani, 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. Philips, 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. Prema 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 Nai Talim, Naitalim Samiti: Wardha.

155

Bachelor of Science and Bachelor of Education

Rani Durgawati University

COURSES OF STUDIES

For

Four Year Integrated

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

SIXTH SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc. Part: Foundation Course Entrepreneurship Development	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 P.C.- I: Physical Science	60	15	75	5
P.C.-II: Bio Science/Maths	60	15	75	5
Gender Issues & Pease Education	40	10	50	3
Schooling, Socialization & Identity	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 electives 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)

157

Semester Name	Paper	Mark	Paper Code	Name of Papers
VI	Paper Theory-XI	30	M-6.1	Metric Spaces
	Paper Theory-XII	30	M-6.2	Linear Algebra
	Internal Test	15		Related To Above Papers
	Practicum	25		Related to Above Papers

B.Sc. Component:

Foundation Course: Entrepreneurship Development – II

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Unit I : Entrepreneurship: Meaning, Concept, Characteristics of entrepreneur, Qualities of Successful Entrepreneurs

Unit II: Types of entrepreneurship, importance and views of various thinkers (Scholars).

- Formation of goals. How to achieve goals.
- Problems in achieving targets and solution.
- Self motivation, elements of self motivation and development.
- Views of various scholars, evaluation, solutions.

  Leadership capacity: Its development and results.

Unit III: Projects and various organisations (Govt., non-Govt.), Govt. Projects, Non- Govt. projects. Contribution of Banks, their limitations, scope.

Unit IV: Functions, qualities, management of a good entrepreneur. Qualities of the entrepreneur (Modern and traditional). Management skills of the entrepreneur. Motive factors of the entrepreneur.

Unit V: Problems and Scope of the Entrepreneur ; -Problem of Capital -Problem of Power - Problem of Registration -Administrative problems -Problems of Ownership.
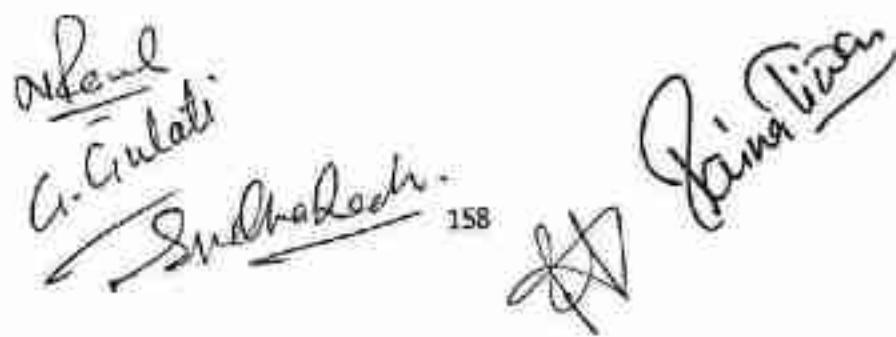
G. Gulati

158

Elective I – Physics

Paper VI: Solid State Devices and Electronics

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 40

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 completion of this course the students will be able to

1) Understand the theory of semiconductor devices and its applications

2) Analyse graphically the characteristic of transistors in different modes

3) Understand the working of field effect transistor, MOSFET and its applications

4) Understanding the usefulness of amplifiers, their working and use in electronic circuit.

5) Understanding the concepts of Digital electronics and construction of simple digital circuits

Unit -1: Solid State Devices

Semiconductors ; intrinsic semiconductors, Fermi level, temperature dependence of electron and hole concentrations; extrinsic semiconductors: doping, impurity states, electronic transport in semiconductor, PN Junction, Diode equation and diode equivalent circuit, Junction Breakdown- Zener breakdown, Zener diodes, Tunnel diode, Diode Rectifiers and rectification, light emitting diode, Schottky diode, photovoltaic cell, Hall effect and its uses.

Introduction to Nanotechnology and properties of selected Nano materials, Nano electronics.

Unit 2: Network Analysis and basic digital electronics

Kirchoff's laws, constant current and voltage sources, Superposition, Norton, Thevenin, maximum transfer theorem, Network elements, Bode Plots. Boolean algebra: Binary number systems; conversion from one system to another system; binary addition and subtraction. Logic Gates AND, OR, NOT, NAND, NOR exclusive OR; Truth tables; combination of gates; de Morgan's theorem, Logic families.

Unit- 3: Transistors

Characteristics of transistors in CB, CE and CC mode, low frequency equivalent circuits. h – parameters, bias stability (emitter follower biasing and voltage divider biasing), Ic idline, thermal runaway, field effect transistor, JFET, MOSFET.

159

Unit-4: Amplifiers and Oscillators

Single stage amplifiers, Multistage amplifiers, RC coupled amplifier, gain frequency response, input and output impedance, transformer coupled amplifiers, Feedback in amplifiers, types of feedback, voltage gain of feedback amplifier, advantages of negative feedback, oscillators, Barkhausen criteria for oscillations, classification of oscillators, Introduction to OPAMP and applications: adder, subtractor, differentiator & integrator.

Unit 5: Modulation and Laser & Fiber Optics

Modulation and its need, Basic theory of amplitude modulation, Power in amplitude modulated wave, Drawbacks of amplitude modulation, Frequency modulation, Comparison between amplitude modulation and frequency modulation

Lasers: Properties of lasers, types of lasers, derivation of Einstein A & B Coefficients, components of lasers, Working of He-Ne and Ruby lasers.

Fibre Optics: Light guidance through optical fibre, types of fibre, acceptance angle and acceptance cone, numerical aperture, V-Number, Fibre dispersion, block diagram of fibre optic communication system,

Applications of laser and optical fibers.

Practical List

1. To draw the characteristic of semiconductor diode and calculate its forward resistance.
2. To draw the characteristic of Zener diode in reverse bias voltage.
3. Zener diode as voltage regulator
4. To draw the input and output characteristic of NPN/PNP transistor in the Common emitter configuration
5. To verify Thevenin's theorem.
6. To verify Norton's theorem
7. To verify Maximum Power transfer theorem.
8. To verify the superposition theorem.
9. To verify De-Morgans law.
10. To study the OR, AND, NOR, NAND & NOT, logic gates & verify the truth table.
11. Study of OPAM as adder, differentiator, integrator.
12. Study of RC Coupled amplifier.
13. Study of h parameters of a transistor.

160

14. To determine hall voltage, hall coefficient and free charge carrier density of a given sample.

Suggested Readings

- Digital Principles and applications by A.P. Malvino and Donald P. Leach
- Electronics: Analog and Digital by I. J. Nagrath
- Modern Digital Electronics 4E by R.P. JAIN
- Handbook of Electronics by S.L. Gupta and V Kumar

Elective I – BOTANY

Paper VI: Plant Physiology and Biochemistry

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 provide an understanding of Biochemical and physiological phenomena at functional and molecular level.

Unit I: Basics of enzymology : Discovery and nomenclature; Nature and characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and cofactors; regulation of enzyme activity; mechanism of action.

Unit II: Plant – Water relations : Importance of water to plant life; physical properties of water; diffusion and osmosis; absorption, transport of water and transpiration; physiology of stomatal movement.

Mineral nutrition : Essential macro and micro-elements and their role; deficiency symptoms; mechanism of mineral uptake.

Transport of organic substances: Mechanism of phloem transport; source-sink relationship; factors affecting translocation.

Unit III: Photosynthesis : Historical aspects; photosynthetic pigments; action spectra and enhancement effects; concept of two photosystems; Z-scheme; photophosphorylation; Calvin cycle; C-4 pathway; CAM plants; photorespiration. Significance of photosynthesis.

161

Respiration : Aerobic and anaerobic respiration, kreb's cycle; electron transport mechanism (chemi-osmotic theory); Redox potential; oxidative phosphorylation; ATP the biological currency? Pentose phosphate pathway.

Unit IV: Nitrogen and lipid metabolism :

Biology of nitrogen fixation; importance of nitrate reductase and its regulation; ammonium assimilation; structure and function of lipids; fatty acid biosynthesis; β-oxidation; saturated and unsaturated fatty acids; storage and mobilization of fatty acids.

Unit V: Growth and development :

Definitions; phases of growth and development; Kinetics of growth ; seed dormancy, seed germination and factors of their regulation; plant movements; the concept of photoperiodism; physiology of flowering; Florigen concept; biological clocks; physiology of senescence, fruit ripening; plant hormones- auxins, gibberellins, cytokinins, abscisic acid and ethylene, history of their discovery, biosynthesis and mechanism of action; photomorphogenesis; phytochrome and cryptochrome, their discovery, physiological role and mechanism of action

Practical

Objectives:

1. To impart the skills of handling and setting up of apparatus to conduct plant physiological

experiment, collection of data and interpretation of results.

Plant Physiology

1. To study the permeability of plasma membrane using different concentrations of organic solvents inorganic salts.
2. To study the effect of temperature on permeability of plasma membrane.
3. To prepare the standard curve of protein and determine the protein content in unknown samples.
4. To study the enzyme activity of catalase and analyse as influenced by pH and temperature.
5. Comparison of the rate of respiration of various plant parts.
6. Separation of chloroplast pigments by solvent method and chromatography.
7. Determining the osmotic potential of vacuolar sap by plasmolytic method.
8. Determining the water potential of any tuber (potato).

162

9. Separation of amino acids in a mixture by paper chromatography and their identification by comparison with standards.

10. Bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant material.

11. Demonstration of root and shoot formation from the apical and basal portion of stem segments in liquid/solid medium containing different hormones.

Scheme of Practical Examination

1. Performing a plant physiology experiment, collection and interpretation of data 5.
2. To perform the given biochemical test. 5
3. Comment upon the experiment set before you. 5
4. Viva-voce 5
5. Sessional and practical record. 5
6. Internal evaluation 5

Suggested Readings

- Salisbury, F.B. and Ross, C.W., 2005, Plant Physiology (4th Edition)
- CBS Publishers & Distributors
- Taiz L. and Zeiger E., 2003, Plant Physiology (2nd Edition)
- Panima Publishing Lorpin, New Delhi
- Mohr. H and Schofer, P. 1995, Plant Physiology, Springer Verlag. Berlin Germany
- Noggle G.R. and Fritz. G.J. 2003 Introductory Plant Physiology, Narosa Publishing House, New Delhi
- Mukherji, S. and Ghosh A.K. 2006 Plant Physiology, New Central Book Agency, New Delhi
- Sinha R.K. 2004, Modern Plant Physiology Narosa Publishing House, New Delhi

---

Elective II – CHEMISTRY

Paper VI

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 the candidates will be required to attempt one.

163

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

(i) Gain detailed knowledge about hard and soft acid and bases and appreciate the use of this concept in the learning of inorganic chemistry.

(ii) Learn silicones and phosphozenes as inorganic polymers and assess the significance of the loading parameters in them.

(iii) Get a comparative view of the valence bond theory and crystal field theory in explaining the behaviour of the complex species.

(iv) Enumerate the factors affecting the thermodynamic stability of the complex species.

(v) Give explanation about the magnetic and spectral behaviour exhibited by various complex species.

(vi) Appreciate the role of organometallic chemistry in the industry.

(vii) Assess the role of metals ions with special reference to alkali and alkaline earth metals in various biological processes.

Instructional Strategy:

In dealing with the Hard and Soft Acids and bases, the teacher may make use of Ausubel's advance organiser model. Use of ICT may be ensured in dealing with silicones and phosphozenes. Bonding in complexes, thermodynamic stability of complexes, magnetic and spectral properties associated with the complexes be dealt with keeping in focus the cognition needs of the learner through problems solving and intentionally arousing cognitive conflict. Organometallic chemistry may be transacted keeping in focus the structured parameters. Bi-inorganic chemistry may be learnt through posters sessions wheresoever posters can be prepared to highlight metabolic paths.

UNIT – I   (A)   Hard and Soft Acids and Bases (HSAB) : Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis & hardness and softness, electronegativity and hardness and softness.

(B) Silicones and Phosphazenes: Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

UNIT – II

(A) Metal-ligand Bonding inn Transition Metal Complexes: Limitations of Valence bond theory, an elementary idea of crystal-field, crystal field splitting

164

in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

(B) Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

UNIT – III

(A) Magnetic Properties of Transition Metal Complexes: Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of μ_s (spin only) and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d-metal complexes.

(B) Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy Level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complexion.

UNIT – IV

Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds. Preparation, Properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metal-ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Organometallic Compounds: Organomagnesium Compounds: The Grignard reagents formation, structure and chemical reactions.

Organozinc compounds: Formation and chemical reactions.

Organolithium compounds: Formation and chemical reactions.

Organosulphur Compounds: Nomenclature, structural feature, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

165

UNIT – V

Bio-inorganic Chemistry: Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}, Nitrogen fixation.

Practical:

1. Gravimetric Analysis
   a. Analysis of Cu as CuCNS.
   b. Analysis of Ni as Nickel dimethylglyoxime.
   c. Analysis of Ba as $BaSO_4$

2. Separation Techniques
   a. Separation of Mg(II) and Fe(II) by solvent extraction.
   b. Separation of Mg(II) and Zn(II) by ion exchange.

3. Synthesis and Analysis
   a. Preparation of sodium trioxalatoferrate(II) and determination of its composition by permanganatometry.
   b. Preparation of Copper(II) tetramine complex.
   c. Preparation of cis and trans bisoxalaodiaquochromate(II) complex.

4. Colorimetery
   a. Job's Method
   b. Mole-ratio Method
   c. Determination of $KMnO_4$ in given solution
   d. Determination of $K_2Cr_2O_7$ in given solution.

Suggested Readings

1. Cotton, F.A. , G. Wilkenson, G. andGaus, P.L. , Basic Inorganic Chemistry: John Wiley and Sons, New York.
2. Lee, J.D. , Concise Inorganic Chemistry ELBS
3. Sharpe, A.G., Inorganic Chemistry ,ELBS
4. Malik, Madan and Tuli; Modern Inorganic chemistry: S. Chand and Company Ltd.
5. Donglas, Bodie E., Concepts and Models of Inorganic chemistry
6. Malik, Madan and Tuli; Advanced Inorganic Chemistry S. Chand and Company Ltd.
7. Huheey, James E., Inorganic Chemistry 4th Ed - New Delhi: Pearson Education.

8. Manku, G.S., Theoretical principles of Inorganic Chemistry, Tata McGraw – Hill Publishing Company, New Delhi

9. Soni, P.L., Textbook in Inorganic chemistry (a modern approach) Sultan Chand and Sons, New Delhi.

Elective III – ZOOLOGY

Paper VI: REPRODUCTIVE BIOLOGY, DEVELOPMENTAL BIOLOGY AND ENDOCRINOLOGY.

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 the candidates will be required to attempt one

Objective – To study reproductive biology, developmental biology, various endocrine glands their structure and function.

Unit-1.

1. Reproductive system in mammals
2. Gametogenesis, structure of sperm and ova.
3. Physiology of reproduction and fertilization in mammals.(with special reference to human)
4. Estrous cycle and menstrual cycle
5. Pregnancy, parturition and lactation.

Unit-2.

1. Types of animal eggs.
2. Clevage pattern.
3. Development of chick embryo up to formation of primitive streak.
4. Extra embryonic membranes and fate map of frog and chick.
5. Placentation in mammals.

167

Unit-3.

1. Concept of competence.
2. Cell determination.
3. Cell differentiation and regeneration.
4. Parthenogenesis.

Unit-4

1. Hormones their classification and mechanism of action.
2. Receptors, primary and secondary messengers and signal transduction.
3. Study of hypothalamus and pituitary gland.
4. Hypothalamo-hypophysial portal system, pituitary hormones and their functions.

Unit-5.

1. Structure and function of Thyroid and Parathyroid gland.
2. Structure and function of Thymus.
3. Structure and function of Islet of Langerhans.
4. Structure and function of Adrenal gland.
5. Hormones released by gonads and their function.

PRACTICAL

Objective – To develop the skills to study embryonic developmental stages of animals, reproductive physiology and endocrinology.

1. To study developmental stages of chick through whole mount, section and models.
2. Study of developmental stages of frog -whole mount section and models.
3. Window preparation of avian egg.
4. Identification of endocrine gland.
5. Identification and study of extra-embryonic membranes, fate map through charts and models.
6. Identification and study of Placentation in mammal through charts and models.
7. Study and identification of gonads. (permanent slides)
8. Study of estrous cycle and menstrual cycle through charts and handouts.

SCHEME OF PRACTICAL EXAMINATION

1. Spotting - 10
2. Window Preparation - 05
3. Exercise based upon reproductive cycle /

168

Placentation   -   03
4. Practical Records   -   03
5. Viva-voce   -   04

Referred books -:

1. Animal Physiology –Eckert and Fremann
2. Animal Physiology –Chaterjee
3. General and Comparative Physiology – William S. Hoar.
4. Principles of Animal Physiology –Wood.
5. Endocrinology – Hadley.
6. Mammalian Physiology –Guyton & Hall.
7. Developmental Biology – V.B. Rastogi
8. Chordate Embryology –Arora.
9. Embryology –Ballinsky.
10. Molecular Development –Wolpert.
11. Comparative Anatomy - Prosser.

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 30+30=60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practicum 5)

Practicum – 25 (Internal)

M - 6.1: METRIC SPACES

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

Objectives: To develop the understanding of the basics of Topology and modern analysis

Unit - I   Definition and examples of metric spaces. Neighbourhoods. Limit points. Interior points, Open and closed sets. Closure and interior. Boundary points. Sub-space of a metric space.

Unit - II   Cauchy sequences. Completeness. Cantor's intersection theorem. Contraction principle. Construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field. Dense subsets.

169

Unit - III   Baire Category theorem. Seperable, second countable and first countable spaces. Continuous functions. Extension theorem.

Unit - IV   Compactness for metric spaces continuous Function and Compact set. Sequential compactness, Heine Borel theorem.

Unit - V   Totally bounded spaces. Finite intersection property. Continuous functions and Connectedness. Continuous functions and connected sets.

Content as in

G.F. Simons -Introduction to Toplogy and Modern Analysis Mc Graw Hill

M - 6.2: LINEAR ALGEBRA

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

Objectives : To develop the understanding of further Abstract Algebra

Unit - I   Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases.

Unit - II   Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.

Unit - III   Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation.

Unit - IV   Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a subspace. Bilinear, Quadratic and Hermitian forms. Inner Product spaces – Cauchy – Schwarz inequality. Orthogonal vectors. Orthogonal complements. Orthonormal sets and bases.

Unit - V   Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization – process. Modules, submodules. Quotient modules. Homomorphism and Isomorphism theorems.

Content as in :

I.N. Heirstein Topics in Algebra Wiley Eastern

170

M - 6.3 Mathematics Practicum

List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester VI Mathematics papers M-6.1 and M-6.2.

- Mathematics seminar.

Education Component

PC – 1. Physical Sciences - 2

Contact Periods/week: 05

Maximum Marks – 60
Min. Pass Marks – 20
Internal – 15

Course objectives: The student teacher will be able to-

1. Plan learning design based on problem-situations, inquiry episodes and projects to facilitate learning of physics.

2. Realise his/her role as a facilitator in transacting physical content in the real classroom situations.

3. Explore the use and relevance of different learning resources and material in learning different in physics.

4. Develop learning materials or selected themes that facilitate learning of physical science.

5. Identify the physical themes for which community can be used as learning sites.

6. Correlate physical science related activities through science club during school attachment programme.

7. Use the science laboratory in schools, facilities and materials available in class that facilitate learning of physical sciences.

8. Get familiarised with the different types of curricular projects in physical sciences and their purposes and themes.

9. Become aware of various professional development programmes in physical sciences

10. Reflect upon his/her own experimental knowledge in the different processes of becoming a physical science teacher.

11. Develop teaching/learning projects using ICT.

171
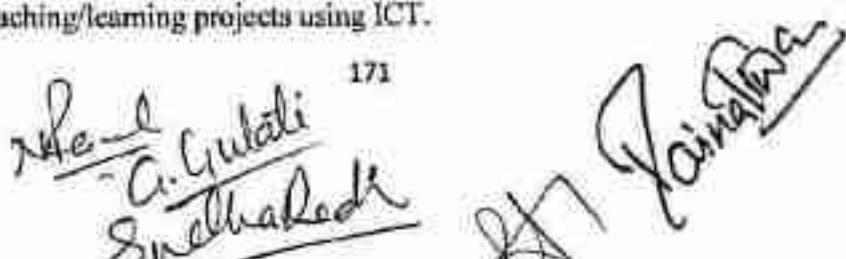
Unit :1 Pedagogic planning in learning physical sciences

Visualising learning situations in

- Grouping of learners for collaborative and cooperative learning, creative learning situations.
- Teacher and students reflections in the process f learning.
- Transaction modes in inaccessible, deprived areas of the society and for group of differently abled children (inclusive education)
- Providing multiple learning context and opportunities, encouraging student ownership of knowledge and engagement in the learning process, effective ways of questioning, engaging in learning episodes, developing the attitudes of being the rational problem solver, taking account of student's prior knowledge, encouraging student's inquiry abilities, valuing student's ideas and small group work, different ways of scaffolding and negotiating, holding brain- storming sessions.

Unit: 2 Learning resources and preparation of materials

- Role of language in science
- Preparation and use of learning aids contextually.
- Audio-visual materials – chart, models, films, and filmstrips, radio, TV, supplementary books, handbooks, laboratory guide, science kits etc.
- Field trips, national parks, study tours, community as a resource site for learning, physics.
- Self-learning materials- worksheets.
- ICT in learning physical science, websites on physical science, interactive websites, on line learning, and preparation of projects using ICT.
- Use of science labs- facilities, equipments, materials, and manuals, science records.
- Unit planning and lesson planning.
- Science exhibitions, contextual activities (Environmental day, Earth day, science day, etc.).
- STS connections
- Enhancing professional competency of physical science teachers through action research, participation in seminars, developing write-ups for research communication.
- Learning beyond textbook

172

Unit: 3 Assessment of learning in physical sciences

- Construction of test items to access simple factual knowledge, higher thinking and application abilities; reliability and validity of test items; preparation of the blue print of a question paper, use of observation techniques for assessment, recording and evaluation procedures to assess the performance of students activities, projects, laboratory skills, group assessment; self and peer assessment, assessment of worksheets; student's writings; use of rubrics in assessment.
- Evaluation of text books in physical sciences at secondary stage

Unit: 4 Curriculum reforms in Physical Sciences

- Salient features, merits and demerits of different science curricula such as PSSC, HPP, CHEMStudy and CBA
- Basic criteria of validity of a science curriculum.
- Role of NCERT in preparation and uses of textbooks, handbook and lab manual at secondary stage.

Unit :5 Strengthening the use of ICT for classroom interactions.

- ICT in learning physical sciences
- Use of websites in accessing useful data for classroom processes
- Online learning
- Preparation of projects
- Preparation of student support material (CAI)

PC – 2. Biological Sciences - 2

Contact Periods/week: 05

Maximum Marks – 60
Min. Pass Marks – 28
Internal – 15

Course objectives: The student teacher will be able to-

1. Realize his/her role as a facilitator in transacting biology content in the real class room situation.
2. Develop learning materials that facilitate learning of biology
3. Identify the biological themes for which community can be used as learning site
4. To know the biology related activities through eco or science club during school attachment.

173

5. Develops the skill of experimental method and investigatory approaches.
6. Become aware of various professional development programmes in Biology
7. Examine the content to seek and understanding that different themes require differential treatment.
8. Develop biology projects using ICT
9. Use the computer in teaching & learning of new inventions about Biological Science.
10. Understand the functions of computer programming in teaching-learning strategies.

Unit I Pedagogical Issues

- Biology and gender issues
- Environmental concerns in biology learning
- Learning beyond textbooks
- Biology related social and ethical issues
- Application of biological knowledge in daily life.
- Role of Peace Education in Biology Education
- Inclusiveness in Biology Education

Unit II Pedagogic Planning in Biological Sciences

- Unit Planning
- Lesson Planning in biology
- Planning for exploration trips
- Learning in peer group
- Planning for teaching training through theatre and films
- Planning for teaching & drawing the diagram
- Planning to use the plant/animal specimen in teaching
- Planning to handle live plants/specimen in classroom/out of classroom teaching.

Unit III Assessment of Learning in Biology-

- Construction of test items (unit test) to assess simple factual knowledge, higher thinking and application abilities. Preparation of blue print of question paper.
- Use of observation techniques, recording and evaluation procedures to assess the performance of students activities, projects, laboratory skills, drawing skills in biology.
- Group assessment, self and peer assessment, assessment of worksheets; students' journals; use of rubrics in assessment.
- Portfolio assessment.

174

Unit IV Learning Resources and Preparation of Material

- Preparation and use of learning aids contextually
- Audio-visual materials, charts, models, aquaria, terraria, school garden, science kits, improvised learning aids, supplementary books
- Self learning materials- worksheets
- Field trips, Natural Parks, Sanctuaries, study tours, biodiversity, economic biology, community as a resource site for learning biology
- Use of biological material in Science labs-facilities, equipments, materials, manuals, records.
- Design of laboratory, nature clubs, eco club, biology club, bird watching, organization of exhibitions, contextual activities (Environmentory, National Science Education will life week etc.

Unit V: Strengthening use of ICT in learning Biology

- Websites on Biological Sciences
- Preparation of projects in ICT
- Use of ICT for learning laboratory techniques in Biology

(Suggested books as given in fifth semester)

PC – 2. Mathematics - 2

Contact Periods/week: 05

Maximum Marks – ??
Min. Pass Marks – ??
Internal – 15

Course objectives: To enable the pupil teacher to:

i.   Understand and appreciate the uses and significance of mathematics in life.
ii. Learn successfully, various approaches of teaching mathematics and to use them judiciously.
iii. Know the methods of planning instruction for the classroom
iv. Construct test items in mathematics.
v.   Appreciate and organize activities to develop aesthetic sense of mathematics.
vi. Obtain feedback both about teaching as well as students learning
vii. Use the tools of ICT for affective transaction of Mathematics Teaching.

175

Unit – 1: Planning in Mathematics Teaching

- Practice of writing specific objectives
- Unit and Lesson planning
- Inductive method of teaching mathematics
- Deductive method of teaching mathematics
- Analytic method of teaching mathematics
- Synthetic method of teaching mathematics

Unit – 2: Learning Resources and materials in Mathematics Textbook

- Self learning materials
- Teaching aids: their - meaning
  - need
  - planning
  - making and
  - appropriately using

Unit – 3: Mathematics laboratory and Mathematics club activities

- Meaning of experiments in Mathematics
- Maths lab its meaning, need & designing
- Distinction between Maths lab and Science lab.
- Mathematical games and amusements
- Recreational Mathematics
- Mathematical puzzles
- Mathematics Club
  - Its organization
  - Special activities
  - Tournaments

Unit – 4: Evaluation in Mathematics

- Test items in Mathematics
  - long answer type
  - short answer type
  - very short answer type
  - objective type

176

- Construction of various types of test items in Mathematics

       - The precautions to be taken

       - Reasons for the precautions

Unit 5: ICT in Mathematics Teaching

- MS PowerPoint: Creating, editing and enhancing PowerPoint presentation, Inserting charts (especially making mathematical documents).
- Use of 'MATHEMATICA' software.
- Use of 'MAPLLE' software
- Internet Exploration: Communicating using e-mail and Internet, locating especially the ones dealing with maths. Visiting sloane sequence and creating more sequences in registering them. Internet resources, use of internet for acquiring information.

Suggested Readings:

1. Nagpal, D.P. : Computer Course
2. Tawney, D.A.: Learning through Computer
3. O'Shea T. and John S: Learning and Teaching with Computer
4. User manual for 'MATHEMATICA' software
5. User manual for 'MAPLLE' software
6. What is Mathematics? An elementary approach to ideas and methods.
7. Richard Courant & Herbert Robbins Oxford University Press
8. The Art of Mathematics – Jerry P. King – Plenum Press
9. Techniques of Problem Solving – Steven G. Krant, Universities Press
10. Culture, Excitement and Relevance of Mathematics –V. Krishnamurthy, Wiley Eastern Limited

---

Gender Issues and Peace Education

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives

To enable teacher trainees to acquire knowledge, attitudes, values, skills and competencies to:

- Become aware of role of education in building peace as dynamic social reality.

177

- Understand and resolve conflicts within, and mediate others'.
- Empower themselves and transcend barriers of identity.
- Use pedagogical skills and strategies in and out of classroom for promoting peace at school level.
- Act as agency to promote peace in the local community influencing school.

Course Outline:

Unit I: Concepts and concerns in Education for peace

- Foundation of peace and its components
- Peace Education, Education for peace: Meaning, Nature and Importance: Education for peace
- Initiative: International, National, and local
- Highlights of various philosophies of Peace: M.K. Gandhi, Krishnamurthy, Arobindo Gijubhai, Budheka, Dalai Lama

UNIT II: Peace Context

- Approaches to Education for peace
- Pedagogical skills, Strategies
- Personality formation- Knowledge, Values, Skills and Attitude
- Respect for differences: Socio-economic, Gender, Caste, Religion, Culture, Languages and Regions etc.
- Activities for education for peace

UNIT III: Understanding conflicts and Empowerment of self

- Nature of conflict: causes for conflict
- Skills and strategies for conflict resolution
- Self-management: Anger, stress management, yoga, Meditation, nurturing ethical behavior, Critical self-reflection, discipline
- Effective parenting
- Teacher as peace builder- listening skills, questioning, Providing feedback
- Critical pedagogy of education for peace, promoting dialoguing, decision making
- Integration of peace in different subjects

Activities to be taken-

- Visits to organizations connected with peace and intercultural harmony, and aesthetic appreciation to experience peace as reality submission of reports on experiences.

178

- Assignments on topics which require deep understanding, and generating creative/alternative ideas to deal with issues and challenges to peace few suggested topics and sharing in groups.

Few suggested topics for assignments:

  - Conflicts experienced at home/in family/ in society/ in school etc.
  - Experiences of handling conflicts in a creative manner.
  - Exploring possible strategies of resolving commonly experienced conflicts.
  - Healthy discipline among school children.
  - Identifying challenges of peace in school and dealing with one such challenge.
  - Strategies of promoting healthy relationships on the job.

- Approaches to peace education-case studies of local and international.
- Role plays to enact situations involving conflict, corporal punishment, discrimination, and domestic violence in day-to-day life.
- Films clips displaying, concerns of peace, good intercultural relationships, environmental presentation and other key ideas and discussions thereon, like- Doha Debates, Sadako etc.
- Preparation of collages from newspapers etc. to highlight issues and challenges to peace or positive response to them.
- Developing an action plan for peace in school and local community.
- Visiting websites on peace education to become familiar with national and international initiatives, approaches and strategies of peace, case studies of conflict in the region.

Suggested readings:

- Gangrade K.D. (2001) Religion and peace, A Gandhian Perspective, Gandhi Smriti and Darshan samiti, New Delhi.
- Harris. I.M. 1998. Peace Education, McFarland, North Carolina, NCERT, New Delhi
- Kaur, B. 2006. Peace Lines. Penguin Publications, New Delhi, (in Press)
- Kumar, K. (2007), Santi Shiksha Aur Gandhi. (in Hindi) Maharishi Valmiki College of Education, Delhi University
- Krishnamurti.J. 1997. The Flame of Attention. Krishnamurti Foundation Trust Ltd., London.

- Ministry of Human Resource Development, 1993, Learning without Burden: A Report of the Advisory Committee, (MHRD), Department of Education, New Delhi.
- NCERT 2005, National Curriculum Framework, NCERT, New Delhi
- NCERT 2005 position paper on Educational for Peace NCERT, New Delhi
- Prasad, D (2005), Education for living; Creatively and Peacefully, Spark India Hyderabad, A.P.
- Hant, T.N. (2004) Being Peace, Nice Printing Press, Delhi
- UNESCO (2001), Learning the way the Peace- A Teacher's Guide to Peace Education, A.S. Balasooriya, UNESCO, New Delhi
- UNESCO (2002), Learning to Be, A Holistic and Integrated Approach to value Education for Human Development Bangkok.
- Well Pierre 2002- The art of living in peace, UNESCO publication, UNIPALK

Schooling, Socialization & Identity

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives:

- To become aware of the processes of socialization at home which contribute in shaping identity formation of the school going child (in Indian contexts)
- To reflect critically on factors that shape identity formation.
- To acquaint with the processes that shape one's own sense of identity.
- To become critically aware of 'identity'
- To 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'
- To recognize the clash of identity as an offshoot of narrow identity assertion
- To appreciate and work in developing national, secular and humanistic identity
- To work for the construction of universalistic and humanistic identity

Course Content:

Unit-I : Socialization and its conditioning influences

180

- Meaning and Nature of Socialization, and Socialization Process
- Social Institutions and Socialization: Role of Family; School: community
- Impact of socialization processes on the development of the 'self'
- Self and related concepts: self esteem; self efficacy and self actualization
- Aspects of self: physical self, social self, competent self and inner self
- Factors influencing self development: Life Skills; Professional Ethics

Unit-II: Identity formation

- Meaning of 'identity formation'
- Culture and Identity formation
- Social categories such as caste, class, gender and religion as determinants of identity formation among individuals and groups
- The influence of peer group, of media messages on identity formation in contemporary society

Unit-III: Schooling and identity

- Schooling for identity formation
- The impact of schooling on identity formation: school culture and ethos; teaching learning practices and teacher discourse in the classroom, (practices, value framework and 'hidden curriculum' in schools)
- Schooling and national identity; schooling and secular identity; schooling and humanistic identity

Unit-IV: Identity, conflict and violence

- Emergence of multiple identities
- Assertion of identities, conflict and violence
- Learning to live together with multiple identities: role of education
- Growing Competition- Increase Conflict
- Conflict Resolution
- Concept of emotional intelligence and its role in practicing peace

Transactional Modes:

- Introductory lectures-cum-discussion, to introduce key themes of the course-socialization, identity formation, sociological notions and experiential sense of 'self' etc.

181

- Group discussion and exploration, around selected readings and key questions;
- Reflective, autobiographical writing, towards self-understanding, on given topics
- Journal writing, on course experiences, to be initiated... to be continued through the year, with occasional sharing with a 'mentor'
- Critical study of identity formation in schools

Suggested Readings:

- Amalendu Misra, (2004). Identity and Religion Foundations of Anti-Islamism in India. Sage Publications, New Delhi.

- Dipankar Gupta (Ed.) (2004). Caste in question : Identity or Hierarchy . Sage Publications, New Delhi.

- Kamala Ganesh & Usha Thakkar (Ed.) (2005). Culture and Making of identity in India. Sage Publications, New Delhi.

- Saraswati, T.S. (Ed.) (1999). Culture, Socialization and Human Development. Theory, Research and Applications in India. Sage Publications, New Delhi.

- Sen Amartya (2006). Identity and Violence. The Illusion of Destiny. Allen and Lane: Penguine Books India Pvt. Ltd. New Delhi.

- Srinivas M.N. (1986). Social Changes in Modern India, Allied Publishers, Bombay.

- Vidyanathan, T.G. (1989), 'Authority and Identity in India', in 'Another India' Daedalus, Fall, 118(H); 147-69.
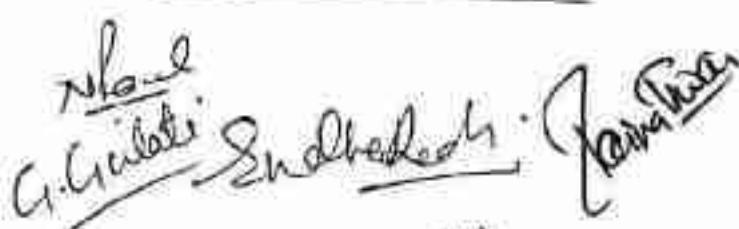
182

Bachelor of Science and Bachelor of Education

Rani Durgawati University
COURSES OF STUDIES
For
Four Year Integrated
B.Sc.B.Ed. (Eight Semesters) Course

SEVENTH SEMESTER

Subject/Paper	Internal/External	Total
B.Ed. Part	50	50
Pre-internship		
Internship (100+100)	200	200
External Final Teaching (100+100)	200	200
Post-internship	50	50
Action Research (25+25)	50	50
Concerns of Education coming from the field:	50	50
A Report		
Grand Total	**600**	**600**

Two school subjects will be Physical Science and Biological Science/ Mathematics

PRE-INTERNSHIP

Weeks: 03

Maximum Marks – 50

Min. Pass Marks – 17

Internal – 50

Activities

A) Training into Micro-teaching Skills   One Week   15 Marks

    i. Skill of Introduction/Induction

    ii. Skill of Explanation

    iii. Skill of Illustration with examples

    iv. Skill of Reinforcement

    v. Skill of Stimulus variation

183

vi.   Skill of Black Board Writing

B) Orientation into process skills and Content Analysis One Week 15 Marks

    i.   Content Analysis of respective school subjects to identify concepts and processes

    ii.   Process of Observation

    iii.   Process of Classification

    iv.   Process of Inference

    v.   Process of Interpretation

    vi.   Process of Measurement

C) Practice of making Unit and Lesson plans Three days 10 Marks

    i.   Preparing Unit-plans (Two in each Pedagogy course)

    ii.   Preparing Lesson Plans/learning situations (Two in each pedagogy course)

D) Evaluation Formats Three days 10 Marks

    i.   Preparation of Blue Print (One in each pedagogy course)

    ii.   Question Paper (One in each pedagogy course)

    iii.   Orientation into Portfolios

    iv.   Orientation into Rubrics

INTERNSHIP

Weeks - 16

Maximum Marks – 200 (100+100)

Min. Pass Marks – 66 (33+33)

Internal – 200

Activities:

> Lesson Delivery in the classrooms (40 in each pedagogy subject)   50+50   100

> Critical observation lesson (One in each pedagogy subject)   25+25   50

> Final Lessons (One in each pedagogy subject)   25+25   50

> Peer Observation and Reporting (Ten in each pedagogy subject)   10+10   20

> Preparation of Pedagogical Resources (In two pedagogy Subjects) 10+10   20

> Scholastic Achievement Test Record (One in each pedagogy subject) 20+20   40

> Case Study Record   20

184

External Final Teaching

Maximum Marks – 200 (100+100)

Min. Pass Marks – 66 (33+33)

External – 200

Activities:
- Lesson Delivery in the classrooms (One in each pedagogy subject) 75+75   150
- Viva Voce   50   50

Post Internship

Week: 02

Maximum Marks – 50

Min. Pass Marks – 17

Internal – 50

Post-Internship Viva-voce and Records of Internship 50

Action Research

Internship/

Maximum Marks – 50

Min. Pass Marks – 17

Internal – 50

Action Research during Internship and submitting Report in Post-Internship

Concerns of Education Coming from the Field: A Report

Internship/

Maximum Marks – 50

Min. Pass Marks – 17

Internal – 50

Concerns of Education Coming from the field- A Reflective Report   50

(Writing future concerns during Internship and submitting Report in Post-Internship: Credit on originality)
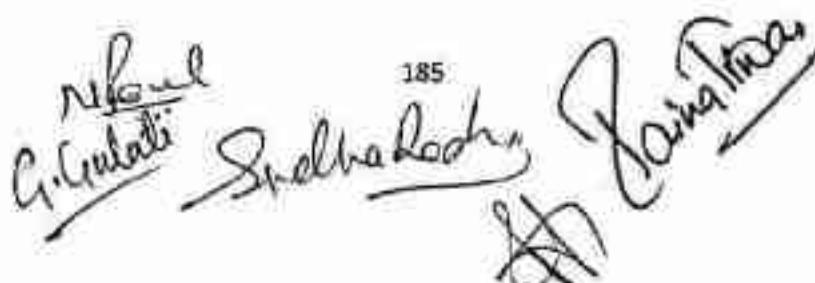
185

Bachelor of Science and Bachelor of Education

Rani Durgawati University

COURSES OF STUDIES

For

Four Year Integrated

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

EIGHTH SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.A./B.Sc. Part: Foundation Course Environmental Education	40	10	50	3
Elective I + Practicum + Pro.	70+50	30	150	9
Elective II + Practicum + Pro.	70+50	30	150	9
Elective III + Practicum + Pro.	70+50	30	150	9
Total	400	100	500	
B.Ed. Part: Vision of Indian Education :Issues and Concerns	40	10	50	3
School Management & Leadership	40	10	50	3
Total	80	20	100	
Grand Total	480	120	600	

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

(All electives 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)

186

Semester Name	Paper	Marks	Paper Code	Name of Papers
VII	Paper Theory-XIII (Select any one Paper)	35	M-8.1(a) M-8.1(b) M-8.1(c) M-8.1(d) M-8.1 (e)	Elementry Number Theory Dynamics of Rigid Bodies Mathematical Statistics Topology, Tensor And Riemannian Geometry Numerical Analysis and '' Language
	Paper Theory-XIV (Select any one Paper)	35	M-8.2 (a) M-8.2 (b) M-8.2 (c) M-8.2 (d) M-8.2 (e)	Hydrostatics Operation Research Discrete Mathematics Differential Geometry Probability Theory
	Internal Test	30		Related to above Papers
	Project, Practical/Dissertation	50		Project, Practical/Dissertation in Mathematics

B.Sc. Component:

Foundation Course: Environmental Education

Paper II

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Distribution of Marks

All five units are compulsory. Two questions to be set from each unit, one to be attempted.

Objectives:

(i) To provide an understanding to the students about basic aspects of the environment and its concerns.

187

(ii)   To generate awareness about the social issues of the environment.

(iii) To enable the students to analyse, evaluate and draw inferences about problems and concerns related to environment.

(iv)   To create awareness about the legal framework for protection of environment and wild life.

Unit I

Ecosystems: Concept, structure and function of an ecosystem. Producers, consumers and decomposers, Ecological succession; Energy flow in the ecosystem: Food chains, food web and Ecological pyramids. Biogeochemical cycles: Oxygen, Carbon, Nitrogen and Phosphorus.

Unit II

Introduction, types, characteristic features, structure and function of the following Ecosystem: Forest, Grassland, Desert ecosystem. Aquatic ecosystems (Ponds, streams, lakes, rivers, ocean, estuaries)

Unit III

Biodiversity and its conservation: Introduction, definition, genetic, species, and Ecosystem diversity.Biogeographical classification of India; Value of biodiversity, consumption and productive use; Social, ethical and aesthetic values.

Unit IV

Biodiversity at global, national and local levels; India as a mega-diversity nation; Hot spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India; Conservation of biodiversity: In situ and ex situ conservation of biodiversity

Unit V

Environmental Pollution: Definition, cause, effects and control measures of – Air pollution, water pollution, marine pollution, noise pollution, thermal pollution and radioactive pollution Nuclear hazards. Solid waste management: cause, effects and control measures of urban and industrialwastes; Role of an individual in prevention of pollution; Pollution case studies;Disaster management :

Floods, earthquakes, cyclone and land slide. Human population and the environment Populationgrowth, population explosion, family welfare programme , variation among nations. Effects environment on human health.

188

FIELD WORK

1. Visit to local area to document environmental assets-rivers, forests, grasslands, hills, and mountains.
2. Visit to local polluted site – Urban, rural, industrial and agricultural
3. Study of common plants, insects, birds.
4. Study of simple ecosystem-pond, river hill slopes, etc. (Field work equal to 5 lecture hours)

Suggested Readings

1. Asthana D.K. and Asthana Meera. 2006 A Textbook of Environmental Studies S.Chand & Co. New Delhi.
2. Purohit, S.S. and Ranjan, R. 2005 Ecology, Environment and Pollution, Agrobios, Jodhpur.
3. Alma Peter 1993 Environmental Concern, Cambridge University Press.
4. Chacha S.K. 1992 Environmental Crisis in India. International Book Distributor, Dehradun.
5. Saveland R.N. 1976. Handbook of Environmental Education. John Wiley & Sons, London.
6. Wright, Richard T and Nebel, Bernard J. 2002 Environmental Science: Towards Sustainable future, Prentice Hall, New Delhi.
7. Abbasi, S.A. 1998: Environmental Everyone Discovery Publishing House, New Delhi.
8. Saxena,A.B. and Anand, V.V. 008 : Essentials of Environmental Education, H.P. Bhargava Book House, Agra.
9. Saxena A.B. 1969: Education for Environmental Concerns. Radha Publications New Delhi.
10. Bharucha, E. 2005: Textbook of Environmental Studies. Universities Press, New Delhi
11. Sodhi G.S. 2005: Fundamental Concepts of Environmental Chemistry Narosa Publishing House, New Delhi.
12. Chapman, J.L. & Reiss, M.J. 2004. Ecology Principles and Applications, Cambridge University Press.

Elective I – PHYSICS

Paper VII: Atomic, Molecular and Nuclear Physics

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (External)

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

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

1. Understand the spectra of hydrogen and the fine structure of spectral lines.
2. Understand Raman Effect and its applications.
3. Understand various spectroscopic techniques.
4. Understand various efforts made by physicists to know about the constituents of the nucleus.
5. Understand nuclear forces and binding of nucleus.
6. Understand the use of nuclear accelerators and detectors.
7. Understand various types of elementary particles, forces of nature

Unit-1: Atomic Physics

Spectra of Hydrogen and alkali atoms, spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules.

Singlet and triplet fine structure in alkaline earth spectra, LS and JJ coupling, Fermi Golden rule.

Unit-2: Molecular Spectra

Discrete set of electronic energies of molecules, quantization of vibrational and rotational energies, determination of inter nuclear distance, pure rotational and rotational – vibrational spectra, dissociation limit for ground and other electronic states, transition rules for pure vibration and electronic vibration spectra.

Raman effect, stokes and anti-stokes lines, complementary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy, ideas about spectroscopic techniques.

150

Unit-3: Structure of Nucleus

Basic nuclear properties - size, binding energy, angular momentum parity, magnetic moment, semi empirical mass formula and application, magnetic moment and non central forces. Meson theory of nuclear forces, salient features of nuclear forces, liquid drop model & shell model of the nucleus - success and limitations.

Alpha decay, Geiger-Nuttal law, Fermi's theory of beta decay, violation of parity in beta decay and continuous and discrete spectra, gamma decay and internal conversion.

Unit-4: Nuclear Detectors and Accelerators

Interaction of charged particles and neutrons with matter, working of nuclear detectors, GM counter, proportional counter and scintillation counter, cloud chamber, spark chamber, emulsion detector. Survey of particle accelerators, cyclotron, synchrocyclotron, betatron, bevatron.

Unit-5: Particle Physics and Nuclear Phenomena

Classification of elementary particles, anti particles and muons and their interactions conversion laws, quark structure of hadrons, field quanta of electro weak and strong interactions, the W-Z particles,

conservation laws.

Q-value of nuclear reactions, nuclear fission and fusion, energy production in stars, nuclear reactors.

Suggested Readings

- Goyal, R.P, Unified Physics, Shivlal Agrawal and Co., Indore.
- Freedman and Young, University Physics, Addison-Wesley
- Sharma, R.C., Nuclear Physics, K. Nath and Co., Meerut.

Physics Practical List

1. To study the nuclear disintegration using GM counter
2. To determine the resistivity of given sample Ge/Si using four probe method

Projects: Innovative approach to experiments

Instructions for students

1. Choose an experiment you want to conduct in a project mode-get allotted.
2. Write its objectives to make it open ended.
3. Collect literature relevant to it.
4. Collect and sequence all materials for conducting it.

191

5. Formulate hypothesis.
6. Envisage process to attack problems and verify hypothesis.
7. Conduct experiments.
8. Tabulate observation for each objective separately.
9. Plot graphs for finding any relationships.
10. Infer from graphs.
11. Discuss reliability of result.
12. Make error analysis.
13. Write questions that need to be answered on the project.
14. Whether the stated objectives have been realized or not. If not what were the constraints (sources of error).
15. Number of consultation done with the teacher, experts and peer group about the project.
16. Write utility and scope of your investigation.
17. Provide references and acknowledgement.
18. Submit project by 15 march of each session.

Topics for suggestive projects (interdisciplinary projects are welcome)

1. communication electronics.
2. nano technology
3. superconductivity
4. projects based innovative experiments like half life simulations, galileo experiment, cart experiment, projectile motions, head on collision, rutherford scattering.
5. atmospheric physics
6. plasma physics
7. biophysics
8. design of power supply.

192

Elective I – BOTANY

Paper VII: Ecology and Improvement of Plant Resources

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (External)

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

Objectives :

> To enable the student teacher to understand the plants in relation to their environment.

> To provide an understanding for the improvement of plants by different methods.

Unit 1: Plants and environment :

Atmosphere (gaseous composition), water (properties of water cycle), light (global radiation, photo synthetically active radiation), temperature, soil (development, soil profiles, physicochemical properties) and biotic factors. Morphological anatomical and physiological responses of plants to water (hydrophytes and xerophytes), temperature (thermo periodicity) and vernalization), light (photoperiodism, heliophytes and sciophytes) and salinity.

Unit II:

Population ecology	:	Growth curves, ecotypes and ecads.
Community ecology	:	Community characteristics, frequency, density, cover, Raunkiar's life forms, biological spectrum; ecological succession.

Unit III: Ecosystems :

Structure, abiotic and biotic components; food chain, food web. Ecological pyramids, energy flow; biogeochemical cycles of carbon, nitrogen and phosphorus.

Unit IV

Biogeographically regions of India, vegetation types of India with special reference to Madhya Pradesh and Chhattisgarh, National Parks in M.P. and Chhattisgarh, endangered plant species and their conservation.

Unit V : Improvement of Plants :

Plant breeding, nature scope and methods of plant breeding.

193

Breeding for disease resistance.

Vegetative propagation methods, micro propagation, grafting and their economic aspects.

PRACTICAL

Objective – To develop the skill of performing practical of ecology, collection of data, analysis of data and its interpretation.

Practical:

1. Frequency, density and abundance of plant their in grassland ecosystem.
2. Frequency, density and abundance of plant in pond ecosystem.
3. Photo sociological study of vegetation of Shyamala Hills.
4. Determine pH of water from various sources.
5. Determine the pH of Soil.
6. Estimation of biomass (Dry weight/fresh weight) of plant species.
7. BOD/DOD of plant system.
8. Emasculations of flower and Hybridization.
9. Grafting and Layering.

SCHEME OF EXAMINATION (Suggestive -Max. Marks: 25)

1. To conduct an Experiment 10
2. To analyse and interpret the given data 05
3. viva-voce 05
4. Practical Records 05

PROJECT (Internal)

Objective: To develop the skills of designing an experiment, collection of data, and its interpretation for making generalization/testing of hypothesis.

List of Suggestive Projects

1. Acquaintance with the local herbaceous flora and an ecological note about these.
2. Preparation of inventory of tree species of RIE Campus.
3. Listing of soil types in relation to altitude from Shyamla Hills.
4. Enumeration of physical and chemical attributes of soil samples from Shyamla Hills and their relevance to the vegetation.
5. Listing of ephemerals from Van Vihar.
6. Phytosociological study of vegetation of Shyamla Hills in terms of density, frequency, abundance of important species.

194

7. Preparation of Raunkiar's frequency classes of an area.

SCHEME OF EXAMINATION (Suggestive -Max. Marks: 30)

1. Project proposal and presentation	5
2. Project work in lab/field	5
3. Project report	10
4. Viva-voce on the project	10

Suggested Readings

- Kumar, H.D. Modern concepts of Ecology 1992. Vikas Publishing House, New Delhi.
- Koromondy., E.J. 1996. Concepts of Ecology Prentice Hall of India Ltd., New Delhi
- Odum, E.P., 1983, Basic Ecology Saunders, Philadelphia
- Gunguly, A.K. and Kumar, N.C. Cytology, Genetics Plant Breeding and Organic Evolution Emkay Publications Delhi – 110051
- Singh B.D. 1997 Plant Breeding
- Gupta, S.K. 2000, Plant Breeding Agrobios Jodhpur
- Ambasht, R.S. 2001, A Text Book of Ecology Student's Friends & Co. New Delhi
- Shukla, S. and Chandel P.S. 2005, A Text Book of Plant Ecology. S. Chand & Co. New Delhi

Elective II – CHEMISTRY

Paper VII

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (External)

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

Objectives:

After completing this semester the students should be able to:

(i) Get a comparative idea of the concepts involved in classical mechanics and quantum mechanics.

(ii) Learn the origin of Schrödinger wave equation and its application in calculating the energy and wave functions of various atomic and molecular systems.

195

(iii) Appreciate to learn the quantum mechanical explanation of the concept of hybridization.

(iv) Assess the various interplay regions of electromagnetic radiations and their interaction with molecular rotational, vibrational and electronic energies.

(v) Get knowledge about NMR spectroscopy technique in elucidation of the structure of organic compounds and solve problems pertaining to elucidation of structures.

(vi) Utilize spectroscopic techniques in the elucidation of molecular structure.

(vii) Get acquaintance with the subject of photochemistry and make a comparative study about thermal and photochemical reactions.

(viii) Appreciate to learn different photo-physical processes responsible for some interesting phenomenon like fluorescence and phosphorescence.

Instructional Strategy:

In dealing with quantum mechanics, the teachers should impress upon the students the role of mathematical modeling in transaction of concepts in physical sciences. The MO theory may be transacted with the help of computer technology. Alongwith theoretical classroom discussions, to effectively teach the spectroscopy ideas a visit to a nearby instrumental laboratory may be fruitful. The technique of open-ended learning may be encouraged in giving treatment to the subject of photochemistry. Students may be encouraged to take some project work on the study of properties associated with the substances as they effect molecular mass calculation and elucidation of structures. The idea of individual learning may be encouraged for some concepts of electrochemistry.

UNIT – I

Elementary Quantum Mechanics: Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect. De Broglie Hypothesis, the Heisenberg's uncertainty principle. Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.

Molecular orbital theory, basic ideas-criteria for forming M.O. from A.O., construction of M.O.'s by LCAO-H2 + ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of $\square$, $\square^*$, $\square$, $\square^*$ orbitals and their

characteristics. Hybrid orbitals –sp, sp2, sp3-, calculation of coefficients of A.O.'s used in these hybrid orbitals.

Introduction to valence bond model of H2, comparison of M.O. and V.B. models.

UNIT – II

Spectroscopy: Introduction: electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

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

Vibrational Spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, Idea of vibrational frequencies of different functions groups.Finger print region, IR spectra of simple organic compounds.

Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle.

Qualitative description of $\square,\square$ and $\square$M.O., their energy levels and the respective transitions. Application of UV- Visible absorption spectroscopy in structural determination-absorption law(Beer –Lambert law),molar absorptivity,types of electronic transition,effect of conjugation,chronophores&auxochromes,bathochromic,hypsochromic,hyperchromic&hypochromic shifts.UV –spectra of ene and enones.woodwordfischerx rule.

UNIT – III

Spectroscopy: Nuclear magnetic resonance (NMR) spectroscopy.

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

197

Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

UNIT – IV

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

UNIT – V

Heterocyclic Compounds: Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution.Mechnaism of nucleophilic substitution reaction in pyridine derivatives.Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles.Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraupsynthesis and Bishchler-Napieralski synthesis.Mechunizm of electrophilic substitution substitution reactions of indole, quinoline and isoquinoline.

Organic Synthesis via Enolates: acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate, the Claisen Alkylation of 1, 3-dithianes Alkylation and acylation of enamines

Suggested Readings:

1. Chandra ,A.K., Quantum Chemistry TMH Publication

2. . Levine, I.N., Quantum Chemistry, Prentice Hall of India Pvt. Ltd.

3. Banwell, C.N., Spectroscopy , TMH Publication

4. Sharma ,Y.R., Elementary Organic Spectroscopy , S. Chand & Company

5. Glastone, S. Theoretical Chemistry, East-West Publication

6. Puri, Sharma &Pathania, Physical Chemistry, SobanLalNagin Chand & Company

7. Atkins, P.W., & Paula, J.D., Physical Chemistry , Oxford Press

8. Vemulapalli , G.K., Physical Chemistry , Prentice Hall of India Pvt. Ltd.

9. RohtagiMukherjee ,K.K., Photochemistry , Wiley Eastern Ltd.

10. Barrow .G.M., Physical Chemistry ,McGraw Hill Kogakusha Ltd. Tokyo 4th Edition 1979.

Elective III – ZOOLOGY

Paper VII: - ECOLOGY, ETHOLOGY AND APPLIED ZOOLOGY

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 70

Min. Pass Marks – 23

Internal – 30 (Theory 20 & Practical 10)

Practical/ Project – 50 (External)

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

Objectives: To develop skill of analysis of behavioural patterns of animals and their place in the ecosystem and to utilize the various biotic components in a practical manner for economic purposes.

Unit-1

1. Concept and ideas of ecology; scope ecology, autecology, synecology, habitat and ecological niche, habitat ecology – aquatic and terrestrial.

2. Concept of ecosystem, different types of ecosystem, structure and function of ecosystem, some major ecosystems, energy flow in an ecosystem

3. Food chains, food webs and ecological pyramids

4. Population Ecology – Definition and characters of population, population density, natality, mortality, age distribution, biotic potential of population, population dispersal

5. Biogeochemical cycles: patterns and basic types of biogeochemical cycles, cycling of pattern in ecosystem like carbon, phosphorus, nitrogen cycle.

Unit-2

1. Community Ecology- Concept of biotic community, community structure, analytical and synthetic characters of community

2. Ecological Succession: Causes, basic types, general process

3. Biodiversity Conservation: Definition, types, value and importance

4. Hotspots of biodiversity, Megabiodiversity nations, conservation of biodiversity (Ex situ and in situ conservation strategies)

5. Forest Resource: types and importance of forest; Forest resources of India. Deforestation effects of Deforestation, Management and conservation of forest

199

Unit-3

1. Environmental pollution- concept of pollutant and contaminant: Primary and secondary pollutants, Air pollution- Definition, sources and effects, Soil pollution- Definition, sources and effects.

2. Water Pollution- Definition, sources and effects, Noise Pollution- sources and effects, Pesticides- Definition, Categories, general effects, Heavy metals- Definition, examples, general effects.

3. Basic idea about acid rain, green house gases and their effects; ozone hole, eutrophication, bioaccumulation, biomagnifications.

4. Toxicology- Basic concepts, Types of Toxicants, Toxicity testing, LC 50, LD 50, acute and chronic toxicity.

5. Pesticide and their toxicological effects, dose-response relationship categories of toxic effects.

Unit-4

1. Animal behavior: Introduction to Ethology.

2. Patterns of behavior (taxes, reflexes, Instinct and motivation)

3. Biorhythms; learning and memory

4. Migration of fishes and birds, social behaviour in animals.

5. Courtship and reproductive Behaviour.

Unit-5

1. Aquaculture and pisciculture

2. Sericulture.

3. Apiculture.

4. Lac-culture.

5. Control of insect pests (Biological and Chemical)

PRACTICAL

Objective – To make students develop skills of maintenance of components of ecosystem in an artificial condition and to take initiatives to analyse the environment and organism to understanding the practical aspects of life.

Mandatory Class Work Experiments:

1. Study of museum specimen of fresh water edible fishes, honey bee and prawn.

2. Study of pH of water and soil.

200

3. Maintenance of aquarium.
4. Study of plankton-Euglena, Paramecium, Cyclops, Mysis, Daphnia and other Planktons in water.
5. Analysis of DO, COD, BOD in water samples.
6. Analyses of chloride, lead, carbonate, zinc ions etc. in water samples.
7. Study of biodiversity through quadrate method.
8. Calculation of Shannon-Weiner index.
9. Toxicity testing through LD50 and LC50 method.
10. Experimentation on learned behaviors of animals.
(eg: light sensitivity in earthworms, olfactory senses in Drosophila sp.)

Individual Project Submission:

Aim: to develop the skill of data collection, hypothesis and generalization and analysis, interpretation of data (related to syllabus of all semesters).

SCHEME OF EXAMINATION (Suggestive)

1. Experiment 1 (Ecology)		09
2. Experiment 2 (animal behaviour/Toxicity testing)		06
3. Spotting		05
4. Study of planktons		02
5. Practical Records		03
6. Project submission and viva-voce 25		
	Total = 50 Marks	

Suggestive books –:

1. Fundamental of Ecology-E.P.Odum,W.B.Saunders Com., 3 rd Edition
2. Environmental Biology, Biswarup Mukherjee, Tata McGrew-Hill Publishing Com. Ltd.
3. A Textbook of Environment, K.M Agarwal, P.K Sikdar & S.C.Deb. MacMillan India Ltd.
4. Concepts of Ecology, Edward J Kormondy Prentice- Hall of India Pvt.Ltd., New Delhi
5. Introduction to Environmental science, Y Anjaneyulu. B.S Publishing Com. Ltd.
6. Principles of Animal Taxonomy, G.G simpson, Columbia University press
7. Environmental Science- A Global concern, William P Cunningham, Barbara Woodworth saigo. WCB McGrew-Hill
8. Principles of Systematic Zoology, Mayur.McGrew-Hill Publishing Com. Ltd.

201

9. Environmental Science, Richard T Wright, Pearson, Prentice Hall

10. Environmental Science; Earth as a Living Planet, Daniel B Botkin & Edward A Keller, John Wiley & sons.Inc.

11. Elements of Ecology, Cierke. John, Wiley & sons

12. Environmental Studies, A.K. De, Age International Pvt.,Ltd

13. Environmental Chemistry, New A.K De, New Age International Pvt.,Ltd

14. Aquaculture

15. A Manual of fresh water aquaculture

16. Aquaculture

17. Tropical Fish Farming

18. Fishes of India

19. Introduction of Fishes

20. Applied Entomology

21. Pest Control and its ecology

22. Laboratory Techniques in Modern Biology

Elective III – Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks – 35+35=70

Min. Pass Marks – 23

Internal – 30

Practicum – 50 (Internal)

(One each to opt. out of M-8.1 and M-8.2)

M — 8.1 (a) ELEMENTARY NUMBER THEORY

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

Objectives : To develop the understanding of Elementary Number Theory

Unit — I   Division algorithm. Congruences and modular arithmetic.G.C.D.

Unit — II   The Diophantine equation ax+by = c Chinese remainder theorem. Euler phi function. Primes and factorization, Fermat's and Wilson's theorem

Unit — III   The order of integer modulo n, Primitive-roots for primes Composite number having primitive roots Quadratic law of reciprocity, and its application.

202

Arithmetical functions. Mobius inversion formula. Numbers of special form-perfect numbers, Mersenne primes, Fermat numbers.

Unit — V The Diphantine equations $x2 + y2 = z2$, $x4 + y4 = z2$. Farey sequences.

Content as in

David M. Burton : Elementary Number theory Wm C.Brown Publishers

M — 8.1(b) DYNAMICS OF RIGID BODIES

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

Unit — I   Moments and products of inertia. The momental Ellipsoid. Equimomental Systems. Principal axes.

Unit — II   D' Alembert's principle. The general equations of motion of a rigid body. Motion of the center of inertia and motion relative to the center of inertia.

Unit — III   Motion about a fixed axis. The compound pendulum. Center of percussion.

Unit — IV   Motion of a rigid body in two dimensions under finite and impulsive forces.

Unit — V   Conservation of Momentum and Energy. Lagrange's equations. Initial Motions. Content as in : S.L. Loney: An Elementary Treatise on the Dynamics of a particle and rigid Bodies Cambridge Univ. Press

M — 8.11 MATHEMATICAL STATISTICS

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

Unit — I   Probability: Independent and dependent events, conditional probability. Addition and multiplication theorems, Bayes theorem, Random variables – Discrete and continuous variates and their distributions.

Unit — II   Binomial, Poison, rectangular, exponential and normal distributions, their derivations, properties and uses.

Unit — III   Methods of least squares, curve fitting, co-relation and regression (two variates only)

Unit — IV   Partial and multiple co-relation, regression (upto three variates only).

Unit — V   Sampling, Null and Alternate hypotheses, errors of first and second kind, level of significance, critical region, one-tailed and two – tailed tests. Test of significance based on Chi-square (goodness of fit and test of independence) 't' and 'F' (to test equality of several means) statistics

Content as in

S.C. Gupta, V.K. Kapoor "Fundamentals of Mathematical statistics"

203

M — 8.1(d) TOPOLOGY, TENSOR AND RIEMANNIAN GEOMETRY

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

Unit -1 Topology: Topological spaces, Comparison of topologies, close set, Neighborhood, Basis for a topology, limit points, Adherent points and derived set, interior, exterior and frontier of a set.

Unit- 2 Continuity in topological space, compact space, Heine-Borel theorem, connected space.

Unit- 3 TENSOR ALGEBRA- Space of N-dimension, Subspace, Curve, Summation convention, Kronecker delta, Transformation of coordinates, Summation of convention, Indicial (or range) convention, Dummy suffix, Contravariant and covariant vectors (Tensor of first order), Tensor of second order (or rank two), Tensor of higher rank (or higher order), Invariant of Scalar, Addition ad subtraction of tensors, Multiplication of Tensor, Contraction, Inner Product, Symmetric Tensor, Skew-symmetric Tensor, Quotient law, Conjugate (or Reciprocal) symmetric tensor, Relative tensor, Tensor field, Christoffel's Index

Unit- 4 Riemannian Geometry: Riemannian metric, Magnitude of a Vectors, Length of a Curve, Unit Tangent Vector, Associated Vectors, Angle between two vectors, Conjugate of Reciprocal Symmetric Tensor, Law of Covariant differentiation of Tensor, Divergence of a Tensor, Curl of a Tensor, Ricci's Theorem, Curvature Tensor or Riemannian Christoffel Tensor, Ricci Identity, Bianch's Identity, Ricci's Tensor, Riemannian christoffel's Tensor of first kind or Associative Curvature tensor or Covariant Curvature tensor,

Unit- 5 Riemannian manifold or Riemannian space, Curvature of a curve, Derived vector, Geodesics and related theorems, Geodesic mapping, Gradient, Weyl's Curvature tensor or Projective Curvature Tensor, Geodesic Coordinate, Riemannian Coordinates, Riemannian curvature, Einsteen space, Flate space, Schur's theorem, Weyl's Tensor, Fundamental theorem of Riemannian geometry.

Content as in :

G.F. Simons	–	Topology and Modern analysis
J.N.Sharma	–	Topology
James R. Munkres	–	Topology —A First Course

M —8.1(e) NUMERICAL ANALYSIS AND 'C' LANGUAGE

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

Unit — I	Programme's model of a computer, Algorithms, Flow Chart, Data Types, Arithmetic and Input/output instruction, overview of C++ programming style. Constant, variables, and data type, operations and expressions, Managing Input and Output operations. Decision making and Branching, Decision making and Looping, Arrays, Handling of Character and strings, File formatting.
Unit — II	Interpolation: Lagrange and Hermite. Interpolation, Divided Differences, Difference Schemes, Interpolation Formulae using Differences. Solution of Non-linear Equations- Bisection, Secant, Regula Falsi, Newton's Method. Roots of Polynomials.
Unit — III	Numerical Quadrature: Newton – Cote's Formula, Gauss Quadrature Formula ,Chebyshev's Polynomials.
Unit — IV	System of Linear Equations: Direct Methods for solving system of Linear Equations – Gauss Elimination, LU Decomposition, cholesky Decomposition. Iterative Methods Jacobi, Gauss- seidel, Relaxation Methods.
Unit — V	Ordinary Differential Equations - Euler Method, Single step Methods, Runge Kutta's Method, Multistep Methods, Milne simpson's Method, Methods based on Numerical Integration, Methods Based on Numerical Differentiation. Eigenvalue Problems.

Content as in :

S.S. Sastry: Introductory Methods of Numerical Analysis

M — 8.2 (a) HYDROSTATICS

NOTE :	Two questions will be set from each unit with Internal choice
Unit — I	Pressure equation, Condition of equilibrium, Lines of Force, Homogeneous and heterogeneous fluids. Elastic fluids.
Unit — II	Surface of Equal pressure. Fluid at rest under action of gravity. Rotating fluids.
Unit — III	Fluid pressure on plane surfaces. Centre of pressure. Resultant pressure on curved surfaces.
Unit — IV	Equilibrium of floating bodies. Curves of buoyancy. Surface of buoyancy. Stability of equilibrium of floating bodies. Meta center. Workdone in producing a displacement. Vessel containing liquid.

Unit — V   Gas laws. Mixtures of gases. Internal energy. Adiabatic expansion. Workdone in compressing a gas. Isothermal Atmosphere. Connective equilibrium.

Content as in : W.H.Besant and A.S. Ramsey : A treatise on Hydromechanics Part I ELBS.

M — 8.2 (b) OPERATION RESEARCH

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

Unit — I   Introduction to Operations Research. The linear programming problem. Problem formulation. Linear programming in matrix notation. Graphical solution of linear programming problems.

Unit — II   Some basic properties of convex sets. convex functions and concave functions. Theory and application of Simplex method of solution of a linear programming problem.

Unit — III   The transportation and Assignment problems.

Unit — IV   Charne's M-Technique. The two phase method .Principle of duality in linear programming problem. Fundamental duality theorem. Simple problems.

Unit — V   Game theory – 2 persons zero sum games

Content as in : Operations Research — Man Mohan Singh.

Operations Research — S.D. Sharma

M — 8.2 I DISCRETE MATHEMATICS

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

Unit — I   Sets and Propositions – Cardinality. Mathematical Induction. Principle of inclusion and exclusion. Computability and Formal Languages – Ordered sets. Languages, Phrase Structure Grammars. Types of Grammars and Languages.

Unit — II   Relations and Functions – Binary Relations. Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle.

Unit — III   Graphs – Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Travelling Salesman Problem.

Unit — IV   Planar Graphs. Trees.

Unit — V   Analysis of Algorithms – Time complexity of Problems. Discrete Numeric Functions and Generating Functions. Recurrence Relations and Recursive Algorithms – Linear recurrence Relations with constant coefficients.

206

Homogenous solutions, Particular solutions Total solution. Solution by the method of Generating Functions.

Content as in :

1.   C.L. Liu   -   Elements of Discrete Mathematics
            -    Discrete Mathematics and its applications.

M — 8.2 (d) DIFFERENTIAL GEOMETRY

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

Unit — I   Local theory of curves. Space curves, Examples. Planar curves, helices, Serret Frenet apparatus, Existence of space curves. Involutes and evolutes of curves

Unit - II   Global curve theory – Rotation index, convex curves, Isoperimetric, inequality, Four vertex theorem.

Unit — III   Local theory of surfaces – Parametric patches on surface, First fundamental form and arc length, Normal curvature, Geodesic curvature and Gauss formula, shape operator LP of a surface at a point, Vector field along a curve, second and third fundamental forms of a surface, Weiengarten map.

Unit — IV   Principal curvatures, Gaussian Curvature, Mean and normal curvatures, Gauss theorem, Isometry groups and the fundamental existence theorems for surfaces.

Unit — V   Global theory of surfaces –Geodesic coordinate patches, Gauss Bonnet formulae, Euler characteristic of a surface, Index of a vector field, spaces of constant curvature.

Content as in

T.J. Willmore :   An introduction to Differential and Riemann Geometry.

M — 8.2 (e) PROBABILITY THEORY

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

Unit — 1   Notation of probability, Random experiment, Sample space, axiom of probability, elementary properties of probability, equally likely outcomes, conditional probability, Bayes theorem, Independence, Geometric Probability.

Unit — II   Random variables. Concept, Cumulative distribution function, discrete and continuous random variables, expectations, mean, variance, moment generating function.

Unit — III   Discrete random variable, Bernoulli random variable, binomial random variable, geometric random variable, Poisson random variable.

Unit — IV Continuous random variable. Uniform random variable. Exponential random variable, Gamma random variable, normal random variable.

Unit — V Bivariate random variable. Joint distribution, joint and conditional distribution, the correlation coefficient.

Content as in

1. R.V. Hogg and A.T. Craig : Introduction to Mathematical Statistics
2. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics.

M — 8.3 Project, Practical / Dissertation in Mathematics

List of Activities:

* Project, Practical / Dissertation related to Mathematics
* Mathematics seminar.

Education Component:

Vision of Indian Education: Issues & Concerns

Contact Periods/week: 03

Maximum Marks — 40

Min. Pass Marks — 15

Internal — 10

Objectives:

After the completion of the course Pupil-teachers will:

> Appreciate Constitutional ideals and values and reflect critically on the role of education in realizing those ideals

> Identify and Internalize Values of New Social order envisioned and enshrined in Indian Constitution

> Understand the diverse and complex nature of Indian Society

> Appreciate that the Indian nation is in the process of making

> Reflect on inherent contradictions present in India

> Develop critical faculty in realizing and interpreting the nature of Indian Schooling

> Develop perspective on issues and concerns of Indian schooling

> Become sensitive towards child rights and classroom practices

Unit-4: Understanding India : Indian Constitution: Concern for New Social Order

- Constitution and Preamble: National Ideals

* Democracy,

- Equality.
- Liberty.
- Secularism, and
- Social Justice.
- Constitutional provisions on education that reflect these ideals: Implicit concerns and Issues
- India as a Society: Socio-economic, cultural, linguistic and regional framework
- India as an evolving Nation state: Vision, Nature and Salient Features
  - Democratic polity,
  - Federal structure.
- Implications to Educational arrangements and responsibility
- India as Developing Economy: Salient features and contradictions
  - Development and Displacement.
  - Development and environmental degradation,
  - Growing incomes and widening inequalities.
- Facets/sectors of Indian economy: Agriculture, Industrial and Service
- India as Knowledge economy
- Implications to education

Unit-II: Education as Fundamental Right: Practices of Indian Schooling

- Child Rights: International Covenants and Indian Constitutional Provisions
- Rights of Girl Child
- Education as a Fundamental Right of Children
- Universalisation of School Education
- Equalization of Educational Opportunities
- Problematization of Indian schooling in understanding the apparent contradictions/
- Paradoxes of universality and equality.
  - Private-public schools
  - Urban –rural schools
  - Centre-state schools
  - Many other forms of in-equalities in Indian Schooling
- Schooling and Access: Physical, Epistemological, and Cultural Access
- Issue of enrollment, retention and success: Sociological analysis

Unit III Secondary Education: Status, Issues and Concerns

- Concept of Secondary Education
- Secondary School: its linkages with primary and higher secondary stages of education
- Aims of Secondary Education with special reference to Secondary Education Commission 1954
- Universalization of Secondary Education: status and issues
  - Quantitative Expansion
  - Qualitative Consolidation
  - Equity Perspective—A Sociological Understanding
  - Skill development and Vocationalization
  - Privatization

Unit IV: Guidance and Counseling

- Guidance –concept, need and principles
- Counseling concept, need and principles
- Guidance-Types- Educational, Vocational, and personal
- Educational guidance-nature, scope and approaches
- Vocational guidance-nature, scope and approaches
- Personal guidance-nature, scope and approaches
- Role of teacher in Guidance and Counseling

Transactional Modes:

The transactional/construction modes of the course work may consist of:

- Lecture-cum discussions.
- Extended reading of certain required portions from Indian constitution and UNO conventions on Human Right and Child Rights.
- Observational studies.
- Analysis of education data.

(Practicum on Forms of inequalities and their reflection in Education- A critical study)

(To situate and understand contradictions/paradoxes of economy a Case study/project work on Big Dams or SEZ and any other pressing economic issues may be undertaken.) (Critical study of alternative schooling in the light of education as a fundamental right of every child)

Suggested Readings:

210

1. Avjit Pathak (2004). Social Implications of Schooling: Knowledge, Pedagogy and Consciousness, Rainbow Publishers, New Delhi.
2. Baxi, Upendra (1995). The Human Rights Education: The promise of the Third Millennium, New Delhi.
3. Dube, S.C. (2005). Indian Society, National Book Trust of India, New Delhi.
4. Kumar, Krishna, (1991). The Political Agenda of Education: A Study of Colonialist and Nationalist Ideas, Sage Publication, New Delhi.
5. Levin, Leah, (1998). Human Rights-Questions and Answers, New Delhi.
6. Naik, J.P. (1975). Equality, Quality and Quantity: The Elusive Triangle in Indian Education, Allied Publishers, Bombay.
7. Nehru, Jawaharlal (1989). The Discovery of India, Oxford University Press, New Delhi.
8. PROBE Team, (1999). Public Report on Basic Education in India, New Delhi, Oxford University Press.
9. Sharma, S.K. (1998). Children and The Human Rights, New Delhi.
10. Tawney, R.H. (1964). Equality, Unwin Books, London.

School Management & Leadership

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives:

After completing this paper, student-teachers will be able:

- To develop understanding about the basic concepts and process of school management.
- To understand different components of school management.
- To realize the multifaceted role of a teacher/head teacher.
- To develop the understanding about different school managements in India.
- To develop understanding about the role of different agencies in school management
- To understand and appreciate the process of becoming an effective teacher.
- To understand the role of individuals as followers and leaders within organizations.
- To critically examine the core and contemporary leadership theories relevant to school practice and settings.

- To sensitize the students about new changes and challenges in leadership of institutions
- To develop capacities for being efficient and effective educational leaders.
- To enable them to recognize the importance of management of resources and effective use of ICT in the context of school management.

Course Content:

Unit I: School management and its Components

1.1 Meaning, scope and process of school management.

1.2 Characteristics of Successful School Management.

1.3 Role of the Head master, Teacher and students

1.4 Managing internal organization: Curricular and co- curricular activities

Unit II: School as an Organization

2.1 School Organization: Meaning, Aims and Objectives

2.2 Resource Requirements of School. i.e., Physical, Human and Financial Resources.

2.3 Schools under Different Managements –

   i)   Government - Central, State and Local Bodies.

   ii)   Private – Aided and Unaided.

2.4 Study of Specific Managements –

   i)   Residential Schools Run by Social Welfare Corporations

   ii)   Navodaya Vidyalayas/ Kendriya Vidyalayas / Sainik Schools /Railway School and Public Undertaking

   iii) National / State Open Schools

UNIT III: School Leadership

3.1 Meaning and Nature of leadership

3.2 Theories of Leadership

3.3 Leadership traits: Responsible, self- disciplined, innovative, imaginative, visionary

3.4 Leadership skills: Decision making, Planning, Coordinating, Communicating Evaluating and Feed Back

3.5 Styles of Leadership: Autocratic, Democratic and Laissez-faire

UNIT IV: Dimensions of leaderships: Challenges and Perspectives

4.1 Responsibilities of leaders: Supervision as leadership, Leadership for the learning community, Leading and managing educational change and improvement

4.2 Obstacles to leadership: Resources and priorities, political pressure, social pressure and personal antagonism

4.3 Issues of diversity in educational organizations, including issues related to gender and multiculturalism

4.4 ICT-A Tool for Resource Management

Sessional work (Any One)

- Study of leadership quality of school administrator / Head of the institution.

- Each student will frame an ideal school timetable.

- Students in group of 4 to 5 will prepare outline of curricular and co-curricular activities in school.

- Write an essay on application of ICT in school management, obstacles to leadership and managing teaching- learning.

Suggested Readings:

- Aggarwal, J.C. (2007). School management. Shipra publication. Daryagunj, New Delhi.

- Bhatnagar, R. P. and Agarwal, V. (2006). Educational Administration Supervision. Planning and Financing.R.Lall Book Depot, Meerut.

- Carlson, R. V. (1996). Reframing and reform: Perspectives on organization, leadership and school change. White Plains, NY: Longman Publishers.

- Davies, B. and Ellison, L. (2001). School leadership for the 21st century. RoutledgeFalmer,London.

- Famulavo Joseph, (1986): Hand book of Human resource Administration. M CGraw Hills, New York.

- Freire, P. (1998). Teachers as cultural workers. Boulder, CO: Westview Press.

- Taj, H .(2008). Current challenges in education. Neelkamal publications,Hyderabad.

- Mohanthy, J. (2007). Educational management supervision schoolorganization Neelkamal Publications Private Limited. Hyderabad.

- Tilak, J.B.G. (1992). Educational planning at Grass roots.Ashishpublishing house, New Delhi.

- Kochhar, S.K. (2011). School Administration and Management.Sterling Publisher Pvt.Ltd.,New Delhi.

- Krishnamacharyulu V. (2011). School management and systems of education Neelkamal Publications Private limited, Hyderabad.

- Marshall, P.L. (2002). Cultural diversity in our schools. Belmont, CA: Wadsworth Publishing.
- National curriculum Frame work for teachers. (2009). NCTE.
- National curriculum frame work. (2005). NCERT, New Delhi.
- Nieto, S. (1999). The light in their eyes: Creating multicultural learning communities. ColumbiaUniversity:Teachers College Press.
- Walia, J.S. (2004). Education in emerging Indian Society. Paul Publishers.
- Walker James W. (1980),.Human resource planning.McGraw Hill, N.Y.